Neutrosophic Sets and Systems
{Special Issue: Impact of Neutrosophy in solving the Latin American's social problems}, Vol. 37, 2020

University of New Mexico

Application of the Neutrosophic AHP Method for the Development of a Training Project on the Adoption Process in Ecuador

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Abstract: Starting from the benefits that can contribute to the people who go through an adoption process, having an adequate knowledge of the current legislation in this respect and a general culture about the impact of this decision in their daily life, their family and especially in the adopted one, this research proposes a training project in child adoption issues in Ecuador. In order to determine precisely which topics the course should be made up of and how much of the total time available should be assigned to each topic, the use of the Analytic Hierarchy Process (AHP) with a neutrosophic approach was used. This approach is justified by the subjective nature of the experts' assessments of the weight of the alternatives for each criterion considered.

Keywords: adoption, training, neutrosophic AHP, SVNS, linguistic term, weighting.

1 Introduction

One of the achievements of contemporary society in the area of human rights is the right to adoption, which, beyond being a legal instrument, is a measure of protection for children and adolescents who are in a state of abandonment. Adoption offers the possibility of forming a family that is not sustained by biological ties; it is a different way of accessing maternity and paternity, where the bond of filiation is symbolically constituted and has the same transcendence as natural reproduction. Its purpose is to provide for the restoration of the child's well-being and security by applying the criteria of unconditional and irrevocable adoption. According to [1] the adoptive parents are committed to caring for their adopted children by instilling in them moral, religious, cultural and social values, providing them with a home full of harmony, love, respect and understanding[2].

The purpose of adoption is to guarantee the right to a family and the integral development of the adopted child by applying the principle of the best interests of the child and ensuring the implementation of public policies that protect and benefit the growth of children and adolescents in an emotional environment that helps them develop physically, psychologically and socially[1]. Adopted children and adolescents are incorporated into families by creating bonds of affiliation and, as a general rule, there is a break in personal, family and legal ties between the children and their biological parents. Adoption as an intervention implies providing the conditions that make possible an adequate psychological development for these children and adolescents because, in essence, this transition can be traumatic[3].

In this sense, some studies have indicated a greater tendency of adopted children to manifest psychological problems. Behavioral problems and the greater presence of adopted children among the clinical population that receives, or has received, mental health treatment have been especially highlighted. A deficit model or a psychopathological model accompanies many of the studies that have been devoted to adoptive samples. Referring to the problems of adoptees is so frequent that one even speaks of the "psychology and psychopathology of adoption" or the "adopted child syndrome"[4]. In recent decades, there has been a significant increase in the number of adoptions worldwide and various ways and criteria have been developed to carry them out, which is legislated in international charters and treaties. The authors [5-7]state that all the regulations in this regard coincide, however, in the need to carry out case studies carefully.

The parent selection process is long and thorough. Applicants may sometimes feel that they are being judged to find their faults, generating doubts and anxiety in the couple. However, this exhaustive assessment is part of the institutional protection system in which the children are found. The evaluating professional must guarantee that these minors will not be victimized again and above all ensure that they are provided with a stable family environment that is capable of covering their needs and therefore their well-being[8] .

The overall characteristics of psychosocial assessment mean that the process involved is not one hundred percent accurate, since even when the criteria to be assessed are clear, it is difficult to recognize the presence or absence of certain qualities, which is why the criteria must be assumed in a flexible manner, always taking into account the characteristics and needs of children. One of the central questions that agitates the discussions, and that mobilizes the main actors, consists in rethinking the place assigned to the families of origin, sometimes called the biological families of the children given up for adoption.

In Ecuador, the adoption procedure lasts eleven months[9]. This period is divided into 90 days, after the application is received, for the application of the adopter, who must be declared suitable by the Ministry of Economic and Social Inclusion (MESI), and up to eight months while waiting for the placement of a child or adolescent. During this process, it is essential that the adopters have the right to adopt through various psychological tests to see if they are capable of gaining a new member of their family. This requires a high level of knowledge of the family and social context, as well as the norms and rules that control the process. That is why, among other aspects, the training process plays a preponderant role for both the adoptee and the adopte[10]r.

