Scientific Journal of **Applied Social and Clinical Science**

ESTIMATION OF THE ORGANIZATIONAL CLIMATE OF A HIGHER EDUCATION INSTITUTION USING FUZZY LOGIC

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Abstract: The development of a fuzzy model is presented to address the problems associated with the measurement of the organizational climate of the teaching staff of the Department of Administrative Economic Sciences of a Higher Education institution in the State of Veracruz. A series of items are proposed to evaluate each of the aspects considered as input variables to detect the weak or negative aspects that were obtained from the results of the field research that was carried out, to achieve improvements in the work performance of the collaborators. Finally, conclusions and proposals for future work are presented.

Keywords: diffuse model, organizational climate, job performance.

INTRODUCTION

In the research of Bermúdez, Pedraza and Rincón (2015), the organizational climate in Universities of Bogotá from the perspective of the students, in their work they mention that from the perception of the students of 6 universities they were able to know what impacts their daily life in the university environment, taking into consideration the experiences, own dynamics and situations of each institution, which imply multiple beliefs and values. In order to know these perceptions, it was necessary to have the investigation instruments, which would allow locating links and nexuses that would facilitate their characterization; for this, focus groups and in-depth interviews were chosen. Addressing the organizational climate in the university environment from the perception of the students allowed to know aspects related to the hierarchical structure, the administrative style and management, the infrastructure, resources and the way in which these aspects come together. These aspects were grouped into what was called the administrative category, which, according to the perceptions expressed by the students, is conceived as the group of elements that allow academic work, such as resources, infrastructure, and management styles. A concept of organizational climate is consolidated from the perceptions of the students, about which it can be affirmed that it is the set of tangible factors such as infrastructure, resources, among others, and intangible factors such as values, interpersonal relationships, situations of interaction, among others that are experienced daily at the university.

Other previous works carried out on Organizational Climate have been developed in educational institutions, such as the one carried out by Sandoval, Magaña and Surdez (2013) entitled Organizational climate in research professors of a higher education institution whose objective is: to determine the perception of the climate organizational in the research teaching staff belonging to academic bodies, that is, groups of researchers who cultivate one or more lines of generation and application of knowledge. This study was carried out at the Universidad Juárez Autónoma de Tabasco, Mexico.

Bobadilla Merlo (2017) verified that there is a relationship between the organizational climate and work performance in the Higher Technological Institutes of Huancayo. This relationship was determined with the Chi-square statistical test, through the hypothesis test. For the variable "job performance" the three levels of performance proposed by the Ministry of Education were considered, these levels are: beginning, in process and achieved. Globally, three Higher Technological Institutes of Huancayo present an "achieved" level of job performance.

At present, human capital has great value within organizations, since the good performance of collaborators contributes to the achievement of objectives and the improvement of the different processes, which

is why organizations must pay close attention to maintaining a climate organization that makes employees feel motivated and safe when performing their duties, achieve greater participation on their part, that they feel satisfied with their actions, which provide increasingly better results.

This research was carried out in the Department of Administrative Economic Sciences of a Higher Education institution in the State of Veracruz, with the purpose of analyzing the organizational climate of the teaching staff of the Institution, to know the opinion about the environment in which they work, and implement improvements for the organization and consequently for the collaborators, with the use of a methodology that includes, frame of reference, approach to the problem, objectives which guided the investigation.

A good organizational climate allows any collaborator to achieve the objectives of the company in an efficient way; As an organization, it must be achieved that each of the workers is in a pleasant work environment, which will favor them, as well as the organization. In other words, in order to achieve the goals, it is necessary to join efforts, creating agreement among the members of the organization and, above all, positive attitudes, highlighting the values, abilities, skills, and competencies that each person possesses.

In the literature there are different types of models to evaluate performance, but models based on fuzzy logic have been presented in recent years, with quite satisfactory results. A fuzzy logic model, based on competencies, for the evaluation and selection of employees, was developed by (Golec & Kahya, 2007). Another generic competency-based performance evaluation model, using fuzzy logic, was developed by (Manjarrés, Castell & Luna, 2013).

Fuzzy Logic provides an inference mechanism that allows modeling and simulating human reasoning procedures in systems based on the knowledge of experts in an activity or process. The most widely used fuzzy operators in system modeling are those of the Mandani, Sugeno, and neural network types (Dubrovin, Jolma, & Turunen, 2002; Lozano & Fuentes, 2003; Isasi & Galván, 2004; Martín del Paso, 2005; Sosa, 2007; Macian, 2012). Therefore, the objective of this research is to analyze the resistance to change and its relationship with the level of performance of the professors of the Department of Administrative Economic Sciences of the Technological Institute of Orizaba, through a model based on fuzzy logic, using as variables of entry the three dimensions of the educational model for the 21st century.

