



Neutrosophic Analysis of the State Negotiation System

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Abstract. State negotiations constitute for each nation the support for the development of society from the acquisition of resources and services. Public contracting has an economic and social impact, where public officials must ensure that they are complied with according to the law. However, public officials have violated the legal principles of public procurement to acquire benefits or personal services without legal support. In studies carried out in Ecuador, this phenomenon has been analyzed in relation to the variability of uncertainties in which public officials understand the regulations. That is why this paper focuses on analyzing and defining the levels of indeterminacy present in the neutrosophic variable that affects the functioning of state negotiation. For the modeling of the study, the use of neutrosophic statistics is suggested to detect the uncertainties of the variable in each dimension. Among the neutrosophic results, the undue use of government policies in state negotiation processes is obtained as the only criterion.

Keywords: state negotiation, neutrosophic statistics, society.

1 Introduction

Public contracts are characterized by special elements where the state legal person intervenes. State negotiations have as their object a public purpose or that of the State Administration for social welfare. State negotiations generate a contractual obligation between public sector entities and suppliers or contractors.

Public negotiations constitute contracting and acquisition operations of products and services carried out by state entities for the welfare of society [1]. The operations must be regulated by specific laws, to guarantee the proper functioning of the public sector, and in particular, transparency and accountability to society (WTO, 2020). To make payment in state negotiations, a payment agreement is made as a legal and effective solution mechanism. With this, the pending assets are fulfilled and they protect the responsibility of paying the fair price of the new service when there has been a budget affectation [2-4]. Public institutions, in exceptional cases to achieve their proposed objectives, receive goods, services, or works from third parties, without contractual support [5].

Most of the deficiencies in the state negotiations come from misuse in the interpretation of the regulations that govern the process. Negative effects such as corruption germinate before these scenes, legal confusion, or omission of the law. Corruption is an element that has been part of administrative contracting since the latter exists. Separating them may be imperative, but at the same time necessary, since corruption has a strong relationship with public contracting, where the public budget is damaged, affecting society.

Public entities make their request to meet needs that lead to payment for the consideration provided. Payments between non-state third parties include the preference for loose budgets to execute millionaire contracts that violate Ecuadorian contracting principles.

The freedom that state institutions have to execute contracts has led to evident corruption complaints in Ecuador. Officials and former government officials have been detected, where the cases have not concluded the analysis and the vast majority have not been tried. These inaccuracies bring with them the repetition of the crime of corruption in the Ecuadorian nation.

Corruption is not new in Ecuador or the world, it is born in all existing cultures and remains with the administration from the first known precarious forms of government. The effects that corruption has caused on societies and the national treasury are unquantifiable and in the same proportion, there are countless efforts to combat this evil that has accompanied the state as a shadow. It is a phenomenon that has become internationalized, has been perfected, and has managed to adapt to different circumstances. Therefore, it is necessary to address the negative effects of state negotiation, by assuming that, although there is an international doctrine, tools must be worked on to deal with contractual illegalities.

Starting from identifying the existing deficiencies, the study requires neutrosophy to visualize the uncertainties that cause corruption in state negotiation. Therefore, the present study has as:

- Main objective: to define the levels of indeterminacy in the functioning of the state negotiation.

- Specific objectives:
 - ❖ Determine the criteria that affect the proper functioning of state negotiation with their respective dimensions that affect the variable analyzed,
 - ❖ Carry out the measurement and modeling of the variable,
 - ❖ Define the dimension with the greatest impact on the functioning of state negotiation.

2 Materials and methods

2.1 Neutrosophic Statistics

Neutrosophic probabilities and statistics are a generalization of classical and imprecise probabilities and statistics. The Neutrosophic Probability of an event E is the probability that the event E occurs [6], the probability that the event E does not occur, and the probability of indeterminacy (not knowing if the event E occurs or not) [7]. In classical probability $nsup \leq 1$, while in neutrosophic probability $nsup \leq 3+$.

The function that models the neutrosophic probability of a random variable x is called neutrosophic distribution: $NP(x) = (T(x), I(x), F(x))$, where T(x) represents the probability that value x occurs, F(x) represents the probability that value x does not occur, and I(x) represents the undetermined or unknown probability of value x.

Neutrosophic Statistics is the analysis of neutrosophic events and deals with neutrosophic numbers, neutrosophic probability distribution, neutrosophic estimation, neutrosophic regression [8], etc. It refers to a set of data, which is formed totally or partially by data with some degree of indeterminacy and the methods to analyze them [9, 10, 11, 16, 17, 19].

