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Neutrosophic Element Res Nullius in Adoption Procedures

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Abstract. Adoption arises to combat homelessness and orphanhood in childhood and adolescence, a social problem that humanity has faced over the years. With the emergence of children adoption regulations, the Ecuadorian State has regulated the adoption process to guarantee the adopter a suitable, permanent, and definitive family. Although much progress has been made at the national level, some obstacles delay the process of the regulatory entities. For this, the present work aims to determine the factors that originate the res nullius element in the adoption process. For the modeling and due to the characteristics of the variable, the use of neutrosophic statistics is necessary. As a result, it is observed that families interested in adopting lack a legal culture about the needs of adopted children. Causes that generate a low knowledge of the regulations due to ignorance or poor training and advice.

Keywords: adoption, res nullius, neutrosophy, neutrosophic statistics.

1 Introduction

The Ecuadorian State defines that the purpose of adoption is to guarantee a suitable family [1]. Minors or adolescents shall have the right to their development, in a family, school, social, and community environment of affection and security [2]. This environment will allow the satisfaction of their social, affective-emotional, and cultural needs, with the support of national and local intersectoral policies [3].

Currently, there are factors such as the delay in the declaration of adoptability and the lack of knowledge of adopters about the regulations and rules that govern each stage. In some cases, the duration of the adoption process has been extended beyond what the regulations establish. These people have not been able to carry out speedy compliance with the procedures. This term which is not determined in any element or regulation is called *res nullius*.

It is called res nullius to the state that "is in no man's land" in the classic description. Although it constitutes an element that is characterized as a variable of a neutrosophic nature, these elements, which often cannot be classified by the variety of states they possess, are called neutrosophic elements [4].

Therefore, this neutrosophic study has as its main objective: to determine the factors that originate the res nullius element in the adoption process and as specific objectives:

- ✓ Determine the factors that affect the analyzed variable
- ✓ Carry out the measurement and modeling of the variable
- ✓ Propose potential alternatives to reduce the res nullius effect.

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 event E is the probability that event E will occur, the probability that event E will not occur, and the probability of indeterminacy (not knowing whether event E will occur or not). In classical probability nsup≤1, while in neutrosophic probability nsup≤3+ [5].

The function that models the neutrosophic probability of a random variable x is called the neutrosophic distribution [6]:

$$NP(x) = (T(x), I(x), F(x)),$$

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, the neutrosophic probability distribution [7, 8, 11, 15, 16], neutrosophic estimation, neutrosophic regression, etc. It refers to a set of data, which is formed totally or partially by data with some degree of indeterminacy and to the methods to analyze them. 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. Neutrosophic Descriptive Statistics comprises 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. [9], [10], [12], [13], [14], [18], [19], [20]

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

$$X_N = X_l + X_u I_N;\ I_N \in [I_l, I_u] \tag{1}$$

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

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

$$\sum_{i=1}^{n} N(X_i - \bar{X}_{iN})^2 = \sum_{i=1}^{n} N\left[\begin{matrix}\min\begin{pmatrix}(a_i + b_i I_L)(\bar{a} + \bar{b} I_L), (a_i + b_i I_L)(\bar{a} + \bar{b} I_U)\\ (a_i + b_i I_U)(\bar{a} + \bar{b} I_L), (a_i + b_i I_U)(\bar{a} + \bar{b} I_U)\end{pmatrix}\\ \max\begin{pmatrix}(a_i + b_i I_L)(\bar{a} + \bar{b} I_L), (a_i + b_i I_L)(\bar{a} + \bar{b} I_U)\\ (a_i + b_i I_U)(\bar{a} + \bar{b} I_L), (a_i + b_i I_U)(\bar{a} + \bar{b} I_U)\end{pmatrix}\end{matrix}\right], I \in [I_L, I_U] \tag{3}$$

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

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

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 SVNN of consensus of justification of the expert opinion, (see table 1).

Linguistic Term	SVNN	Linguistic Term Neutrosophic Knowledge Quotient (NKQ)
No Influence (NI)	(1,0,0)	Full knowledge of the subject of study (FK)
Nearly No Influence (NNI)	(0.9, 0.1, 0.1)	Very very good in the subject of study (VVGK)
Very Low Influence (VLI)	(0.8,0,15,0.20)	Very good in the subject of study (VGKS)
Low Influence (LI)	(0.70,0.25,0.30)	Good at study subject (GK)
Slight Influence (SI)	(0.60,0.35,0.40)	Fairly good in the subject of study (FGK)
Influence (I)	(0.50,0.50,0.50)	Know the subject of study (K)
Moderately Influence (MI)	(0.40,0.65,0.60)	Moderately poorly knows the subject of study (MPK)
Severely influence (SI)	(0.30,0.75,0.70)	Poorly knows the subject of study (PK)
Very Influential (VI)	(0.20,0.85,0.80)	Very poorly knows the subject of study (VPK)
High Influence (HI)	(0.10,0.90,0.90)	Very very poorly knows the subject of study (VVPK)
Extremely Influential (EI)	(0,1,1)	Null knowledge of the subject of study (NK)

