Compensatory Fuzzy Logic with Single Valued Neutrosophic Numbers in the Analysis of University Strategic Management

Jesús E. Ricardo, Ariel J. R. Fernández, Maikel Y. L. Vázquez

Universidad Regional Autónoma de los Andes (UNIANDES), Ecuador

E-mails: ua.jesusestupinan@uniandes.edu.ec; ua.arielromero@uniandes.edu.ec; ub.c.investigacion@uniandes.edu.ec

Abstract

In today's university management, it is necessary to promote synchronous leadership as a strategy in the current environment deteriorated by the crisis caused by Covid-19. Therefore, the need to diagnose the strategic management of a higher education institution in Quito, Ecuador, which applies synchronous leadership in university management as part of a course project for business engineering students, is exposed as a problem situation. Consequently, it is stated as a specific objective: to carry out the strategic analysis through the SWOT matrix, applying compensatory fuzzy logic in its neutrosophic version for its processing. The results indicate that the institution must draw up strategies to better face the threats of the environment and take advantage of the opportunities.

Keywords: strategic management; SWOT; neutrosophic CFL

1. Introduction

The ability to improve a school establishment depends, in a relevant way, on management teams with leadership that actively contribute to energizing, supporting, and encouraging its development to build its internal capacity for improvement. At this end of modernity, the conditions for exercising management, with different degrees of incidence depending on each country, are changing significantly (autonomy of schools, accountability, and pressure for results). As a general trend, from a bureaucratic model focused on management, there is a tendency toward a pedagogical direction, aimed at increasing learning and the results of the school[1].

Leadership, from many different perspectives, including leadership styles, the impact that leadership has on the management and culture of the Company, and observable behaviors in the different styles of leadership, among others. Leadership styles have also been characterized by different names, including the following:

- Autocratic leadership
- Bureaucratic leadership
- Charismatic leadership
- Participatory or democratic leadership
- Laissez faire leadership
- People-oriented leadership
- Natural leadership
- Task-oriented leadership
- Transactional leadership
- Transformational leadership

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1.1 Synchronous leadership

Synchronous leadership or reaching synchrony in the Executive Committee means that each and every one of its members is consistently absolutely clear about the following:

- The Strategic Architecture: Vision, Purpose, Game Plan, Differentiating Capabilities, Strategic Priorities, and Project Portfolio.
- Management Architecture: Processes, Governance, Forums, Indicators
- Cultural Architecture: Cultural DNA, Leadership, Recognition and Consequence, Communication.
- From the Road Map of Transformation
- Of the objective and the role that each one has in all of the above.
- What each one requires from the rest of the Team and what each one can contribute, both for their professional and personal skills.

Synchronous leadership goes beyond servant and collaborative leadership but laysits groundwork on these. Therefore, in order to achieve synchrony, it is necessary to cultivate humility, consistency and discipline, service, genuine interest in the common good, proactivity, and personal responsibility. Its achievement leads the Executive Committee to act as a single entity and a single voice in the following:

- Focus on Differentiating Capabilities: in its daily management, the filter for investment decisions, time, or effort, are the differentiating capabilities defined in the Strategic Architecture and not functional priorities.

- The resources belong to the Company: the management of human, financial, and infrastructure resources is the total Company; they are allocated where they generate the most value.

- Process-based operation: without losing agility or generating extra costs, processes are respected, measured, reviewed, and improved. An example of this is the synchronous application of management model tools.

- They are a Team: they are a real Work Team that is backed, supported, and committed to the greater good (strategy) and the common good (total Company).

Research shows that while effective leaders need to be able to keep their teams on schedule and manage time effectively to meet deadlines (something time-pressed individuals excel at), they also need to facilitate interpersonal interactions within these times to help employees function as a team (something that individuals with a high preference for synchrony excel at).

A specific objective of this investigation: to carry out the strategic analysis through the SWOT matrix, applying the compensatory fuzzy logic in its neutrosophic version for its processing [2]. After a review of the bibliography and the consultation of several authors, it was decided that, due to its versatility in the investigation of factors, this neutrosophic analysis should be applied. The SWOT is a strategic analysis technique to determine the external and internal environment that allows and determines the context in which it moves, in turn, allows the design of strategies to defend, take advantage of or adapt to anything that affects the sector [2, 3].