Therefore, the objective of this research is to analyze the organizational climate of a higher education institution in the State of Veracruz, through a model based on fuzzy logic, in order to improve the weak or negative aspects that were obtained in the results of the investigation. of field that was carried out, to achieve improvements in the labor performance of the collaborators.

METHOD DESCRIPTION

DEFINITION OF THE PROBLEM

The present investigation will be carried out among the teachers who belong to the Department of Administrative Economic Sciences of a Higher Education institution in the State of Veracruz, during the period January 2010 to December 2021. The reason why the problem of measuring the organizational climate was addressed of the personnel in the Department of Administrative Economic Sciences; It is based on the support that the success or failure in an organization depends in great importance on the work environment that prevails within it.

Currently, this phenomenon is given greater importance due to the need to understand everything that influences performance and People satisfaction, as a necessary condition to obtain excellence in the change process and thus achieve greater organizational efficiency. Likewise, it is necessary to highlight that the organizational climate is the result of certain working conditions or situations encountered by the worker, which can increase or decrease their productivity and job stability. That is why when the climate is evaluated, what is done is to determine, through the perception of the workers, what are the difficulties that exist within their work area and the influence that organizational structures, internal or external factors exert on them. of the work process acting as facilitators or hinderers of the achievement of the quality of the objectives of the institutions.

As mentioned above, Fuzzy Logic provides an inference mechanism that allows modeling and simulating human reasoning procedures in systems based on the knowledge of experts in an activity or process.

Therefore, the objective of this research is to measure the perception of the organizational climate of the professors of the Department of Administrative Economic Sciences of a Higher Education institution in the State of Veracruz, through a model based on fuzzy logic, which will allow answering the following question. Research question: Is it possible to measure the organizational climate of the Department of Administrative Economic Sciences of a Higher Education institution in the State of Veracruz, through a model based on fuzzy logic?

DESCRIPTION OF THE MODEL USED

This project will address the problem of developing a model based on fuzzy logic, to measure the perception of the organizational climate of the professors of the Business Management Engineering program of a higher education institution in the state of Veracruz. The model will be developed with Mamdani-type fuzzy inference, which allows modeling and simulating human reasoning procedures in systems based on the knowledge of experts in an activity or process (Golec & Kahya, 2007). The fuzzy model simulation was developed using the MATLAB fuzzy logic tool.

HYPOTHESIS

The perception of the organizational climate of the professors of the Department of Administrative Economic Sciences of a Higher Education institution can be determined with a model based on fuzzy logic.

CONCEPTUAL DEFINITION

For this study, the concept of organizational climate is understood as the existing environment among the members of an organization, which is closely linked to the motivation of employees and specifically indicates the labor properties of the organizational environment (Chiavenato, 2009); while work performance is understood as the level of execution reached by the worker in achieving goals within an organization in a given time (Araujo and Guerra, 2007).

In the present investigation, the organizational climate has been defined by the following dimensions: Leadership, Communication, Teamwork and, Remuneration; which have been analyzed based on the following indicators: Ethics, Motivation, Feedback, Participation and Responsibility. Additionally, job performance has been defined by the following dimensions: Motivation, Professional Development, Promotion, and Interpersonal Relations; which have been analyzed based on the following indicators: Recognition, Job

Satisfaction, Training, Professional Growth and Attitude.

DEVELOPMENT OF THE MODEL BASED ON FUZZY LOGIC

A model with fuzzy inference Mamdani type was developed. Figure 1 shows the five fuzzy sets that were used for the input variables, while figure 2 shows the seven fuzzy sets that were used for the output variables. The range was set from 0 to 5. The complete fuzzy model was developed in modular, interconnected blocks with three inputs and one output. The fuzzy rules were established heuristically, taking the MacVicar-Whelan distribution as a starting point.
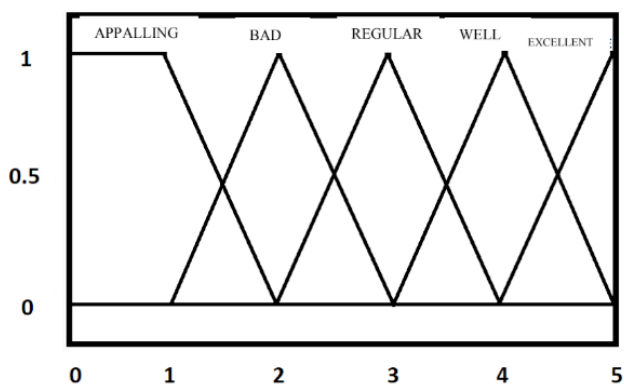

Figure 1. Fuzzy sets for the input variables.

