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Neutrosociology for Analyzing Public Procurement in Ecuador around the Health Emergency

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Abstract. This research aims to carry out a sociological study on the causes of acts of corruption in public procurement around the health emergency imposed by COVID 19 in Ecuador regarding the role of the state in its prevention and the need for legal reform. For this purpose, we propose using Neutrosophic Sociology or Neutrosociology, to use an indeterminate membership function that allows modeling the unawareness, doubts, and contradictions that may exist in the answers of any human being. The results obtained showed that the city of Guayaquil identifies as the main cause of acts of corruption in public procurement during the COVID 19 health emergency in the country: the interference of public servants as partners in different companies supply medical supplies. However, it does not recognize as a possible cause the existence of legal gaps in the public procurement norm.

Keywords: Neutrosociology, survey, single-valued neutrosophic sets, public procurement, corruption.

1 Introduction

Public procurement has emerged since the beginning of the 20th century in Latin America. Ecuador, in the face of the systematic evolution of the world economy, has carried out reforms in public procurement, under the constitutionality of the principles and rights in terms of good living, adapting to public purchases of the state and of the contracting parties as natural and/or legal persons [1-3].

Public procurement includes the state budget for the effective management of public funds. Jose Luis Piñuel [1] In its publication, *The Communication Directorate* considers that the budget is the study of costs that covers a service or a product, presented with the need of interested people, for example, when buying rooms or products for a specific use [1].

According to those theoretical assumptions, the author Carmen Chinchilla [1] states that public procurement is a legal regime, including the conclusion of contracts in public administration in compliance with transparent procedures. Public entities contract obligations and duties through the contracting of the state between natural and legal persons, formalizing the relationship of public dependency between the state and the citizens in benefit of the rights and principles of good living.

As a way to attend and mitigate the adequate contingency caused by Covid 19, the National Public Procurement Service (SERCOP) reported in an official statement that the declaration of a state of emergency between the contracting entities will be executed according to the regulations that frame the state of exception, for its regulation and effective control [1].

According to the National Service for Risk and Emergency Management, the state of health emergency was declared on March 11, 2020, through ministerial agreement No. 00126-2020 issued by the Ministry of Public Health. During the state of emergency, public contracts were made to prevent the spread of Covid-19. At the end of the same year, the State Comptroller General's Office sent a report indicating that there were irregularities in at least 179 of the contracts that were executed in the health system.

The newspaper *El Comercio* [1] published under the title "Surcharges in contracts investigated by the State Comptroller General", the surcharges in medical supplies and biosafety instruments, where the purchase was detailed of 800 boxes of N95 masks at 159 USD each. Which gave the value of 127,200 USD to this State contract,

in addition to 1,500 biosafety protective suits at USD 69.90 each, valuing the contract at a USD 104,850 difference in which its commercial sale was USD 20 per unit.

Among other relevant data, the newspaper El Universo [1] also circulated key statistics and mentioned that the Director of the National Public Procurement Service, Juan Aguirre, stated that between the first six months of 2020, when the country registered 2,230 million USD, before the declaration of the health emergency, complaints were reported on alleged surcharges for medical supplies.

In this context, the Director of the SERCOP requested amendments to the regulations of the Organic Law of the National System of Public Procurement, to maintain strict observance of transparency, in the face of contracting exposed as fraudulent, generally due to overpricing between State entities and their contracting parties. These facts, he argued, hinder rationality in the face of the state of emergency, forging an improper and illegal use that violates the rights of good living endorsed in the Constitution of Ecuador [1].

The emerging situation, which has frozen attitudes for the good of society, has been completely violated in Ecuador since the contracting system has perished without justification due to corruption, overpricing and attrition of the state. Susana Roa Chejin confronts the pandemic with corruption and tells about how much the cases of corruption in public procurement cost the country during the health crisis in one of her newspaper articles in the newspaper GK titled "The operation that went wrong" [1].