Due to the need to establish mathematical modeling of linguistic terms with compensatory fuzzy logic, indeterminacies can be treated more precisely. The theory of neutrosophy proposed by Florentin Smarandache, for the treatment of neutralities generalizes theories [4], of sharp and fuzzy sets, where indeterminacies have support. Neutrosophy is a useful theory that is increasing the number of its applications in many fields. In this case, the inclusion of this theory enriches the possibilities of the PESTEL analysis, mainly due to two issues, firstly, the addition of the notion of indeterminacy and, secondly, the possibility of calculating using linguistic terms [3, 5, 6]. For this reason, it was decided to opt for a fusion of both techniques and carry out the study with a hermeneutic vision, since it manages to make a comparative interpretation of various interest groups regarding the subject in question [7].

Based on those mentioned above, the study is structured as follows: a second section where the basic concepts necessary to achieve the solution of this problem are described in a summarized and compact manner; a third section to describe the results of the application of the neutrosophic analysis in the

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solution of the raised problem. Finally, the conclusions and references allowed the document's development.

2. Strategic analysis

One of the tools to carry out strategic analysis is the SWOT matrix. It is a map through which the organization's weaknesses, threats, strengths, and opportunities are established. An internal and external analysis of the environment in which the main activity is carried out to improve its profitability, operation, and positioning in the market [8]. SWOT is a fundamental tool to get to know the situation in which the Company finds itself, and from which the future strategy will be drawn up. It is a tool for studying the situation of a company, institution, project, or person, analyzing its internal characteristics (Strengths and Weaknesses) and its external situation (Opportunities and Threats) [9]. According to [10] it 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 of changing something

Which in this paper will be used as the predicates of compensatory fuzzy logic to describe the success factors in business management of synchronous leadership.

3. Neutrosophy applied to Compensatory Fuzzy Logic

The theory of neutrosophy, in this case, the inclusion of this theory enriches the possibilities of analysis by complementing the values shown in table 1 ([11, 12]). This is mainly due to two issues: 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. First, let us formally expose the original definition of neutrosophic logic as shown in [13-18].

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+[, which satisfies 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 $x \in X$. $u_A(x), r_A(x)\ y\ v_A(x)$denote the true, indeterminate, and false membership functions of x in A, respectively, and their images are standard or nonstandard subsets of -0,1+[[17].

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

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

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 $x \in X$. $u_A(x), r_A(x)\ y\ v_A(x)$denote the true, indeterminate, and false membership functions of x in A, respectively. For convenience, a Single Value Neutrosophic Number (SVNN) will be expressed as A = (a, b, c), where a, b, c [0,1] and satisfies 0 ≤ a + b + c ≤ 3.

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

1. Given A1 = (a1, b1, c1) and A2 = (a2, b2, c2) two SVNNs we have that the sum between A1 and A2 is defined as:

$$A_1A_2 = (a_1 + a_2 - a_1a_2, b_1b_2, c_1c_2) \tag{2}$$

2. Given A1 = (a1, b1, c1) and A2 = (a2, b2, c2) two SVNNs, the multiplication between A1 and A2 is defined as:

$$A_1A_2 = (a_1a_2, b_1 + b_2 - b_1b_2, c_1 + c_2 - c_1c_2) \tag{3}$$

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

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$$A = (1 - (1 - a), b, c) \quad (4)$$

4. Let $\{A_1, A_2, \ldots, A_n\}$be a set of n SVNNs, where = (a_j, b_j, c_j) (j = 1, 2, …, n), then the Single Value Neutrosophic Weighted Mean Operator (SVNWMO) over the set is calculated by the following Equation:

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

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

In this paper, linguistic terms will be associated with SVNN, so that experts can carry out their evaluations in linguistic terms, which is more natural. Therefore, the scales shown in Table 2 will be taken into account.

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

Truth value	Category	SVNN
0	Fake	(0,1,1)
0.1	almost fake	(0.10,0.90,0.90)
0.2	pretty fake	(0.20,0.85,0.80)
0.3	somewhat fake	(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	somewhattrue	(0.70,0.25,0.30)
0.8	true enough	(0.8,0,15,0.20)
0.9	almost true	(0.9, 0.1, 0.1)
1	Real	(1,0,0)

To convert neutrosophic numbers to neat numbers the following equation will be used:

$$s(V) = 2 + T - F - I \quad (6)$$

Compensatory Fuzzy Logic uses mathematical operators that guarantee the effective combination of intangible elements valued by experts, considering categorical scales of veracity, with quantitative information, which provides truth values through conveniently defined predicates based on such information:

Table 2: Presentation of the mathematical operators in the logic of predicates of the CFL.