Neutrosophic statistical methods allow neutrosophic data (data that may be ambiguous, vague, imprecise, incomplete, or even unknown) to be interpreted and organized to reveal underlying patterns.

Finally, Neutrosophic Logic, Neutrosophic Sets, and Neutrosophic Probabilities and Statistics have a wide application in various research fields and constitute a novel study reference in full development [12, 13, 14, 15, 18, 20, 21, 22, 23, 24].

Neutrosophic Descriptive Statistics encompasses all the techniques for summarizing and describing the characteristics of neutrosophic numerical data.

Neutrosophic Numbers are numbers of the form $N = a + bI$, where a and b are real or complex numbers, while "I" is the indeterminacy part of the neutrosophic number N.

The study of neutrosophic statistics refers to a neutrosophic random variable where X_l and $X_u I_N$ represent the lower and correspondingly higher level that the studied variable can reach, in an indeterminate interval. Follow the neutrosophic mean of the variable by formulating:

$$X_N = X_l + X_u I_N; I_N \in [I_l, I_u] \quad (1)$$

$$\text{Where, } \bar{x}_a = \frac{1}{n_N} \sum_{i=1}^{n_N} X_{il}, \quad \bar{x}_b = \frac{1}{n_N} \sum_{i=1}^{n_N} X_{iu}, \quad n_N \in [n_l, n_u], \quad (2)$$

However, for the calculation of neutral squares (NNS), it can be calculated as follows.

$$\sum_{i=1}^n N(X_i - \bar{X}_{iN})^2 = \sum_{i=1}^n N \left[\begin{array}{l} \min \left((a_i + b_i I_l)(\bar{a} + \bar{b} I_l), (a_i + b_i I_l)(\bar{a} + \bar{b} I_u) \right) \\ (a_i + b_i I_u)(\bar{a} + \bar{b} I_l), (a_i + b_i I_u)(\bar{a} + \bar{b} I_u) \\ \max \left((a_i + b_i I_l)(\bar{a} + \bar{b} I_l), (a_i + b_i I_l)(\bar{a} + \bar{b} I_u) \right) \\ (a_i + b_i I_u)(\bar{a} + \bar{b} I_l), (a_i + b_i I_u)(\bar{a} + \bar{b} I_u) \end{array} \right], I \in [I_l, I_u] \quad (3)$$

Where $a_i = X_l b_i = X_u$. The variance of the neutrosophic sample can be calculated by

$$S_N^2 = \frac{\sum_{i=1}^{n_N} (X_i - \bar{X}_{iN})^2}{n_N} \in [S_L^2, S_U^2]; S_N^2 \in [S_L^2, S_U^2] \quad (4)$$

The neutrosophic coefficient (NCV) measures the consistency of the variable. The lower the value of the NCV, the more consistent the performance of the factor is than that of the other factors. The NCV can be calculated as follows.

$$CV_N = \frac{\sqrt{S_N^2}}{\bar{X}_N} \times 100; CV_N \in [CV_L, CV_U] \tag{5}$$

The neutrosophic argumentation coefficient evaluates the criteria through Linguistic Terms with NNNU of consensus of justification of the expert opinion, (see table 1).

Linguistic term	SVNN
Unaffected (U)	(1,0,0)
Almost unaffected (AU)	(0.9, 0.1, 0.1)
Very low affectation (VLA)	(0.8,0,15,0.20)
Low affectation (LA)	(0.70,0.25,0.30)
Slight affectation (SA)	(0.60,0.35,0.40)
Affects (A)	(0.50,0.50,0.50)
Moderately affected (MA)	(0.40,0.65,0.60)
Severely affected (SA)	(0.30,0.75,0.70)
Very affected (VA)	(0.20,0.85,0.80)
High affectation (HA)	(0.10,0.90,0.90)
Extremely Affected (EED)	(0,1,1)

Table 1: Linguistic terms that represent the weight of the factors. Source: own elaboration.

3 Method development

3.1 Data Collection and Characteristics of the Neutrosophic Variable

The variability of the data and criteria obtained determines the use of neutrosophic statistics for modeling. The level of indeterminacy in the functioning of state negotiation requires analysis at the dimensional level and the level of subsets of the study variable. For the neutrosophic study, it is defined as:

- Variable to model: levels of indeterminacy in the functioning of state negotiation.
- Variable coding: FSN
- Neutrosophic scale: [0; 1]. Weights are calculated based on the linguistic terms in Table 1.

