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Neutrosophic Analysis of Group Dynamics and Teamwork

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Abstract. Group dynamics refers to how members of a team interact and communicate. Understanding the personalities, skills, and roles of each member is crucial to the success of the group. Decision-making, conflict resolution, and time management are key aspects of group dynamics. Teamwork involves efficient collaboration to achieve common goals. These aspects are fundamental for group cohesion, so values in this regard must be promoted in universities. The objective of this research was to understand how group dynamics and teamwork work in university students. Twelve professors were consulted by experts to proceed with a Strategic Analysis applying Neutrosophy to Compensatory Fuzzy Logic. This theory enriches the possibilities of both quantitative and qualitative analysis and interpretation. With this analysis, it was possible to know the predominant influence of internal factors on the development of the dynamics of the group in question. Therefore, the need to work on weaknesses is highlighted, enhancing strengths to achieve better preparation for these future professionals.

Keywords: group dynamics, teamwork, university students, neutrosophy.

1 Introduction

Group work is characterized by the negotiation established by all participants, during the different phases of the task, to agree on a common response that everyone knows, and accepts and for which they are equally responsible. A channel of fluid communication is established between group members, links of collaboration, solidarity, and the development of personal characteristics [1]. A team can be defined as a set or group of people who have complementary capabilities and who collaborate to achieve common objectives, and share responsibilities [2].

Teamwork multiplies the possibilities to generate new knowledge and motivate learning. It is a dynamic, multidimensional competition. Which involves personal disposition and collaboration with others in carrying out activities to achieve common objectives, carrying out information exchange activities, assignment of responsibilities, conflict resolution, and a contribution to collective improvement and development [3]. What defines the team is a set of articulated people, with defined roles to solve a task. The essence of the team is the search for results. These results are the product of the task. However, the task is not linear, but rather a rocky path where people bring into play aspects that mobilize them and aspects that hinder them [4].

The key to making a team function properly lies, first of all, in its constitution. To form a team, it is necessary to consider not only the intellectual abilities of its potential members but also their socio-psychological and personality characteristics. From the selection and training stage, an attempt is made to assemble a group of individuals capable of performing their functions and meeting the objectives for which the work team will be created. Certain teams are formed to carry out specific tasks, others to advise and others to manage [5].

In teams where individuals with different expertise converge, it is possible to construct an interdisciplinary approach through collaborative work, provided that the team explicitly commits to it and works towards that goal. As long as the various forms of expertise within the team are embodied in individuals who identify with their respective training and models, the task faces all the challenges typical of any team that must confront the emotions stirred by the task, while simultaneously dealing with the emotions that the presence of other team members and the shared task evoke in them [6].

The degree of group dynamics is given by its expertise in transforming conflicts into problems through their explanation, its ability to manage them, and its ability to resolve them within the organizational framework. That is, not because of the absence of conflicts, but because of the degree to which they are actually assumed by its members in the performance of their tasks and functions. What defines work teams as transversal competence is their internal functioning and constantly changing dynamics. This permanent change is often expressed in the form of conflict. In this sense, conflict is inherent to any structure formed by people in interaction [2].

Various research shows the importance of integrating diverse profiles with teamwork skills into professional organizations, recognizing that this multidimensional competence is of vital importance due to its effectiveness when addressing tasks, achieving established goals, and solving problems [7]. The reasons for asking students to carry out group work are mainly two. First, it provides an environment that maximizes their learning by collaborating with other students and considering other points of view. Secondly, it prepares students for a work-like environment, improving their employability and developing the skills required for teamwork. Some examples are the development of interpersonal skills and individual responsibility or the improvement of transversal skills related to communication, presentation, problem-solving, leadership, or organization [8].

According to Johnson, Johnson and Holubec (1999), cited by [1], cooperative learning is characterized by these five dimensions:

- Positive interdependence: occurs when each member of the group understands that their success is measured based on the success achieved by the other members of the group and, with it, the group itself.
- Individual and team responsibility: occurs when all members of the group assume the responsibility of taking charge of the task entrusted to them and at the same time knowing, and if necessary, responding to the task of anyone else.
- Stimulating interaction: t is the one carried out face to face between team members and during which they support each other in their learning process by sharing their resources, knowledge, and past experiences, and connecting their own knowledge while supporting, encouraging, and congratulating others for the work done.
- Social and group work skills: these are skills that students learn to use as a result of the need for interaction. They include negotiation, decision-making, and conflict resolution mechanisms, creation of communication channels, proposal of creative ideas and constructive criticism, and also their acceptance.
- Group reflection: this evaluates the functioning and dynamics of the group, as well as its performance and the extent to which its results conform to the proposed objectives. From this, changes and improvement proposals can be established for future work, ensuring that all members receive feedback about the positive aspects and points for improvement of their intervention.