Operators	Predicate logic
Conjunction	(Y) C,∧
Disjunction	(or), d, ∨
Fuzzy strict order	(either)
Denial	(not)

Maps from $[0,1]^n$ to [0,1], or go from $[0,1]^2$ to [0,1] and n from [0,1]. Which satisfies the following axioms ([19]):

1. min[20] ≤ d(x1, x2, ⋯, xn) ≤ max{ x1, x2, ⋯, xn } (Compensation Property).
2. d(x1, x2, ⋯, xn) = d(x1, x2, ⋯, xn) (Property of Commutativity or Symmetry).
3. If x1 = y1, x2 = y2, ⋯, xi−1 = yi−1, xi+1 = yi+1, ⋯, xn = yn, such that neither is zero, and xi >yi, then d (x1, x2, ⋯, xn) > d(y1, y2 ,⋯,yn) (Strict Growth Property)
4. If xi = 1 for some i, then d (x1, x2, ⋯, xn) = 1 (Veto Property)

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5. c(x1, x2, ⋯, xn) = d(x1, x2, ⋯, xn) = x (Idempotency 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 repeated the most in the analyzed range)
- If Cv<0.20, take the value of the arithmetic mean (average rating of the experts)

$$Cv = \frac{S}{X_{med}} \quad (7)$$

Where S: Standard deviation of the data and X_{med}: Mean of the data

4. Application of Compensatory Fuzzy Logic in neutrosophic extension

For the diagnosis of strategic management, business engineering students were asked to:

a) survey the directors and administrators of the faculty;

b) apply the SWOT matrix as a means of classifying and organizing the information obtained;

c) analyze by applying compensatory fuzzy logic in neutrosophic extension:

  i. statement of simple and compound predicates

  ii. decision tree construction

  iii. neutrosophic calculus with the single-valued neutrosophic numbers

  iv. determination of the state through linguistic terms.

The results are shown below:

Simple and compound predicates and their calculation expressions:

- Strategic management $SM(X) = IA(X) \wedge EA(X)$
- Internal analysis $IA(X) = W_{1-4}(X) \wedge S_{1-4}(X)$
- External analysis $EA(X) = T_{1-3}(X) \wedge O_{1-2}(X)$
- Weaknesses $W_{1-4}(X) = W_1(X) \wedge W_2(X) \wedge W_3(X) \wedge W_4(X)$
- Strengths $S_{1-4}(X) = S_1(X) \wedge S_2(X) \wedge S_3(X) \wedge S_4(X)$
- Threats $T_{1-3}(X) = T(X) \wedge T_2(X) \wedge T_3(X)$
- Opportunities $O_{1-2}(X) = O_1(X) \wedge O_2(X)$
- $W_1(X)$ Training needs
- $W_2(X)$ Managers show a lack of commitment
- $W_3(X)$ Fluctuating administrative staff
- $W_4(X)$ Non-collaborative work environment
- $S_1(X)$ Workers express a desire for change
- $S_2(X)$ Highly qualified staff
- $S_3(X)$ Administrative staff committed to university management
- $S_4(X)$ Staff who contribute ideas based on extensive experience
- $T_1(X)$ Competitive environment between institutions
- $T_2(X)$ Economic crisis forcing students to drop out of school
- $T_3(X)$ Migration of professionals
- $O_1(X)$ Trend toward management by European models
- $O_2(X)$ State interest in strengthening university management in the National Development Plan 2021-2025