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

For the definitive selection of the experts, the coefficient of neutrosophic expert competence (K_N) was used, calculated from:

Definition 1. Let A = (a, b, c) a SVNN, the score function S of a SVNN, based on true membership degree, undetermined membership degree, and false membership degree is defined by the following Equation :

$$S(K_N) = \frac{1 + a - 2b - c}{2} \tag{6}$$

Where $S(K_N) \in [-1, 1]$ and when applying equation (1), the following is obtained:

$$K_N = \{\langle x, u_K(x), r_K(x), v_K(x)\rangle : x \in X\}$$

In this coefficient, two factors were averaged, the knowledge coefficient (K_{CN}) and the argumentation coefficient (K_{aN}).

$$K_N = \frac{1}{2}(K_{aN} + K_{cN}) \tag{7}$$

Where $S(K_{aN})$ and $S(K_{cN}) \in [-1, 1]$ and when applying equation (1), the following is obtained:

$$K_{aN} = \{\langle x, u_{Ka}(x), r_{Ka}(x), v_{Ka}(x)\rangle : x \in X\}$$

$$K_{cN} = \{\langle x, u_{Kc}(x), r_{Kn}(x), v_{Kn}(x)\rangle : x \in X\}$$

The so-called neutrosophic knowledge coefficient is determined by the information that the expert himself presents about the object of study. It is determined through a self-assessment process on a scale to establish knowledge of the subject analyzed and the object of study (see Table 1). The Neutrosophic Argumentation coefficient evaluates the criteria through Linguistic Terms with SVNN of consensus of justification of the expert opinion, (see Table 2). From the weighted sum of values obtained in a series of elements of Influence determined by the experience obtained through its activity and practice, knowledge of the state of the matter at a national and international level, intuition about the topic addressed, technology knowledge, and study of works and publications on the subject of study. [17]

The evaluation of the answers of the experts establishes as an objective criterion the coefficient of neutrosophic expert competence with a required critical level established for a certain value. The evaluation and validation of the criteria use the neutrosophic scale to achieve greater objectivity in the treatment of information that allows the evaluation of the criteria individually (see Table 2).

Linguistic term	SVNN	Linguistic term to evaluate Criterion	Linguistic term to evaluate K_{AN} and K_N
Very Adequate (VA)	(0.9;0.1;0.1)	Indispensable	Very High (MA)
Fairly Adequate (FA)	(0.75;0.25;0.20)	Very useful	High (A)
Adequate (A)	(0.50;0.5;0.50)	Useful	Mean (M)
Poorly Adequate (PA)	(0.35;0.75;0.80)	little useful	Low (B)
Not Adequate (NA)	(0.10;0.90;0.90)	Useless	Very Low (MB)

Table 2: Neutrosophic linguistic terms to validate the criteria between subsets. 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 existing in the elements present in the adoption process requires analysis at the dimensional level and the level of subsets of the study variable. For the neutrosophic study, the following is defined:

- Neutrosophic variable: factors that originate the res nullius element in the adoption process (ERNA).
- Variable coding: ERNA

- Neutrosophic scale: Weights are calculated based on the linguistic terms in Table 1.

3.2 Selection and validation of the experts to participate in the study

The modeling of neutrosophic statistics requires selecting the experts with the highest level of knowledge on adoption issues. Therefore, experts are required to have more weight in their decision to define what factor affects the res nullius element in the adoption process. For them, it was decided to determine the neutrosophic argumentation coefficient based on the experience obtained in the adoption processes (see Table 3).