For the neutrosophic statistical modeling, the experts are presented with eight criteria that affect the correct functioning of state negotiation. The studied variable is analyzed from the neutrosophic set and its relationships between subsets. For each criterion, a dimension is established with a code to be used in the modeling (Table 2). The data for the modeling visualize the use of the public budget in works and purchase of resources. For data processing, feedback was provided from studies at the Universidad de Los Andes.

Code	Criteria	Code	Dimension
C1	Corruption in payment agreements	E	Economic
C2	Image of bad payer at international level	E	Economic
C3	Policies of the government of the day that hinder the hiring process	P	Political
C4	Increase in public debt	E	Economic
C5	Violations in the contracting processes.	L	Legal
C6	Losses of the technological autonomy of the nation	T	Technological
C7	High interest rates imposed by creditors	E	Economic
C8	Budget cuts in social works	S	Social

Table 2: Crites that affect the proper functioning of state negotiation with their respective dimensions. Source: own elaboration.

3.2 Neutrosophic analysis at the dimensional level

For neutrosophic dimensional analysis, the use of neutrosophic statistics is required. It is required to evaluate a neutrosophic sample to determine the critical points between dimensions and their level of indeterminacy. For the development of the study, the dimensions of the neutrosophic variable FSN were visualized in the analyzed sample (see Table 3).

For the development of the study, a sample of 80 experts in public negotiation issues is used. Each expert is allowed to assess each dimension based on the criteria that comprise it. The answers of the experts must be represented in linguistic terms according to their representation (see table 1). Neutrosophic frequencies are plotted from expert responses.

