

# **A METHODOLOGY BASED ON MULTI-CRITERIA TECHNIQUES (AHP AND ANP) FOR MEASURING THE DEGREE OF ALIGNMENT BETWEEN THE OBJECTIVES OF A UNIVERSITY AND THE RESULTS OBTAINED IN ITS RELATIONS WITH THE SOCIOECONOMIC ENVIRONMENT**

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## **1 INTRODUCTION**

According to [5,6], the development of universities over the years has led them to undertake missions that are increasingly more committed to the society around them: 1. Teaching: conservation and dissemination of knowledge (from their early days until the late 19th century), 2. Teaching and research. Research was incorporated as another mission of the university in the first academic revolution (from the late 19th century), 3. Teaching, research and direct contribution to social and economic development, or the so-called Third Mission. Incorporating the Third Mission as another mission is known as the second academic revolution (from the end of the 20th century). Technology transfer mechanisms (TTMs henceforth) are the practical means by which interaction is established between the university and its socioeconomic environment. Several studies have focused on the interaction between the university and its socioeconomic environment through these mechanisms. Most of them concentrate on the relation between university and business, and develop econometric models based on information provided by different universities through surveys, semi-structured interviews and structured interviews. The aim of these studies is to analyse the attitudes of faculty members with regard to technology transfer [2,4,7], the characteristics of the interaction process [9,10] and the organisational problems involved in the linking process [13]. Some of the more important TTMs that have recently appeared include research or technological spin-offs or joint ventures, business incubators and technology parks. These options complement and reinforce the traditional methods, such as human resources training schemes, industrial training units, academic consultancy, scientific and technological services, recruitment of future professionals, joint or specific contract research projects on technological innovation, the use of university facilities, use of licences to make use of inventions developed by others [8,9,13,14]. The aim of this study is to propose a method for analysing the degree of alignment between the objectives stated by the University and the actions that are actually carried out the University in order to achieve these objectives, that is to say, the technology transfer mechanisms (TTMs). This will enable the academic authorities to introduce corrective measures should any deviations be detected. The model proposed here is based on the use of Multi-Criteria Decision Analysis (MCDA) techniques, such as ANP [12] and AHP [11]. This model and the theoretical tools on which it is based are described below. To demonstrate its validity, the model was applied to the National University of Colombia – Bogotá Campus.

## 2 THE METHOD OF ANALYSIS AND FACILITATING PROCESS

The method of analysis (Figure 1) proposed here takes into account the characteristics of the alignment problem that we intend to analyse [3], the general stages of the decision process [1] and those that are specific to the multi-criteria decision techniques that are applied, that is, AHP and ANP [11, 12] Since this method is a novel application for the University in its problem structuring and MCDA techniques are unknown for the experts who collaborate in the study, it has been necessary to stress the role of the facilitator during the whole process.

## 3 RESULTS

By using the Analytic Hierarchy Process we have succeeded in prioritising the objectives of the university and proved that not all the objectives are equally important (Figure 2). In contrast, the Analytic Network Process (Figure 3) allowed us to prioritise them according to the actual results that were obtained by the TTMs as regards the objectives of the university (Figure 2). A comparison of the first prioritisation with the second one makes it possible to establish the degree of alignment of the university's objectives regarding its socioeconomic environment (Figure 2). From all this, it can be concluded that there is a strong misalignment between the expected and actual objectives, since only two of the five objectives that were analysed were aligned, these being the objective "To create and incorporate advanced knowledge at a national and international level" and the objective "To train citizens, professionals and researchers".

## 4 CONCLUSIONS

In this paper it is shown how it is possible to address such complex problems as measuring the alignment of strategic objectives of a university regarding its socioeconomic environment with the results achieved using its TTMs, by means of MCDA techniques. This was achieved by making use of a hierarchical (AHP) and a network structure (ANP). Detecting a misalignment enables the university to apply corrective policies in order to accomplish the theoretical objectives. During the work with the experts it became obvious that designing the hierarchy and the network requires experience in and knowledge of the problem being dealt with, and it is therefore essential to have a proper facilitating support all along the process. Finally, it must be pointed out that in the Colombian university the analytic hierarchy process (AHP) and the analytic network process (ANP) can be used for a number of applications. These techniques can be used to support complex prioritisation and decision-making processes that are typically found in the university community. The following cases could be cited as examples: evaluating the merits of faculty members, university strategy planning; evaluation of research papers, assignation of the university budget, redesigning the curricula of Master's degrees, selection of members of teaching staff, evaluation of the effectiveness of the different teaching techniques for meeting training goals, assignation of university resources and planning the information infrastructure, and planning the university infrastructure, among other applications

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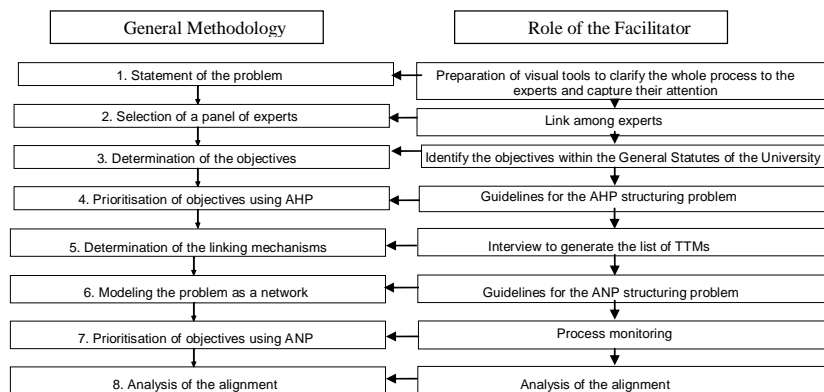
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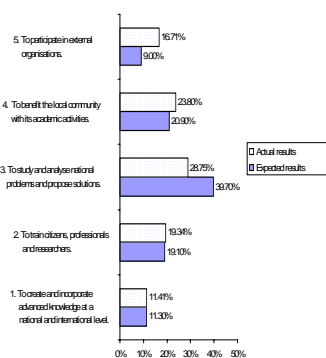
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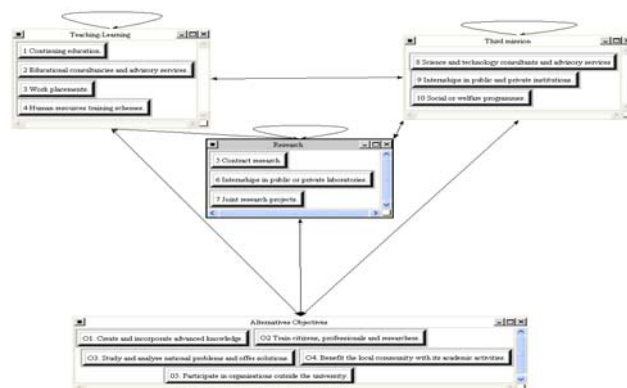
**FIGURES**



**Figure 1. Stages of the proposed methodology for alignment with AHP and ANP**



**Figure 2.UNC- BOGOTA. Objectives. Comparison of the results of prioritisation**



**Figure 3.UNC-Bogotá Technology transfer mechanisms linked to the different missions**