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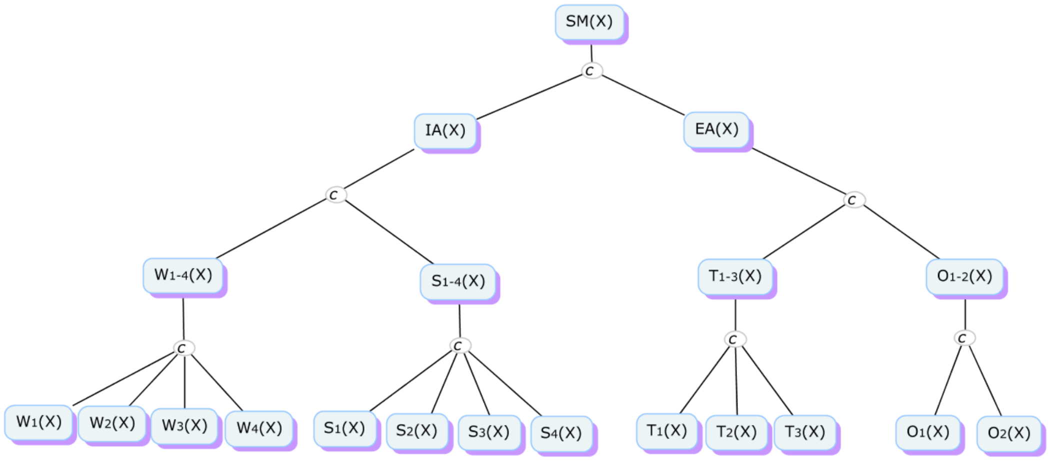

Figure 1: Tree of predicates. Source: own elaboration

Next, we show the calculus of simple predicates. To this end, the experts were asked to rate the current status of each one of the simple predicates according to the linguistic terms shown in Table 1. Anonymous surveys were used as an instrument for collecting information for each expert consulted.

Table 1 shows the single-valued neutrosophic numbers that will serve for scoring. Each predicate, as shown in tables 3-5, is qualified according to the criteria of the experts using these values as input data from the surveys.

Table 3: Qualification of the experts of group 1

Simple predicates	**High direction**				
	Expert 1	**Expert 2**	**Expert 3**	**Expert 4**	**Expert 5**
$W_1(X)$	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(1;0;0)	(0.9;0.1;0.1)	(0.9;0.1;0.1)
$W_2(X)$	(0.3;0.75;0.7)	(0.3;0.75;0.7)	(0.6;0.35;0.4)	(0.9;0.1;0.1)	(1;0;0)
$W_3(X)$	(0.7;0.25;0.3)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.7;0.25;0.3)
$W_4(X)$	(0.9;0.1;0.1)	(1;0;0)	(1;0;0)	(1;0;0)	(0.6;0.35;0.4)
$S_1(X)$	(0.7;0.25;0.3)	(1;0;0)	(1;0;0)	(0.6;0.35;0.4)	(0.9;0.1;0.1)
$S_2(X)$	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(1;0;0)
$S_3(X)$	(0.9;0.1;0.1)	(1;0;0)	(0.7;0.25;0.3)	(0.7;0.25;0.3)	(0.9;0.1;0.1)
$S_4(X)$	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.7;0.25;0.3)	(0.7;0.25;0.3)
$T_1(X)$	(0.7;0.25;0.3)	(0.7;0.25;0.3)	(0.7;0.25;0.3)	(0.6;0.35;0.4)	(0.6;0.35;0.4)
$T_2(X)$	(0.9;0.1;0.1)	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.6;0.35;0.4)
$T_3(X)$	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.4;0.65;0.6)	(0.4;0.65;0.6)	(0.4;0.65;0.6)
$O_1(X)$	(0.9;0.1;0.1)	(0.3;0.75;0.7)	(0.2;0.85;0.8)	(0.3;0.75;0.7)	(0.3;0.75;0.7)
$O_2(X)$	(0.4;0.65;0.6)	(0.3;0.75;0.7)	(0.2;0.85;0.8)	(0.2;0.85;0.8)	(0.2;0.85;0.8)