No	E	P	L	T	S
1	[(0.1,0.9,0.95);(0.3,0.7 5,0.8)]	[(0.2,0.8,0.85);(0.6,0.3 5,0.5)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0.4,0.5,0.55);(1,0.05, 0)]	[(0.2,0.8,0.85);(0.3,0.7 5,0.8)]
2	[(0.3,0.75,0.8);(0.9,0.1 2,0.15)]	[(0.2,0.8,0.85);(0.4,0.5, 0.55)]	[(0.3,0.75,0.8);(0.9,0.1 2,0.15)]	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]	[(0.4,0.5,0.55);(0.7,0.3, 0.4)]
3	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]	[(0,0.95,1);(0,0.95,1)]	[(0.1,0.9,0.95);(0.6,0.3 5,0.5)]	[(0.4,0.5,0.55);(0.4,0.5, 0.55)]	[(0.4,0.5,0.55);(0.8,0.1 5,0.25)]
4	[(0.3,0.75,0.8);(0.9,0.1 2,0.15)]	[(0,0.95,1);(0.4,0.5,0.5 5)]	[(0.2,0.8,0.85);(0.2,0.8, 0.85)]	[(0.4,0.5,0.55);(0.8,0.1 5,0.25)]	[(0,0.95,1);(0.3,0.75,0. 8)]
5	[(0.1,0.9,0.95);(0.2,0.8, 0.85)]	[(0.2,0.8,0.85);(0.7,0.3, 0.4)]	[(0.4,0.5,0.55);(0.6,0.3 5,0.5)]	[(0.3,0.75,0.8);(0.9,0.1 2,0.15)]	[(0.2,0.8,0.85);(0.6,0.3 5,0.5)]
6	[(0.2,0.8,0.85);(0.7,0.3, 0.4)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0.4,0.5,0.55);(0.7,0.3, 0.4)]	[(0.3,0.75,0.8);(0.8,0.1 5,0.25)]	[(0.4,0.5,0.55);(0.4,0.5, 0.55)]
7	[(0.2,0.8,0.85);(0.6,0.3 5,0.5)]	[(0.4,0.5,0.55);(0.8,0.1 5,0.25)]	[(0.1,0.9,0.95);(0.1,0.9, 0.95)]	[(0,0.95,1);(0.2,0.8,0.8 5)]	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]
8	[(0,0.95,1);(0,0.95,1)]	[(0,0.95,1);(0.4,0.5,0.5 5)]	[(0.3,0.75,0.8);(0.4,0.5, 0.55)]	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]	[(0.3,0.75,0.8);(0.4,0.5, 0.55)]
9	[(0.4,0.5,0.55);(0.4,0.5, 0.55)]	[(0.3,0.75,0.8);(0.6,0.3 5,0.5)]	[(0.3,0.75,0.8);(0.4,0.5, 0.55)]	[(0.4,0.5,0.55);(0.4,0.5, 0.55)]	[(0.1,0.9,0.95);(0.2,0.8, 0.85)]
10	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]	[(0.2,0.8,0.85);(0.7,0.3, 0.4)]	[(0.3,0.75,0.8);(0.6,0.3 5,0.5)]	[(0.4,0.5,0.55);(0.9,0.1 2,0.15)]	[(0,0.95,1);(0.4,0.5,0.5 5)]
11	[(0.1,0.9,0.95);(0.3,0.7 5,0.8)]	[(0,0.95,1);(0.4,0.5,0.5 5)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]
12	[(0.4,0.5,0.55);(1,0.05, 0)]	[(0,0.95,1);(0.4,0.5,0.5 5)]	[(0.4,0.5,0.55);(0.7,0.3, 0.4)]	[(0.1,0.9,0.95);(0.4,0.5, 0.55)]	[(0.2,0.8,0.85);(0.3,0.7 5,0.8)]
13	[(0.3,0.75,0.8);(0.8,0.1 5,0.25)]	[(0.1,0.9,0.95);(0.2,0.8, 0.85)]	[(0.2,0.8,0.85);(0.6,0.3 5,0.5)]	[(0.2,0.8,0.85);(0.4,0.5, 0.55)]	[(0.2,0.8,0.85);(0.6,0.3 5,0.5)]
14	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]	[(0.4,0.5,0.55);(1,0.05, 0)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0.2,0.8,0.85);(0.4,0.5, 0.55)]	[(0.3,0.75,0.8);(0.8,0.1 5,0.25)]
15	[(0.4,0.5,0.55);(1,0.05, 0)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0.2,0.8,0.85);(0.3,0.7 5,0.8)]	[(0.2,0.8,0.85);(0.6,0.3 5,0.5)]	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]
16	[(0.1,0.9,0.95);(0.2,0.8, 0.85)]	[(0.2,0.8,0.85);(0.3,0.7 5,0.8)]	[(0.2,0.8,0.85);(0.3,0.7 5,0.8)]	[(0.2,0.8,0.85);(0.6,0.3 5,0.5)]	[(0.3,0.75,0.8);(0.6,0.3 5,0.5)]
17	[(0,0.95,1);(0.1,0.9,0.9 5)]	[(0.4,0.5,0.55);(1,0.05, 0)]	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]	[(0.1,0.9,0.95);(0.3,0.7 5,0.8)]	[(0,0.95,1);(0.4,0.5,0.5 5)]
18	[(0.3,0.75,0.8);(0.9,0.1 2,0.15)]	[(0,0.95,1);(0,0.95,1)]	[(0.3,0.75,0.8);(0.4,0.5, 0.55)]	[(0,0.95,1);(0.1,0.9,0.9 5)]	[(0.1,0.9,0.95);(0.1,0.9, 0.95)]
19	[(0.1,0.9,0.95);(0.6,0.3 5,0.5)]	[(0.1,0.9,0.95);(0.1,0.9, 0.95)]	[(0.4,0.5,0.55);(0.6,0.3 5,0.5)]	[(0.3,0.75,0.8);(0.9,0.1 2,0.15)]	[(0.4,0.5,0.55);(0.6,0.3 5,0.5)]
20	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0,0.95,1);(0.2,0.8,0.8 5)]	[(0,0.95,1);(0.1,0.9,0.9 5)]	[(0.2,0.8,0.85);(0.3,0.7 5,0.8)]
21	[(0.1,0.9,0.95);(0.2,0.8, 0.85)]	[(0.3,0.75,0.8);(0.4,0.5, 0.55)]	[(0.2,0.8,0.85);(0.3,0.7 5,0.8)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0.1,0.9,0.95);(0.4,0.5, 0.55)]
22	[(0,0.95,1);(0,0.95,1)]	[(0.2,0.8,0.85);(0.4,0.5, 0.55)]	[(0,0.95,1);(0,0.95,1)]	[(0.4,0.5,0.55);(0.9,0.1 2,0.15)]	[(0,0.95,1);(0.2,0.8,0.8 5)]
23	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]	[(0.3,0.75,0.8);(0.4,0.5, 0.55)]	[(0.1,0.9,0.95);(0.3,0.7 5,0.8)]	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]
24	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]	[(0,0.95,1);(0.1,0.9,0.9 5)]	[(0.1,0.9,0.95);(0.6,0.3 5,0.5)]	[(0.3,0.75,0.8);(0.8,0.1 5,0.25)]	[(0,0.95,1);(0.4,0.5,0.5 5)]
25	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]	[(0.3,0.75,0.8);(0.9,0.1 2,0.15)]	[(0.3,0.75,0.8);(0.6,0.3 5,0.5)]	[(0.1,0.9,0.95);(0.6,0.3 5,0.5)]	[(0.4,0.5,0.55);(0.7,0.3, 0.4)]
26	[(0.1,0.9,0.95);(0.3,0.7 5,0.8)]	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]	[(0.1,0.9,0.95);(0.3,0.7 5,0.8)]	[(0.1,0.9,0.95);(0.1,0.9, 0.95)]	[(0.2,0.8,0.85);(0.2,0.8, 0.85)]
27	[(0.2,0.8,0.85);(0.3,0.7 5,0.8)]	[(0.3,0.75,0.8);(0.7,0.3, 0.4)]	[(0.3,0.75,0.8);(0.8,0.1 5,0.25)]	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]	[(0.3,0.75,0.8);(0.6,0.3 5,0.5)]
28	[(0.3,0.75,0.8);(0.3,0.7 5,0.8)]	[(0,0.95,1);(0.3,0.75,0. 8)]	[(0.4,0.5,0.55);(0.6,0.3 5,0.5)]	[(0.1,0.9,0.95);(0.1,0.9, 0.95)]	[(0.3,0.75,0.8);(0.6,0.3 5,0.5)]
29	[(0.2,0.8,0.85);(0.4,0.5, 0.55)]	[(0,0.95,1);(0,0.95,1)]	[(0.2,0.8,0.85);(0.4,0.5, 0.55)]	[(0.3,0.75,0.8);(0.4,0.5, 0.55)]	[(0.1,0.9,0.95);(0.1,0.9, 0.95)]