Given these statements, the Economic Regime Commission showed alarming figures that demonstrate the bleeding of the State budget for corruption purposes, where it was determined that in the special regime from January to June 2020; this figure reckoned 195 million USD (Ministry of Economy and Finance, 2020).

Likewise, under a common and competitive regime, 1,580 million dollars were contracted where a reduction of 9.7% was registered, taking into account that in the last six months there had been a consolidation of $ 2,230 million, as clarified by SERCOP in which 280 daily contests enter the system, of which 190 have been awarded [1].

Considering the abovementioned, it was determined that the public markets around the health crisis were affected, taking into account the guarantee of rights and principles that form the right to a dignified life, the right to equal conditions without discrimination some, to contractual freedom in honor of the effectiveness of transparency and good reputation.

This research aims to carry out a sociological study on the causes of acts of corruption in public procurement around the COVID 19 health emergency in Ecuador regarding the role of the state in its prevention and the need for legal reform.

For this purpose, we propose the use of Neutrosophic Sociology or Neutrosociology, which is the study of sociology using neutrosophic scientific methods [14]. It is argued that sociology data can be vague, incomplete, contradictory, hybrid, biased, ignorant, redundant, superfluous, meaningless, ambiguous, and unclear, among others. In this new approach to the study of sociology, the concepts are represented in the form of <A>, which is the primary concept, <Anti A>, which is the opposite and <Neut A>, which represents those that are neither <A> nor <Anti A>. The data collected in the form of a neutrosophic set allow the respondent to express himself with greater precision and also with greater indeterminacy about his true thoughts and feelings, due to the indeterminate membership function [4-22], which allows modeling unawareness, doubts, contradictions, etc. that can exist in the answers of any human being [7, 11].

2 Materials and methods

This section contains the main concepts related to neutrosophy, neutrosophic statistics and Neutrosociology that we use in this paper. The method used for the sociologic study is also described.

Definition 1: ([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 satisfy the condition $^-0 \leq \inf u_A(x) + \inf r_A \inf r_A(x) + \inf v_A(x) \leq \sup u_A(x) + \sup r_A(x) + \sup v_A(x) \leq 3^+$ for all x∈X. $u_A(x), r_A(x)$ and $v_A(x)$ are the membership functions of truthfulness, indeterminacy and falseness of x in A, respectively, and their images are standard or non-standard subsets of $]^-0, 1^+[$.

Definition 2:

([1]) Let X be a universe of discourse. A *Single-Valued Neutrosophic Set* (SVNS) A on X is a set 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∈X. $u_A(x), r_A(x)$ and $v_A(x)$ denote the membership functions of truthfulness, indeterminate, and falseness of x in A. For convenience a *Single-Valued Neutrosophic Number* (SVNN) will be expressed as $A = (a, b, c)$, where $a, b, c \in [0,1]$ and satisfy $0 \leq a + b + c \leq 3$.

Neutrosophy studies triads, where if <A> is an item or a concept then the triad is (<A>, <neut A>, <anti A>),[23, 24]. Neutrosociology is based on triads. E.g., the concept A = imperialist society, has an antiA = communist society, and neutA = neutral society.

Neutrosophic Statistics extends the classical statistics, such that we deal with set values rather than crisp values, [25]. Neutrosophic Statistics can be used as a quantitative research method in sociology for testing social hypotheses.

Neutrosophic Descriptive Statistics is comprised of all techniques to summarize and describe the neutrosophic numerical data characteristics.

Neutrosophic Inferential Statistics consists of methods that permit the generalization from a neutrosophic sampling to a population from which the sample was selected.

Neutrosophic Data is the data that contains some indeterminacy.

The *univariate neutrosophic data* is neutrosophic data that consists of observations on a neutrosophic single attribute.

A *Neutrosophic Frequency Distribution* is a table displaying the categories, frequencies, and relative frequencies with some indeterminacies. Most often, indeterminacies occur due to imprecise, incomplete, or unknown data related to frequency. Therefore, relative frequency becomes imprecise, incomplete, or unknown too.

