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Abstract

The performance evaluation of bank branches is a difficult task. One of the main reasons for this difficulty is the complexity inherent in the variety of aspects to be considered in the evaluation, and the multiple and conflicting interests of the different stakeholders involved. In this paper we aim to show how cognitive mapping and the MACBETH approach can be used to support the evaluation of bank branches through the development of multidimensional performance evaluation systems, and to deal explicitly with the trade-offs between the different dimensions of performance and interests of different stakeholders. A case study is discussed where these techniques are used in a constructive way, making the learning activity easier and introducing transparency in the decision making process. The strengths and weaknesses of the integrated use of these two operational research techniques in this context are also discussed.

Keywords — Bank Branches; Cognitive Mapping; MCDA; Performance Evaluation.

JEL classifications: C44, G21, L25, M10

Introduction

The increasing degree of competition in the banking sector, the irruption of new technologies in the banking activity, the spread of new financial products and services, and the increasing needs for qualified labour have subjected the banking institutions, and in particular bank branches, to a very demanding evolution process in order to achieve competitive advantages or just to survive. In broad terms, bank branches are very much like any other retail channel. However, for some financial products, their role assumes increasing importance for the success of the banks' strategy, namely when customers require human interaction in the course of certain transactions and/or technical advice. Also, when it comes to forecasting demand, their importance appears to be highlighted. Bank branches' performance evaluation is, therefore, critical. Several reasons have been offered to explain why it is fundamental to carry out appropriate performance measurement exercises at the bank branch level (*e.g.* Cook and Hababou, 2001; Hartman *et al.,* 2001; Aleskerov *et al.,* 2003; Emel *et al.,* 2003; Cook *et al.,* 2004; Portela *et al.,* 2004; Camanho and Dyson, 2005; Udeshi, 2005 and Ioannou and Mavri, 2006). Firstly, banking efficiency studies made at an institutional level only reveal branches efficiency averages. Secondly, analysis at a branch level may reveal new business opportunities. Thirdly, branch level studies may be more productive in terms of recommendations and implementation of practical solutions. Finally, detailed studies of branches' efficiency may improve variables behaviour because branches are more sensitive to demographic, regional and/or economic variables.

In addition to these reasons, it is important to emphasise that the banking liberalization, the decreasing intermediation rates, the increasing rates of competition, and the increasing complexity of the banking sector together with the fact that bank branches still have favourable contacts with customers, turned them into important means to improve efficiency in the financial markets. Performance measurement of bank branches is fundamental, not only because it supports the decision process but also because it can contribute to improve results. Therefore, a methodology is needed to support bank branches' performance evaluation. Nevertheless, it is important to bear in mind that performance measurement is not an easy task. Performance measurement of bank branches is difficult because it is not always easy to know what to measure and how to measure it, and also because an agreement between the decision makers involved in the evaluation process is often required.

In spite of the remarkable progress that has been made over recent years in the development of better integrated, balanced and strategically driven performance measurement frameworks, of which the Balanced Scorecard (Kaplan and Norton, 1992) is one of the best known examples, it is recognised that there are still issues which deserve further research if performance measurement systems are to provide a stronger basis from which to manage effectively for improvement.

Diverse reasons may be offered to justify why many efforts to improve performance through performance measurement and management have not met with great success. Taking a holistic view of the field, these reasons can be grouped into two major intertwined categories: the first refers to the design and implementation of performance measurement systems; the second refers to the analysis and use of the information resulting from measurement.

In this paper we focus on the former category. Furthermore, by acknowledging the impossibility of defining a single unifying framework applicable in all contexts and organisations, this paper focuses primarily on the process underlying the design and implementation of performance measurement systems, rather than on measurement frameworks and it adopts a complementarity perspective. That is, it bears in mind the limitations of the most traditional evaluation techniques (*e.g.* efficiency averages and ratios) but tries to make use of some of their positive features by including them, in a constructive and integrated way, in a more holistic performance measurement system.

It is widely recognised that poorly designed performance measurement systems can seriously inhibit their implementation and, consequently, their ultimate impact. It is therefore vital that organisations fully realise the importance of developing appropriate measurement tools.

The identification of factors affecting performance and the understanding of their relationships is one of the most important steps in performance measurement systems' design. It is well known that unless the process of identifying appropriate measures is understood and properly carried out, performance measurement frameworks will be of little practical value (Neely *et al.,* 2000 and 2002). Several techniques have been proposed in recent years to help identify the factors affecting performance, including cognitive maps (Suwignjo *et al.,* 2000), strategy maps (Kaplan and Norton, 2000) and system dynamics (Santos *et al.,* 2002 and 2007). However, the identification of a set of performance measures does not, by itself, conclude the process. It is important to bear in mind that it is likely that some of the performance measures will conflict given that it is difficult for an organisation to excel in all of them simultaneously and, therefore, trade-offs among these measures are inevitable.

Making trade-offs explicit is, therefore, another important step in developing measurement systems. Many other authors have recognised the existence and the need to evaluate trade-offs among performance measures (*e.g.* Richardson *et al.,* 1985; Cross and Lynch, 1988/89; Fitzgerald *et al.,* 1991; Lynch and Cross, 1991, Eccles and Pyburn, 1992; Mapes *et al.,* 1997 and Da Silveira and Slack, 2001). Some of the most well known performance measurement frameworks (*e.g.* the *Balanced Scorecard*, *Results and Determinants Framework* and *Performance Pyramid*) also emphasise the need of measurement systems to make explicit the trade-offs between the various performance measures, but are vague in how to deal with these trade-offs. In these frameworks, trade-offs are implicitly made through the selection of a balanced or multidimensional set of performance measures, but suggestions on how to make the trade-offs explicit in practice are often not offered. Indeed, there appears to be little concern in the field of business performance measurement on the use of structured approaches to guide managers in explicitly dealing with these trade-offs, helping them to prioritise performance objectives and areas in which to concentrate resources. Some exceptions include the works of Suwignjo *et al..* (2000) and Santos *et al..* (2002) who propose the use of the AHP – *Analytic Hierarchy Process* – and the use of MAVF – *Multi-Attribute Value Functions* –, respectively, to help managers make explicit the relative importance of the different performance measures through the specification of acceptable trade-offs between these measures. The MAVF and AHP approaches have already been used with success in several different applications. However, the former approach has been criticised on the grounds of being too demanding on the decision maker in terms of the information required, and on the grounds of requiring judgements that are difficult to elicit from the decision makers. In order to address these difficulties the latter approach has been proposed. The AHP uses pairwise comparisons along with a semantic and ratio scale to assess the decision maker's preferences. However, this approach has also its own shortcomings. In particular it has been criticised by the possibility of exhibiting rank reversal (Belton and Gear, 1983) and by its use of the eigenvalue procedure to derive priorities (Bana e Costa and Vansnick, 2001). In order to address the fundamental problem in using the principal eigenvector of a positive pairwise comparison matrix to derive priorities, Bana e Costa and Vansnick (1997 and 1999) have proposed the MACBETH approach – *Measuring Attractiveness by a Categorical Based Evaluation Technique*. In the

MACBETH approach the absolute judgements are based on differences of attractiveness, rather than on ratios of priority or of importance, as required by the AHP method. Considering that the MACBETH approach uses semantic judgements to elicit information from the decision makers and incorporates systematic theoretical and semantic checks on the consistency of judgements, it is our belief that it can also play a fundamental role on the field of performance measurement and management. It is, therefore, our aim to explore its usefulness in explicitly dealing with the trade-offs between performance measures and in making the process of performance measurement and management more transparent and defendable.

While progress has been made on these issues, more research is, however, required to improve our current knowledge on how to prevent implementation failure and to expand the available empirical evidence regarding the use of these and other techniques to assist the design of more effective performance measurement systems. In particular, the use of analytical tools that help managers to identify performance measures and their relationships and that help them to take explicit account of trade-offs between measures should be encouraged.