No	E	P	L	T	S
30	[(0.4,0.5,0.55);(0.7,0.3,0.4)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.1,0.9,0.95);(0.4,0.5,0.55)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.3,0.75,0.8);(0.9,0.12,0.15)]
31	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.095,1);(0.2,0.8,0.85)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]
32	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.095,1);(0.2,0.8,0.85)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]	[(0.1,0.9,0.95);(0.4,0.5,0.55)]
33	[(0.1,0.9,0.95);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.4,0.5,0.55);(0.8,0.15,0.25)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.9,0.12,0.15)]
34	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.9,0.12,0.15)]
35	[(0.1,0.9,0.95);(0.2,0.8,0.85)]	[(0.4,0.5,0.55);(0.4,0.5,0.55)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]
36	[(0.1,0.9,0.95);(0.6,0.3,0.5)]	[(0.095,1);(0.4,0.5,0.55)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.4,0.5,0.55)]
37	[(0.4,0.5,0.55);(0.6,0.3,0.5)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.6,0.3,0.5)]	[(0.3,0.75,0.8);(0.6,0.3,0.5)]
38	[(0.3,0.75,0.8);(0.6,0.3,0.5)]	[(0.2,0.8,0.85);(0.2,0.8,0.85)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.1,0.9,0.95);(0.6,0.3,0.5)]
39	[(0.2,0.8,0.85);(0.2,0.8,0.85)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.2,0.8,0.85);(0.6,0.3,0.5)]	[(0.1,0.9,0.95);(0.4,0.5,0.55)]
40	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.9,0.12,0.15)]	[(0.1,0.9,0.95);(0.2,0.8,0.85)]	[(0.095,1);(0.3,0.75,0.8)]
41	[(0.4,0.5,0.55);(0.4,0.5,0.55)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.7,0.3,0.4)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.6,0.3,0.5)]
42	[(0.4,0.5,0.55);(1,0,0,0)]	[(0.4,0.5,0.55);(0.6,0.3,0.5)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]
43	[(0.4,0.5,0.55);(0.9,0.12,0.15)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(1,0,0,0)]	[(0.2,0.8,0.85);(0.7,0.3,0.4)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]
44	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.4,0.5,0.55);(0.6,0.3,0.5)]	[(0.2,0.8,0.85);(0.7,0.3,0.4)]	[(0.1,0.9,0.95);(0.1,0.9,0.95)]
45	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.6,0.3,0.5)]	[(0.3,0.75,0.8);(0.9,0.12,0.15)]	[(0.4,0.5,0.55);(0.7,0.3,0.4)]	[(0.1,0.9,0.95);(0.1,0.9,0.95)]
46	[(0.4,0.5,0.55);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.6,0.3,0.5)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.4,0.5,0.55);(0.4,0.5,0.55)]
47	[(0.2,0.8,0.85);(0.6,0.3,0.5)]	[(0.2,0.8,0.85);(0.2,0.8,0.85)]	[(0.3,0.75,0.8);(0.6,0.3,0.5)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.2,0.8,0.85);(0.7,0.3,0.4)]
48	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.2,0.8,0.85);(0.6,0.3,0.5)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.1,0.9,0.95);(0.2,0.8,0.85)]
49	[(0.3,0.75,0.8);(0.9,0.12,0.15)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]
50	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.4,0.5,0.55);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.6,0.3,0.5)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]
51	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.095,1);(0.4,0.5,0.55)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.7,0.3,0.4)]	[(0.4,0.5,0.55);(0.8,0.15,0.25)]
52	[(0.2,0.8,0.85);(0.6,0.3,0.5)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]
53	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.095,1);(0.2,0.8,0.85)]	[(0.4,0.5,0.55);(0.9,0.12,0.15)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]	[(0.095,1);(0.095,1)]
54	[(0.095,1);(0.1,0.9,0.95)]	[(0.2,0.8,0.85);(0.7,0.3,0.4)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]
55	[(0.4,0.5,0.55);(0.6,0.3,0.5)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.4,0.5,0.55);(0.8,0.15,0.25)]	[(0.2,0.8,0.85);(0.2,0.8,0.85)]	[(0.3,0.75,0.8);(0.6,0.3,0.5)]
56	[(0.1,0.9,0.95);(0.4,0.5,0.55)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(1,0,0,0)]	[(0.4,0.5,0.55);(0.9,0.12,0.15)]	[(0.1,0.9,0.95);(0.2,0.8,0.85)]
57	[(0.3,0.75,0.8);(0.6,0.3,0.5)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.095,1);(0.2,0.8,0.85)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.6,0.3,0.5)]
58	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.6,0.3,0.5)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.095,1);(0.2,0.8,0.85)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]