All that has been previously discussed leads to the necessity of understanding how group dynamics and teamwork function among university students, who will become the future professionals of society. Thus, the objective is to assess the dynamics and teamwork of a group of university students. With this research, the aim is to contribute to their better education, not only on an academic level but also by promoting cooperative learning and preparing them for their future professional development and team-oriented work.

2 Description of the Methodology

The research was conducted using a quantitative-qualitative methodology to strategically analyze the dynamics of a group of 40 university students from Uniandes, who specialize in Medicine. Specifically, the study focused on their hospital practice to observe and evaluate how teamwork and group dynamics unfold. For this purpose, 12 professors responsible for teaching these students, including physicians and nurses who collaborate with the students during their hospital tasks, were consulted. The educators were provided with a set of parameters to assess, including group cohesion, communication, collaboration, responsibility, and team task dynamics. They were asked to identify both positive and negative internal and external factors related to group dynamics and teamwork. Three aspects per category were selected from these factors. Subsequently, a Neutrosophic Analysis was conducted using Compensatory Fuzzy Logic.

2.1 Strategic analysis

One of the tools to carry out strategic analysis is the SWOT matrix. It is a map through which the strengths, weaknesses, opportunities, and threats of the organization are established. An internal and external analysis of the environment in which the activity is carried out to improve its profitability, operation, and market positioning. SWOT is the acronym for Strengths, Weaknesses, Opportunities, and Threats. It is a fundamental tool to know the situation in which the company finds itself, from which the future strategy will be drawn. It is a tool for studying

the situation of a company, institution, project, or person, analyzing its internal characteristics (Weaknesses and Strengths) and its external situation (Threats and Opportunities) [9, 23-26]. A SWOT matrix can be used for:

- ✓ Explore new solutions to problems.
- ✓ Identify the barriers that will limit objectives.
- ✓ Decide on the most effective direction.
- ✓ Reveal the possibilities and limitations to change something.

In this article, it will be used as the predicates of compensatory fuzzy logic to describe the success factors in business management of synchronous leadership.

2.2 Compensatory Fuzzy Logic (CFL) [10-15-27].

- ✓ It is a branch of Fuzzy Logic created by the multidisciplinary scientific group Business Management in Uncertainty of the José Antonio Echeverría Higher Polytechnic Institute of Cuba.
- ✓ It consists of a new multivalent system that breaks with traditional axiomatics to achieve semantically better behavior.
- ✓ In processes that require decision-making, compound predicates are required.
- ✓ The truth values obtained on these compound predicates must be sensitive to changes in the truth values of the basic predicates.
- ✓ A predicate is a function of the universe.
- ✓ It renounces compliance with the classical properties of conjunction and disjunction, which makes it a sensible logic.
- ✓ It is flexible and tolerant of imprecision, making it possible to model natural language expressions, promoting the use of complete sentences rather than simple linguistic variables to take advantage of the knowledge accumulated by experts following the notion of Knowledge Engineering.
- ✓ It is compatible with the branches of mathematics related to decision-making by using human language, made up of interrogative, imperative, and declarative phrases, which in many cases present a degree of truthfulness.
- ✓ Vagueness and uncertainty are the objects of its modeling.

2.3 Neutrosophy applied to Compensatory Fuzzy Logic

In this case, the inclusion of the neutrosophic theory enriches the possibilities of the analysis by complementing the values presented in Table 1. This is due to two issues, firstly, the addition of the notion of indeterminacy and, secondly, the possibility of calculating using linguistic terms. For this reason, it was decided to opt for a fusion of both techniques and carry out the study through the use of neutrosophic CFL. Firstly, let us formally expose the original definition of neutrosophic logic as it is shown in [16-22-24-25-28].