Neutrosophic Survey Results are survey results that contain some indeterminacy.

In this study, we deal with indeterminacy based on single-valued neutrosophic sets and Neutrosociology concepts. The method consists of the following:

First, the primary concept to be measured is determined [1] and the social group in which the study will be carried out. Next, the questionnaire is designed to have information about the triad (<A>, <neut A>, <anti A>). Each question must have three variants, one of them related to one of the three elements of the triad. Ambiguous or vague answers such as "I don't know", "It is difficult to determine", etc., are associated with <neut A>.

The interviewer points out that the answers can be given in the form of intervals if it makes sense or if the respondent considers that it corresponds better with their opinions. In addition, questionnaires can include answers in the form of linguistic values.

In short, the respondent should feel free to write what they think about the topic of the questions.

For the processing of the results of the surveys, the following procedure will be carried out.

Let us denote $X_j = \{x_i^j\}_{i=1}^{m_j} q_j$ as the set of possible answers to the question ($j = 1, 2,…, n$).

The frequency of every possible answer is calculated for every element of the triad, let us call them $f_{<A>}(x_i^j)$, $f_{<neut\,A>}(x_i^j)$, and $f_{<anti\,A>}(x_i^j)$.x

If N is the size of the social group to study, we calculate the following probabilities:

$$p_{<A>}(x_i^j) = \frac{f_{<A>}(x_i^j)}{N} \tag{2}$$

$$p_{<neut\,A>}(x_i^j) = \frac{f_{<neut\,A>}(x_i^j)}{N} \tag{3}$$

$$p_{<anti\,A>}(x_i^j) = \frac{f_{<anti\,A>}(x_i^j)}{N} \tag{4}$$

The properties of, $p_{<A>}$, and are the following:$(x_i^j)p_{<neut\,A>}(x_i^j)p_{<anti\,A>}(x_i^j)$

- For every X_j then $p_{<A>}(x_i^j), p_{<neut\,A>}(x_i^j), p_{<anti\,A>}(x_i^j) \in [0,1]$
- For every X_j then.$\sum_{i=1}^{m_j}\left(p_{<A>}(x_i^j) + p_{<anti\,A>}(x_i^j)\right) \leq 1$
- For every X_j then.$\sum_{i=1}^{m_j}\left(p_{<A>}(x_i^j) + p_{<neut\,A>}(x_i^j) + p_{<anti\,A>}(x_i^j)\right) \geq 1$
- Let us remark that the probabilities $p_{<A>}(x_i^j)$ and $p_{<anti\,A>}(x_i^j)$ should satisfy the property of subjective probability approach, [26], whereas, when $p_{<neut\,A>}(x_i^j)$ is included then the sum can exceed the unity. This is because of $p_{<neut\,A>}(x_i^j)$ and the others two can have common answers for some individuals.
- Now, for every concept A we have a single-valued neutrosophic set defined as follows:

$$A = \left\{ \langle x, \min_j \left(p_{<A>}(x_i^j) \right), \max_j \left(p_{<neut\ A>}(x_i^j) \right), \max_j \left(p_{<anti\ A>}(x_i^j) \right) \rangle : x \in \Pi_{j=1}^n X_j \right\} \tag{5}$$

- Let us note that Π is the Cartesian product and the set A contains the definition of n-norm, [27]. Also, let us remark we are using neutrosophic statistics with neutrosophic data.
- The single-valued neutrosophic set A can be de-neutrosophied to a crisp set where the elements of the triad are reduced to numerical values, using the scoring function or a precision index.
- A scoring function $s: [0,1]^3 \rightarrow [0,3]$ is defined in Equation 6, it is an adapted scoring function since the one defined in [28].

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

- Where a is an SVNN with values (T, I, F).
- The definition of the precision index is given in Equation 7.

$$a(a) = T - F \tag{7}$$

- Where $a: [0,1]^3 \rightarrow [-1,\ 1]$.