Expert	Profile	Kc	Ka	K	Assessment
E1	PSYCHOLOGY	(0.6,0.35,0.4)	(0.75,0.25,0.20)	(0.50,0.5,0.50)	MEDIUM
E2	ACADEMIC	(0.9,0.1,0.1)	(0.50,0.5,0.50)	(0.75,0.25,0.20)	HIGH
E3	ACADEMIC	(0.1,0.9,0.9)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E4	ACADEMIC	(0.5,0.5,0.5)	(0.75,0.25,0.20)	(0.50,0.5,0.50)	MEDIUM
E5	FISCAL	(0.4,0.65,0.6)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E6	ACADEMIC	(0.4,0.65,0.6)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E7	DOCTOR	(0.7,0.25,0.3)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E8	JUDGE	(0.9,0.1,0.1)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E9	FISCAL	(0.9,0.1,0.1)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E10	DOCTOR	(0,1,1)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E11	ACADEMIC	(0.9,0.1,0.1)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E12	ACADEMIC	(0.4,0.65,0.6)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E13	DOCTOR	(1,0,0)	(0.75,0.25,0.20)	(0.9,0.1,0.1)	VERY HIGH
E14	PSYCHOLOGY	(0.7,0.25,0.3)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E15	ACADEMIC	(0.6,0.35,0.4)	(0.35,0.75,0.80)	(0.50,0.5,0.50)	MEDIUM
E16	ACADEMIC	(0.6,0.35,0.4)	(0.35,0.75,0.80)	(0.50,0.5,0.50)	MEDIUM
E17	FISCAL	(0.6,0.35,0.4)	(0.35,0.75,0.80)	(0.50,0.5,0.50)	MEDIUM
E18	DOCTOR	(0.5,0.5,0.5)	(0.35,0.75,0.80)	(0.35,0.75,0.80)	LOW
E19	ACADEMIC	(0.1,0.9,0.9)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E20	ACADEMIC	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E21	ACADEMIC	(0.2,0.85,0.8)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E22	ACADEMIC	(0,1,1)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E23	FISCAL	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E24	PSYCHOLOGY	(0.4,0.65,0.6)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E25	FISCAL	(0.4,0.65,0.6)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E26	ACADEMIC	(1,0,0)	(0.50,0.5,0.50)	(0.75,0.25,0.20)	HIGH
E27	ACADEMIC	(1,0,0)	(0.35,0.75,0.80)	(0.50,0.5,0.50)	MEDIUM
E28	FISCAL	(0.6,0.35,0.4)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E29	ACADEMIC	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E30	ACADEMIC	(0.2,0.85,0.8)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E31	ACADEMIC	(0.7,0.25,0.3)	(0.35,0.75,0.80)	(0.50,0.5,0.50)	MEDIUM
E32	DOCTOR	(0.1,0.9,0.9)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E33	ACADEMIC	(0.3,0.75,0.7)	(0.75,0.25,0.20)	(0.50,0.5,0.50)	MEDIUM
E34	FISCAL	(1,0,0)	(0.50,0.5,0.50)	(0.75,0.25,0.20)	HIGH
E35	PSYCHOLOGY	(0.3,0.75,0.7)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E36	ACADEMIC	(0.1,0.9,0.9)	(0.9,0.1,0.1)	(0.50,0.5,0.50)	MEDIUM
E37	ACADEMIC	(0.4,0.65,0.6)	(0.75,0.25,0.20)	(0.50,0.5,0.50)	MEDIUM
E38	ACADEMIC	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E39	DOCTOR	(0.1,0.9,0.9)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW

Expert	Profile	Kc	Ka	K	Assessment
E40	DOCTOR	(0.4,0.65,0.6)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E41	ACADEMIC	(0.1,0.9,0.9)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E42	ACADEMIC	(0.4,0.65,0.6)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E43	ACADEMIC	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E44	ACADEMIC	(0.9,0.1,0.1)	(0.35,0.75,0.80)	(0.50,0.5,0.50)	MEDIUM
E45	ACADEMIC	(0.9,0.1,0.1)	(0.35,0.75,0.80)	(0.50,0.5,0.50)	MEDIUM
E46	ACADEMIC	(0.2,0.85,0.8)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E47	PSYCHOLOGY	(0.2,0.85,0.8)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E48	PSYCHOLOGY	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E49	FISCAL	(0.7,0.25,0.3)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E50	ACADEMIC	(0.4,0.65,0.6)	(0.35,0.75,0.80)	(0.35,0.75,0.80)	LOW
E51	ACADEMIC	(0.6,0.35,0.4)	(0.75,0.25,0.20)	(0.50,0.5,0.50)	MEDIUM
E52	ACADEMIC	(0.9,0.1,0.1)	(0.50,0.5,0.50)	(0.75,0.25,0.20)	HIGH
E53	ACADEMIC	(0.5,0.5,0.5)	(0.35,0.75,0.80)	(0.35,0.75,0.80)	LOW
E54	FISCAL	(0.2,0.85,0.8)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E55	ACADEMIC	(0.5,0.5,0.5)	(0.75,0.25,0.20)	(0.50,0.5,0.50)	MEDIUM
E56	ACADEMIC	(0.3,0.75,0.7)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E57	DOCTOR	(0.4,0.65,0.6)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E58	DOCTOR	(0.2,0.85,0.8)	(0.75,0.25,0.20)	(0.50,0.5,0.50)	MEDIUM
E59	PSYCHOLOGY	(0.7,0.25,0.3)	(0.75,0.25,0.20)	(0.75,0.25,0.20)	HIGH
E60	ACADEMIC	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E61	ACADEMIC	(0.1,0.9,0.9)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E62	ACADEMIC	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E63	PSYCHOLOGY	(0.6,0.35,0.4)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E64	ACADEMIC	(0.3,0.75,0.7)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E65	PSYCHOLOGY	(0,1,1)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E66	ACADEMIC	(0.6,0.35,0.4)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E67	DOCTOR	(0.2,0.85,0.8)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E68	ACADEMIC	(0.5,0.5,0.5)	(0.9,0.1,0.1)	(0.50,0.5,0.50)	MEDIUM
E69	ACADEMIC	(0.2,0.85,0.8)	(0.35,0.75,0.80)	(0.35,0.75,0.80)	LOW
E70	ACADEMIC	(0.5,0.5,0.5)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E71	ACADEMIC	(0.7,0.25,0.3)	(0.50,0.5,0.50)	(0.75,0.25,0.20)	HIGH
E72	ACADEMIC	(0.7,0.25,0.3)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E73	ACADEMIC	(0.9,0.1,0.1)	(0.50,0.5,0.50)	(0.50,0.5,0.50)	MEDIUM
E74	FISCAL	(0,1,1)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E75	DOCTOR	(0.2,0.85,0.8)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E76	ACADEMIC	(0.3,0.75,0.7)	(0.75,0.25,0.20)	(0.50,0.5,0.50)	MEDIUM
E77	ACADEMIC	(0.3,0.75,0.7)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW
E78	ACADEMIC	(1,0,0)	(0.75,0.25,0.20)	(0.9,0.1,0.1)	VERY HIGH
E79	ACADEMIC	(1,0,0)	(0.75,0.25,0.20)	(0.9,0.1,0.1)	VERY HIGH
E80	ACADEMIC	(0,1,1)	(0.50,0.5,0.50)	(0.35,0.75,0.80)	LOW

