FUZZY AHP MODEL TO SUPPLIER PERFORMANCE EVALUATION IN PUBLIC INSTITUTIONS

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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.

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.

Vice-Rectory for Investigations at the Universidad del Valle

Research and training management

Transference of results

Institutional Laboratory System
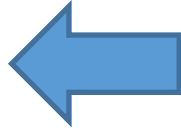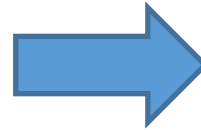
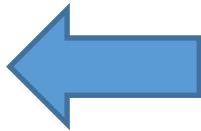International Relations

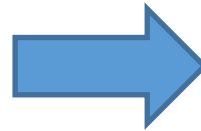Editorial Program

Missings

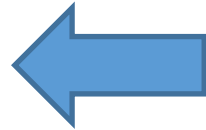Quality problems

Delayed research projects

Limited knowledge about supplier performance

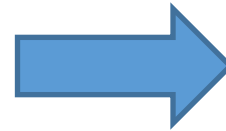Poor communication

Bottlenecks

Non-compliance with delivery times.
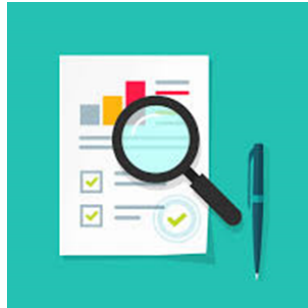
Summary of applications of the DM techniques.	
DM TECHNIQUES	**Authors**
AHP	Ho et. al (2010); Chan and Chan (2004); Kumar and Roy (2011)
FUZZY AHP	(Dotoli et al., 2020); Dabbaghian et al. (2014); Gao and Hailu (2012); Chen et al. (2010)
TOPSIS	Alkahtani et al. (2019); (Sadeghzadeh & Salehi, 2011)
ELECTRE	Sepehriar et al. (2013); González & Garza (2004)
DEA	Wu et. al (2007); Songhori et al. (2011)
FUZZY LOGIC	(Mardani et al. 2015); Amin et al. (2011); Chen et al. (2006)
ANP	Lin (2012); Vinodh et al. (2011)

✓ 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.

FUZZY AHP METHODOLOGY

Step 1: Selection of the group of experts and criteria definition

Step 2: Fuzzy scale and comparision matrices

Step 3: Criteria Weighting (Buckley method)

Step 4: Consistency analysis

Consistent?