Table 4: Qualification of the experts of group 2

Simple predicates	**Middle managers**				
	Expert 1	**Expert 2**	**Expert 3**	**Expert 4**	**Expert 5**
$W_1(X)$	(1;0;0)	(0.8;0.15;0.2)	(0.8;0.15;0.2)	(0.6;0.35;0.4)	(0.9;0.1;0.1)
$W_2(X)$	(0.9;0.1;0.1)	(1;0;0)	(1;0;0)	(0.9;0.1;0.1)	(1;0;0)
$W_3(X)$	(0.5;0.5;0.5)	(0.9;0.1;0.1)	(0.8;0.15;0.2)	(0.9;0.1;0.1)	(0.9;0.1;0.1)
$W_4(X)$	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.8;0.15;0.2)	(0.8;0.15;0.2)
$S_1(X)$	(1;0;0)	(0.7;0.25;0.3)	(0.7;0.25;0.3)	(1;0;0)	(1;0;0)
$S_2(X)$	(0.6;0.35;0.4)	(0.5;0.5;0.5)	(0.6;0.35;0.4)	(0.9;0.1;0.1)	(0.9;0.1;0.1)
$S_3(X)$	(0.7;0.25;0.3)	(0.7;0.25;0.3)	(0.7;0.25;0.3)	(0.6;0.35;0.4)	(1;0;0)
$S_4(X)$	(1;0;0)	(0.9;0.1;0.1)	(1;0;0)	(0.9;0.1;0.1)	(1;0;0)
$T_1(X)$	(0.7;0.25;0.3)	(1;0;0)	(0.7;0.25;0.3)	(0.7;0.25;0.3)	(0.7;0.25;0.3)

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$T_2(X)$	(1;0;0)	(1;0;0)	(0.9;0.1;0.1)	(0.8;0.15;0.2)	(0.9;0.1;0.1)
$T_3(X)$	(0;1;1)	(0.6;0.35;0.4)	(0.9;0.1;0.1)	(0;1;1)	(0.5;0.5;0.5)
$O_1(X)$	(1;0;0)	(1;0;0)	(1;0;0)	(1;0;0)	(1;0;0)
$O_2(X)$	(0.6;0.35;0.4)	(0.8;0.15;0.2)	(0.8;0.15;0.2)	(0.9;0.1;0.1)	(0.9;0.1;0.1)

Table 5: Qualification of the experts of group 3

Simple predicates	**Other administrative of interest**				
	Expert 1	**Expert 2**	**Expert 3**	**Expert 4**	**Expert 5**
$W_1(X)$	(0.7;0.25;0.3)	(0.8;0.15;0.2)	(0.8;0.15;0.2)	(0.8;0.15;0.2)	(0.5;0.5;0.5)
$W_2(X)$	(0.8;0.15;0.2)	(0.7;0.25;0.3)	(0.7;0.25;0.3)	(0.8;0.15;0.2)	(0.7;0.25;0.3)
$W_3(X)$	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)
$W_4(X)$	(0.6;0.35;0.4)	(0.5;0.5;0.5)	(0.8;0.15;0.2)	(0.8;0.15;0.2)	(0.5;0.5;0.5)
$S_1(X)$	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.7;0.25;0.3)
$S_2(X)$	(0.7;0.25;0.3)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)
$S_3(X)$	(0.6;0.35;0.4)	(0.8;0.15;0.2)	(0.8;0.15;0.2)	(0.7;0.25;0.3)	(0.6;0.35;0.4)
$S_4(X)$	(0.6;0.35;0.4)	(0.5;0.5;0.5)	(0.6;0.35;0.4)	(0.5;0.5;0.5)	(0.5;0.5;0.5)
$T_1(X)$	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)
$T_2(X)$	(0.8;0.15;0.2)	(0.6;0.35;0.4)	(0.7;0.25;0.3)	(0.6;0.35;0.4)	(0.6;0.35;0.4)
$T_3(X)$	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)	(0.9;0.1;0.1)
$O_1(X)$	(0.8;0.15;0.2)	(0.5;0.5;0.5)	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.5;0.5;0.5)
$O_2(X)$	(0.5;0.5;0.5)	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.6;0.35;0.4)	(0.6;0.35;0.4)

Table 6: Calculation of the weighted averages of the qualification of the experts of both groups using ecuation 5

