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

TOPSIS with a Neutrosophic Approach for a Study of Strategies to Confront the Crime of Feminicide in Ecuador

Ignacio Fernando Barcos Arias[1], Jorge Manuel Macías Bermudez[2], and Federico Miguel Estrella Gómez[3]

[1] Universidad Regional Autónoma de los Andes (UNIANDES), Avenida Jorge Villegas Final, Babahoyo CP 120105, Los Ríos, Ecuador. Email: ub.ignaciobarcos@uniandes.edu.ec
[2] Universidad Regional Autónoma de los Andes (UNIANDES), Avenida Jorge Villegas Final, Babahoyo CP 120105, Los Ríos, Ecuador. Email: ub.jorgemacias@uniandes.edu.ec
[3] Universidad Regional Autónoma de los Andes (UNIANDES), Avenida Jorge Villegas Final, Babahoyo CP 120105, Los Ríos, Ecuador. Email: ub.federicoestrella@uniandes.edu.ec

Abstract. In this investigation, we make use of the neutrosophic TOPSIS technique for the evaluation of four strategies in order to achieve the decrease of feminicide crimes in Ecuador, which constitute a problem that continues to increase, mainly in the canton of Babahoyo. Four alternatives were evaluated, based on the criteria of fifteen specialists on the subject. This technique, based on Neutrosophy, made it possible to capture the specialists' evaluation criteria in a way that was more in line with the truth. As a result, we found that the decision alternative, or the most important strategy, is to establish a more preventive criminal legislation for the protection of victims of domestic and gender violence.

Keywords: Feminicide, Neutrosophy, TOPSIS, single valued neutrosophic set.

1 Introduction

According to author Diana Russell [1], feminicide is the act in which a female is killed by someone of the opposite sex driven by pleasure, contempt, hate or a sense of possession towards women. A shorter interpretation of this definition is the murder of a woman by a man, because the simple fact of being a woman.

Feminicide occurs because humanity has produced behaviors that admit attacks against the integrity, health, and the main right to life of women. Feminicide is made up of discrimination and machismo, of violence against women, of legal voids coming from the government, from which an unsafe coexistence for women is produced, because it benefits the set of crimes that we ask to clarify and eradicate[2].

As for its legal treatment, the author expresses[3]:

"The Law is a non-neutral legal body. In this regard, too much has been written to prove that, as a social element, it is impregnated by gender relations. For this reason, feminist legal theory has projected that it is a product of patriarchal societies and has been built mainly from the experience of men. It is a "naturalized" model of the human being, which therefore reflects and protects values, needs and interests that correspond mostly only to that half of humanity".

With the acceptance of laws that condemn feminicide in the country, it is proposed to develop a criminal policy with a gender perspective that strengthens, on one hand, the tactics of persecution and punishment of those who practice violence against women and, on the other hand, that certifies the settlement and compensation of the victims. The objective is to diminish impunity so that the criminal justice system can carry out its task of special and general prevention of crime[4, 5].

Gender violence has always been a problem in Ecuador. Among the results derived by the Ministry of the Interior with the support of Ecuador's National Institute of Statistics and Censuses, the following elements are highlighted from a survey applied to a total of 1,800 women in 2014 (Figure 1)[6].