In this paper we aim at showing how cognitive mapping and the MACBETH approach can be used in an integrated way to support the development of multidimensional performance evaluation systems and to deal explicitly with the trade-offs between the different dimensions of performance and interests of different stakeholders. In doing so, we also aim to explore the practical difficulties that arise in their use in this context. A case study is discussed where these techniques are used in a constructive way, making the learning activity easier and introducing transparency in the decision making process. The case study involved directors from the five biggest banks that operate in the Portuguese financial system and was conducted during a two-year period. The strengths and weaknesses of the integrated use of these two operational research techniques in this context are also discussed.

The paper is structured in three main parts. It begins with an overview of the literature on bank branch performance measurement, followed by a presentation and discussion of the different decision support phases of the process we have adopted to design a performance measurement system for bank branches evaluation and the way in which the cognitive mapping and MACBETH methodologies were used. Finally it concludes with a discussion on the results achieved and implications of this research.

Bank Branch Performance Measurement

As far as bank branch performance evaluation is concerned, four different categories of performance measurement methods have been distinguished. These include *traditional ratios*; *parametric* or *econometric models*; *non-parametric* or *free distribution tests* and *integrated systems for performance evaluation*.

As for *traditional ratios*, the main idea relies on the fact that banks that usually report higher profitability ratios are also seen by stakeholders and costumers as preferential, and this attracts the biggest share of deposits and potential borrowers. This has been the most used method to evaluate bank branch performance (Barros and Leite**,** 1996; Cyree *et al.*, 2000; Milis and Mercken, 2004 and Lau and Sholihin, 2005). However, traditional ratios have been criticised on several grounds. They have been criticised for relying predominately or exclusively on financial measures; for revealing difficulties in operating multiple criteria at the same time; for being essentially based on past data (*i.e.* lag indicators) and for being extremely sensitive to economic, social and seasonal factors, among other reasons (for further developments, see Lau and Sholihin, 2005 and Wu *et al.*, 2006).

An alternative to these ratios is the use of parametric or econometric models. These models are intrinsically related to statistical distributions and/or to well known mathematical techniques that obey to certain parameters to achieve optimum solutions (*e.g.* linear regression, correlation analysis and factor analysis). However, parametric models have been criticised on the grounds that they require a priori definition of a production function and seek to optimize it. Thus, they are based on pure objectivism and only seldom consider the possibility that optimum solutions may not exist. In addition, causal relations between factors are not always well explored by parametric and econometric models, and these causal relations assume an increasing importance in a bank branch performance evaluation context.

To address some of these limitations, *non-parametric* techniques have been proposed. Perhaps one of the best known is the DEA – *Data Envelopment Analysis* – technique. DEA was first proposed by Charnes *et al.* (1978) and it has been used by several authors in the context of bank branches efficiency measurement (*e.g.* Dekker and Post, 2001; Halkos and Salamouris, 2004; Paradi and Schaffnit, 2004; Camanho and Dyson, 2005 and Yang, 2009). One of the interesting features of DEA is that it allows each unit to identify a benchmarking group; that is, a group of units that are following the same objectives and priorities, but performing better. In this regard, DEA aims to respect the priorities of each DMU – *Decision Making Unit* – by allowing each one of them to choose the weight structure for inputs and outputs that most benefit its evaluation. As a result, it aims to classify each unit in the best possible light in comparison to the other units. Another feature of DEA is that it does not require specification of a cost or production function, allowing for richer models. In addition, DEA uses all the available data to construct a best practice empirical frontier, to which each non-optimal production point is compared. This is a distinct advantage when compared to regression-based techniques that focus on the average units and construct an average production function. Moreover, if information is available, it allows the incorporation of several distinct assumptions regarding the relationships operating at the frontier, regarding the returns to scale, the disposability of the inputs and outputs, and the convexity of the production function. Despite all these advantages, DEA does have some limitations. Firstly, standard DEA models do not take into account stochastic variation in the data and assume that any deviation to the best practice frontier is inefficiency. Secondly, DEA assumes that it is possible to fully characterise the production of goods/services by identifying a set of inputs and outputs of production. However, some of the outputs of some companies are not easily measurable. Furthermore, there are an extensive number of factors operating at different levels which impact on this transformation and which may lead to the violation of the linear input-output relationship. Finally, DEA assumes proper envelopment of all the DMUs. That is, a meaningful measure of efficiency can only be calculated if the decision making unit under evaluation has a comparison set. Otherwise, the DMU will be classified as efficient, simply because no comparison can be established. This problem can, however, be solved by the introduction of weight restrictions regarding the admissible ranges of input or output weights.

The dissatisfaction shown towards some of these methods or just the need to complement them has motivated a variety of performance measurement innovations. These innovations have ranged from the design of new metrics (particularly non-financial measures relating to quality, stakeholders satisfaction, flexibility and time) to the development of integrated systems for performance evaluation. Among those developed include the BSC – *Balanced Scorecard* – (Kaplan and Norton, 1992). In the banking context, the BSC has not been much explored and/or well reported yet. However, in broad terms, it may be characterized as a conceptual framework for translating an organisation's strategic objectives into a set of performance measures distributed among four perspectives: Financial, Customer, Internal Business Processes, and Learning and Growth. The Balanced Scorecard is developed from the organisation's vision and strategies and its main strength is in the way it seeks to integrate different measures and make explicit the links between different dimensions of performance into a single system. Despite its strengths and widespread use, numerous authors have identified shortcomings of the Balanced Scorecard. It has been criticised, for example, for oversimplicity (Brignall, 1992), for not specifying how trade-offs are to be made between the different performance measures used (Otley, 1999), and for neglecting important dimensions of performance like competitiveness (Neely *et al.*, 1995), employee satisfaction, supplier performance, product/service quality and environmental/community perspective (Brown, 1996).

Whilst strengths and weaknesses can be pointed out to each one of these four categories of methods, a review of the literature allows us to conclude that the main reason why some of the performance measurement initiatives that have relied on them have not met the expected results is related with difficulties in their implementation. Two major sources of criticism have been identified. The first is related with the way in which the performance measures are often selected, which leads to the omission of important evaluation criteria, as pointed out by Lovell and Pastor (1997), Suwignjo *et al.* (2000), Hartman *et al.* (2001), Manandhar and Tang (2002), Jahanshahloo *et al.* (2004) and Camanho and Dyson (2005). The second is related with a lack of transparency in dealing with the trade-offs between measures, as highlighted by Suwignjo *et al.* (2000), Mihelis *et al.* (2001) and Wu *et al.* (2006).

In the following sections we aim at showing how cognitive mapping and the MACBETH approach can be used in an integrated way to support the identification of evaluation criteria and to deal explicitly with the trade-offs between the different dimensions of performance and interests of different stakeholders.

It is important to emphasize that important advances have been made in recent years to address these issues. For instance, Suwignjo *et al.* (2000) proposed the integrated use of cognitive maps and the AHP to define evaluation criteria and to add transparency in dealing with trade-offs between these criteria. Santos *et al.* (2002 and 2004) proposed, in turn, the integrated use of SD – *Systems Dynamics* – and the MAVF approach. However, to the best of our knowledge no evidence has been documented exploring the integrated use of cognitive mapping and of the MACBETH approach in this particular context.

Cognitive maps (see, *e.g.* Eden, 1995 and 2003; Ackermann and Eden, 2001; Eden and Banville, 2003 and Eden and Ackermann, 2004) are seen as important tools that aim at helping the facilitator (*i.e.* researcher, scientist or consultant) in structuring complex problems. They may assume different visual and interactive forms that help individuals to materialize their experiences, thoughts and ideas while discussion and knowledge are promoted. Thus, their use seems to be useful in a bank branch performance evaluation context, not only because they might reduce the omission rate of important criteria, but also because they might promote a deeper understanding of the causal relations between those evaluation criteria.