Table 3: Determination of the coefficient of neutrosophic expert competence. Source: own elaboration.

Due to the difficulty of the object of investigation, an assessment of competence of "high" was assigned when the expert's neutrosophic coefficient was established above a high value (see table 4). The resulting group of experts is made up of 6 academics, 1 doctor, 1 prosecutor, and 1 psychologist for a total of 9 experts.

Profile	Very high	High	Medium	Low	Very low	Total
Academic	2	4	28	15	0	49
Doctor	1	0	3	7	0	11
Fiscal	0	1	6	3	0	10
Judge	0	0	1	0	0	1
Psychologist	0	1	5	3	0	9
Total	3	6	43	28	0	80

Table 4: Qualification of the experts according to the competence coefficient. Source: own elaboration.

For the analysis of the neutrosophic variable, the use of neutrosophic statistics is required. It is necessary to evaluate a neutrosophic sample to determine the factors that originate the res nullius element in the adoption (see Table 7). For the development of the study, 5 groups of 80 people were interviewed about the study variable. Among the most frequently asked questions were, *what were the most common obstacles in the adoption process?*

The interviewees were given possible answers that they should use to qualify the factor that affects the res nullius element in adoption (see Table 1). In each response, the person was given the option to give more than two answers in different contexts (different regions or institutions). To obtain the data, the groups were separated to obtain a variety of criteria for the neutrosophic variable ERNA in the analyzed sample (see Table 5).