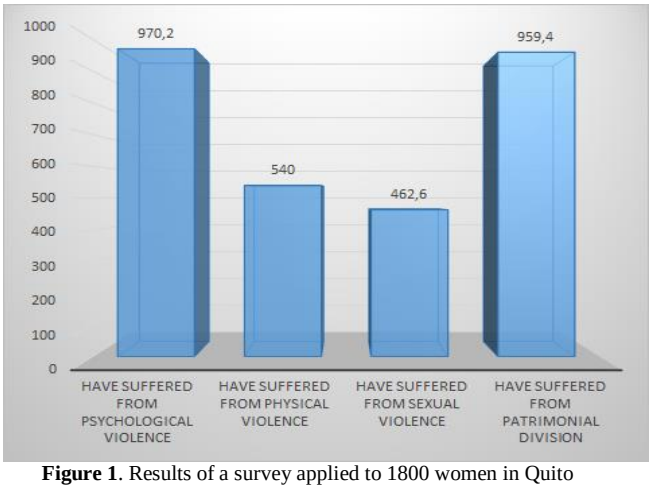

Figure 1. Results of a survey applied to 1800 women in Quito

This study also shows that 6 out of 10 women have experienced some type of gender-based violence, with a higher percentage among indigenous people (67%) and Afro-descendants (66.7%). It was also observed that 1 out of 4 women have experienced sexual violence at some point in their lives. 64% of feminicides are perpetrated by the lover or ex-boyfriend at the house of the victim or the aggressor.

The investigations recognize that the individuals who have committed these crimes are often people close to the home. The higher percentages of feminicide have been caused by ex-boyfriends, husbands, ex-spouses and boyfriends. Parents, friends, stepparents, lovers and sons-in-law are also among those involved.

According to the national media, in 2011 Ecuador begin to debate the possibility of incorporating into Ecuadorian legislation a criminal law that is adapted to gender situations. Thus, on August 14, 2014, the Integral Organic Penal Code introduced two articles referred to the criminal type of feminicide and its aggravating factors, which describes the crime and the situations that aggravate it, and also establishes the respective penalties[7].

In the canton of Babahoyo, there are few trials, if any, for the crime of feminicide, despite the fact that all of the requirements that could be included in this type of crime are usually met. The death of women is usually typified as murder and not as feminicide; and the elements of conviction are not enough to show that they are carried out according to the conditions and with elements established by the law.

For this reason, this research makes a study of possible strategies to follow so that this problem does not continue to advance in the country and that it is given the legal treatment that corresponds to such crime.

2 Materials and methods

In order to study the best strategies to reduce the occurrence of feminicide crimes and to achieve an adequate legal treatment of these cases, the TOPSIS technique (Technique for Order Preference by Similarity to Ideal Solution) was used. This method is characterized by its effectiveness and the simplicity of its principle in the solution of multi-criteria decision problems. To enrich this technique, the neutrosophic TOPSIS is applied, see [8-10].

Neutrosophy is a mathematical theory developed by Florentin Smarandache to deal with indetermination [9, 11, 12]. It has been the base for the development of new methods to handle indeterminate and inconsistent information, such as the neutrosophic sets and the neutrosophic logic and, especially, in the decision-making problems [9, 13, 14].The truth value in the neutrosophic set is defined as follows [15-17]:

Let X be a universe of discourse, a SVNS A over X has the following form [18, 19]:

$$A = \{\langle x, u_a(x), r_a(x), v_a(x)\rangle : x \in X\}d \quad (1)$$

Where

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

Con

$0 \leq u_a(x), r_a(x), v_a(x) \leq 3, \quad \forall\, x \in X$

The intervals $u_a(x), r_a(x)$ and $v_a(x)$ denote the memberships to true, indeterminate and false of x in A, respectively.

For convenience a Single Valued Neutrosophic Number (SVNS) will be expressed as A = (a, b, c), where a, b, c ∈ [0.1] and satisfies 0 ≤ a + b + c ≤ 3.

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

1. Let $A_1 = (a_1, b_1, c_1)$ and $A_2 = (a_2, b_2, c_2) \in$SVNS, the sum between A_1 and A_2 is defined by:

$$A_1 \oplus A_2 = (a_1 + a_2 - a_1a_2, b_1b_2, c_1c_2) \quad (2)$$

2. Let $A_1 = (a_1, b_1, c_1)$ and $A_2 = (a_2, b_2, c_2) \in$ SVNS the multiplication between A_1 and A_2 is defined

by:

$A_1 \otimes A_2 = a_1a_2, b_1 + b_2 - b_1b_2, c_1 + c_2 - c_1 + c_2)$ (3)

3. The multiplication by a positive scalar $\lambda \in \Re$ with SVNS, A = (a, b, c) is defined by:

$\lambda A = \left(1 - (1 - a)^{\lambda}, b^{\lambda}, c^{\lambda}\right)$ (4)

4. Let $\{A_1, A_2, \dots, A_n\} \in$ 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[20]:

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

(5)

Where:

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

5. 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 falsehood membership degree is defined by[21, 22]:

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

(6)

Where

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

6. Let $A^* = (A_1^*, A_2^*, \dots, A_n^*)$ a vector SVNS such that $A_j^* = (a_1^*, b_2^*, c_2^*)$ $(j = 1,2, \dots, n)$ and $B_i = (B_{i1}, B_{i2}, \dots, B_{im})$ $(i = 1,2, \dots, m)$ are m vectors such that $B_{ij} = (a_{ij}, b_{ij}, \dots, c_{ij})$ $(i = 1,2, \dots, m)(j = 1,2, \dots, n)$, then the distance measure between B_i and A^* is as follows:

$$s_i = \left(\frac{1}{3}\sum_{j=1}^{n}\left\{\left(a_{ij} - a_j^*\right)^2 + \left(b_{ij} - b_j^*\right)^2 + \left(c_{ij} - c_j^*\right)^2\right\}\right)^{\frac{1}{2}}$$

(7)

This article will associate linguistic terms with SVNS, so that experts can carry out their evaluations in linguistic terms, which is more natural. Therefore, the scales shown in table 1 will be taken into account.

LINGUISTIC TERM	EVALUATION	SVNS
Very Important	(VI)	(0.9, 0.1, 0.1)
Important	(I)	(0.75,0.25,0.2)
Medium	(M)	(0.5,0.5,0.5)
Low-Important	(LI)	(0.35,0.75,0.8)
Not Very Important	(NVI)	(0.1,0.9,0.9)

Table 1. Linguistic terms and its SVNS

The TOPSIS method for SVNS assumes that, having a set of alternatives and a set of criteria, the following steps will be carried out [23, 24]:

Step 1: Determine the weight of the experts

The experts are evaluated according to the linguistic scale shown in table 2, and the calculations are made with their associated SVNS.

LINGUISTIC TERM	EVALUATION	SVN NUMBERS
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)
Medium High	MH	(0,60; 0,35; 0,40)
Medium	M	(0,50; 0,50; 0,50)
Medium Low	ML	(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 2. Linguistic terms used for expert's evaluation

Let us call $A_t = (a_t, b_t, c_t)$ the SVNS corresponding to the t-th decision maker (t = 1, 2,..., k). The weight is calculated by the following formula:

$$\lambda_t = \frac{a_t + b_t\left(\frac{a_t}{a_t + c_t}\right)}{\sum_{t=1}^{k} a_t + b_t\left(\frac{a_t}{a_t + c_t}\right)} \quad (8)$$

Where:

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

Step 2: Construction of the single valued neutrosophic aggregated decision matrix

This matrix is defined by $D = \sum_{t=1}^{k} \lambda_t d_{ij}$, where $d_{ij} = (u_{ij}, r_{ij}, v_{ij})$ is used to aggregate all individual assessments.

d_{ij} is calculated as the aggregation of the evaluations given by each expert $(u_{ij}{}^t, r_{ij}{}^t, v_{ij}{}^t)$, using the weights of each one with the help of Equation 5.

In this way a matrix D = $(d_{ij})_{ij}$, where each d_{ij} is a SVNS (i = 1,2,.., m; j = 1,2,…, n).

Step 3: Determination of the Weight of the Criteria ([7]).