For this reason, this research aims to design a training course project on the current legislation regarding adoption in the country, psychological and sociological foundations of the family context and the treatment of children and adolescents in the process of adoption, for people who are going through, or intend to start, an adoption process in Ecuador. In order to determine the specific topics to be included in the course, as well as the distribution of the hours to be taught on each topic, according to its importance in achieving a successful adoption, the use of the Analytic Hierarchy Process (AHP) with a neutrosophic approach is proposed[11-13].

2 Materials and methods

In this section, we expose the basics concepts of Neutrosophy and the AHP method tha were used.

2.1 Some basic concepts of Neutrosophy

Neutrosophy is a mathematical theory developed by Florentin Smarandache to deal with indetermination [14-16]. It has been the base for the development of new methods to handle indeterminate and inconsistent information as the neutrosophic sets and the neutrosophic logic and, especially, in decision-making problems[17-19] .

Let $N = \{(T, I, F): T, I, F \subseteq [0,1]\}n$, be a neutrosophic evaluation of a mapping of a group of formulas propositional to N, and for each sentence p you have:

$$v(p) = (T, I, F) \quad (1)$$

In order to facilitate the practical application to decision-making problems, the use of single-value neutrosophic sets (SVNS) [20, 21] was proposed, through which it is possible to use linguistic terms, in order to obtain a greater interpretability of the results.

Let X be a universe of discourse, a SVNS A over X has the following form:

$$A = \{\langle x, u_a(x), r_a(x), v_a(x)\rangle : x \in X\} \quad (2)$$

Where

$u_a(x): X \to [0,1], r_a(x): X \to [0,1]\ y\ v_a(x): X \to [0,1]$

With $0 \le u_a(x), r_a(x), v_a(x) \le 3, \forall\, x \in X$

The intervals $u_a(x), r_a(x)$ and $v_a(x)$ denote the memberships to true, indeterminate and false from 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[22].

Let $\{A_1, A_2, \ldots, A_n\} \in$ SVNS (x), where $A_j = (a_j, b_j, c_j)$ (j = 1, 2, …, n), then, the Single Valued Neutrosophic Weighted Average Operator is defined by[23]:

$$P_w(A_1, A_2, \ldots, A_n) = \langle 1 - \prod_{j=1}^{n}\left(1 - T_{A_j}(x)\right)^{w_j}, \prod_{j=1}^{n}\left(I_{A_j}(x)\right)^{w_j}, \prod_{j=1}^{n}\left(F_{A_j}(x)\right)^{w_j}\rangle \quad (3)$$

Where: $w = (w_1, w_2, \ldots, w_n)$ is vector of $A_j (j = 1,2, \ldots, n)$ such that $w_n \in [0,1]$ y $\sum w_j = 1$.

Let A = (a, b, c) be a single neutrosophic number, a score function S of a single valued neutrosophic value, based on the truth-membership degree, indeterminacy-membership degree and falsity membership degree is defined by[24, 25]:

$$S(A) = 2 + a - b - c \quad (4)$$

Where $S(A) \in [-1,1]$

2.2 AHP Method

Developed by Thomas Saaty, the AHP (Analytic Hierarchy Process) method essentially consists of formalizing our intuitive understanding of complex problems using a hierarchical structure[26-28]. It has three fundamental concepts: the structuring of the complex decision problem as a hierarchy of objectives, criteria and alternatives, comparisons by pairs of elements of the same level of the hierarchy with respect to each criterion of the superior level, and finally in a vertical way the judgments on the different levels of the hierarchy are synthesized . The application of the AHP method is supported in the structuring of the problem hierarchy in a visual way (Figure 1), where a hierarchy of attributes is constructed containing the purpose or objective of the problem, the different decision criteria and the alternatives[29, 30].