No	G1	G2	G3	G4	G5
1	[(0.1,0.9,0.9);(0.4,0.65,0.6)]	[(0.1,0.9,0.9);(0.3,0.75,0.7)]	[(0.1,0.9,0.9);(0.4,0.65,0.6)]	[(0.2,0.85,0.8);(0.6,0.35,0.4)]	[(0.5,0.5,0.5);(0.6,0.35,0.4)]
2	[(0.1,0.9,0.9);(0.2,0.85,0.8)]	[(0.2,0.85,0.8);(0.2,0.85,0.8)]	[(0.4,0.65,0.6);(0.6,0.35,0.4)]	[(0.3,0.75,0.7);(0.4,0.65,0.6)]	[(0.1,0.9,0.9);(0.5,0.5,0.5)]
3	[(0.3,0.75,0.7);(0.3,0.75,0.7)]	[(0.4,0.65,0.6);(0.5,0.5,0.5)]	[(0,1,1);(0.5,0.5,0.5)]	[(0.2,0.85,0.8);(0.6,0.35,0.4)]	[(0.4,0.65,0.6);(0.7,0.25,0.3)]
4	[(0.5,0.5,0.5);(0.9,0.1,0.1)]	[(0.3,0.75,0.7);(0.7,0.25,0.3)]	[(0,1,1);(0.2,0.85,0.8)]	[(0,1,1);(0,1,1)]	[(0,1,1);(0,1,1)]
5	[(0.4,0.65,0.6);(0.5,0.5,0.5)]	[(0.1,0.9,0.9);(0.3,0.75,0.7)]	[(0.2,0.85,0.8);(0.2,0.85,0.8)]	[(0.5,0.5,0.5);(0.5,0.5,0.5)]	[(0.3,0.75,0.7);(0.5,0.5,0.5)]
6	[(0.3,0.75,0.7);(0.3,0.75,0.7)]	[(0.4,0.65,0.6);(0.4,0.65,0.6)]	[(0,1,1);(0.4,0.65,0.6)]	[(0.2,0.85,0.8);(0.6,0.35,0.4)]	[(0.5,0.5,0.5);(0.5,0.5,0.5)]
7	[(0.4,0.65,0.6);(0.5,0.5,0.5)]	[(0.1,0.9,0.9);(0.4,0.65,0.6)]	[(0,1,1);(0.4,0.65,0.6)]	[(0,1,1);(0,1,1)]	[(0.3,0.75,0.7);(0.4,0.65,0.6)]
8	[(0.5,0.5,0.5);(0.6,0.35,0.4)]	[(0.3,0.75,0.7);(0.7,0.25,0.3)]	[(0.5,0.5,0.5);(0.9,0.1,0.1)]	[(0.2,0.85,0.8);(0.2,0.85,0.8)]	[(0.4,0.65,0.6);(0.9,0.1,0.1)]
9	[(0,1,1);(0.1,0.9,0.9)]	[(0.4,0.65,0.6);(0.5,0.5,0.5)]	[(0,1,1);(0.2,0.85,0.8)]	[(0.5,0.5,0.5);(0.7,0.25,0.3)]	[(0.3,0.75,0.7);(0.5,0.5,0.5)]
10	[(0.2,0.85,0.8);(0.5,0.5,0.5)]	[(0.2,0.85,0.8);(0.5,0.5,0.5)]	[(0,1,1);(0.2,0.85,0.8)]	[(0,1,1);(0.5,0.5,0.5)]	[(0.4,0.65,0.6);(0.6,0.35,0.4)]
11	[(0.5,0.5,0.5);(0.5,0.5,0.5)]	[(0.3,0.75,0.7);(0.3,0.75,0.7)]	[(0.2,0.85,0.8);(0.2,0.85,0.8)]	[(0.3,0.75,0.7);(0.4,0.65,0.6)]	[(0.5,0.5,0.5);(0.5,0.5,0.5)]
1-80	**[(0.2,0.85,0.8);(0.4,0.65,0.6)]**	**[(0.2,0.85,0.8);(0.4,0.65,0.6)]**	**[(0.1,0.9,0.9);(0.4,0.65,0.6)]**	**[(0.2,0.85,0.8);(0.4,0.65,0.6)]**	**[(0.2,0.85,0.8);(0.5,0.5,0.5)]**

Table 5: Neutrosophic frequency of ERNA dimensions. Source: own elaboration.

Each group explains how the factor in the res nullius element affects the adoption process. From the results obtained, the following are the res nullius element in the adoption process (see Table 6).

Code	Items	Group that chooses the criterion	Neutrosophic res nullius element
C1	Time dilation of the adoption process	G1, G2, G3, G4, G5	Variation over time of what is legislated. Adopters wait longer than what is legislated. A space in time with res nullius neutrosophic characteristics is created where this variable behaves in an indeterminate way.
C2	Ignorance of the adoption process	G1, G2, G4	People in their eagerness to adopt lack certain knowledge necessary to start the adoption process. A neutrosophic res nullius element is created where knowing: What knowledge is enough to face the process?

Code	Items	Group that chooses the criterion	Neutrosophic res nullius element
C3	Dilation in the declaration of adoption	G1, G2, G3, G4, G5	The answer is not included in the classical numbering, it can only be answered from neutrosophy. In several judges, there are dissimilar periods to give the verdict. Although it is regulated, various elements delay when the person receives the court ruling influence. Those time spaces diverge in couples, institutions, localities, and other neutrosophic elements present in any sample.
C4	Under counseling	G3, G5	The question is: How prepared is a person to face the adoption process? There is no answer outside of neutrosophy that encompasses such terms.
C5	Lack of skills in candidates	G1, G2, G3, G4, G5	The vast majority of adopters report that when they began the adoption process, they were unable to do so because they did not meet the suitability requirements. These requirements may vary or increase over the years. Therefore it is a variable that varies in time and place.
E6	Contradiction in regulations	G1, G2, G3, G4	The interpretation of regulations leads to a neutrosophic understanding of each official. It is an element that varies from legendary times.
E7	divergence between zones	G3	Even if the nation applies a regulation, there is a high neutrosophic probability that it will be applied differently in each region.
E8	Irregularities in procedures	G5	There is a high probability of bureaucracy in the procedures. Adopters report that they have carried out adoption procedures where the information to be delivered differs in different locations.

Table 6: Res nullius elements determined by the groups surveyed. 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 RNAE variable according to the sample analyzed (see Table 7). From the results, the average range of occurrence is observed for each group:

Cluster	Occurrence in the ERNA variable	Observations
G1 G2 G4	Very influential to moderately influential	The answers given by these groups are in the same neutrosophic dimension. It states that, if a criterion is given by a group that is in the same dimension, the groups within this subset will be present. It only has three states.
G3	Highly influential to moderately influential	This group belongs to the same dimension, and although it intersects with other dimensions, it has unique characteristics. Within its same dimension, it has four states.
G5	From very influential to influential	

Table 7: Neutrosophic statistical analysis of the average of the RNAE variable by groups. Source: own elaboration.