Suppose that the weight of each criterion is given by $W = (w_1, w_2, \dots, w_n)$,where w_j it denotes the relative importance of the criterion β_j. If $w_j^t = a_j^t, b_j^t, c_j^t$it is the evaluation of the criterion $\beta_j$by the t-th expert. Then, Equation 5 is used, to add the with w_j^t the weights λ_t.

Step 4: Construction of the single valued neutrosophic decision matrix of the weighted mean with respect to the criteria.

$$D^* = D \otimes W, where\ d_{ij}^* = W_j \otimes d_{ij} = (a_{ij}, b_{ij}, c_{ij}) \quad (9)$$

Step 5: Calculation of the positive and negative SVNS ideal solutions

The criteria can be classified as either cost-type or benefit-type. Be G_1 the set of benefit-type criteria and G_2 the cost-type criteria. The ideal alternatives will be defined as follows[25]:

$$\rho^+ = \left(a_{\rho^+w}(\beta_j), b_{\rho^+w}(\beta_j), c_{\rho^+w}(\beta_j)\right) \quad (10)$$

Denotes the positive ideal solution, corresponding to G_1.

$$\rho^- = \left(a_{\rho^-w}(\beta_j), b_{\rho^-w}(\beta_j), c_{\rho^-w}(\beta_j)\right) \quad (11)$$

Denotes the negative ideal solution, corresponding to G_2.

Where

$$a_{\rho^+w}(\beta_j) = \begin{cases} max_i a_{\rho_i w}(\beta_j), & if \quad j \in G_1 \\ min_i a_{\rho_i w}(\beta_j), & if \quad j \in G_2 \end{cases}$$

$$b_{\rho^+w}(\beta_j) = \begin{cases} min_i b_{\rho_i w}(\beta_j), & if \quad j \in G_1 \\ max_i b_{\rho_i w}(\beta_j), & if \quad j \in G_2 \end{cases}$$

$$c_{\rho^+w}(\beta_j) = \begin{cases} min_i c_{\rho_i w}(\beta_j), & if \quad j \in G_1 \\ max_i c_{\rho_i w}(\beta_j), & if \quad j \in G_2 \end{cases}$$

And

$$a_{\rho^-w}(\beta_j) = \begin{cases} min_i a_{\rho_i w}(\beta_j), & if \quad j \in G_1 \\ max_i a_{\rho_i w}(\beta_j), & if \quad j \in G_2 \end{cases}$$

$$b_{\rho^-w}(\beta_j) = \begin{cases} max_i b_{\rho_i w}(\beta_j), & if \quad j \in G_1 \\ min_i b_{\rho_i w}(\beta_j), & if \quad j \in G_2 \end{cases}$$

$$c_{\rho^-w}(\beta_j) = \begin{cases} max_i c_{\rho_i w}(\beta_j), & if \quad j \in G_1 \\ min_i c_{\rho_i w}(\beta_j), & if \quad j \in G_2 \end{cases}$$

Step 6: Calculation of the distances to the ideal positive and negative SVNS solutions

With the help of Equation 7, the following equations are calculated[21]:

$$s_i^+ = \left(\frac{1}{3}\sum_{j=1}^{n}\left\{\left(a_{ij} - a_j^+\right)^2 + \left(b_{ij} - b_j^+\right)^2 + \left(c_{ij} - c_j^+\right)^2\right\}\right)^{\frac{1}{2}}$$

$$s_i^- = \left(\frac{1}{3}\sum_{j=1}^{n}\left\{\left(a_{ij} - a_j^-\right)^2 + \left(b_{ij} - b_j^-\right)^2 + \left(c_{ij} - c_j^-\right)^2\right\}\right)^{\frac{1}{2}}$$

Step 7: Calculation of the Proximity Coefficient (PC).
The PC of each alternative is calculated with respect to the positive and negative ideal solutions.

$\tilde{\rho}_j = \frac{s^-}{s^+ + s^-}$
Where
$0 \leq \tilde{\rho}_j \leq 1$

Step 8: Sorting the alternatives.

