FUZZY AHP MODEL TO SUPPLIER PERFORMANCE EVALUATION IN PUBLIC INSTITUTIONS

ABSTRACT

The problems that arise in the selection of suppliers do not end when the correct supplier is found and a contract is established. The problems can persist throughout the customer-supplier relationship. Working to increase knowledge about each supplier is the most effective way to minimize potential complications related to the purchasing function and its effects on the supply flow. The objective of this document is to present an integrated model for the objective evaluation of suppliers in a Higher Education Institution of the Public Sector, which, in turn, is subject to a series of regulations, legal provisions and control entities. In this sense, a methodology of Fuzzy Analytical Hierarchy Process (Fuzzy AHP) is proposed, which uses fuzzy preference relationships to incorporate the ambiguities and uncertainties that usually exist in human judgment. Additionally, sensitivity analysis is performed to demonstrate the credibility of the model.

Keywords: Supplier Evaluation, Decision Making, Fuzzy AHP, Public Institution.

Introduction

The Vice-Rectory for Investigations (VRIN) at the Universidad del Valle is responsible for supporting the formulation, implementation, monitoring and evaluation of research policy and the corresponding research-related action plans. Although this office has a database of suppliers, it does not have a formal and systematic registry that describes the behavior of the providers. In addition, there are some perceived problems with providers known to the VRIN, such as providers with poor communication, non-compliance with delivery times, shortages, quality problems, among others.

Therefore, it is necessary to improve the purchasing process in the VRIN through a tool that supports the administrative management and the execution of research projects, in order to eliminate bottlenecks and dissatisfaction in users.

Literature Review

Among the most important articles for the realization of this work are (Osiro et al., 2014), (Ho et al. 2010), which focus on the criteria for the selection and evaluation of suppliers. For their part (Mardani, Jusoh, & Zavadskas, 2015) and (Dotoli et al., 2020) support the application of the Fuzzy AHP tool in this type of process, particularly for institutions in the public sector.

Specific Objectives

The objective then is to provide the organization with a tool that allows it to have a global vision of the performance of its suppliers in light of the criteria that the organization considers fundamental in this activity.

Methodology

Two stages were established for the supplier performance evaluation process:

I Stage: Fuzzy AHP

The application of the Fuzzy AHP methodology is carried out each time the criteria and its weights need to be revised. Comparisons by pairs of alternatives are made through linguistic variables represented by triangular numbers.

II Stage: Supplier Qualification

The rating scale is established for each of the criteria. These supplier performance measurements will be made only during the post-contract stage. These criteria are evaluated on a scale of 1 to 5, where 5 is the maximum score and 1 the lowest possible value. The measurement scales for each criterion are constructed based on the needs and interests of each organization and are expected to be practical to manage.

The following intervals were considered to guide the actions to be taken according to the final score: Excellent Performance: Between 4.5 and 5.0. Good Performance: Between 3.7 and 4.49. Regular Performance: Between 3.0 and 3.69. Poor Performance: Less than 3.0.

It is fundamental to establish an action plan when the supplier classifies in a regular performance, which allows him to improve the negative aspects that he presents in front of some criterion and thus improves his position. On the other hand, a poor performance is enough to determine that the supplier should not be continued.

Data Analysis

After defining the rating scales and establishing the evaluation format, the evaluation was carried out on 4 suppliers.

Limitations

When applying the methodology, it can be seen that situations can arise where the number of comparisons of pairs required is very large or very small, which will generate possible inconsistencies, increasing the uncertainty of the decision process.

Additionally, the proposed assessment scales have some subjective elements that may affect the final outcome of the assessment.

Conclusions

Evaluating performance allows for cost reduction, understanding of key processes, identification of potential problems and future improvement actions, among others. Although this is not a simple job, the application of Fuzzy Multi-Criteria decision making techniques manages to address problems that are marked by different conflicting interests and the subjectivity of the judgments.

The proposed Fuzzy AHP model is presented as simple and easy to apply, since it does not require a deep mathematical knowledge. Additionally, it helps to model the subjectivity and uncertainty of the

judgment of experts, using qualitative and quantitative criteria that reinforces the evaluation process and future actions.

Taking into account the amount of techniques available and the multiple solutions that these can provide, as future work, it is recommended to investigate how to extend the existing multi-criteria decision techniques or to guide the development of new quantitative models. It would be important, for example, to apply Fuzzy TOPSIS or DEA to issue different solutions.

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