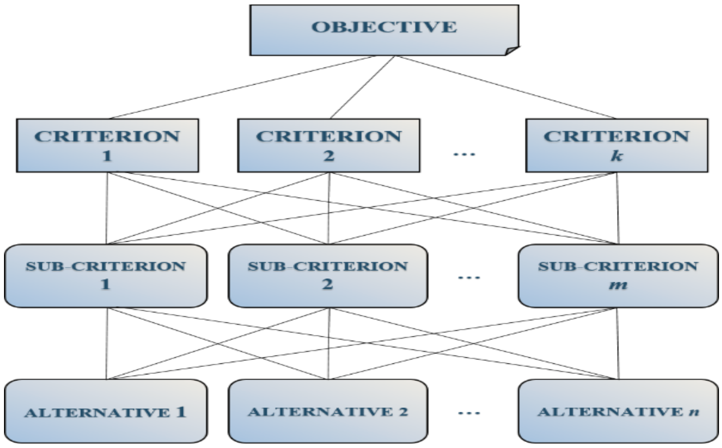

Figure 1. Tree diagram of the elements needed to apply the AHP method

For its application, the following steps are executed:

Step 1. Define the problem and decision criteria in the form of hierarchical objectives

The hierarchy is structured in different levels, starting at the top with the definition of the main objective of the hierarchy process, then the intermediate levels are defined (criteria and sub-criteria to be evaluated) and finally, at the lowest level the alternatives to be compared are described.

Step 2. Evaluate (weigh) the different criteria, sub-criteria and alternatives according to their corresponding importance at each level

Qualitative and quantitative criteria can be compared using informal judgments to obtain weights and priorities. For qualitative criteria, the AHP technique uses simple comparisons (pairwise) to determine the weights and evaluate them. In this way the analyst can concentrate on only two criteria at the same time and indicate how many times one element is more important than another element, with respect to the criterion or property with which they are being compared. In fact, the AHP technique is based on the assumption that the analyst (decision maker) can more easily choose a comparison value than an absolute value. Verbal judgments are translated into a rating scale (Table 1) proposed by [31].

Numerical scale	Verbal scale
1	Both criteria or elements are of equal importance
3	Weak or moderate importance of one over the other
5	Essential or strong importance of one criterion over the other
7	Demonstrated importance of one criterion over the other
9	Absolute importance of one criterion over the other
2, 4, 6, 8	Intermediate values between two adjacent trials, which are used when an average between two of the above intensities is necessary

Table 1. Saaty after determining the values of the comparisons for each level: "Pairwise Comparison Matrix" [8].

Step 3. Determine the weights of each sub-criterion with respect to the previous criterion

In order to calculate them, the columns of the Pair Comparison Matrices are normalized by dividing each number of a column by its total sum, and from these values the average value of the values of each row is obtained, which correspond to the values of the main vector that reports the priority weights of the criteria or sub-criteria. The AHP method allows the analyst to evaluate the congruence of the judgments with the radius of inconsistency. Before determining an inconsistency, it is necessary to estimate the consistency index of a trial matrix, where it is defined by **[32]**:

$$CI = \frac{\lambda max - n}{n-1} \quad (5)$$

Where λmax it is the maximum self value of the matrix.

In this way it is defined by:

$$RI = \frac{CI}{R_i} \quad (6)$$

Where R_i it is a random average value of for a matrix. The values of are shown in table 2.

N	*1*	*2*	*3*	*4*	*5*	*6*	*7*
R_i	0	0	0,52	0,89	1,11	1,25	1,35

Table 2. Values of R_i for different order matrices proposed by [16]

Judgments may be considered acceptable if it is less than or equal to 0.1. In cases of inconsistency, the evaluation process for the evaluated matrix is immediately repeated. Inconsistencies greater than 0.1 or more justify further investigation of the criteria evaluated.

Step 4. Construct Alternative Payment Matrix

In this matrix, for each last level criterion, an assessment of the consequences of the alternatives is made. There are 2 options [8]:

If the data of the alternatives vs. criteria (payment matrix) are available, equation 3 is used, where the values are normalized Z_i to values A_i for each criterion i.

$$\sum_{i=1}^{n} A_i = 1 \quad (7)$$

If the payment matrix is not available, the decision maker makes comparisons to form a n x n matrix of relative importance between alternatives, similar to that of the criteria.