The MACBETH approach (for a general overview and some practical applications, see Bana e Costa *et al.*, 1999; Bana e Costa *et al.*, 2002; Belton and Stewart, 2002; Bana e Costa and Chagas, 2004; Bana e Costa *et al.*, 2005 and Bana e Costa *et al.*, 2006) is considered as an interactive technical procedure that supports the construction of numerical scales of intervals, which aim at quantifying the difference of attractiveness between two alternatives considered, based on semantic judgments. However, MACBETH deals with cardinal value scales in a more innovative way because, unlike the AHP that is based on the concept of priority/importance and on ratio scales, the MACBETH methodology makes use of scales of difference of attractiveness, considered more appropriated, among other things, to project repulsive judgments (for further discussion, see Bana e Costa *et al.* 2001, Bana e Costa and Chagas, 2004; Bana e Costa *et al.*, 2003 and Bana e Costa *et al.*, 2005).

Both cognitive maps and the MACBETH approach have been intensively researched and each has individually proved its potential to inform and support the decision making process. Nevertheless, their independent use in the context of performance measurement is relatively scarce and there is no documented evidence reporting their integrated use to support the design and implementation of performance measurement systems in a bank branch performance evaluation domain.

The next sections document how these two analytical tools were combined to help design a performance measurement system to evaluate the performance of bank branches, and discuss the strengths and limitations of their integrated use in this particular context. Although this research has been conducted with the collaboration of experts from different banks that operate in the Portuguese banking system, it is important to highlight that the measurement system we discuss in the next section is illustrative and reflects only the point of view of the participants involved.

Designing a "New" Performance Measurement System

The case study presented in this paper was conducted during a two-year period and it followed the main steps of a 'typical' MCDA – *Multiple Criteria Decision Analysis* – process (*e.g.* Bana e Costa *et al.* 1997; Belton and Stewart, 2002; Bana e Costa and Chagas, 2004 and Bana e Costa *et al.*, 2004). The design of the performance measurement system was, therefore, organised in three main phases: the first phase, called the *structuring phase*, was concerned with analysing the existing performance measurement practices and with applying cognitive maps as a way to identify the key performance areas and the key performance indicators to assess bank branches; the second phase is the *evaluation phase,* which aimed at applying the MACBETH technique to make explicit the relative importance of each performance area and indicator; the third phase, called the *recommendations phase*, explored the use of cognitive maps and the MACBETH technique as means of adding value to the existing practices regarding bank branch performance evaluation.

The study involved several individual interviews with six bank directors from five of the largest banks operating in Portugal, extensive analysis of relevant information and a series of group meetings, with a two-fold purpose. Firstly, to develop a "new" performance measurement system integrating the use of cognitive maps and the MACBETH approach. Secondly, to explore whether the "new" system could overcome some of the shortfalls of the existing measurement practices, namely, testing whether the process adopted simplified the identification process of the evaluation criteria and introduced transparency in the trade-offs between procedures of those criteria.

In the following sections, the process used to design the "new" performance measurement system is described and discussed. The system's ability to add value to existing practices is also analysed.

The Structuring Phase

The Actors

It is widely accepted that effective performance measurement systems should provide decision makers with information about the degree to which organisational objectives are being achieved and how well an organisation is performing its tasks. To get this information, an appropriate set of performance measures is required. The selection of these measures should be the responsibility of a decision maker or a group of decision makers which will, ultimately, act on the information the measures provide. The first step in the design process we have adopted was, therefore, the selection of a decision group that could assist us in the design of the performance measurement system and that could critically assess it. We were particularly interested in exploring the value added by the use of the cognitive maps and the MACBETH approaches to the current practices of evaluation of bank branches.

Generally, the decision making literature defines a decision group as a set of two or more people responsible for detecting and defining a problem, analysing it, creating possible solutions and evaluating them, and/or conceiving strategies to implement improvement actions (Turban, 1995). Furthermore, when an organisation is facing a complex problem, an external expert, with specific knowledge and experience in the area of the problem, is often consulted, which allows the group to be aware of alternatives, chances of success and any costs they may incur (Belton and Hodgkin, 1999). However, when deciding who and how many should take part in the group it is important to bear in mind that to get al.l the members together in a particular place at the same time can become a difficult if not impossible task. Indeed, the meetings can become protracted, coming into conflict with the pressuring timings of the problem. If to these considerations we add decision makers' hesitations and doubts (see Keeney, 1992), then the selection of the elements that will compose the panel of experts is assumed as a matter of vital importance for the design of a multicriteria decision-support model.

Considering that there is no ideal number of experts, as different authors recommend different numbers (*e.g.* Bana e Costa and Thomaz, 2000; Ackermann and Eden, 2001; Mingers and Rosenhead, 2001; Eden and Ackermann, 2001b and 2004 and Bana e Costa *et al.*, 2002), when forming the group of experts that would cooperate with us in the development of the performance measurement system we took into consideration three basic principles. Firstly, we tried to include in the group directors and skilled banking technicians with senior responsibilities in the Portuguese banking system as *"the process of quantifying values seems much simpler with individuals higher up in an organization"* (Keeney, 1992: 153). Secondly, we tried to form a group that was "manageable", that is, that we anticipated could be brought together with some ease. Thirdly, in spite of us being aware that each bank has its own strategies and priorities, we tried to integrate in the group elements from different institutions and from different parts of the country in order to ensure the representation of different objectives and different management perspectives.

As a result, we ended up with a group formed by six members, most of whom were banking experts with coordination responsibilities (*e.g.* commercial directors and coordination directors). This was, however, a panel of convenience, which resulted from the contacts made by the facilitator and from the availability of the decision makers.

The Problem Definition

Considering that the main objective of this research was to test the practical relevance of the use of cognitive mapping and of the MACBETH approach to add value to the process of performance evaluation of bank branches, the development of a "new" measurement system based on their use was fundamental. This system should allow the assessment of bank branches based on the decision makers' values, but also serve as a tool for learning and improvement. Because the intended system should also allow the ordination of bank branches, we can say that the decision, technically problematic, is one of assessment and the technical issue of the problem is one of ordination. However, it is important to emphasise that the order resulting from the scores that each bank branch will receive through its evaluation is used mainly to establish priorities for action and not to define rankings of branches.

We can say, therefore, that the problem in hand involves the design of a multicriteria decision analysis model through the identification of FPVs – *Fundamental Points of View* – (see Bana e Costa *et al.*, 1999) considered important to assess the performance of bank branches and to allow comparisons between them.

Identifying the Key Performance Areas

In order to identify the key performance indicators (*i.e.* the FPVs) we defined a trigger question that provided the focus for the discussion. This question was: "Based on your values, what are the main characteristics of a good bank branch?".

The development of individual cognitive maps was, however, the first formal step of the structuring process and took over twelve weeks to be concluded. Several meetings with an average duration of three hours took place and different actors were involved, namely: facilitator, decision makers, psychologist (responsible for providing support in the clarification of some concepts and for facilitating the application of the techniques) and a communication assistant (responsible for the graphic and photographic recording of the sessions). For convenience reasons, and motivated by limitations to the decision makers' availability, it was considered appropriate to start the structuring process following the SODA I approach – *Strategic Options Development and Analysis* – (Eden and Ackermann, 2001a and 2001b) (*i.e.* the process started with individual interviews of the decision makers). Furthermore, between each session, some time was made available for the facilitator to reflect on what had happened. This reflection was important to conceive recommendations for the next meeting and, of course, consistently proceed in the process. Based on these guidelines, each session began with a brief presentation of the basic concepts involved in the structuring process of complex problems, accompanied by a simple explanation of the concept of cognitive maps. After the exchange of some points of view, cognitive maps and cognitive processes became known to all decision makers.