No	E	P	L	T	S
59	[(0.4,0.5,0.55);(0.7,0.3,0.4)]	[(0.3,0.75,0.8);(0.9,0.12,0.15)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]
60	[(0.4,0.5,0.55);(0.7,0.3,0.4)]	[(0.2,0.8,0.85);(0.2,0.8,0.85)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]
61	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.2,0.8,0.85);(0.7,0.3,0.4)]	[(0.1,0.9,0.95);(0.6,0.35,0.5)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]
62	[(0.1,0.9,0.95);(0.2,0.8,0.85)]	[(0.4,0.5,0.55);(0.6,0.35,0.5)]	[(0.1,0.9,0.95);(0.1,0.9,0.95)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]
63	[(0.095,1);(0.095,1)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]
64	[(0.3,0.75,0.8);(0.9,0.12,0.15)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.095,1);(0.095,1)]	[(0.1,0.9,0.95);(0.4,0.5,0.55)]
65	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.2,0.8,0.85);(0.6,0.35,0.5)]	[(0.2,0.8,0.85);(0.2,0.8,0.85)]
66	[(0.1,0.9,0.95);(0.1,0.9,0.95)]	[(0.095,1);(0.2,0.8,0.85)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.095,1);(0.095,1)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]
67	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.6,0.35,0.5)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.4,0.5,0.55);(0.9,0.12,0.15)]
68	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.4,0.5,0.55);(0.4,0.5,0.55)]	[(0.095,1);(0.4,0.5,0.55)]
69	[(0.3,0.75,0.8);(0.9,0.12,0.15)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]
70	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.4,0.5,0.55);(0.9,0.12,0.15)]	[(0.2,0.8,0.85);(0.6,0.35,0.5)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.095,1);(0.095,1)]
71	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.2,0.8,0.85);(0.2,0.8,0.85)]	[(0.1,0.9,0.95);(0.4,0.5,0.55)]	[(0.4,0.5,0.55);(0.8,0.15,0.25)]
72	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.2,0.8,0.85);(0.6,0.35,0.5)]	[(0.4,0.5,0.55);(0.8,0.15,0.25)]	[(0.095,1);(0.4,0.5,0.55)]
73	[(0.4,0.5,0.55);(1,0,0,0)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.6,0.35,0.5)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]
74	[(0.3,0.75,0.8);(0.6,0.35,0.5)]	[(0.3,0.75,0.8);(0.6,0.35,0.5)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.1,0.9,0.95);(0.4,0.5,0.55)]
75	[(0.4,0.5,0.55);(0.9,0.12,0.15)]	[(0.095,1);(0.4,0.5,0.55)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.095,1);(0.3,0.75,0.8)]	[(0.1,0.9,0.95);(0.1,0.9,0.95)]
76	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.6,0.35,0.5)]	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]
77	[(0.3,0.75,0.8);(0.6,0.35,0.5)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.6,0.35,0.5)]
78	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.9,0.12,0.15)]	[(0.095,1);(0.4,0.5,0.55)]	[(0.4,0.5,0.55);(1,0,0,0)]
79	[(0.4,0.5,0.55);(0.8,0.15,0.25)]	[(0.4,0.5,0.55);(1,0,0,0)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.7,0.3,0.4)]	[(0.1,0.9,0.95);(0.3,0.75,0.8)]
80	[(0.3,0.75,0.8);(0.3,0.75,0.8)]	[(0.2,0.8,0.85);(0.3,0.75,0.8)]	[(0.3,0.75,0.8);(0.8,0.15,0.25)]	[(0.095,1);(0.1,0.9,0.95)]	[(0.095,1);(0.3,0.75,0.8)]
1-80	[(0.3,0.75,0.8);(0.5,0.53)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.5,0.53)]	[(0.2,0.8,0.85);(0.4,0.5,0.55)]	[(0.3,0.75,0.8);(0.4,0.5,0.55)]