Because each group defines more than one criterion to evaluate in the studied variable, it is decided to analyze the neutrosophic set and its relationships between subsets. For this, it is necessary to validate the criteria obtained from the surveyed groups, based on the experience of the experts in the adoption processes (see Table 8). The validation allows obtaining the existing uncertainties in each criterion that originate the res nullius element in the adoption process. For each criterion, a scale is used in the modeling (see Table 2) and data processing, the frequency, and the neutrosophic statistical probability in each subset (see Tables 8, 9, and 10).

Expert	C1	C2	C3	C4	C5	C6	C7	C8
E2	(0.9,0.1,0.1)	(0.10,0.90, 0.90)	(0.75,0.25, 0.20)	(0.75,0.25, 0.20)	(0.9,0.1,0.1)	(0.10,0.90, 0.90)	(0.10,0.90, 0.90)	(0.9,0.1,0.1)
E13	(0.75,0.25, 0.20)	(0.9,0.1,0.1)	(0.75,0.25, 0.20)	(0.75,0.25, 0.20)	(0.35,0.75, 0.80)	(0.75,0.25, 0.20)	(0.10,0.90, 0.90)	(0.10,0.90, 0.90)
E26	(0.10,0.90, 0.90)	(0.9,0.1,0.1)	(0.10,0.90, 0.90)	I	(0.75,0.25, 0.20)	(0.75,0.25, 0.20)	(0.35,0.75, 0.80)	(0.75,0.25, 0.20)
E34	(0.35,0.75, 0.80)	(0.35,0.75, 0.80)	(0.10,0.90, 0.90)	(0.9,0.1,0.1)	(0.75,0.25, 0.20)	(0.35,0.75, 0.80)	(0.35,0.75, 0.80)	

E52	(0.9,0.1,0.1)	(0.10,0.90, 0.90)	(0.75,0.25, 0.20)	(0.35,0.75, 0.80)	I	(0.10,0.90, 0.90)	(0.9,0.1,0.1)	(0.75,0.25, 0.20)
E59	(0.10,0.90, 0.90)	I	(0.75,0.25, 0.20)	(0.9,0.1,0.1)	(0.9,0.1,0.1)	I	(0.35,0.75, 0.80)	I
E71	(0.9,0.1,0.1)	I	(0.10,0.90, 0.90)	I	I	(0.75,0.25, 0.20)	I	(0.10,0.90, 0.90)
E78	(0.75,0.25, 0.20)	(0.75,0.25, 0.20)	(0.35,0.75, 0.80)	(0.10,0.90, 0.90)	I	(0.9,0.1,0.1)	(0.10,0.90, 0.90)	(0.10,0.90, 0.90)
E79	(0.75,0.25, 0.20)	(0.9,0.1,0.1)	(0.35,0.75, 0.80)	(0.75,0.25, 0.20)	(0.10,0.90, 0.90)	I	(0.9,0.1,0.1)	(0.10,0.90, 0.90)

Table 8: Criteria validation level. Source: own elaboration.

The analysis highlights that:

- For criteria C2, C4, C5, C6, C7, and C8, there is a level of indeterminacy between the given evaluations, with a higher incidence in factor C5.
- Expert E71 (academic) identified four of the six criteria with a high level of indeterminacy (C2, C4, C5, and C7)

Indicators	(0.9;0.1;0.1)	(0.75;0.25;0.20)	(0.50;0.5;0.50)	(0.35;0.75;0.80)	(0.10;0.90;0.90)
C1 (1)	0.3333	0.6667	0.6667	0.7778	1,0000
C2 (2)	0.3333	0.4444	0.6667	0.7778	1,0000
C3 (3)	0.0000	0.4444	0.4444	0.6667	1,0000
C4 (4)	0.2222	0.5556	0.7778	0.8889	1,0000
C5 (5)	0.2222	0.4444	0.7778	0.8889	1,0000
C6 (6)	0.1111	0.4444	0.6667	0.7778	1,0000
C7 (7)	0.2222	0.2222	0.3333	0.6667	1,0000
C8 (8)	0.1111	0.3333	0.5556	0.5556	1,0000

Table 9: Relative frequency, neutrosophic cumulative probability. Source: own elaboration