Definition 1. Let X be a universe of discourse. A Neutrosophic Set (NS) is characterized by three membership functions, $u_A(x), r_A(x), v_A(x): X \rightarrow]^-0,1^+[$, that satisfy the condition $-0 \leq inf u_A(x) + inf r_A(x) + inf v_A(x)$ $sup\ u_A(x) + sup\ r_A(x) + \sup v_A(x) \leq 3^+$ for all $x \in X$. $u_A(x), r_A(x)\ and\ v_A(x)$ denote the true, indeterminate, and false membership functions of x in A, respectively, and their images are standard or non-standard subsets of -0,1+[.

Definition 2. Let X be a universe of discourse. A Single-Valued Neutrosophic Set (SVNS) A over X is an object of the form:

$$A = \{\langle x, u_A(x), r_A(x), v_A(x)\rangle : x \in X\} \quad (1)$$

Where $u_A, r_A, v_A: X \rightarrow [0,1]$ satisfy the condition $0 \leq u_A(x), r_A(x), v_A(x) \leq 3$ for all $x \in X$. $u_A(x), r_A(x)\ and\ v_A(x)$ denote the true, indeterminate, and false membership functions of x in A, respectively. For convenience, a Single-Valued Neutrosophic Number (NNVU) will be expressed as A = (a, b, c), where a, b, c [0,1] and satisfies $0 \leq a + b + c \leq 3$.

The SVNN arose with the idea of applying neutrosophic sets for practical purposes. Some operations between SVNN are expressed below:

1. Given A1 = (a1, b1, c1) and A2 = (a2, b2, c2) two NNVUs, the sum between A1 and A2 is defined as:
$$A_1\ A_2 = (a_1 + a_2 - a_1a_2, b_1b_2, c_1c_2) \quad (2)$$
2. Let $A_1 = (a_1, b_1, c_1)$ and $A_2 = (a_2, b_2, c_2)$ be two SVNNs, the multiplication between A_1 and A_2 is defined as:
$$A_1\ A_2 = (a_1a_2, b_1+b_2 - b_1b_2, c_1 + c_2 - c_1c_2) \quad (3)$$

3. The product of a positive scalar with an SVNN, A = (a, b, c) is defined by:

$$A = (1 - (1 - a), b, c) \tag{4}$$

4. Let $\{A_1, A_2, \dots, A_n\}$ be a set of n SVNN, where Aj = (aj, bj, cj) (j = 1, 2, …, n), then the *Single Value Neutrosophic Weighted Mean Operator* (SVNWMO) over the set is calculated using the following equation:

$$\sum_{j=1}^{n} \lambda_j A_j = \left(1 - \prod_{j=1}^{n} \left(1 - a_j\right)^{\lambda_j}, \prod_{j=1}^{n} {b_j}^{\lambda_j}, \prod_{j=1}^{n} {c_j}^{\lambda_j}, \right) \tag{5}$$

Where λ_j is the weight of Aj, $\lambda_j \in [0, 1]$ and $\sum_{j=1}^{n} = 1$.

In this article, linguistic terms will be associated with SVNNs, so that experts can carry out their evaluations in linguistic terms, which is more natural. Therefore, the scales shown in Table 1 will be considered.

Table 1: Evolution of the scale from diffuse to neutrosophic linguistic variables

Truth value	Category	SVNN
0	False	(0,1,1)
0.1	Almost false	(0.10,0.90,0.90)
0.2	Fairly false	(0.20,0.85,0.80)
0.3	Somewhat false	(0.30,0.75,0.70)
0.4	More false than true	(0.40,0.65,0.60)
0.5	As true as false	(0.50,0.50,0.50)
0.6	More true than false	(0.60,0.35,0.40)
0.7	Somewhat true	(0.70,0.25,0.30)
0.8	Fairly true	(0.8,0,15,0.20)
0.9	Almost true	(0.9, 0.1, 0.1)
1	True	(1,0,0)

To convert neutrosophic numbers into crisp numbers, the following equation will be used:

$$s(V) = 2 + T - F - I \tag{6}$$

Compensatory fuzzy logic uses mathematical operators that guarantee the effective combination of intangible elements valued through experts, considering categorical scales of truthfulness, with quantitative information, which provides truth values through predicates conveniently defined from such information:

Table 2: Presentation of mathematical operators in FCL predicate logic.