3 Results

A group of fifteen experts in the field of study were selected for the application of the Neutrosophic TOPSIS technique. They are free practice lawyers and public defenders from the Public Defender's Office in the Criminal Area of the Babahoyo canton, registered with the Los Ríos Bar Association. 40% of these are women. All of them have had vast experience and theoretical preparation in dealing with the crimes of feminicide and gender violence inside and outside the country. Their evaluations and corresponding weights (step 1) are shown in table 3.

EXPERT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EVALUATION	MH	MH	H	H	H	H	VH	VH	VH	VH	VVH	VVH	VVH	VVH	VVH
$\boldsymbol{\lambda_t}$	0,049	0,049	0,053	0,053	0,053	0,053	0,055	0,055	0,055	0,055	0,059	0,059	0,059	0,059	0,059

Table 3. Results of the experts' weight determination

The experts agreed that the strategies to be considered would be the following:

1. Classification of feminicide in the Integral Organic Criminal Code.
2. Training of public agents acting in the legal norms on violence against women.
3. More preventive criminal legislation for the protection of victims of domestic and gender violence.
4. Establishment of rules to ensure that the principle of the need for proof is considered in crimes of feminicide.

After a debate on the criteria to be analyzed, they decided that it would be appropriate to analyze the strategies to be followed according to two criteria:

1. Social impact on the reduction of feminicide crimes
2. Adequate legal treatment as a feminicide crime

The single valued neutrosophic aggregated decision matrix (step 2) was obtained from the results of the expert assessment of the strategies according to the two criteria, as shown in tables 4 and 5.

ESTRATEGY	**EXPERT**														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	VI	VI	I	VI	I	M	VI	I	M	VI	I	I	M	I	M
2	M	M	I	M	VI	M	M	VI	I	VI	M	I	M	VI	VI
3	M	I	I	M	VI	I	I	I	M	VI	I	I	VI	I	VI
4	VI	VI	I	VI	I	M	VI	I	M	VI	I	I	M	I	M

Table 4. Experts' assessment of strategies in terms of the criterion Social impact on the reduction of feminicide crimes

ESTRATEGY	**EXPERT**														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	VI	VI	M	M	VI	M	I	M	I	M	M	I	VI	I	VI
2	I	VI	VI	M	M	I	M	I	VI	I	VI	M	M	VI	VI
3	M	I	VI	VI	VI	M	I	M	I	I	I	VI	VI	VI	M
4	VI	VI	M	M	VI	M	I	M	I	M	M	I	VI	I	VI

Table 5. Expert assessment of strategies in terms of the criterion "Adequate legal treatment as a feminicide crime"

Taking into account the SVNS associated to the linguistic variables used, the aggregations of the experts' assessments for each strategy were made according to each criterion. Results are shown in table 6.

ESTRATEGY	CRITERION 1	CRITERION 2
1	(0,707 ; 0,293 ; 0,272)	(0,687 ; 0,313 ; 0,297)
2	(0,68 ; 0,32 ; 0,308)	(0,715 ; 0,285 ; 0,272)
3	(0,711 ; 0,289 ; 0,262)	(0,728 ; 0,272 ; 0,256)
4	(0,707 ; 0,293 ; 0,272)	(0,687 ; 0,313 ; 0,297)

Table 6. Single valued neutrosophic aggregated decision matrix

The weights that each experts assigned to each criterion (step 3) are shown in table 7.

CRITERION	EXPERT														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1.-Social impact on the reduction of feminicide crimes	MI	M	I	M	MI	MI	MI	I	M	I	I	I	MI	MI	MI
2.-Adequate legal treatment as a feminicide crime	I	M	M	M	M	MI	MI	MI	MI	MI	M	M	MI	I	M

Table 7. Evaluation of the weight of each criterion according to the experts

With these ratings, the weight of the criteria expressed in SVNS was calculated (table 8).