Indicators	(0.9;0.1;0.1)	(0.75;0.25;0.20)	(0.50;0.5;0.50)	(0.35;0.75;0.80)	(0.10;0.90;0.90)	Average	N- Avg.	SVNN	Order
C1 (1)	-0.43	0.43	0.43	0.76	3.50	0.94	**-0.29**	(0.75;0.25;0.20)	2
C2 (2)	-0.43	-0.14	0.43	0.76	3.50	0.82	**-0.17**	(0.75;0.25;0.20)	4
C3 (3)	-3.50	-0.14	-0.14	0.43	3.50	0.03	**0.62**	(0.35;0.75;0.80)	
C4 (4)	-0.76	0.14	0.76	1.22	3.50	0.97	**-0.32**	(0.75;0.25;0.20)	1
C5 (5)	-0.76	-0.14	0.76	1.22	3.50	0.92	**-0.27**	(0.75;0.25;0.20)	3
C6 (6)	-1.22	-0.14	0.43	0.76	3.50	0.67	**-0.02**	(0.50;0.5;0.50)	
C7 (7)	-0.76	-0.76	-0.43	0.43	3.50	0.40	**0.25**	(0.50;0.5;0.50)	
C8 (8)	-1.22	-0.43	0.14	0.14	3.50	0.43	**0.22**	(0.50;0.5;0.50)	
Cut points	**-1.14**	**-0.15**	**0.30**	**0.72**	**3.50**	**0.65**	**= N**		
						N =	**0.65**		

Table 10: Calculation of cut-off points and scale of neutrosophic indicators. Source: own elaboration.

The determination of the degree of neutrosophic relevance of each subset by the experts indicates that criteria C3, C6, C7, and C8 should not be included in the study as the factors that originate the res nullius element in the adoption process. The neutrosophic statistical analysis determines that the following criteria are factors that originate the res nullius element in the adoption process:

C4. Under counseling: Y_N (0.017 + 0.195 I); CVN (0.076 + 0.661 I) for I = 88.50% (lower CVN, because it is the element with the highest incidence)

C1. Time dilation of the adoptive process: SN (0.014 + 0.163 I); NVC (0.054 + 0.629 I) for I= 91.40%

C5. Lack of skills in the candidates: S_N (0.016 + 0.182 I); NVC (0.065 + 0.746 I) for I= 91.30%

C2. Ignorance of the adoption process: Y_N (0.016 + 0.165 I); CVN (0.061 + 0.635 I) for I= 90.40%

Partial solutions to mitigate the res nullius effect in the adoption process:

Foundations, entities, and organizations must conduct and guide training and counseling programs through conferences, courses, meetings, and workshops where adopters clear up doubts about the process.

The regulatory institutions (Ministry of Social Welfare, National Council for Children and Adolescents, Technical Adoption Units, Judge) that direct the process must work with society in their training and preparation to

achieve a legal culture in society (especially for adopters who make up a family for the adoptee) through the various channels of communication in a precise and direct way, where the feeling of disappointment, misinformation, and disappointment in the adopters does not surface.

Conclusion

Neutrosophic statistics allows and determines the factors that originate the res nullius element in the adoption process. The consensus of the experts yielded that the factors with the highest incidence were under counseling and ignorance of the adoption process. The one in the study of the neutrosophic subset refers as the main factor the low advice to the candidates for adopters with an average of 0.97 for the neutrosophic value of (0.75; 0.25; 0.20). While at the level of the set or neutrosophic dimension, a CVN (0.076 + 0.661 I) is obtained for 88.50% indeterminacy. It was detected that the legal norms that protect the process present fissures that originate the res nullius element, breaches, and in the case of the rights of the adoptee, they are not fully regulated. Therefore, the use of basic alternatives focused on compliance with regulations and the training of adopters is recommended. Include the role of institutions in promoting the child adopted from a foster family without falling into extensive processes that give rise to the res nullius element.

References

[1] J. Sánchez Rodríguez, T. a. Morillo Lesme, and C. Riera Quintana, "Evaluating the affective needs of adopted children: demonstrations of psychomotor expressiveness. ," *Revista Española de Pedagogía*, vol. 76, no. 269, pp. 157-173, 2018, doi: https://doi.org/10.22550/REP76-1-2018-08.

[2] E. B. N. Arias, B. M. G. Nuñez, L. N. Fernández, and J. M. R. Pupo, "CRISP-DM and K-means neutrosophic in the analysis of risk factors for hearing loss in children. CRISP-DM y K-means neutrosofía en el análisis de factores de riesgo de pérdida de audición en niños," *Neutrosophic Computing and Machine Learning (NCML): An lnternational Book Series in lnformation Science and Engineering. Volume 16/2021*, p. 73, 2021.

[3] L. Gouveia, E. Magalhães, and V. S. Pinto, "Foster families: A systematic review of intention and retention factors," *Journal of Child and Family Studies*, vol. 30, no. 11, pp. 2766-2781, 2021.

[4] I. Cáceres, C. Moreno, M. Román, and J. Palacios, "The social competence of internationally-adopted and institutionalized children throughout childhood: a comparative and longitudinal study," *Early Childhood Research Quarterly*, vol. 57, July, pp. 260-270, 2021/10/01/ 2021, doi: https://doi.org/10.1016/j.ecresq.2021.07.002.