3 Survey design and information processing

The technique used is the survey, since it allows obtaining information on the topic of interest provided by a considerable number of people through a questionnaire. The primary concept we want to measure is, A = "Cause of corruption in public procurement during the health emergency of COVID 19 in Ecuador", the antiA = "Not cause of corruption in public procurement during the health emergency of COVID 19 in Ecuador ", and the neut A =" Cannot be determined as cause".

The questionnaire applied consists of the following statement on the causes of acts of corruption in public procurement in Ecuador around the health emergency:

1. The acts of corruption that took place in public procurement in Ecuador during the health emergency were caused by:
   a) Lack of control of SERCOP as a regulatory entity.
   b) Belated action of SERCOP as a regulatory entity.
   c) Existence of legal gaps in the public procurement regulation.
   d) Existence of monopolization of public contracts for certain companies.
   e) The interference of public servants as partners in different companies that supply medical supplies.

The respondent must answer which ones he considers true, indeterminate, or false. The social group to be analyzed is the population of the city of Guayaquil, a canton that belongs to the province of Guayas.
According to the Ecuadorian Institute of Statistics and Censuses (INEC), the population of the city of Guayaquil according to the census carried out in November 2010 is 2,350,915 inhabitants; and has a growth rate of 2.5% on average each year, with a projection for the year 2021 of 2`720,000 according to ECLAC sources. Of this figure, approximately 1,673,851 should be available to survey since their ages range between 18 and 65 years, which represent 71.2% of the inhabitants.

For the calculation of the size of the population sample to be surveyed, equation (8) was used:

$$n = \frac{N * Z_\alpha^2 * p * q}{d^2 * (N-1) + Z_\alpha^2 * p * q} \tag{8}$$

Where:
n = Size of the required sample.
Z = confidence level which is the probability that a confidence interval includes the 95% population parameter (standard value of 1.96).
p = Probability of success. (95% = 0.95)
q = Probability of failure. (5% = 0.05)
d = Maximum level of error used. (3% = 0.03)
N = Total population.
For the processing of the results of the applied survey, we used the method described in the previous section:

4 Results

According to the result of the sample size formula (Equation 8) with a confidence level of 95% and a maximum error of 3%, a total of 203 people were selected using a Simple Random Sampling. The purpose of the study and

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how to answer the questionnaire was explained to these people.

The results of the applied survey are shown in Table 1.