Operators	Predicate logic
Conjunction	(and), c, ⋀
Disjunction	(or), d,⋁
Strict fuzzy order	(o)
Denial	(not)

They go from [0,1] n to [0,1], or go from [0,1] 2 to [0,1] and n from [0,1] [11]. Which satisfies the following axioms:

1. Min $(x_1, x_2, \dots, x_n) \leq c(x_1, x_2, \dots, x_n) \leq \max(x_1, x_2, \dots, x_n)$ (Compensation Axiom)
2. $c(x_1, x_2, \dots, x_i, \dots, x_j, \dots, x_n) = c(x_1, x_2, \dots, x_i, \dots, x_j, \dots, x_n)$ (Axiom of Commutativity of Symmetry)
3. If $x_1 = y_1, x_2 = y_2, \dots, x_{i-1} = y_{i-1}, x_{i+1} = y_{i+1}, \dots, x_n = y_n$, such that none is zero and $x_i > y_i$, then $c(x_1, x_2, \dots, x_n) > c(y_1, y_2, \dots, y_n)$ (Strict Growth Axiom)
4. If $x_1 = 0$ for some i, then $c(x_1, x_2, \dots, x_n) = 0$ (Veto Axiom)
5. If $o(x, y) \geq 0.5$ and $i(y, z) \geq 0.5$, then $o(x, z) \geq \max\{o(x, y), o(y, z)\}$ (Axiom of Fuzzy Transitivity)

6. $n\big(c(x_1, x_2, \dots, x_n)\big) = d\big(n(x_1), n(x_2), \dots, n(x_n)\big).n\big(d(x_1, x_2, \dots, x_n)\big) = c(n\big(c(x_1), n(x_2), \dots, n(x_n)\big)$(Morgan's Laws)

From the previous axioms the following properties are derived:

1. $\text{Min}(x_1, x_2, \dots, x_n) \leq d(x_1, x_2, \dots, x_n) \leq \max(x_1, x_2, \dots, x_n)$ (Compensation Property)
2. $d\big(x_1, x_2, \dots, x_i, \dots, x_j, \dots, x_n\big) = d(x_1, x_2, \dots, x_i, \dots, x_j, \dots, x_n)$ (Property of Commutativity or Symmetry)
3. If $x_1 = y_1, x_2 = y_2, \dots, x_{i-1} = y_{i-1}, x_{i+1} = y_{i+1}, \dots, x_n = y_n$, such that none is zero and $x_i > y_i$, then $d(x_1, x_2, \dots, x_n) > d(y_1, y_2, \dots, y_n)$ (Strict Growth Property)
4. If $x_1 = 1$ for some i, then $x_1 = 1 d(x_1, x_2, \dots, x_n) = 1$ (Veto Property)
5. $c(x_1, x_2, \dots, x_n) = d(x_1, x_2, \dots, x_n) = x$ (Idempotence Property)

The coefficient of variation (Cv) of the predicates will be calculated using equation 5 applying statistical decision criteria according to the following parameters:

- If Cv ≥0.20, take the modal value (rating given by the experts that is most repeated in the analyzed range)
- If Cv <0.20, take the value of the arithmetic mean (average rating of the experts)

$$Cv = \frac{S}{X_{med}} \tag{7}$$

Where S is the standard deviation of the data, and X_{med} is the Mean of the data.

3 Results

3.1 Application of Compensatory Fuzzy Logic

For the SWOT analysis, the criteria of the professors who serve as guides for the group of university students under evaluation were sought. The factors to be analyzed, both internal and external, were outlined, and the following steps were then carried out:

1. Apply the SWOT matrix for better information processing.
2. Analyze by applying compensatory fuzzy logic:
   a) Statement of simple and compound predicates.
   b) Development of the decision tree.
   c) Calculation of simple and compound predicates.
   d) Determination of status through linguistic terms.

Table 3: Statement of simple and compound Predicates and their calculation expressions. Note: own elaboration.

Group dynamics and teamwork	$\boldsymbol{GD(X) = IA(X) \wedge EA(X)}$
Internal Analysis	$IA(X) = W_{1-4}(X) \wedge S_{1-3}(X)$
External Analysis	$EA(X) = T_{1-3}(X) \wedge O_{1-3}(X)$
Weaknesses	$W_{1-3}(X) = W_1(X) \wedge W_2(X) \wedge W_3(X)$
Strengths	$S_{1-3}(X) = S_1(X) \wedge S_2(X) \wedge S_3(X)$
Threats	$T_{1-3}(X) = T_1((X) \wedge T_2(X) \wedge T_3(X)$
Opportunities	$O_{1-3}(X) = O_1(X) \wedge O_2(X)) \wedge O_3(X)$
$W_1(X)$	Interpersonal conflicts
$W_2(X)$	Lack of responsibility
$W_3(X)$	Lack of alignment with the goals
$S_1(X)$	Workload distribution
$S_2(X)$	Emotional Support
$S_3(X)$	Improved decision making
$T_1(X)$	Changes in educational technology