Once we gained the trust of the decision makers and once their interest for the construction of individual cognitive maps aroused, the next step was the identification and selection of the fundamental criteria necessary for the performance evaluation of bank branches. To that end, we used the above mentioned trigger question and we used the commonly called "post-its technique". The essence of this technique is to write what the decision makers consider as relevant criteria on stickers – one post-it for each criterion – which are then grouped in clusters, creating a division of the map in areas of concern (for further developments on this technique see *e.g.* Ackermann and Eden, 2001 and Bana e Costa *et al.*, 2006).

Understanding the Cause and Effect Relationships

After grouping the post-its in areas of concern, the next step was to perform an internal analysis of each cluster. In practice, the main objective of the internal analysis of each cluster was to identify relationships of influence (*i.e.* cause-effect links) between the identified criteria. Based on a direct and constant interaction with each one of the decision makers, the communication assistant was responsible for monitoring the process and for registering such links (or arrows) in their maps. Once all the links were registered, each decision maker was invited to reflect on his/her map, and was given the opportunity to reshape the clusters, introduce or change criteria and/or even restart the entire process.

The Collective Map

As mentioned before, the structuring process developed in this study started with individual interviews. However, in line with the SODA I approach, after obtaining the individual cognitive maps, the holding of a group session becomes necessary to allow the definition of a collective map (Eden and Ackermann, 2001a and 2001b). Due to the lack of availability and/or travel difficulties expressed by two of the decision makers, we had to pursue in the attempt of obtaining a collective map with only four of the six original decision makers. The difficulty in bringing together all the decision makers in a single session had, indeed, been anticipated. Whilst the selection of the six initial participants was based on the need for the model to reflect, among other things, different approaches of management, social and geographical imbalances (*e.g.* Interior vs. Seaside) and regional issues (*e.g.* North vs. South), we were fully aware that the number of decision makers could decrease during the process. It is important to emphasise, however, that the contributions of the two decision makers which have failed to integrate the final panel were reflected in the collective map. Furthermore, to increase the discussion between decision makers and enrich the outcomes of the process, one of the decision makers that had been further consulted was invited to participate in the group work session.

In order to move from the individual maps to a collective map, the facilitator, based on the analysis of the individual maps, decided to propose a preliminary version of a group map to the decision makers. This preliminary version aggregated the various concepts given in each of the individual maps and was presented to the group. Through negotiation, the group reached a compromise solution for the problem. Following this, a strategic cluster map was then established, discussed and reviewed by the panel. It should be emphasised, however, that the task of building a strategic cluster map proved to be quite a difficult and challenging task, given that often similar terms were used by the decision makers but with different meanings reflecting different ways of thinking. In practice, this process was interactive and only ended once all the decision makers agreed with the form and the content of the final map. During the group working session several aspects were discussed with and among decision makers, and not always a convergence of points of views was absolutely achieved. However, once a compromise agreement was reached a collective (or strategic) map was defined. *Figure 1* illustrates part of that map.

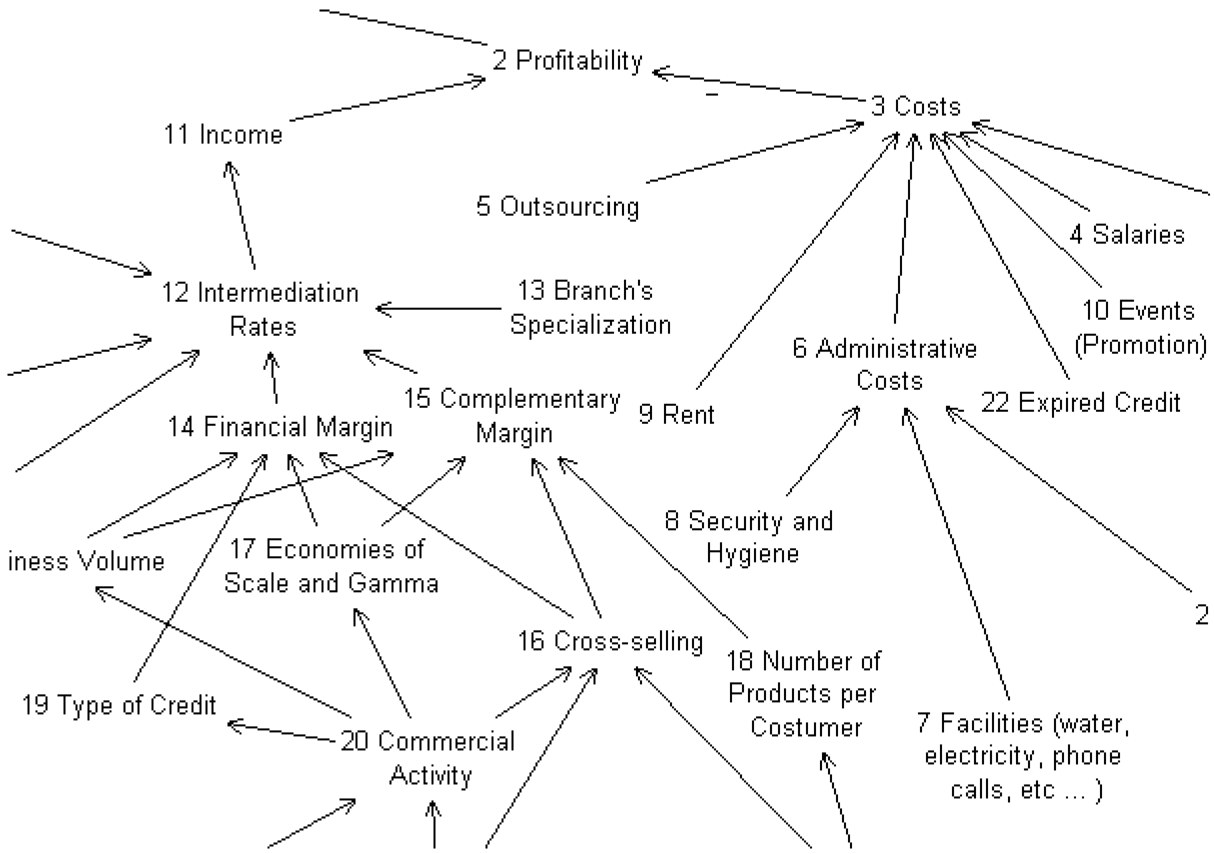

Figure 1 – Part of the Collective Map

It should be noted, however, that in spite of totalling more than two hundred concepts and providing consolidated information on the problem, this final version of the collective map could have been different or more thorough, had the sessions lasted longer or had the circumstances or the people involved been others. Thus, it seems appropriate to interpret this as a final product of the negotiation and the agreement stated among the decision makers involved in the process.

Selecting FPVs, Descriptors and Impact Levels

After re-establishing the discussion with the decision makers and based on the knowledge gained during the process, it was found that some concepts had been considered to be critical in the strategic map, and therefore should be included in a system to compare the performance of bank branches. These concepts include: *Effective Efficiency* and *Potential Differentiation*. Whilst the former is common to bank branch evaluation processes and can be easily measured in terms of profitability for example. The latter is much less common and it refers essentially to the intangible variables that might increase the attractiveness of the branches under evaluation. These two concepts were then broken down into three major areas of concern, understood as fundamental for a bank branch performance evaluation process: *Potential Attractiveness*, *Profitability* and *Customer Satisfaction*.

These three areas configure concerns of different strategic and operational nature. Although several concepts exposed on the strategic map were not translated into key concerns, they served to clarify the problem. It is also important to emphasise that the construction of a tree of performance indicators or PVs – *Points of View* –, as it is often referred to in the MCDA literature, is characterized as a very subjective procedure and, as mentioned before, it strongly depends on the individual skills of the facilitator. However, and in spite of not being a smooth transition, the construction of the tree becomes easier when based on the strategic map, according to the high volume of information it offers.