Table 3: Neutrosophic frequency of FSN dimensions. Source: own elaboration.

The results obtained from the analysis of the neutrosophic frequency present an indeterminacy level close to 0.5. The result defines in what proportion the factor influences the stability of democracy in Ecuadorian society according to the sample analyzed. From the results it is observed the dimension:

- The economic and legal dimensions range from affected to severely affected when the FSN variable is analyzed. The analysis of the statistical frequencies represents that in the negotiations in the public sector there are economic elements that lead to the committing of economic crimes. While, legally, each economic actor violates legal regulations that lead to the malfunction of public negotiations.
- The political and technological dimensions present a certain relationship, although both are moderately affected to highly affected. This relationship means that in the relations of each nation there are policies aimed at directing large-scale public works. Although the security of technology has been violated to favor personal interests over society.

- The social dimension is in a state between moderately affected and severely affected. This dimension visualizes the problems in which the malfunction of public negotiations affects society. Poverty is a reflection of the mismanagement of the public debt and the public budget.

To measure the uncertainty value of each factor, the associated referent uncertainty measure is calculated for $\bar{x} \in [\bar{x}_L; \bar{x}_U]$, $S_N \in [S_L; S_U]$ and $CV_N \in [CV_L; CV_U]$ in the form of neutrosophic numbers (Table 4).

Dimensions	\bar{x}_N	Y_N	CV_N	I \in		
				\bar{x}_N	Y_N	CV_N
E	0.286 + 0.534 I	0.014 + 0.347 I	0.049 + 0.65 I	46.40	96.00	92.50
P	0.211 + 0.474 I	0.017 + 0.334 I	0.081 + 0.705 I	55.50	94.90	88.50
L	0.255 + 0.514 I	0.016 + 0.322 I	0.063 + 0.626 I	50.40	95.00	89.90
T	0.239 + 0.504 I	0.015 + 0.329 I	0.063 + 0.653 I	52.60	95.40	90.40
S	0.26 + 0.481 I	0.015 + 0.306 I	0.058 + 0.636 I	45.90	95.10	90.90

Table 4: Neutrosophic forms with the measure of indeterminacy. Source: own elaboration.

The values CV_N range from 0.049 to 0.081 with the measure of indeterminacy of [0.885; 0.925]. It is generated by a sample of [0;80] questionnaires and statistical information, obtained from 80 experts (Figures 1 and 2). Therefore, it is required to evaluate the most affected dimension where the variable becomes indeterminate.