Step 5. Determine total evaluations of the alternatives

The definitive evaluation of each alternative is obtained by using equation 8 for each last level criterion j:

$$V_j(A_k) = \sum_{i=1}^{q} p_i \times a_{ki} \quad (8)$$

Where:

V_j: Is the evaluation of the alternative A_k

A_k: Is the alternative $k, (k = 1,2, \dots, n)$

p_i: Is the priority weighting of the criterion or sub-criterion $i, (i = 1,2, \dots, q)$

a_{ki}: Corresponds to the value of the alternative evaluated with respect to the Z_i.

This calculation must be performed for each criterion at other levels, until the main hierarchy node is reached.

2.3 Neutrosophic AHP Method

Neutrosophic AHP has several advantages over classical AHP, for example, it presents the user with a richer frame structure than classical AHP, fuzzy AHP and intuitionist fuzzy AHP. It describes the expert's judgment values by efficiently handling vagueness and uncertainty about fuzzy AHP and fuzzy intuitionist AHP because it considers three different degrees: degree of membership, degree of indeterminacy, and degree of non-membership. Another advantage is that it is calculated from linguistic terms, which allows for more natural communication with experts [33].

Neutrosophic AHP consists of applying the following steps:

Step 1. Select the experts and measure their weight according to their level of knowledge in the analyzed topic.

To determine the weight of the experts, the selected specialists self-evaluate their level of knowledge in the topic to be analyzed according to a linguistic scale associated with SVNS values, as shown in Table 3.

LINGUISTIC TERM	EVALUATION	SVNS
EXTREMELY HIGH	EH	(1; 0; 0)
VERY VERY HIGH	VVH	(0.9, 0.1, 0.1)
VERY HIGH	VH	(0,8; 0,15; 0,20)
HIGH	H	(0.70,0.25,0.30)
NOT VERY HIGH	NVH	(0,60; 0,35; 0,40)
MEDIUM	M	(0,50; 0,50; 0,50)
BETWEEN LOW AND MEDIUM	BLM	(0,40; 0,65; 0,60)
LOW	L	(0.30,0.75,0.70)
VERY LOW	VL	(0,20; 0,85; 0,80)
VERY VERY LOW	VVL	(0.10,0.90,0.90)
EXTREMELY LOW	EL	(0; 1; 1)

Table 3. Linguistic terms for the evaluation of experts

If $A_t = (a_t, b_t, c_t)$ is the SVNS corresponding to the t-th decision maker (t = 1, 2,..., k), the weight of each expert is calculated by the following formula:

$$\lambda_t = \frac{a_t + b_t\left(\frac{a_t}{a_t + c_t}\right)}{\sum_{t=1}^{k} a_t + b_t\left(\frac{a_t}{a_t + c_t}\right)} \quad (9)$$

Where:

$\lambda_t \geq 0$ y $\sum_{t=1}^{k} \lambda_t = 1$

Step 2. Define the problem and decision criteria in the form of hierarchical objectives

This step is accomplished in the same way as in the classic AHP method. The experts must design an AHP tree, specify the criteria, sub-criteria and alternatives to perform the evaluation.

Step 3. Evaluate (weigh) the different criteria, sub-criteria and alternatives according to their corresponding importance at each level

In order to create the matrices for each level of the tree, according to the experts' evaluations, these must be expressed in SVNS form, for which the original Saaty numerical scale is adapted to a linguistic scale as can be seen in Table 4.

SAATY'S SCALE	DEFINITION	SVNS
1	Equally important	$(0.50, 0.50, 0.50)$
3	Moderate importance	$(0.30, 0.75, 0.70)$
5	Strong importance	$(0.80, 0.15, 0.20)$
7	Very strong or proven importance	$(0.90, 0.10, 0.10)$
9	Extreme importance	$(1, 0, 0)$
2	Sporadic values between two scales close to each other	$(0.40, 0.65, 0.60)$
4		$(0.60, 0.35, 0.40)$
6		$(0.70, 0.25, 0.30)$
8		$(0.85, 0.10, 0.15)$