Group dynamics and teamwork	$\boldsymbol{GD(X) = IA(X) \wedge EA(X)}$
$T_2(X)$	Access to research resources
$T_3(X)$	Cultural and generational diversity
$O_1(X)$	Student exchange programs
$O_2(X)$	Technological advances
$O_3(X)$	Government support for higher education

Figure 1: Predicate tree. Source: own elaboration.

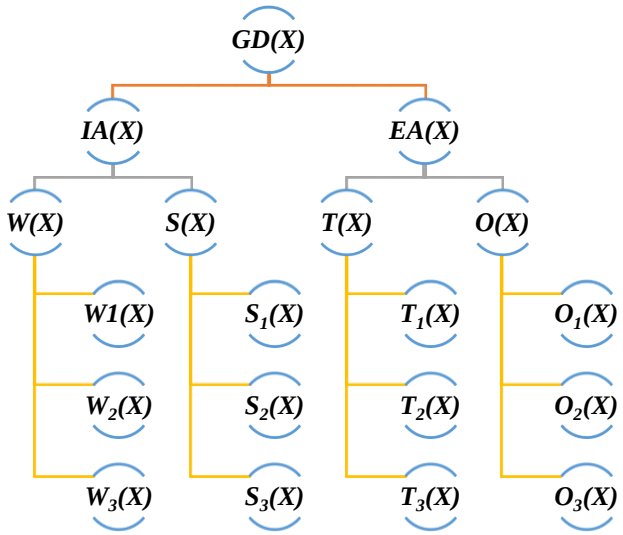

Table 4: Calculation of the truth value of the simple predicates of experts 1 to 4. Source: expert evaluation. Own elaboration

Simple Predicates	**E1**	**E2**	**E3**	**E4**
$\boldsymbol{W_1(X)}$	(0.9, 0.1, 0.1)	(1,0,0)	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)
$\boldsymbol{W_2(X)}$	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)
$\boldsymbol{W_3(X)}$	(0.8,0,15,0.20)	(0.8,0,15,0.20)	(0.60,0.35,0.40)	(0.9, 0.1, 0.1)
$\boldsymbol{S_1(X)}$	(0.50,0.50,0.50)	(0.40,0.65,0.60)	(0.60,0.35,0.40)	(0.60,0.35,0.40)
$\boldsymbol{S_2(X)}$	(1,0,0)	(0.8,0,15,0.20)	(0.60,0.35,0.40)	(0.60,0.35,0.40)
$\boldsymbol{S_3(X)}$	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)
$\boldsymbol{T_1(X)}$	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)	(0.50,0.50,0.50)	(0.70,0.25,0.30)
$\boldsymbol{T_2(X)}$	(0.50,0.50,0.50)	(0.60,0.35,0.40)	(0.60,0.35,0.40)	(0.60,0.35,0.40)
$\boldsymbol{T_3(X)}$	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)
$\boldsymbol{O_1(X)}$	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)
$\boldsymbol{O_2(X)}$	(0.9, 0.1, 0.1)	(1,0,0)	(0.9, 0.1, 0.1)	(1,0,0)
$\boldsymbol{O_3(X)}$	(0.9, 0.1, 0.1)	(0.8,0,15,0.20)	(0.9, 0.1, 0.1)	(0.8,0,15,0.20)

Table 5: Calculation of the truth value of the simple predicates of experts 4 to 8. Source: expert evaluation. Own elaboration