Therefore, based on the collective strategic map, on the increased understanding that emerged from its development, and following Keeney's methodological orientations (see Keeney, 1992), a set of key concepts and performance measures were derived and structured (using the M-MACBETH software) in a performance measures tree (also known by tree of PVs) as shown in *Figure 2*. These measures, some of which were later broken down into more specific performance indicators, formed the basis of the performance measurement system. Nevertheless, it seems important to highlight that this structure was proposed by the facilitator and that changes resulting from the feedback received from the decision makers involved in the process have been incorporated in order to adequately represent their views.

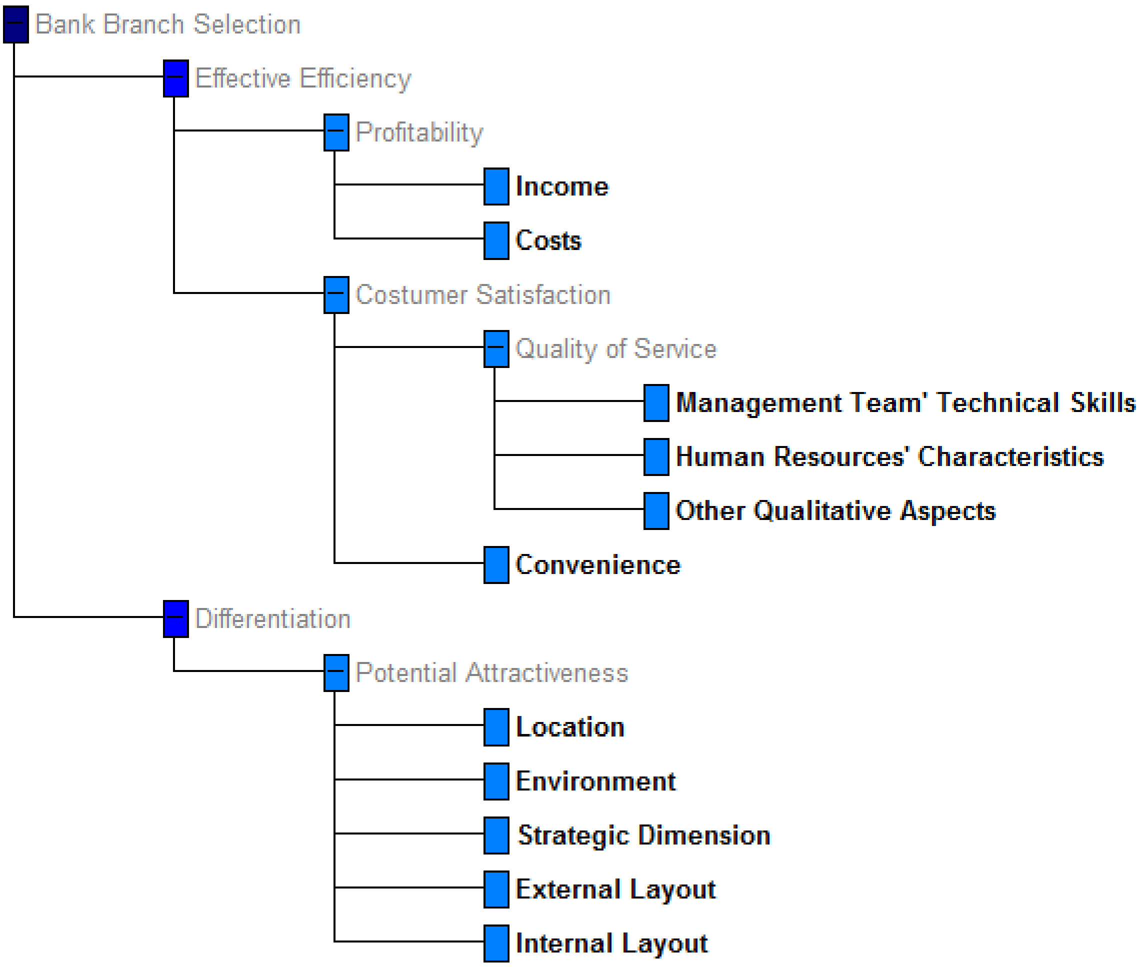

Figure 2 – Performance Measures Tree

Once the tree of performance indicators was derived, its properties checked and the meaning of each of the eleven FPV agreed upon (bold marked in *Figure 2*), the next step of the structuring process consisted in the construction of descriptors in order to enable each FPV to properly reflect the judgment values of the decision makers and the characteristics of the bank branches to be assessed. Again, this phase of the process was conducted with the direct involvement of the decision makers. We started by defining a descriptor for each FPV, and then moved to define the impact levels for each descriptor. For example, FPV1

(*Income*) became operational by a descriptor that balances the sum of (financial and complementary) intermediation rates with the business volume. According to this descriptor, the higher the ratio the better the bank branch will be. To define the impact levels we first had to decide on the lower and upper limits of the impact as well as identify reference levels for each FPV. *Table 1* presents the seven impact levels (L_i with i =1, 2, ..., 7) of the FPV1's descriptor and exemplifies what was done for all FPVs.

Impact Levels	Reference Levels	Description
L_1		Σ Intermediation Rates / Business Volume $\geq$ 2‰ (Month).
L_2		1.7‰ $\leq$ Σ Intermediation Rates / Business Volume < 2‰ (Month).
L_3	Good	1.4‰ $\leq$ Σ Intermediation Rates / Business Volume < 1.7‰ (Month).
L_4		1.1‰ $\leq$ Σ Intermediation Rates / Business Volume < 1.4‰ (Month).
L_5	Neutral	0.8‰ $\leq$ Σ Intermediation Rates / Business Volume < 1.1‰ (Month).
L_6		0.5‰ $\leq$ Σ Intermediation Rates / Business Volume < 0.8‰ (Month).
L_7		Σ Intermediation Rates / Business Volume < 0.5‰ (Month).

Table 1 – Impact levels of the descriptor of the FPV1 (Income)

Once the limits and reference levels were identified, we were able to sort the levels in order to obtain the value functions by sections. Only when the impact levels for each descriptor were defined, were we able to move to the next step, that is, to the evaluation stage.

The Evaluation Phase

Value Judgments and Local Preferences

This phase of the process consisted of the construction of value judgment matrices for the defined descriptors. This procedure is required in order to obtain local preference scales for each one of the FPVs comprised in the model. In other words, the construction of a cardinal value function for each one of the descriptors allows the measurement of the partial attractiveness of the branches in accordance with each FPV. The construction of these scales was implemented based on the MACBETH methodology which took place in a group work session that lasted approximately twelve hours.

Despite the occurrence of some inconsistencies, which were promptly addressed with further discussions with and among the decision makers, it was precisely at this stage that the greater advantage of the MACBETH technique emerged. In fact, in contrast to the *direct rating* and to the *bisection* approach to illicit value functions, MACBETH does not require major cognitive efforts from the decision makers. A major advantage resulting from this technique is the ability it offers to manage information that decision makers have, but in a disorganized form, proposing numerical scales based on semantic judgments, seen as a much more natural way of value expression (for further discussion, see Bana e Costa and Chagas, 2004). Based on this approach, the value judgment matrices were completed using the following categories of semantic differences of attractiveness: 0 – null; 1 – very weak; 2 – weak; 3 – moderate; 4 – strong; 5 – very strong and 6 – extreme (Bana e Costa *et al.*, 1999). As an example, *Figure 3* illustrates the value judgments, the scales proposed and the value function of the FPV 1. After obtaining a cardinal value scale for each descriptor, which allows the local evaluation of the different branches, the next step of the methodology used was to obtain the trade-offs between the FPVs identified for this problem. This step is important because the definition of cardinal value scales on the descriptors only allows the partial assessment of the branches, in accordance with each FPV. Therefore, in order to be able to add the local assessments and to get a global assessment of the bank branches, it is necessary to determine the relative importance of each FPV (*i.e.* the weights, trade-offs or substitution rates).