CRITERION	WEIGHT (SVNS)
1.-Social impact for the reduction of feminicide crimes	(0,739 ; 0,261 ; 0,242)
2.-Adequate legal treatment as a feminicide crime	(0,693 ; 0,307 ; 0,3)

Table 8. Weights of criteria

Then, the single valued neutrosophic decision matrix of the weighted mean with respect to the criteria (step 4) is shown in table 9.

ESTRATEGY	CRITERION 1	CRITERION 2
1	(0,522 ; 0,478 ; 0,448)	(0,476 ; 0,524 ; 0,508)
2	(0,503 ; 0,497 ; 0,476)	(0,496 ; 0,504 ; 0,49)
3	(0,526 ; 0,474 ; 0,44)	(0,505 ; 0,495 ; 0,479)
4	(0,522 ; 0,478 ; 0,448)	(0,476 ; 0,524 ; 0,508)

Table 9. Weighted aggregate decision matrix.

The ideal positive and negative SVNS solutions calculated in step 5 are shown in table 10.

CRITERION	POSITIVE IDEAL VALUE	NEGATIVE IDEAL VALUE
1	(0,526 ; 0,474 ; 0,44)	(0,503 ; 0,497 ; 0,476)
2	(0,505 ; 0,495 ; 0,479)	(0,476 ; 0,524 ; 0,508)

Table 10. SVNS positive and negative ideal solutions by criteria.

The distances to the positive and negative SVNS ideal solutions (step 6), as well as the Proximity Coefficient (PC) and the resulting order of the alternatives (steps 7 and 8), are shown in table 11.

ALTERNATIVES	d+	d-	PC	ORDER
1	0,028848946	0,01934405	0,59861284	3
2	0,029253255	0,018873979	0,60783163	4
3	0	0,039605326	0	1
4	0,028848946	0,022455394	0,56231005	2

Table 11. Distances to ideal solutions, proximity coefficient and order of alternatives

This result shows that the most important strategy in order to decrease the number of feminicides in the country and that these cases have the appropriate legal treatment, is to establish a more preventive criminal legislation for the protection of victims of domestic and gender violence. Secondly, a rule must be established to ensure that the principle of the need for proof is observed in crimes of feminicide.

Conclusions

The criminal legislation in Ecuador, and in several countries, has been insufficient to reduce violence against women, and it is even perceived that the levels of violence continue to increase. Given this reality, the majority of Ecuadorian women live in concern, particularly in the city of Babahoyo.

National and international studies by different authors, which have addressed the issue of violence against women, are largely oriented only towards the crime of feminicide, without proposing legal reforms to reduce it.

With the application of the neutrosophic TOPSIS technique, four alternatives were evaluated to achieve the reduction of feminicide in Ecuador, as well as a more adequate legal treatment in these cases, based on the criteria of fifteen experts on the subject. This technique, based on Neutrosophy, made it possible to capture the specialists' evaluation criteria in a more accurate way.

As a result, we found that the best alternative, or the most important strategy, is to establish a more preventive criminal legislation for the protection of victims of domestic and gender violence and to punish those who, knowing the state of vulnerability of a woman, of the violence under which she lives, do not inform the competent authorities.