Table 4. Adapting the Saaty scale for SVNS use

The neutrosophic decision matrix is obtained by combining equation (3), (4) and (9), is defined as:

$$D = \begin{vmatrix} sa_{11} & sa_{12} & \dots sa_{1n} \\ sa_{21} & sa_{22} & \dots sa_{2n} \\ . & . & . \\ . & . & . \\ sa_{n1} & sa_{n2} & \dots sa_{nn} \end{vmatrix},$$

where $sa_{ij} = 3 - \prod_{t=1}^{k}\left(1 - T_{A_{ij_t}}(x)\right)^{\lambda_t} - \prod_{t=1}^{k}\left(I_{A_{ij_t}}(x)\right)^{\lambda_t}, - \prod_{t=1}^{k}\left(F_{A_{ij_t}}(x)\right)^{\lambda_t}$ (10)

Step 4. Determine the weights of each sub-criterion with respect to the previous criterion

The consistency of the assessments for each matrix is verified, and then step 5 of the traditional AHP is applied.

3 Results

A total of 15 experts were selected to apply the AHP method in the design of the training course:

- Five of them are judges from the Family, Women, Children and Adolescents Unit of Quito City
- Three are judges from the National Court of Justice
- Four are professors of law at the Central University of Ecuador
- Three are freelance lawyers with extensive professional experience in the field.

The experts evaluated their own knowledge on the subject analyzed from the scale shown in table 1 and determined its weight by means of equation 9.

As a second step, the experts were asked to make a proposal of the issues and criteria they considered fundamental for the successful achievement of an adoption process. From the processing of this first information provided by the experts, the following proposals were elaborated, which were sent to them again and were approved by all. These are the proposed themes and criteria:

Themes (decision alternatives)

1. The family and its characteristics. Psychological and sociological foundations of the family context.
2. Ecuadorian Code of Childhood and Adolescence. Theoretical and methodological bases of the adoption process.
3. Psychology of the adoption.
4. Adoption in Ecuador, procedures and requirements.
5. Adoption in the National Legislation of Ecuador.
6. Principles and guarantees of the adoption. Rights of the adopters and rights of the adoptee.

The criteria on which the alternatives were evaluated were focused on the objectives to which the level of knowledge reached in the matters could contribute:

1. Successful completion of all stages of the adoption process
2. To guarantee the integral development of the adopted child
3. To guarantee the adopted child or adolescent a family environment with harmony, love, respect and understanding
4. Be better prepared to meet the challenge of adoption.

The results of the application of the Neutrosophic AHP Method are shown below.

Applying (9), the values of for each expert were obtained, which were used as a weighting coefficient for each of the aggregated matrices. Each of the elements of the matrices are shown as SVNS, but all the weigths were calculated by applying (10) and then, step number 3 of the AHP Classic Method. Table 5 shows the matrix of pairwise comparisons between the criteria.

Criteria	Pairwise SVNS Comparison Matrix				Weight
	Criterion 1	Criterion 2	Criterion 3	Criterion 4	
Criterion 1	1	(0,523 ; 0,381 ; 0,429)	(0,518 ; 0,416 ; 0,469)	(0,577 ; 0,343 ; 0,387)	0,362
Criterion 2	(0,188 ; 0,754 ; 0,851)	1	(0,499 ; 0,419 ; 0,472)	(0,518 ; 0,429 ; 0,484)	0,266
Criterion 3	(0,189 ; 0,755 ; 0,851)	(0,196 ; 0,74 ; 0,835)	1	(0,21 ; 0,715 ; 0,806)	0,171
Criterion 4	(0,17 ; 0,765 ; 0,863)	(0,189 ; 0,736 ; 0,83)	(0,478 ; 0,483 ; 0,545)	1	0,202

Table 5. Pairwise Comparison Matrix

As can be seen, the most important criterion is number 1, followed by 2, 4 and 3 in that order. The matrix is consistent with an RI=0.015 so these weights per vector will be used for the final comparison between the alternatives.

The components of the priority or hierarchy vectors for each alternative according to each criterion are shown from table 6 and up to table 10.