[5] R. P. Alava, J. M. Murillo, R. B. Zambrano, & , and M. I. Zambrano Vélez, "PEST Analysis Based on Neutrosophic Cognitive Maps: A Case Study for Food Industry," *Neutrosophic Sets and Systems*, vol. 21, no. 1, p. 10, 2018.

[6] K. P. Teruel, CedeñoCedeñ, J., Gavilanez, H. L., Diaz, C., & Vázquez, M. L., "A framework for selecting ccloud computing services based on consensus under single valued neutrosophic numbers. ," *Neutrosophic Sets and Systems*, vol. 22, no. 1, pp. 38-40, 2018.

[7] U. Afzal, H. Alrweili, N. Ahamd, and M. Aslam, " Neutrosophic statistical analysis of resistance depending on the temperature variance of conducting material," *Scientific Reports*, vol. 11, no. diciembre, p. 23939, 2021.

[8] S. E. Bonilla Veloz & M. Y. M. Y. Muñoz Medina. “Diseño de dieta para el tratamiento de enfermedades mentales en Ambato”. Universidad y Sociedad, vol. 14 no. S2, pp- 285-289, 2022.

[9] D. M. Sandoval Malquín & D. M. Sandoval Pozo. “El Cuadro de Mando Integral como herramienta de planificación financiera para la Compañía de Transporte de Carga Contrancarchi SA”. Universidad y Sociedad, vol. 14 no. S2, pp 277-284, 2022.

[10] D. M. Sandoval Malquín & D. M. Sandoval Pozo. “Estrategias financieras en tiempo de crisis para las Pymes de la ciudad de Tulcán”. Universidad y Sociedad, vol. 14 no. S2, pp 268-276, 2022.

[11] Romero Fernández, A. J., Álvarez Gómez, G. A., & Estupiñán Ricardo, J. “La investigación científica en la educación superior como contribución al modelo educativo”. Universidad Y Sociedad, vol. 13 no. S3, pp 408-415, 2021

[12] Ricardo, J. E., Vázquez, M. Y. L., Palacios, A. J. P., & Ojeda, Y. E. A. “Inteligencia artificial y propiedad intelectual”. Universidad y Sociedad, vol. 13 no. S3, pp 362-368, 2021.

[13] Leyva Vázquez, M. Y., Viteri Moya, J. R., Estupiñán Ricardo, J., & Hernández Cevallos, R. E. “Diagnóstico de los retos de la investigación científica postpandemia en el Ecuador”. Dilemas contemporáneos: educación, política y valores, vol. 9 no. (SPE1), 2021.

[14] Ricardo, J. E. (2018). “Estrategia de Gestión en la Educación Superior; pertinencia e impacto en la interrelación de los procesos académicos, de investigación científica y de vinculación con la sociedad en el periodo enero 2016-mayo 2018 en la Facultad de Ciencias Jurídicas, Sociales y de la Educación de la Universidad Técnica de Babahoyo en Ecuador”. Infinite Study, 2018.

[15] Álvarez Gómez, G. A., Viteri Moya, J. R., Viteri Intriago, D. A., & Estupiñán Ricardo, J. “Integración de los procesos sustantivos para la mejora de la calidad del aprendizaje”. Conrado, vol. 17 no. 80, pp 21-27, 2021.

[16] Caballero, E. G., Leyva, M., Ricardo, J. E., & Hernández, N. B. "NeutroGroups Generated by Uninorms: A Theoretical Approach". In Theory and Applications of NeutroAlgebras as Generalizations of Classical Algebras (pp. 155-179). IGI Global, 2022.

[17] von Feigenblatt, O. F., Calderon, R. D., & MacDonald, T. "The Case for an Eclectic and Flexible Leadership Research Agenda: Dealing with Social Justice and Diversity in the 21st Century Workplace". Centro Sur, vol. 6 no. 1, pp 130-142, 2022.

[18] J. B. Intriago Hidalgo, I. X León Rodríguez, J. L. Maldonado Cando & J. X Iglesias Quintana. "Vulneración del Principio de Celeridad en los procesos investigativos y judiciales en los casos de violencia psicológica en Ecuador". Universidad y Sociedad, vol. 14 no. S4, pp 649-656, 2022.

[19] B. D. Coronel Casanova, Y. G. Calva Vega, J. O. Jácome Cordones & B. D. C. Viteri Naranjo. "La vulneración de derechos de los afiliados al Instituto Ecuatoriano de Seguridad Socia"l. Universidad y Sociedad, vol. 14 no. S4, pp 641-648, 2022.

[20] C. F. Rey Siquilanda, E. A. Rengel Delgado, F. A. Garcés Córdova & E. M. Vásquez Llerena. "La defensa técnica gratuita a la víctima en contravenciones penales flagrantes en la Legislación ecuatoriana". Universidad y Sociedad, vol. 14 no. S4, pp 634-640, 2022.

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