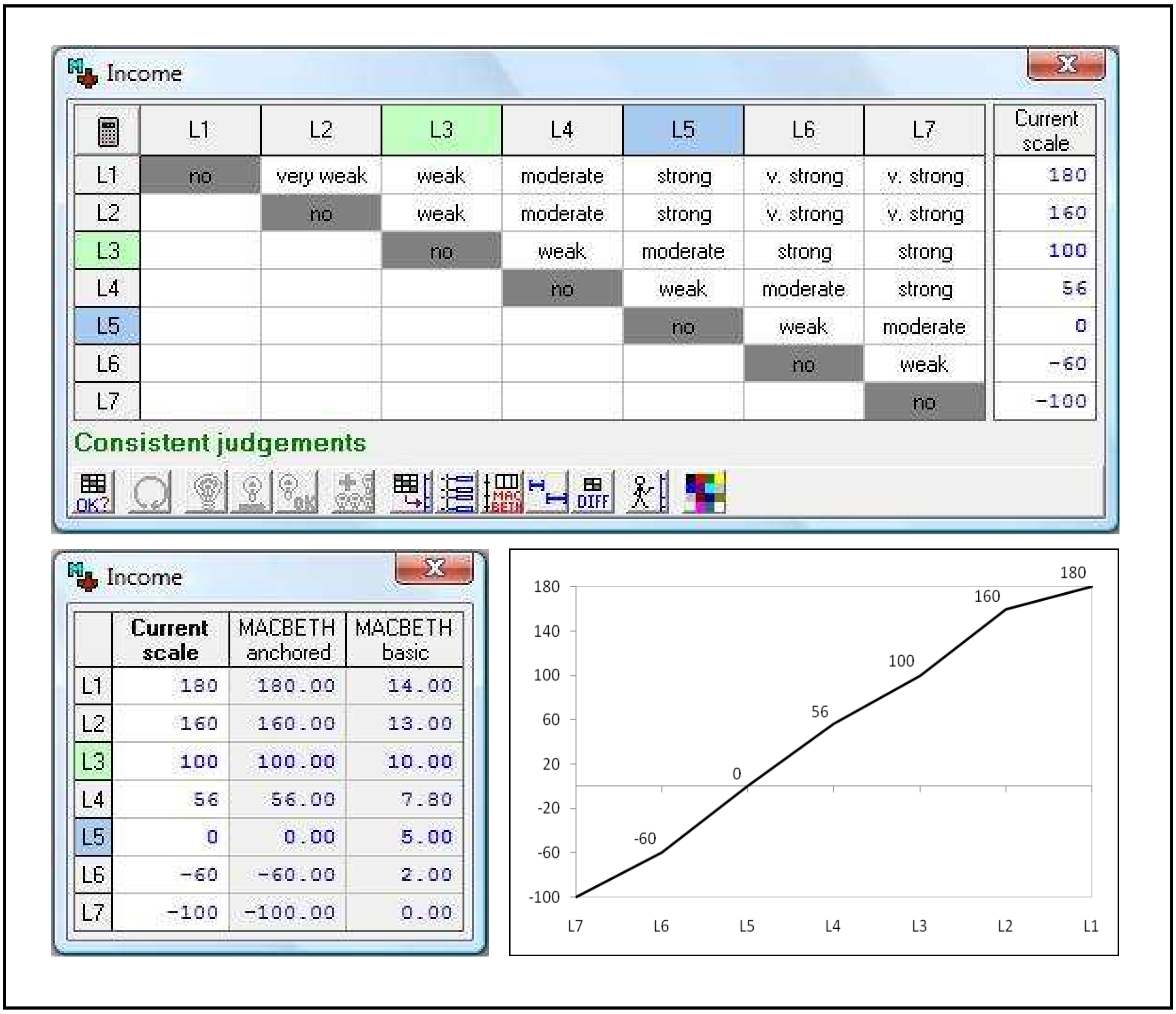

Figure 3 – Value judgments, proposed scales and value function of the FPV 1

The Trade-Offs Procedures

Once the local scales were obtained and the tests of mutual preferential independence were conducted (for further discussion, see Bana e Costa and Beinat, 2005), the procedure used to calculate the relative weights of the FPVs consisted of two main stages. Firstly, based on a matrix of comparisons, the decision makers were asked to pairwise compare and order all the FPVs in terms of decreasing overall attractiveness (for an in-depth discussion, see Bana e Costa *et al.*, 1999). Secondly, decision makers were asked to project their semantic judgments in relation to the difference of attractiveness between those FPVs. With the projection of those semantic judgments, a MACBETH scale with the trade-offs values was proposed for discussion. Once the trade-offs between the FPVs of the model were obtained, the relative and the overall evaluation of some bank branches became possible. In fact, this enabled the decision makers to assess branch performance and, therefore, to start testing the model and the processes used for its design. However, it was necessary to request information on some bank branches. The request for information was sent to one of the five largest banking institutions that operate in Portugal and the information regarding four bank branches was provided to us under anonymous conditions. The number of bank branches and the branches to be used in the testing of the model was an administrative decision of the bank under analysis. In spite of the low number of bank branches used and the fact that the data referred to a particular time period (September/2006), the information we derived from the testing of the model was considered very useful to conclude about its applicability in a real context, to increase the decision makers' interest for a practical application of the model and process used, and to promote (again) the discussion between the group members.

Measuring the Performance of Four Bank Branches

For the overall evaluation of the bank branches it was necessary to determine, in advance, the partial attractiveness values of each branch on which the information was available. Based on the descriptors and on the cardinal value scales obtained for each FPV, the partial impact values in each FPV were easily calculated. The partial attractiveness revealed by each branch (called Alphas for confidentiality reasons) is given in *Tables 2* and *3*.

	FPV_1	FPV_2	FPV_3	FPV_4	FPV_5	FPV_6	FPV_7	FPV_8	FPV_9	FPV_{10}	FPV_{11}
Alpha 1	L_5	L_1	L_2	L_3	L_6	L_2	L_1	L_1	L_{11}	L_1	L_1
Alpha 2	L_4	L_1	L_2	L_4	L_6	L_5	L_1	L_7	L_7	L_4	L_7
Alpha 3	L_3	L_1	L_2	L_4	L_6	L_6	L_1	L_1	L_7	L_5	L_1
Alpha 4	L_3	L_3	L_5	L_2	L_6	L_6	L_3	L_6	L_7	L_2	L_7
Good Robot	L_3	L_3	L_4	L_2	L_2	L_2	L_2	L_2	L_5	L_2	L_3
Neutral Robot	L_5	L_5	L_5	L_5	L_3	L_6	L_3	L_4	L_8	L_3	L_6

Table 2 - Levels of partial attractiveness revealed by the evaluated branches

	FPV_1	FPV_2	FPV_3	FPV_4	FPV_5	FPV_6	FPV_7	FPV_8	FPV_9	FPV_{10}	FPV_{11}
Alpha 1	0	175	300	66.67	-800	100	200	125	-83.33	216.67	140
Alpha 2	55	175	300	33.33	-800	25	200	-87.5	33.33	-16.67	-20
Alpha 3	100	175	300	33.33	-800	0	200	125	33.33	-133.33	140
Alpha 4	100	100	0	100	-800	0	0	-50	33.33	100	-20
Good Robot	100	100	100	100	100	100	100	100	100	100	100
Neutral Robot	0	0	0	0	0	0	0	0	0	0	0

Table 3 - Values of partial attractiveness revealed by the evaluated branches

As can be observed from *Tables 2* and *3*, two fictitious branches, called *Good Robot* and *Neutral Robot*, were also defined. This procedure aimed to facilitate cognitive comparisons, as the *Good Robot* defines a branch that meets the good levels of all FPVs, while the *Neutral Robot* reflects a branch that, by aggregating all neutral levels, is not considered attractive or repulsive by the decision makers involved in the process. With the local values of the four evaluated branches, it became possible to make considerations about their behaviour in each FPV. For example, Alpha 1 shows a good performance in FPV 10. However, it reveals the worst performance according to FPV 9. Naturally, this bad performance influences the final score of its overall assessment. On the other hand, this enables the decision maker (or the model user) to ascertain why a performance is so low and, if appropriate, to propose actions to improve the performance of that branch under that FPV.