Alternative	Aggregated SVNS matrix						Priority Vector
	1	2	3	4	5	6	
1	1	(0.779, 0.244, 0.253)	(0.845, 0.153, 0.159)	(0.903, 0.098, 0.102)	(0.943, 0.106, 0.11)	(0.98, 0.084, 0.087)	0,322
2	(0.149, 0.91, 0.945)	1	(0.169, 0.882, 0.915)	(0.745, 0.265, 0.275)	(0.857, 0.181, 0.188)	(0.875, 0.181, 0.188)	0,176
3	(0.133, 0.923, 0.958)	(0.658, 0.359, 0.372)	1	(0.748, 0.31, 0.322)	(0.841, 0.22, 0.228)	(0.904, 0.137, 0.142)	0,213
4	(0.122, 0.929, 0.965)	(0.152, 0.904, 0.939)	(0.153, 0.896, 0.93)	1	(0.77, 0.252, 0.261)	(0.883, 0.16, 0.166)	0,131
5	(0.122, 0.931, 0.967)	(0.132, 0.919, 0.954)	(0.14, 0.916, 0.95)	(0.15, 0.908, 0.943)	1	(0.194, 0.855, 0.888)	0,073
6	(0.122, 0.937, 0.972)	(0.131, 0.92, 0.955)	(0.129, 0.928, 0.963)	(0.13, 0.924, 0.959)	(0.583, 0.455, 0.472)	1	0,086

Table 6 Pairwise comparison matrix for the alternatives according to criterion 1

According to the previous results, the theme 1 of the course: "The family and its characteristics. Psychological and sociological foundations of the family context" has a higher priority according to the criterion: "Successful completion of all stages of the adoption process".

Alternative	Aggregated SVNS matrix						Priority Vector
	1	2	3	4	5	6	
1	1	(0.832, 0.231, 0.24)	(0.821, 0.182, 0.189)	(0.881, 0.19, 0.198)	(0.899, 0.168, 0.174)	(0.907, 0.141, 0.146)	0,315
2	(0.144, 0.915, 0.95)	1	(0.172, 0.884, 0.917)	(0.75, 0.282, 0.293)	(0.797, 0.203, 0.211)	(0.895, 0.178, 0.185)	0,175
3	(0.14, 0.92, 0.955)	(0.681, 0.37, 0.384)	1	(0.759, 0.289, 0.3)	(0.768, 0.264, 0.274)	(0.851, 0.184, 0.191)	0,212
4	(0.138, 0.923, 0.958)	(0.151, 0.901, 0.935)	(0.156, 0.904, 0.938)	1	(0.766, 0.237, 0.246)	(0.846, 0.189, 0.196)	0,133
5	(0.129, 0.923, 0.958)	(0.137, 0.913, 0.948)	(0.147, 0.904, 0.938)	(0.146, 0.909, 0.943)	1	(0.191, 0.858, 0.891)	0,076
6	(0.132, 0.929, 0.964)	(0.13, 0.922, 0.957)	(0.133, 0.919, 0.953)	(0.136, 0.919, 0.954)	(0.596, 0.448, 0.465)	1	0,089

Table 7. Pairwise comparison matrix for the alternatives according to criterion 2

According to criterion 2 the same hierarchical order is maintained for the course topics.

Alternative	Aggregated SVNS Matrix						Priority Vector
	1	2	3	4	5	6	
1	1	(0.825, 0.243, 0.252)	(0.844, 0.222, 0.231)	(0.848, 0.199, 0.206)	(0.823, 0.184, 0.191)	(0.858, 0.16, 0.166)	0,310
2	(0.146, 0.913, 0.948)	1	(0.169, 0.889, 0.922)	(0.763, 0.272, 0.283)	(0.828, 0.219, 0.228)	(0.873, 0.18, 0.187)	0,177
3	(0.142, 0.917, 0.951)	(0.689, 0.348, 0.361)	1	(0.732, 0.296, 0.307)	(0.814, 0.257, 0.267)	(0.799, 0.243, 0.252)	0,213
4	(0.14, 0.92, 0.955)	(0.154, 0.906, 0.94)	(0.159, 0.901, 0.935)	1	(0.754, 0.286, 0.297)	(0.737, 0.268, 0.278)	0,130
5	(0.136, 0.918, 0.953)	(0.139, 0.914, 0.949)	(0.149, 0.911, 0.946)	(0.153, 0.902, 0.936)	1	(0.191, 0.857, 0.89)	0,077
6	(0.133, 0.923, 0.958)	(0.135, 0.922, 0.957)	(0.146, 0.911, 0.945)	(0.151, 0.903, 0.937)	(0.602, 0.455, 0.472)	1	0,092

Table 8. Pairwise comparison matrix for the alternatives according to criterion 3

Once again topics 1 to 3 are the most important according to this criterion and the rest is kept in the same order with topic 5 evaluated as the least important for the course.