Simple Predicates	E5	E6	E7	E8
$W_1(X)$	(0.9, 0.1, 0.1)	(1,0,0)	(1,0,0)	(0.70,0.25,0.30)
$W_2(X)$	(0.8,0,15,0.20)	(1,0,0)	(1,0,0)	(0.8,0,15,0.20)
$W_3(X)$	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)	(0.50,0.50,0.50)	(0.60,0.35,0.40)
$S_1(X)$	(0.70,0.25,0.30)	(0.70,0.25,0.30)	(0.8,0,15,0.20)	(0.50,0.50,0.50)
$S_2(X)$	(0.8,0,15,0.20)	(1,0,0)	(1,0,0)	(0.9, 0.1, 0.1)
$S_3(X)$	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)	(0.70,0.25,0.30)	(0.50,0.50,0.50)
$T_1(X)$	(0.9, 0.1, 0.1)	(0.70,0.25,0.30)	(1,0,0)	(1,0,0)
$T_2(X)$	(0.50,0.50,0.50)	(0.40,0.65,0.60)	(0.50,0.50,0.50)	(0.20,0.85,0.80)
$T_3(X)$	(0.9, 0.1, 0.1)	(0.40,0.65,0.60)	(0.70,0.25,0.30)	(0.70,0.25,0.30)
$O_1(X)$	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(0.50,0.50,0.50)
$O_2(X)$	(0.9, 0.1, 0.1)	(1,0,0)	(1,0,0)	(1,0,0)
$O_3(X)$	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(1,0,0)	(1,0,0)

Table 6: Calculation of the truth value of the simple predicates of experts 7 to 12. Source: expert evaluation. Own elaboration

Simple Predicates	E9	E10	E11	E12
$W_1(X)$	(0.8,0,15,0.20)	(0.9, 0.1, 0.1)	(1,0,0)	(0.60,0.35,0.40)
$W_2(X)$	(0.8,0,15,0.20)	(0.8,0,15,0.20)	(0.8,0,15,0.20)	(0.8,0,15,0.20)
$W_3(X)$	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	(1,0,0)
$S_1(X)$	(0.50,0.50,0.50)	(0.20,0.85,0.80)	(0.50,0.50,0.50)	(0.50,0.50,0.50)
$S_2(X)$	(0.9, 0.1, 0.1)	(0.8,0,15,0.20)	(1,0,0)	(0.70,0.25,0.30)
$S_3(X)$	(0.70,0.25,0.30)	(1,0,0)	(0.70,0.25,0.30)	(0.8,0,15,0.20)
$T_1(X)$	(0.70,0.25,0.30)	(0.70,0.25,0.30)	(0.50,0.50,0.50)	(0.8,0,15,0.20)
$T_2(X)$	(0.50,0.50,0.50)	(0.8,0,15,0.20)	(0.70,0.25,0.30)	(0.70,0.25,0.30)
$T_3(X)$	(0.50,0.50,0.50)	(0.60,0.35,0.40)	(0.60,0.35,0.40)	(0.40,0.65,0.60)
$O_1(X)$	(1,0,0)	(1,0,0)	(0.8,0,15,0.20)	(0.8,0,15,0.20)
$O_2(X)$	(1,0,0)	(0.70,0.25,0.30)	(1,0,0)	(1,0,0)
$O_3(X)$	(0.70,0.25,0.30)	(0.70,0.25,0.30)	(1,0,0)	(0.70,0.25,0.30)

Table 7: Calculation of Truth Values of simple predicates. Source: expert evaluation. Own elaboration.

Predicates	Mode	Mean	Truth value	Category
$W_1(X)$	(1,0,0)	(0.8,0,15,0.20)	(0.8,0,15,0.20)	Fairly true
$W_2(X)$	(0.8,0,15,0.20)	(0.8,0,15,0.20)	(0.8,0,15,0.20)	Fairly true
$W_3(X)$	(0.9, 0.1, 0.1)	(0.8,0,15,0.20)	(0.9, 0.1, 0.1)	Almost true
$S_1(X)$	(0.50,0.50,0.50)	(0.50,0.50,0.50)	(0.50,0.50,0.50)	As true as false
$S_2(X)$	(1,0,0)	(0.9, 0.1, 0.1)	(0.9, 0.1, 0.1)	Almost true
$S_3(X)$	(0.70,0.25,0.30)	(0.70,0.25,0.30)	(0.70,0.25,0.30)	Somewhat true
$T_1(X)$	(0.70,0.25,0.30)	(0.8,0,15,0.20)	(0.70,0.25,0.30)	Somewhat true

Predicates	Mode	Mean	Truth value	Category
$T_2(X)$	(0.50,0.50,0.50)	(0.50,0.50,0.50)	(0.50,0.50,0.50)	As true as false
$T_3(X)$	(0.40,0.65,0.60)	(0.50,0.50,0.50)	(0.40,0.65,0.60)	More false than true
$O_1(X)$	(0.9, 0.1, 0.1)	(0.8,0,15,0.20)	(0.9, 0.1, 0.1)	Almost true
$O_2(X)$	(1,0,0)	(0.9, 0.1, 0.1)	(1,0,0)	True
$O_3(X)$	(1,0,0)	(0.9, 0.1, 0.1)	(0.8,0,15,0.20)	Fairly true