Having completed this phase, the next step consisted in the aggregation of the local ratings, based on a simple additive model. *Table 4* shows the values of (relative and global) attractiveness revealed by each one of the evaluated bank branches.

	Global	FPV_1	FPV_2	FPV_3	FPV_4	FPV_5	FPV_6	FPV_7	FPV_8	FPV_9	FPV_{10}	FPV_{11}
Alpha 1	65.02	0	175	300	66.67	-800	100	200	125	-83.33	216.67	140
Alpha 2	39.60	55	175	300	33.33	-800	25	200	-87.5	33.33	-16.67	-20
Alpha 3	62.31	100	175	300	33.33	-800	0	200	125	33.33	-133.33	140
Alpha 4	-12.86	100	100	0	100	-800	0	0	-50	33.33	100	-20
Good Robot	100	100	100	100	100	100	100	100	100	100	100	100
Neutral Robot	0	0	0	0	0	0	0	0	0	0	0	0
Weights		0.1139	0.1062	0.1216	0.1313	0.0618	0.0927	0.1293	0.0714	0.0888	0.0309	0,0521

Table 4 - Partial values and overall attractiveness revealed by the evaluated branches

Once the aggregation of partial values and the calculation of the overall scores of the four bank branches took place, it was possible to obtain a rank of the branches according to their overall performance. Alpha 1 was ranked in first place (best overall score of 65.02); Alpha 3 and 2 were ranked in second and third places, respectively, and Alpha 4 was ranked in last place (worst overall score of -12.86). It is important to emphasise, however, that the ranking was not seen as an end in itself but as a means to discuss the results and learn from them.

Analysing the Results

Based on a facilitator's proposal, and following the example of Phillips and Bana e Costa (2007), a final discussion of the results and of the process used was performed. This discussion was important to reflect further on the results and derive some practical lessons. Based on that discussion, it was possible to take important lessons, such as: (1) overall performance values allowed an effective discrimination of the studied branches (despite being only four), (2) it was also evident for all the actors involved in the process that the total score achieved with the *Good Robot* (100 points) showed that the degree of demand was high, since the best overall score was only 65.02 points (Alpha 1) and (3) the comparison of branches with the robots (*Good* and *Neutral*) proved to be a very useful exercise as it made the process of obtaining a more accurate idea about the relative position of the four branches easier.

The model developed in this study was still useful to identify the sources of a lower performance achieved by the branches, which could facilitate the identification and/or application of improvement actions. With the final ranking of the bank branches, the evaluation phase was completed. At this point, the receptiveness and the satisfaction expressed by the decision makers on the achieved results should be noted. Following this stage, several different analyses were carried out with the aim of validating the results and checking the stability of the model. In particular, we have carried out map, sensitivity and robustness analyses. These analyses were the basis of the *recommendations phase*.

The Recommendations Phase

This phase of the process rather than aiming to provide recommendations about the problem was a useful step to reflect on the process, model and results achieved. This allowed all decision makers involved to gain a clearer understanding of the problem of performance assessment of bank branches and to think about some of the characteristics that the process and models should have to allow a more effective performance measurement.

The fact that the process adopted followed a non-prescriptive position, and was supported by two operational research tools that allowed the decision makers to include their views and interests in the multicriteria evaluation model was regarded as a very important characteristic to ensure a successful implementation. This implementation may benefit as well from the versatility and flexibility of the process adopted, as it easily allows new information to be included or irrelevant information to be excluded. The versatility and flexibility of the process make it also easily adaptable to the development of assessment models based on some well known performance measurement frameworks as is the case of the Balanced Scorecard.

As far as the model is concerned, its development and assessment allowed us to conclude that most of its usefulness derives from the increased understanding of the problem that it promotes. Rather than using performance assessment models as control tools, it is fundamental to see them as important learning mechanisms. In fact, by taking a social-technical approach, the process increased communication and shared understanding among the decision makers, which increased transparency and turned bank branch evaluation easier. For example, the model developed during this research does not aim to prescribe optimal solutions. Rather it aims to promote a better understanding of the problem of assessing bank branch performance. Moreover, because the model was built based on the preferences of a specific group of decision makers, its generalization to other contexts (or to other groups), without the necessary adjustments and changes, could jeopardize the results arising from its use. It is important to bear in mind that the model presented in this research and the results obtained with the assessment we have carried out for testing purposes, should be regarded only as the result of an exploratory negotiation process with the decision makers involved. As such, the model should be faced as a starting point for any assessment exercise in this context and not an end in itself.

As far as the results of assessment are concerned, the research made it clear that these will depend strongly on the context and actors involved. Indeed, the existence of different contexts of analysis or different beliefs and values on the part of the decision makers might lead to different results. This should not, however, be regarded as a weakness. It is important to bear in mind that different decision makers or organizations might have different priorities which will be captured in the weights defined by the multicriteria models and, therefore, in the results they provide. The analysis on the results of the model also brought to light the need to be careful when interpreting these results. It is highly recommended that the results be complemented by a thorough analysis of sensitivity and robustness in order to support performance evaluations in contexts of uncertainty and/or information inaccuracy.

Testing the Process and the "New" System

After validating the results, we conducted a last session involving the facilitator and a Director of the bank under analysis. This Director was responsible for the bank branches' strategic planning at a national level and was also the person that provided us with the information of the four bank branches evaluated. Her views on the system and the process were regarded by us as very important as she knew in first hand the assessed branches and was a neutral and external element to the process, since she had not participated in any of the previous sessions. This final session took place at the bank's headquarters in Lisbon and lasted two and half hours. With this session we aimed: (1) to increase our understanding on the current practices of this bank regarding bank branch performance evaluation; (2) to discuss the extent to which the integrated use of cognitive maps and the MACBETH approach could add value to those practices, and (3) to get feedback on the results obtained in the previous work sessions. The attainment of these objectives would provide us with fundamental information to assess the practical relevance of the process we have followed and of the model we have developed, and to identify the strengths and weaknesses of both.

To this purpose we began the session with a brief presentation of the research framework, and moved then to ask the Director how the performance of bank branches in her bank was being assessed. The answers provided pointed to a fragmented use of several ratios, indexes and volumes, predominantly based on a financial perspective (*e.g. Business Volume*, *Profitability* and *Degree of Recovery*), which reinforced our previous conclusion that the current measures and indicators for assessing the performance of bank branches continue to be dominated by the use of traditional indexes. However, it was pointed out that the this bank is in a transition phase, which seeks to introduce in the branches evaluation process some service indicators, namely Q*uality Management*, considered by the Director as one of the most important ones. Once the Director finished commenting on the current practice, and prior to our presentation of the results, she was asked to express her views regarding the performance of the four branches we have assessed. Although she did not want to go into much detail at this stage regarding her perceived performance of these branches, she emphasised that Alpha 1 was the best performer and Alpha 4 was the worst, which corroborated the results provided by the model as previously discussed.

The next phase of this session began with a brief presentation of the process we have followed to design the assessment model and with the presentation of the results it has provided. The Director was then asked to comment both the process and its results. This phase of the session proved to be very fruitful in terms of results consolidation, especially when it was explicitly recognised by the Director that the process we have used, and which made use of cognitive maps, allows a deeper knowledge on how the different performance indicators interact, facilitates communication between decision makers and helps to reduce the rate of omitted criteria in a bank branches' performance evaluation process. Moreover, the possibility of aggregating information through the MACBETH approach was considered extremely important for branch management, not only because it offers an overall performance score for each bank branch but also because it makes use of semantic judgements to obtain the trade-offs between criteria, which may be useful in obtaining judgements from the decision makers.