References

1. Araujo Escobar, E., Soxo Andachi, J. & Sailema Armijos, J. (2020) Estudio basado en modelos matemáticos sobre la formación de las competencias humanísticas de estudiantes de derecho en UNIANDES, Ecuador. Investigación Operacional, 41(5), 612-621.
2. Liu, P., Liu, J. & Merigó, J. M. (2018) Partitioned Heronian means based on linguistic intuitionistic fuzzy numbers for dealing with multi-attribute group decision making, Applied Soft Computing, 62, 395-422.
3. Liu, P. & Shi, L. (2017) Some neutrosophic uncertain linguistic number Heronian mean operators and their application to multi-attribute group decision making, Neural Computing and Applications, 28, 1079-1093.
4. Liu, P. & Tang, G. (2016) Multi-criteria group decision-making based on interval neutrosophic uncertain linguistic variables and Choquet integral, Cognitive Computation, 8, 1036-1056.
5. Liu, P. & Teng, F. (2018) Multiple attribute decision making method based on normal neutrosophic generalized weighted power averaging operator, International Journal of Machine Learning and Cybernetics, 9, 281-293.
6. Ortega, E., & Valladares, L. (2007). Feminicidio o el riesgo mortal de ser mujer, estudio exploratorio. Quito: MDMQ.
7. Quintana, Y., Rosero, J., Serrano, J., & Pimentel, J. (2014). La Violencia de Género contra las mujeres en el Ecuador: análisis de los resultados de la encuesta Nacional sobre relaciones familiares y violencia de género contras las mujeres. Quito - Ecuador: AECID.
8. Russell, D. E. (2006). Feminicidio: una perspectiva global. México.
9. Şahin, R. & Yiğider, M. (2014) A Multi-criteria neutrosophic group decision making metod based TOPSIS for supplier selection. https://arxiv.org/abs/1412.5077 [Accessed 22/05/20].
10. Trujillo, L. (2011). El femicidio. Género, Diversidad, Violencia Intrafamiliar. Casos prácticos. Quito - Ecuador: Editorial Jurídica del Ecuador.
11. Russell, D., *Defining femicide, Introductory speech presented to the United Nations Symposium on Femicide on 11/26/2012*. 2019.
12. Chenou, J.-M. and C. Cepeda-Másmela, *# NiUnaMenos: Data Activism From the Global South.* Television & New Media, 2019. **20**(4): p. 396-411.
13. Camacho, G., *La violencia de género contra las mujeres en el Ecuador: Análisis de los resultados de la Encuesta Nacional sobre Relaciones Familiares y Violencia de Género contra las Mujeres*. 2014.
14. Ricardo, J.E., V.M.V. Rosado, J.P. Fernández, and S.M. Martínez, *Importancia de la investigación jurídica para la formación de los profesionales del Derecho en Ecuador*. Dilemas contemporáneos: Educación, Política y Valores, 2020.
15. Vera, D.C., A.V.T. Suntaxi, G.C.I. Alcívar, J.E. Ricardo, and M.D.O. Rodríguez, *Políticas de inclusión social y el sistema de ingreso a las instituciones de educación superior del ecuador*. Dilemas Contemporáneos: Educación, Política y Valores, 2018. **6**(1).
16. INEC. *Encuesta Nacional sobre Relaciones. Familiares y. Violencia de. Género contra las. Mujeres - ENVIGMU*. 2019 [cited 2020 July 20]; Available from: https://www.ecuadorencifras.gob.ec/documentos/web-

inec/Estadisticas_Sociales/Violencia_de_genero_2019/Principales%20resultados%20ENVIGMU%202019.pdf.