Alternati	Aggregated SVNS Matrix	Priori

ve	1	2	3	4	5	6	ty Vecto r
1	1	(0.796, 0.24, 0.249)	(0.829, 0.18, 0.187)	(0.841, 0.171, 0.178)	(0.915, 0.138, 0.143)	(0.962, 0.088, 0.091)	0,319
2	(0.149, 0.913, 0.947)	1	(0.173, 0.883, 0.916)	(0.707, 0.3, 0.312)	(0.792, 0.22, 0.229)	(0.893, 0.12, 0.125)	0,178
3	(0.133, 0.917, 0.952)	(0.659, 0.364, 0.378)	1	(0.743, 0.311, 0.323)	(0.811, 0.236, 0.245)	(0.822, 0.205, 0.213)	0,213
4	(0.139, 0.923, 0.958)	(0.159, 0.897, 0.931)	(0.158, 0.898, 0.932)	1	(0.757, 0.255, 0.265)	(0.218, 0.839, 0.871)	0,107
5	(0.132, 0.93, 0.965)	(0.142, 0.912, 0.947)	(0.147, 0.914, 0.948)	(0.147, 0.905, 0.939)	1	(0.208, 0.853, 0.885)	0,076
6	(0.12, 0.934, 0.969)	(0.124, 0.927, 0.962)	(0.142, 0.918, 0.952)	(0.523, 0.503, 0.521)	(0.557, 0.47, 0.488)	1	0,108

Table 9. Pairwise comparison matrix for the alternatives according to criterion 4

Once all the necessary vectors to establish the comparison between the alternatives were obtained, the vectorial decision matrix was constructed, which includes the weight vector of the criteria q obtained at the beginning of the application of this method. The results are shown in table 10.

Alternative	Criteria				Hierarchical Index
	Criterion 1	Criterion 2	Criterion 3	Criterion 4	
1	0,322	0,315	0,310	0,319	0,317
2	0,176	0,175	0,177	0,178	0,176
3	0,213	0,212	0,213	0,213	0,213
4	0,131	0,133	0,130	0,107	0,127
5	0,073	0,076	0,077	0,076	0,075
6	0,086	0,089	0,092	0,108	0,092
Weigth	0,362	0,266	0,171	0,202	

Table 10. Decision matrix for Alternatives

From the values of the previous table it was possible to establish the hierarchical order of the topics of the course, as well as the index of hierarchy that they present for the assignment of class hours that are programmed. The order and the respective indexes for each topic are as follows:

1. The family and its characteristics. Psychological and sociological foundations of the family context (31.7%)
2. Psychology of adoption (21.3%)
3. Ecuadorian Children and Adolescents Code. Theoretical and methodological bases of the adoption process (17.6%)
4. Adoption procedure in Ecuador, procedures and requirements (12.7%)
5. Principles and guarantees of adoption. Rights of adopters and rights of adoptees (9.2%)
6. Adoption in Ecuador's National Legislation (7.5%)

Conclusions

- The training course project on the current legislation regarding adoption in the country, psychological and sociological foundations of the family context and the treatment of children and adolescents in the process of adoption, is designed to be useful to people who are going through, or intend to start, an adoption process in Ecuador.
- The course is designed to enhance the knowledge that directly contributes to the successful completion of all stages of the adoption process, as well as to guarantee the integral development of the adopted child in a family environment with harmony, love, respect and understanding.
- The application of the neutrosophic AHP method from the information provided by the experts consulted, allowed the establishment of a hierarchical order for the topics of the course according to their relevance, as well as to estimate the proportion of time that should be assigned to each topic in correspondence with its hierarchy index.

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Received: April 24, 2020. Accepted: August 25, 2020