Table 8: Calculation of the truth values of compound predicates. Source: expert evaluation. Own elaboration

Predicates	Truth value	Category
GD(x)	(0.8,0,15,0.20)	Fairly true
IA(x)	(0.8,0,15,0.20)	Fairly true
EA(x)	(0.60,0.35,0.40)	More true than false
W(x)	(0.70,0.25,0.30)	Somewhat true
S(x)	(0.8,0,15,0.20)	Fairly true
T(x)	(0.8,0,15,0.20)	Fairly true
O(x)	(0.60,0.35,0.40)	More true than false

Based on the results obtained, it was possible to reflect on the value of internal factors in the analyzed group. As they are inherent to the students and do not depend on external factors, they have greater capacity and possibility of resolution. This reflects the need for the group to stay together, working to overcome Weaknesses, and increasing Strengths. An introspective analysis must be carried out on each member, to solve those personal aspects that influence both positively and negatively on the study group. Threats from the external environment must also be considered, such as changes in educational technology, access to research resources, and cultural and generational diversity. These aspects mentioned are not decisive in this situation, but due to their impact, they could generate disharmony in the functioning of the group dynamics.

The interpretation of the results allowed to know that the factors that most affect the dynamics of the analyzed group are the Internal ones, so the Weaknesses must be corrected by enhancing the Strengths. The actions taken will be based on modifying these Weaknesses. Teams offer a supportive environment where members can motivate each other, share knowledge, and overcome challenges together. Improve decision-making through discussion and collaboration. In groups it is important to divide tasks and responsibilities, which can increase efficiency and reduce individual workload, this encourages unity and improves their efficiency. Strengthening these skills also has a positive impact not only on the proper functioning of the group but also on an individual basis for each member.

4 Discussion

Group dynamics and teamwork are fundamental elements of the university experience. Teamwork promotes empathy, effective communication, and the ability to adapt to different personalities, which improves personal and professional relationships. University students find themselves with the constant need to collaborate with their peers on academic projects, which requires understanding and effectively applying these concepts. College students who master these skills are more likely to achieve better academic results and be better prepared for the world of work.

The need to strengthen teamwork and group dynamics is undeniable in a world that is increasingly interconnected and oriented toward collaboration. First, teamwork is essential to address complex challenges and interdisciplinary projects. In university and professional settings, solutions often require a combination of diverse skills and perspectives. Strengthening teamwork allows you to make the most of the collective potential and creativity of the group members. Learning to understand and manage differences of opinion in a collaborative environment is a crucial skill in any field. Furthermore, a group with good dynamics can make more informed and agile decisions, which is essential in a constantly changing world.

That is why the need to strengthen teamwork and group dynamics is evident in solving complex problems, making decisions, developing social skills, and improving well-being. In this process, university professors have an important mission, of transmitting ethical and moral values that promote adequate dynamics in their groups. Also important are the aspects detected as Opportunities offered by the external environment, such as student

exchange programs, technological advances, and government support for higher education. The groups that know how to take advantage of the opportunities that the external environment offers will be more likely to achieve better results both academically and in terms of their practical development as future professionals.

Conclusions

University teams are usually made up of students with different skills and knowledge, which enriches the discussion and leads to the generation of creative ideas and innovative solutions. Group dynamics and teamwork promote collaboration among university students, allowing them to share knowledge and experiences to address academic challenges more effectively. In the group studied, it is important to strengthen the factors internally, due to their great importance for adequate group dynamics. Considering that teamwork at the university helps students develop communication, conflict resolution, and leadership skills, valuable skills in both the academic and professional fields.

Group dynamics and teamwork can lead to better academic performance, as students can tackle projects and challenges more effectively, sharing the workload and leveraging the strengths of their peers. Learning to work as a team in college is essential, as collaboration is an essential skill in most professions and today's work environment. The use of Compensatory Fuzzy Logic with Neutrosophic numbers allowed the establishment of a better interpretation of the strategic analysis, providing a wide possibility of interpretations, quantitatively and qualitatively.

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