17. Oficial, R., *Código Orgánico Integral Penal*. 2014.
18. Martinez, M.A.Q., D.T.L. Rugel, C.J.E. Alcivar, and M.Y.L. Vazquez. *A Framework for Selecting Classification Models in the Intruder Detection System Using TOPSIS*. in *International Conference on Human Interaction and Emerging Technologies*. 2020. Springer.
19. Ortega, R.G., M.L. Vazquez, J.A. Sganderla Figueiredo, and A. Guijarro-Rodriguez, *Sinos river basin social-environmental prospective assessment of water quality management using fuzzy cognitive maps and neutrosophic AHP-TOPSIS.* Neutrosophic Sets and Systems, 2018. **23**(1): p. 13.
20. Vazquezl, M.Y.L., L.A.B. Peñafiel, S.X.S. Muñoz, and M.A.Q. Martinez. *A Framework for Selecting Machine Learning Models Using TOPSIS*. in *International Conference on Applied Human Factors and Ergonomics*. 2020. Springer.
21. Ricardo, J.E., R.M. Peña, G.R. Zumba, and I.I.O. Fernández, *La Pedagogía como Instrumento de Gestión Social: Nuevos Caminos para la Aplicación de la Neutrosofía a la Pedagogía*. 2018: Infinite Study.
22. Smarandache, F., *A unifying field in logics: Neutrosophic logic. neutrosophy, neutrosophic set, neutrosophic probability: Neutrosophic logic: neutrosophy, neutrosophic set, neutrosophic probability*. 2003: Infinite Study.
23. Becerra Arévalo, N.P., M.F. Calles Carrasco, J.L. Toasa Espinoza, and M.V. Córdova, *Neutrosophic AHP for the prioritization of requirements for a computerized facial recognition system.* Neutrosophic Sets & Systems, 2020. **34**.
24. Cadena, M.A.T., E.M.P. Medina, M.J. Burgos, and F.J. Vaca, *Neutrosophic AHP in the analysis of Business Plan for the company Rioandes bus tours*. Neutrosophic Sets and Systems, 2020. **34**: p. 16.
25. Alias, S., D. Mohamad, and A. Shuib, *Rough neutrosophic multisets relation with application in marketing strategy*. Neutrosophic Sets Syst, 2018. **21**: p. 36-55.
26. Saleh Al-Subhi, S.H., I.P. Pupo, R.G. Vacacela, and P.Y. Pinero Perez, *A New Neutrosophic Cognitive Map with Neutrosophic Sets on Connections: Application in Project Management.* Neutrosophic Sets and Systems, 2018. **22**(1): p. 6.
27. Smarandache, F., M.A. Quiroz-Martínez, J.E. Ricardo, and N. Batista, *APPLICATION OF NEUTROSOPHIC OFFSETS FOR DIGITAL IMAGE PROCESSING.* Investigacion Operacional, 2020. **41**: p. 603-610.
28. 18. Altinirmak, S., Y. Gul, B.O. Okoth, and C. Karamasa, *Performance evaluation of mutual funds via single valued neutrosophic set (svns) perspective: a case study in turkey*. Neutrosophic Sets and Systems, 2018. **23**(1): p. 10.
29. Mondal, K., S. Pramanik, and B.C. Giri, *Hybrid binary logarithm similarity measure for MAGDM problems under SVNS assessments.* Neutrosophic Sets and Systems, 2018. **20**(1): p. 12-25.
30. Fernández Rodríguez, K.L., G.A. Peña, M.T. Ortiz Luzuriaga, Y. Ramos López, G.E. Cevallos Uve, E.E. Obaco Soto, and C.F. Rey Suquilanda, *Neutrosophic model to measure the impact of management projects on the process of pedagogical-research training.* Neutrosophic Sets & Systems, 2019. **26**.
31. Peng, X. and J. Dai, *Approaches to single-valued neutrosophic MADM based on MABAC, TOPSIS and new similarity measure with score function.* Neural Computing and Applications, 2018. **29**(10): p. 939-954.
32. Şahin, R., *Multi-criteria neutrosophic decision making method based on score and accuracy functions under neutrosophic environment.* arXiv preprint arXiv:1412.5202, 2014.
33. Biswas, P., S. Pramanik, and B.C. Giri, *TOPSIS method for multi-attribute group decision-making under single-valued neutrosophic environment.* Neural computing and Applications, 2016. **27**(3): p. 727-737.
34. Zaied, A.N.H., A. Gamal, and M. Ismail, *An Integrated Neutrosophic and TOPSIS for Evaluating Airline Service Quality*. Neutrosophic Sets and Systems, 2019. **29**(1): p. 3.
35. Amat Abreu, M. and D. Cruz Velázquez, *Neutrosophic model based on the ideal distance to measure the strengthening of values in the students of Puyo university*. Neutrosophic Sets & Systems, 2019. **26**.

Received: April 18, 2020. Accepted: August 20, 2020