i	Answer	i	Answer	i	Answer	i	Answer
1	({e}, {a, b}, {d, c})	52	({e, d}, {b}, {a, c})	103	({a, d}, {b, c}, {e})	154	({d, e}, {a}, {c, b})
2	({d, e}, {a, c}, {b})	53	({e, a}, {b, d}, {c})	104	({d, e}, {c}, {a, b})	155	({a, c}, {b, e}, {d})
3	({d, e}, {a, b}, {c})	54	({a, e}, {b, d}, {c})	105	({a, e}, {d, b}, {c})	156	({a, e}, {b, c}, {d})
4	({e}, {a, c}, {b, d})	55	({a, e}, {c, d}, {b})	106	({a, e}, {b, c}, {d})	157	({a, e}, {, d}, {c, b})
5	({a, e}, {d, c}, {, b})	56	({c, d}, {a, e}, {b})	107	({c, d}, {e, b}, {a})	158	({a, e}, {d, c}, {b})
6	({a, d}, {b, e}, {c})	57	({d, e}, {b}, {c, a})	108	({d, e}, {b}, {a, c})	159	({a, d}, {e, b}, {c})
7	({a, e}, {c, d}, {b})	58	({d, e}, {a, c}, {b})	109	({a, e}, {d, b}, {c})	160	({b, e}, {d}, {a, c})
8	({a, e}, {b, b}, {c})	59	({d, e}, {b}, {a, c})	110	({b, e}, {d}, {a, c})	161	({b, c}, {a, e}, {d})
9	({a, d}, {b, e}, {c})	60	({d, e}, {d}, {a, c})	111	({d, e}, {c}, {a, b})	162	({e}, {c, b}, {a, d})
10	({e, d}, {a, b}, {c})	61	({d, e}, {b}, {a, c})	112	({a, e}, {b, c}, {d})	163	({d, e}, {b, d}, {b})
11	({a, e}, {c, d}, {b})	62	({d, e}, {a, c}, {b})	113	({a, e}, {d}, {b, c})	164	({c, a}, {d, e}, {b})
12	({a, d}, {e, b}, {c})	63	({e, d}, {b}, {a, c})	114	({a, e}, {c}, {b, d})	165	({e, a}, {d, b}, {c})
13	({d, e}, {a, c}, {b})	64	({d, e}, {a, b}, {c})	115	({b, d}, {c, e}, {a})	166	({a, d}, {e}, {b, c})
14	({d, e}, {a, b}, {c})	65	({d, e}, {b, c}, {a})	116	({b, d}, {e, c}, {a})	167	({a, e}, {b}, {d, c})
15	({e, d}, {a, b}, {c})	66	({d, e}, {a}, {b, c})	117	({d, e}, {c, a}, {b})	168	({a, e}, {c, b}, {d})
16	({e, d}, {c, e}, {b})	67	({e, a}, {d, b}, {c})	118	({a, d}, {e}, {c, b})	169	({e, d}, {a}, {b, c})
17	({d}, {a, e}, {b, c})	68	({a, e}, {b, d}, {c})	119	({e}, {d, b}, {a, c})	170	({e, d}, {a}, {b, c})
18	({a, e}, {c, d}, {b})	69	({d, e}, {c, b}, {a})	120	({d, e}, {a}, {b, c})	171	({a, e}, {d}, {b, c})
19	({d, e}, {b, c}, {a})	70	({d, e}, {b}, {a, c})	121	({d, c}, {e}, {a, b})	172	({d, e}, {a}, {b, c})
20	({d, e}, {a, b}, {c})	71	({b, e}, {b}, {c, c})	122	({b, e}, {d}, {a, c})	173	({a, d}, {e, c}, {b})
21	({e, d}, {b, c}, {a})	72	({a, e}, {b, d}, {c})	123	({a, e}, {b}, {c, d})	174	({a, e}, {d, b}, {c})
22	({a, d}, {e, c}, {b})	73	({e, d}, {b, a}, {c})	124	({b}, {c, e}, {a, d})	175	({a}, {d, e}, {b, c})
23	({d, e}, {a, b}, {c})	74	({a, d}, {e, b}, {c})	125	({a, e}, {b, d}, {c})	176	({a, e}, {b, d}, {c})