With regards to the results obtained, and in particular the final ordering of the branches obtained with the model application, the Director completely agreed on the place occupied by Alpha 1 and Alpha 4 (first and last, respectively). She expressed, however, some uncertainty on the positions occupied by the other two branches (Alpha 2 and Alpha 3). She started by emphasising that these two branches were located in the same commercial region of Lisbon, which could cause some initial difficulty in assessing the achieved positions, but she finished by recognising that her bank's current practice for bank branch evaluation does not offer an overall performance score as complete as the one offered by the model we propose here. On this basis, a careful analysis of the impact profiles of the four bank branches, including an analysis of their distance against the robots, allowed the Director to get a deeper understanding of the results obtained and realise the full potential of the process and model used.

In spite of considering that in some circumstances it may be difficult to rank some bank branches, the Director recognised the potential of the techniques used and of the model derived to bring very valuable insights to the process of bank branch performance assessment. This became apparent when the Director stated that the greatest contribution of this work is not the ranking it allows, but the improvement actions that can arise from the analysis it generates. These actions *"are not easily identifiable by traditional indicators"*, according to the Director.

In the final stage of the work session, the Director was asked to express explicitly what could be the value added by the process adopted and the model derived to assess the performance of bank's branches on a regular basis. She emphasised that by following this process it would be possible to capture more performance dimensions, and therefore to carry out a more complete performance evaluation than the one that is currently in practice.

Although the performance assessment model that derives from the process we suggest was considered to be strongly dependent on the opinion of the decision makers involved in its development, the potential of this model to capture the cause and effect relationships between performance variables and to facilitate the identification of gaps and points where there is a need to intervene in order to improve branches' performance was emphasised. The process was also seen as *"interesting for a planning central system"* (according to the Director), because it offers a holistic view of the branches' rating system, increases decision makers' degree of knowledge and direct involvement, increases the potential for planning scenarios and detects opportunities for improvement actions.

The Director was also asked whether she agreed that the integrated use of cognitive maps and the MACBETH approach can help reduce the rate of omitted criteria and can add transparency in dealing with the trade-offs between performance indicators. According to the Director, *"maps facilitate the identification of all possible evaluation factors*", and it was concluded that they contribute to reduce the rate of omitted criteria. In fact, among other reasons, the Director highlighted that maps' exploratory character revealed to be extremely important in a bank branch evaluation context, since it allows decision makers to understand and to structure their own thinking at several stages of the evaluation process. Between those stages, decision makers are allowed to (re)analyse their thoughts, to share and to reform ideas, and/or to explore new ones. This facilitates the identification of new (forgotten?) evaluation factors. However, it was pointed that the information collected with the cognitive maps was very sensitive to contingent issues, and this requires precaution in generalizing the findings. When confronted with the value added by the MACBETH approach to make the trade-offs between performance criteria more transparent, the Director mentioned that she does not know enough about the methodology to draw a definitive conclusion but emphasised that the use of semantic judgements by the MACBETH approach is a much more natural way to express values. In addition, it was recognised that the technique simplifies the calculation procedures and may decrease the degree of cognitive requirement for the comparisons that give origin to the trade-offs.

The Director also expressed her views on the practical relevance of the model developed. She pointed out that the model was consistent and able to translate *"a more complete and fairer rating system"* (according to the Director). Moreover, it was defined as *"an actionable output, allowing you to know where to act and how to compare"* (also according to the Director).

Some concerns were, however, raised during the discussion. In particular, the need to reduce the subjectivity involved in the process of collecting information and consequently the need to find more objective criteria for modelling some of the subjective aspects included in the model was emphasised. Still, the Director considered the model as *"flexible enough to be adopted"*, where *"nothing falls off or ceases to be considered"* and *"has sufficient flexibility to introduce the level of detail that each organisation desires"*. Moreover, while defending bank branch performance evaluation as one of the most difficult tasks of modern management, the Director stressed the practical relevance of the model, because *"it translates all the major themes that are present in the assessment of a bank branch and identifies relationships of cause and effect"*.

Before the session ended we still asked if her bank would be willing to implement a system with these features in the near future. The answer to this question was affirmative and it was mentioned that *"her bank has all interest in evaluating a system of this nature"* and that *"it makes sense to have a system like this in the organization"*. It was also stated that *"it is something worthy of being discussed among the bank's departments"*. It was, however, recognised that *"the introduction, implementation and operation of the system within the organisation would require the intervention of a facilitator"* as his/her expertise would be a critical factor of success in dealing with methodologies that are not well known among non-academics.

Discussion and Conclusions

Cognitive Mapping and MACBETH are two modelling approaches that have individually proved their potential to inform and support decision making. Their use in an integrated way to assess and evaluate policy options and to prioritise public investments, among many other decision problems, has also shown fruitful results. This paper has sought to demonstrate that there is also a clear potential for these approaches to be employed in support of performance measurement and management. The use of these approaches can bring new insights to inform and support the development of more effective performance measurement and management systems, as it was shown with the development of a system to assess the performance of bank branches.

The integrated use of cognitive maps and of the MACBETH approach provides an important tool for discussion and a shared language between the different individuals and groups of decision makers, which facilitates communication and learning. Throughout the modelling process, the participants have the opportunity to share and make explicit mental models they have as well as the priorities and values that influence their decision making. This will provide a powerful means for exploring and reconciling important differences in the models and value systems held by the different participants involved, facilitating a holistic vision of the problem under analysis and/or the system under construction, increasing negotiation, consensus and commitment among them and leading to a better understanding of the situation and of each other's perceptions of it. This understanding is very important to decide what to measure and why, preventing the omission of relevant performance indicators and inputting transparency along the decision making process, and may prove invaluable for the successful implementation of the measurement system. Furthermore, because the MACBETH approach allows the generation of cardinal value functions, capable of representing the decision makers' semantic preferences, it adds simplicity and transparency into the process of calculating the trade-offs among the evaluation criteria and facilitates the process of quantifying overall performance scores for the units being assessed.

Another important contribution of a performance measurement system design process based on the use of these approaches is that it is very versatile, allowing the aggregation of new knowledge as decision makers advance in the development of the performance measurement system.

It is important to note, however, that the use of these approaches to support performance measurement and management processes is not without its own weaknesses. On the one hand, the development of cognitive maps requires an enormous willingness on the part of decision makers, and a high dedication on the part of the facilitator. Indeed, notwithstanding the progress achieved in each session, some difficulties were evident on the part of decision makers, such as: (1) a reluctant attitude and some initial mistrust regarding the contribution of cognitive maps for designing the model, (2) tendency to put more than one concept on each post-it and (3) difficulties in the means-ends analysis, with implications for the establishment of links between concepts. Therefore, on several occasions, the intervention of the facilitator (and the psychologist who accompanied the process) was necessary, to provide further information to the decision makers involved. On the other hand, the application of the MACBETH methodology was also faced with some difficulties including: (1) difficulties in constructing the descriptors, (2) the fact that some of these descriptors were built with many levels of impact turned the matrices completion into a demanding task for all the players involved in the process, (3) the impact levels ordering in each descriptor was not always immediate, requiring the development of matrices of preferences, which contributed to saturate even more the process of building the model, (4) the definition of neutral levels was often associated with the definition of average values, which is not the same thing and (5) despite advantages of the use of the additive model of aggregation, its implementation required a thorough and prior preparation of the information (*e.g.* tests of mutual independence preference). Nevertheless, it was felt that some of these limitations may have its roots not in the methodologies followed, but in the little experience of the facilitator in their implementation. Finally, it is important to highlight that the results presented here are based on a single case study and on the opinion of a very limited number of participants. As such, this poses some difficulties in generalizing the findings and implies that future research and more case studies should be strongly encouraged. However, while limitations and implementation challenges exist, the conceptual validity of the process proposed in this paper taken together with the feedback received from the practitioners involved in its use and validation, indicates that these can be addressed and that, in appropriate circumstances, significant benefits can be gained.

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