Simple predicates	**Average by groups**		
	Group 1	**Group 2**	**Group 3**
$W_1(X)$	(1;0;0)	(0.8;0.15;0.2)	(0.9988;0.7697;0.8208)
$W_2(X)$	(1;0;0)	(1;0;0)	(0.99892;0.6952;0.78048)
$W_3(X)$	(0.99991;0.00006;0.00009)	(0.8;0.15;0.2)	(0.99999;0.40951;0.40951)
$W_4(X)$	(1;0;0)	(0.9;0.1;0.1)	(0.996;0.88259;0.904)
$S_1(X)$	(1;0;0)	(0.7;0.25;0.3)	(0.99232;0.86612;0.90928)
$S_2(X)$	(1;0;0)	(0.6;0.35;0.4)	(0.99997;0.50793;0.54073)
$S_3(X)$	(1;0;0)	(0.7;0.25;0.3)	(0.99808;0.77106;0.83872)
$S_4(X)$	(0.99991;0.00006;0.00009)	(1;0;0)	(0.98;0.94719;0.955)
$T_1(X)$	(0.99568;0.00191;0.00432)	(0.7;0.25;0.3)	(0.99999;0.40951;0.40951)
$T_2(X)$	(0.99744;0.0015;0.00256)	(0.9;0.1;0.1)	(0.99616;0.82493;0.87904)
$T_3(X)$	(0.96544;0.03364;0.03456)	(0.9;0.1;0.1)	(0.99999;0.40951;0.40951)
$O_1(X)$	(0.97256;0.03586;0.02744)	(1;0;0)	(0.992;0.91022;0.928)
$O_2(X)$	(0.78496;0.29939;0.21504)	(0.8;0.15;0.2)	(0.9872;0.91075;0.9352)

Table 7: Calculation of the predicates according to their neutrosophic truth values

Simple predicates	**Fashion**	**Half**	**Truth value**	**Category**
$W_1(X)$	(0.9;0.1;0.1)	(1;0;0)	(0.9;0.1;0.1)	Almost true
$W_2(X)$	(1;0;0)	(1;0;0)	(1;0;0)	True
$W_3(X)$	(0.9;0.1;0.1)	(1;0;0)	(0.9;0.1;0.1)	Almost true
$W_4(X)$	(0.9;0.1;0.1)	(1;0;0)	(0.9;0.1;0.1)	Almost true
$S_1(X)$	(1;0;0)	(1;0;0)	(1;0;0)	True
$S_2(X)$	(0.9;0.1;0.1)	(1;0;0)	(0.9;0.1;0.1)	Almost true
$S_3(X)$	(0.7;0.25;0.3)	(1;0;0)	(0.7;0.25;0.3)	More true than false
$S_4(X)$	(0.9;0.1;0.1)	(1;0;0)	(0.9;0.1;0.1)	Almost true
$T_1(X)$	(0.7;0.25;0.3)	(1;0;0	(0.7;0.25;0.3)	More true than false
$T_2(X)$	(0.6;0.35;0.4)	(1;0;0)	(0.6;0.35;0.4)	As true as false
$T_3(X)$	(0.9;0.1;0.1)	(1;0.;0)	(0.9;0.1;0.1)	Almost true

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$O_1(X)$	(1;0;0)	(1;0;0)	(1;0;0)	True
$O_2(X)$	(0.6;0.35;0.4)	(1;0;0)	(0.6;0.35;0.4)	As true as false

Table 8: Neutrosophic truth values of compound predicates

Compound predicates	Neutrosophic truth value
SM(X)	Somewhat real
AI(X)	Pretty true
EA(X)	Somewhat real
W(X)	Almost true
S(X)	Pretty true
T(X)	Somewhat real
O(X)	Pretty true

5. Conclusion

Indeterminacy is incorporated into modeling the causal relationships between the analyzed factors, where neutrosophic science is an active part and a person who makes decisions. The methodology used during the development of this research work allowed an analysis of the different positions and the need to propose action strategies. The study verified the versatility of this mathematical tool.

As can be seen, the experts of the three groups agree that most of the simple predicates have a high level of significance and presence within the university's strategic management. This highly influences the perception of synchronous leadership as a strategy in the search for competitiveness as a center of university education. Therefore, you must:

- Strengthen the commitment of administrative staff to university management
- Outline strategies to deal with the competitive environment between institutions and the economic crisis that forces students to drop out of school
- Take advantage of the State's interest in strengthening university management in the 2021-2025 National Development Plan and achieve government support strategies to strengthen the institution.

From the compound predicates, it can be said that strategic management is qualified within acceptable limits, but external factors have a negative impact. As can be seen in table 8, the necessary values for improvement are those related to threats and opportunities, therefore, it is necessary to draw up strategies to better face threats and take advantage of opportunities in the environment.

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