24	({d, e}, {b, a}, {c})	75	({d, e}, {a, b}, {c})	126	({d}, {b, c}, {a, e})	177	({a, d}, {e, b}, {c})
25	({d, e}, {b, c}, {a})	76	({e, d}, {a, b}, {c})	127	({a, e}, {d, c}, {b})	178	({e, d}, {a}, {b, c})
26	({d, e}, {c}, {a, b})	77	({e, d}, {b}, {a, c})	128	({c, e}, {a, d}, {b})	179	({a, e}, {c, b}, {e})
27	({d, a}, {e, b}, {, c})	78	({d, e}, {c}, {a, b})	129	({a, d}, {e, c}, {b})	180	({a, c}, {e}, {d})
28	({b, e}, {d, c}, {a})	79	({e, d}, {a, b}, {c})	130	({e, c}, {b, d}, {a})	181	({d, e}, {b}, {c})
29	({a, e}, {b, d}, {c})	80	({e, d}, {a, b}, {c})	131	({a, e}, {b, c}, {d})	182	({a B C D E})
30	({a, d}, {c, e}, {, b})	81	({d, e}, {a, b}, {c})	132	({a, e}, {b, d}, {c})	183	({a, d}, {b, e}, {c})
31	({d, e}, {c}, {a, b})	82	({d, e}, {c}, {a, b})	133	({c, e}, {a, b}, {d})	184	({a}, {e, c}, {b, d})
32	({e, d}, {a, b}, {c})	83	({e, d}, {a, c}, {b})	134	({a, e}, {d, b}, {c})	185	({e, d}, {a, c}, {b})
33	({d, e}, {b}, {a, c})	84	({d, e}, {c, a}, {b})	135	({e, a}, {b, c}, {d})	186	({a, e}, {b, d}, {c})
34	({d, e}, {b}, {a, c})	85	({b, b}, {b}, {c, c})	136	({a, e}, {c, d}, {b})	187	({a, e}, {a, c}, {c})
35	({d, e}, {a, b}, {, c})	86	({d, e}, {, b}, {c, a})	137	({a, b}, {d}, {c, e})	188	({d, a}, {e}, {b, c})
36	({c, e}, {a, b}, {b})	87	({d, e}, {a}, {b, c})	138	({a, d}, {b, e}, {c})	189	({a, e}, {d, b}, {c})
37	({e, d}, {a, b}, {c})	88	({a, d}, {b, e}, {c})	139	({c, e}, {d, c}, {a})	190	({a, e}, {d, b}, {c})
38	({b, e}, {d, a}, {c})	89	({b, c}, {e}, {a, d})	140	({d, e}, {a, c}, {b})	191	({d, e}, {b, a}, {c})
39	({e, a}, {b, c}, {d})	90	({d}, {b, e}, {a, c})	141	({e, d}, {a, b}, {c})	192	({a, d}, {e, b}, {c})
40	({d, c}, {b, e}, {a})	91	({d, a}, {e}, {b, c})	142	({d, e}, {b, c}, {a})	193	({d, e}, {a, b}, {c})
41	({a, e}, {d, b}, {c})	92	({d, e}, {a, c}, {b})	143	({b, d}, {c}, {a, e})	194	({a, c}, {e, b}, {d})
42	({d, e}, {c, b}, {a})	93	({a, e}, {c, b}, {d})	144	({a, e}, {c, b}, {d})	195	({a, e}, {d, b}, {c})
43	({a, e}, {d, c}, {b})	94	({e, a}, {b, c}, {d})	145	({d, e}, {a, c}, {b})	196	({a, d}, {c, e}, {b})
44	({c, e}, {b, a}, {c})	95	({c, e}, {b, d}, {a})	146	({a, c}, {d, b}, {e})	197	({a, e}, {b, d}, {c})
45	({d, e}, {b}, {b, c})	96	({b, e}, {d, a}, {c})	147	({b, d}, {e, c}, {a})	198	({a, e}, {b, d}, {c})
46	({a, e}, {c, d}, {b})	97	({d, e}, {b}, {a, c})	148	({b, d}, {a, c}, {e})	199	({a, e}, {b, d}, {c})