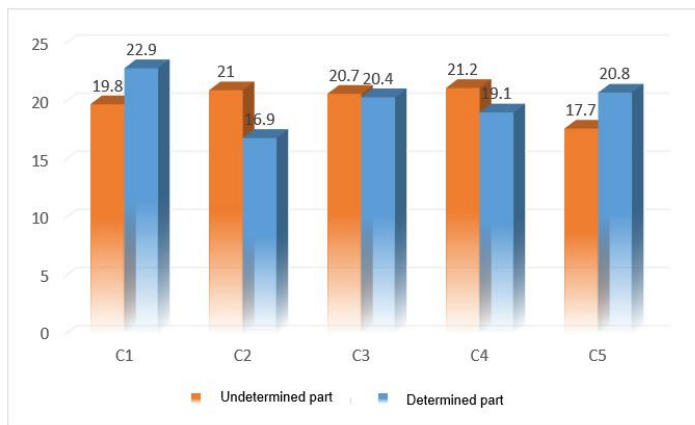


Figure 1: Neutrosophic bar chart of incidents for online business development. Source: own elaboration.

Figure 1 shows that the levels of indeterminacy are between [17.7; 21.2], while in the determination of the variable they are located between [16.9; 22.9]. The levels of indeterminacy for the analyzed sample are included in the dimensions for the displayed ranges. It is evident that for experts on public procurement issues, these dimensions play a fundamental role. The balance of each dimension leads to a good performance in matters of state negotiation. The levels of indeterminacy define the cause of the variety in the states of the variable.

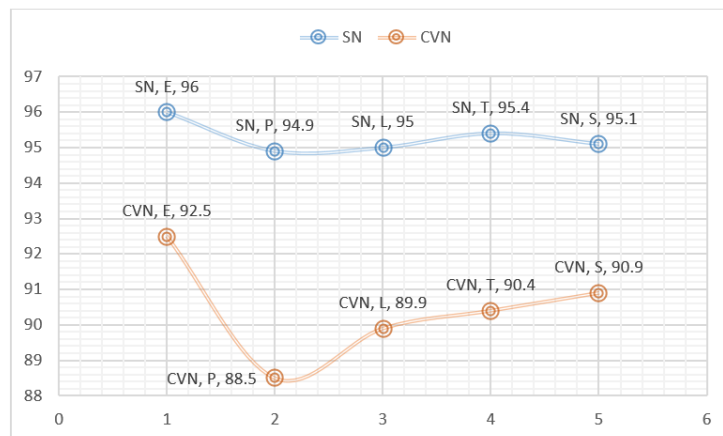


Figure 2: Value of uncertainty in S_N and CV_N for each dimension. Source: own elaboration.

From the result of the analysis of the neutrosophic frequencies, the political dimension with the greatest affectation is determined, as the subset with the greatest incidence in the process of public negotiations in the country. This dimension has as its sole criterion the policies of the government in power that hinder the hiring process and reflects a unique characteristic within the subset. This criterion is seen in several countries that, by making the hiring process difficult, leads to a chain reaction in the adjoining dimensions.

It is proposed to minimize the uncertainties of this dimension, and reduce the possible criteria to arise:

- Evaluate the regulations that govern state negotiation processes and propose regulations to apply a negotiation system that complies with contracting laws,
- Endorse by the officers that the regulations are complied with the processes of acquisition of goods or services or execution of works,
- The acquisition of goods, services, or works fostered by favorable policies must be approved and justified under equal conditions in the national and international markets.

Conclusion

Once the investigation was concluded, the following conclusions could be reached:

The application of neutrosophy allows obtaining results of a variable with a certain level of indeterminacy. In the study of state negotiations or public negotiations, various criteria that affect various dimensions of the proper functioning of the contracting process are disseminated. To guarantee the full execution of public contracts and compliance with regulations, each undetermined criterion must be analyzed.

The analysis of the neutrosophic statistics arrived that the variable has indeterminate elements that affect the proper functioning of the negotiations in the public sector. Of the results obtained, it refers to the political dimension, with a level of indeterminacy of 88.5% in relation to state negotiations. It should be noted that the indeterminacy of the variable in the political dimension directly affects the other dimensions. The explanation is given from the fact that the policies aimed at public negotiations affect economic results, the relaxation of laws, and have a direct effect on society.

The neutrosophic statistical analysis yields a lower value of CV to the policies of the government in power that hinder the hiring process since it is the only criterion within the dimension. Therefore, it is suggested to carry out a deeper study of each neutrosophic factor at the neutrosophic subset level. Although, when determining the political dimension, it is suggested that the governing bodies that govern the state's public negotiation process create the mechanisms for its proper functioning. For this, the public administration must dedicate efforts to implement actions that benefit the proper use of public resources, to satisfy the needs of citizens.

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