NO

YES

Step 5: Scales of qualification for criteria

Step 6: Suppliers evaluation

Step 7: Final decision

I STAGE

II STAGE
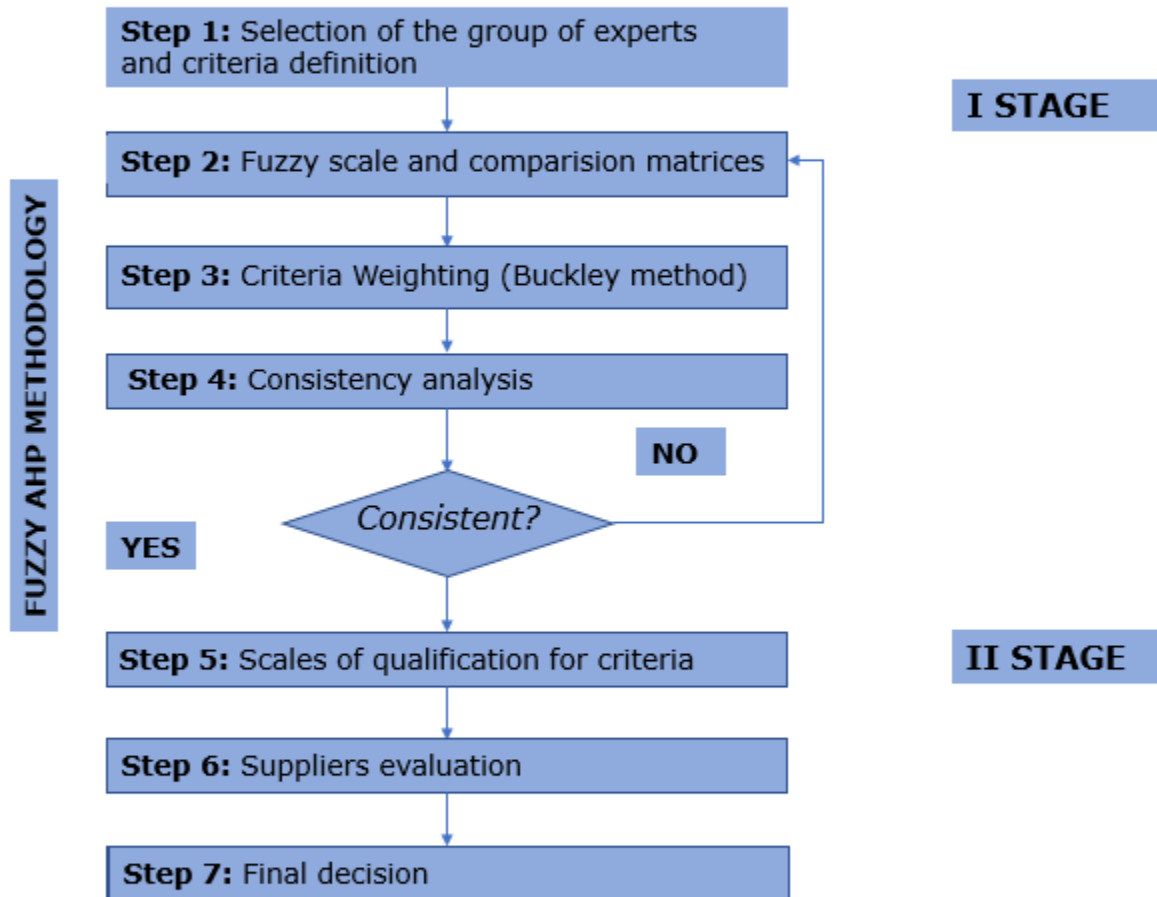
PERFORMANCE	Qualification
Excellent Performance:	Between 4.5 and 5.0.
Good Performance:	Between 3.7 and 4.49.
Regular Performance:	Between 3.0 and 3.69.
Poor Performance	Less than 3.0.

It is fundamental to establish an action plan when the supplier classifies in a regular performance. On the other hand, a poor performance is enough to determine that the supplier should not be continued.

1. Sensitivity Analysis: 0,06

2. After defining the rating scales and establishing the evaluation format, the evaluation was carried out on 1 supplier.

CRITERIA	Criteria Weighting (%)	SUPPLIER 1
Delivery time	12,09%	3,00
Warranty	17,31%	3,00
Quality	32,26%	4,67
Contractual compliance	18,27%	5,00
Costumer service	5,26%	2,67
Reliability	14,81%	3,67
FINAL SUPPLIER EVALUATION		3,98

✓ 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.

✓ Evaluating performance allows for cost reduction, understanding of key processes, identification of potential problems and future improvement actions, among others.

✓ 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.

✓ Buckley, J. J. (1985). Fuzzy hierarchical analysis, Fuzzy Sets and Systems 17: 233–247. https://doi.org/10.1016/0165-0114(85)90090-9

✓ Dotoli, M., Epicoco, N., & Falagario, M. (2020). Multi-Criteria Decision Making techniques for the management of public procurement tenders: A case study. Applied Soft Computing Journal, 88, 106064. https://doi.org/10.1016/j.asoc.2020.106064

✓ Güneri, A. F., Ertay, T., & Yücel, A. (2011). An approach based on ANFIS input selection and modeling for supplier selection problem. Expert Systems with Applications, 38(12), 14907–14917. https://doi.org/10.1016/j.eswa.2011.05.056

✓ Mardani, A., Jusoh, A., & Zavadskas, E. K. (2015). Fuzzy multiple criteria decision making techniques and applications - Two decades review from 1994 to 2014. *Expert Systems with Applications*, *42*(8), 4126–4148. https://doi.org/10.1016/j.eswa.2015.01.003

✓ Osiro, L., Lima-junior, F. R., Cesar, L., & Carpinetti, R. (2014). A fuzzy logic approach to supplier evaluation for development. Intern. Journal of Production Economics, 153, 95–112. https://doi.org/10.1016/j.ijpe.2014.02.009

✓ Ho, W., Xu, X., & Dey, P. K. (2010). Multi-criteria decision making approaches for supplier evaluation and selection: A literature review. European Journal of Operational Research, 202(1), 16–24. https://doi.org/10.1016/j.ejor.2009.05.009

¡THANKS!