TECHNIQUES AND INSTRUMENTS FOR DATA COLLECTION

The instrument used in this research is a self-made questionnaire that allows knowing teacher performance and resistance to change. A Likert-type scale of five response alternatives is used: a) Very frequently, b) Frequently, c) Occasionally, d) Rarely, e) Never. This scale measures the perception of the organizational climate, from their own perspective, and is evaluated in three dimensions: leadership and motivation dimension; dimension of communication, teamwork and remuneration; and dimension of professional development, promotion and

interpersonal relations. The questionnaire has been validated with an exhaustive review of the theoretical framework, in the same way it was reviewed by three experts belonging to the Division of Postgraduate Studies and Research of a Higher Education institution in the State of Veracruz.

Table 1 presents the indicators and items used to evaluate the level of performance of the perception of the organizational climate of the professors of the Department of Administrative Economic Sciences of a Higher Education institution in the State of Veracruz, in the dimension of leadership and motivation. ; while Table 2 presents the indicators and items used to measure performance in the dimension of communication, teamwork and remuneration; and in Table 3, the indicators and items used to measure performance in the dimension of professional development, promotion, and interpersonal relationships.

FINAL COMMENTS

The results obtained with the model based on fuzzy logic were evaluated to measure the perception of the organizational climate of the professors of the Department of Administrative Economic Sciences of a Higher Education institution in the State of Veracruz. Below is a summary of results.

SUMMARY OF RESULTS

Table 4 presents the results obtained with the model based on fuzzy logic, for the perception of the organizational climate by the professors of the Department of Administrative Economic Sciences of a Higher Education institution in the State of Veracruz.

CONCLUSIONS

The present research work addressed the problem of developing a fuzzy model to measure the perception of the organizational climate of a higher education institution
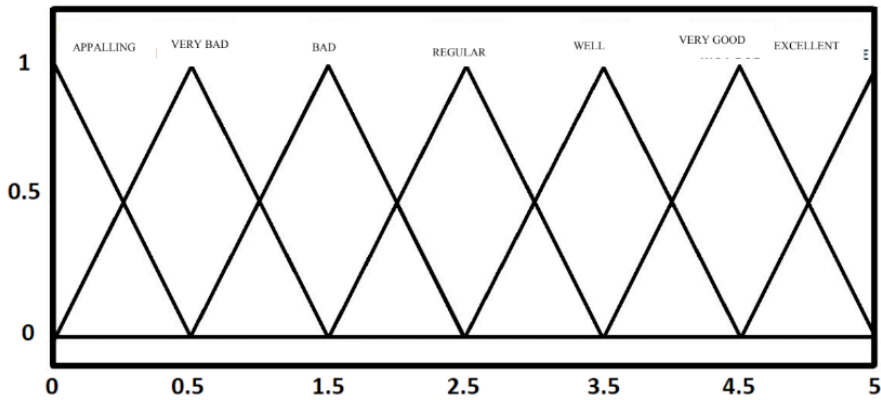
Figure 2. Fuzzy sets for the output variables.

Indicators	items	Performance level
Ethics	3	Leadership and Motivation Dimension
Recognition	6	
Work satisfaction	9	

Table 1. Items used to assess performance in the dimensions of leadership and motivation. philosophical.

Indicators	Items	Performance level
Feedback	2	Dimension of Communication, Teamwork and Remuneration
Participation	5	
Responsibility	8	

Table 2. Items used to assess performance in the dimensions of communication, teamwork and remuneration.

Indicators	Items	Performance level
Training	1	Dimension of Professional Development, Promotion and Interpersonal Relations
Professional growth	4	
Attitude	7	

Table 3. Items used to assess performance in the dimensions of professional development,

Performance level	Qualification	Organizational climate
Dimensions of Leadership and Motivation	3.892 (on a scale of 0 to 5)	68% Good 32% Average
Dimensions of Communication, Teamwork and Remuneration	3.876 (on a scale of 0 to 5)	
Dimensions of Professional Development, Promotion and Interpersonal Relations	3.228 (on a scale of 0 to 5)	

Table 4. Organizational Climate of a Higher Education Institution in the State of Veracruz.

in the State of Veracruz, specifically in the Department of Administrative Economic Sciences.

A methodology based on a quantitative report and with the application of a survey to 26 collaborators was used, which was validated with the Cronbach's Alpha test. Based on the results obtained, a measurement of the perception of the organizational climate of 68% good and 32% regular was obtained, with the diffuse model developed, which allows us to assume that the perception of the organizational climate by the teachers of the Department of Administrative Economic Sciences is relatively good, although approximately a third of those surveyed have a regular perception. In this regard, in the dimensions of professional development, promotion and interpersonal relationships, the lowest rating was obtained, which was 3,228 on a scale of 0 to 5, which corresponds to a perception of 72% regular and 28% good.

Therefore, to improve the organizational climate, it is proposed to implement strategies to contribute to the professional growth of teachers.

RECOMMENDATIONS

Researchers interested in continuing our research could focus on the correlation of training and career growth indicators and their influence on the organization's level of job performance.

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