| 47	({a, e}, {d, c}, {b})	98	({a, d}, {c, e}, {b})	149	({b, e}, {a, d}, {c})	200	({a, d}, {c, e}, {b})
48	({d, e}, {a, b}, {c})	99	({b, e}, {d, a}, {c})	150	({e, c}, {b, d}, {a})	201	({a, e}, {b, d}, {c})
49	({d, e}, {b}, {a, c})	100	({a, e}, {b, d}, {c})	151	({a, e}, {b}, {d, c})	202	({d, a}, {e, b}, {c})
50	({a, d}, {e}, {b, c})	101	({a, d}, {b, e}, {c})	152	({c, a}, {e}, {b, d})	203	({a, e}, {b, d}, {c})
51	({a, d}, {e}, {b, c})	102	({d, e}, {a}, {c, b})	153	({a, e}, {d}, {b, c})		

Table 1: Results of the applied survey

Table 2 summarizes the frequencies of each answer.

| Answers X_1	$f_{<A>}(x_i^1)$	$f_{<neut\ A>}(x_i^1)$,	$f_{<anti\ A>}(x_i^1)$.
a	94	56	48
b	21	117	68
c	20	70	117
d	111	60	27
e	150	46	8

Table 2: Frequencies of the answers

From equations 2, 3, and 4, the probabilities were obtained. The truthfulness, indeterminacy, and falseness membership functions are depicted in Figure 1.
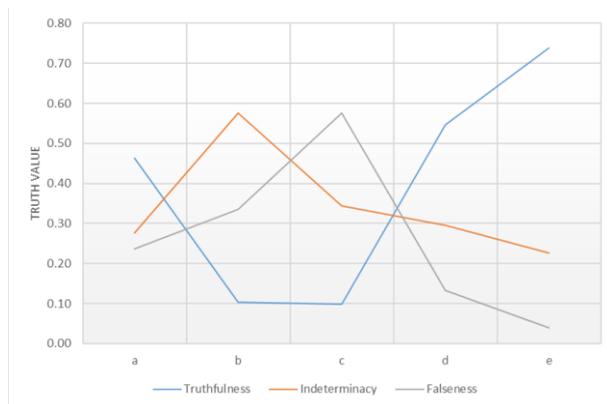
Figure 1. Truthfulness, indeterminacy and falseness membership functions of the concept "Cause of acts of corruption in public procurement during the health emergency of COVID 19 in Ecuador".

It can be seen in the figure that the highest truth values are reached by the causes listed in sections e), d) and a), in that order, the value of e) being much higher than the rest (approximately 72%). The highest falsehood value was reached by the cause listed in section c) and the greatest uncertainty was presented to assign section b) (both close to 58%).

Through equation 5, these functions are de-neutrosophicated to obtain a single probability function of the concept "Cause of acts of corruption in public procurement during the health emergency of COVID 19 in Ecuador". Figure 2 shows a chart of the scoring function.
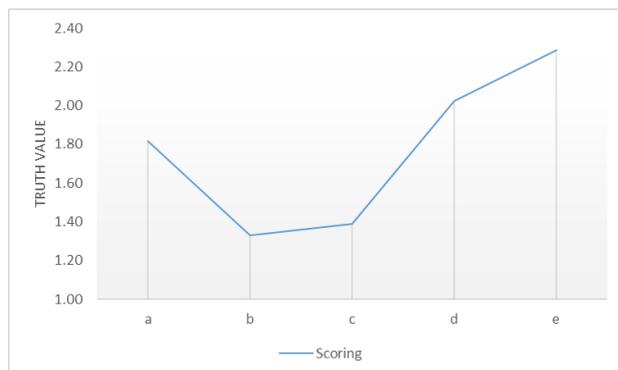
Figure 2: Scoring function of the single-valued neutrosophic set in Figure 1

It can be summarized that, according to the results obtained in this study, the main cause recognized by the population of acts of corruption in public procurement in the country during the health emergency is "interference by public servants as partners in different supplier companies of medical supplies" (e). The causes were also identified very frequently, although to a lesser extent: "lack of control of SERCOP as a regulatory entity" (a) and "the existence of monopolization of public contracts for certain companies" (d).

It is also interesting to note that the population does not recognize as a possible cause of corruption acts the existence of legal gaps in the public procurement norm and that we cannot affirm with certainty that SERCOP's late action is or is not a cause of corruption in public procurement during the health emergency.

Conclusions

During the state of health emergency, the public procurement processes in Ecuador were affected by acts of corruption in which the violation mainly corresponds to the lack of transparency as a universal principle of acquisition of accountability between the state and society.

Through this sociological study, it was possible to determine that the population of the city of Guayaquil identifies as the main cause of acts of corruption in public procurement during the health emergency imposed by COVID 19 in the country, *the interference of public servants as partners in different companies supplying medical supplies*. However, does not recognize as a possible cause *the existence of legal gaps in the public procurement regulation*.

The Neutrosociology method used allowed respondents to express their thoughts and feelings more accurately since indeterminacy is considered and a membership function independent of falsehood.

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