Neutrosophic Social Structures and Neutrosophic 2-tuples Technique for Studying Labor Insertion and Gender Inequality

Michael R. Vásquez-Ramírez[*1], Ketty M. Moscoso-Paucarchuco [2], Percy T. Avila-Zanabria[3], Omar A. Vivanco-Nuñez[4], Paul C. Calderon-Fernandez[5]

[1] Universidad Peruana los Andes, Perú
[2] Universidad Nacional Autónoma Altoandina de Tarma, Perú
[3] Universidad Peruana los Andes, Perú
[4] Universidad Peruana los Andes, Perú
[5] Universidad Peruana los Andes, Perú
Emails: d.mvasquezr@ms.upla.edu.pe[*]; kmoscoso@unaat.edu.pe; d.pavila@ms.upla.edu.pe; d.ovivanco@ms.upla.edu.pe; d.pcalderon@ms.upla.edu.pe

Abstract

This study explores the dynamics of job placement and gender inequality at the Universidad Peruana Los Andes in Huancayo, Peru, with a focus on the application of neutrosophic methods. Recognizing the nuanced differences in professional opportunities for men and women, we employ the Smarandachean theory of neutrosophic social structures to examine these disparities. During 2021-2022, we conducted surveys among university graduates, utilizing the 2-tuple linguistic neutrosophic model to measure their satisfaction levels. This approach, grounded in neutrosophy, allows for a more precise capture of the participants' thoughts and feelings by effectively incorporating the inherent indeterminacies of social phenomena. The use of these neutrosophic tools provides a deeper understanding of the complex interplay between job placement and gender in professional settings.

Keywords: Neutrosophic social structure; 2-tuple linguistic neutrosophic model; NeutroSociology; Job insertion; Gender inequality.

1. Introduction

Job insertion is understood as the ability to access or develop professionally in the workplace. So getting a job will be related to the structural and occasional situation of the labor market at a given time. Then, job insertion can be defined as an action that involves obtaining a job position according to the specialization of each person and to the current situation.

Gender inequality in the workplace is related to inequality in the labor market between men and women. This disparity is expressed in a reduced percentage of female employability in industrial and commercial jobs. Taking this into account, gender inequality is defined as the gap in participation between men and women in the labor market. This inequality is reflected in the greater hiring of men than women in industrial jobs.

Beyond the Peruvian borders, gender inequalities in the labor market in Latin America and the Caribbean are notorious. Current trends indicate that women have a lower participation rate in the labor market compared to men. According to data provided by Economic Commission for Latin American and the Caribbean (ECLAC), in recent years the labor participation of women has meant a low labor insertion. In 2012 the average unemployment rate was 7.9% and in the case of men, it was only 5.4%. In 2017, the rates had increased to 10.4% and 7.6%, respectively, so currently the gap between both genders remains around 2 percentage points.

DOI: https://doi.org/10.54216/IJNS.240220
Received: October 27, 2023 Revised: February 05, 2024 Accepted: April 22, 2024

Given the gender inequality that persists in the workplace, to combat gender segregation in the labor market, women must attend courses traditionally reserved for men so that they can improve their situation in the labor market, and fill positions that are currently held only by men. In this sense, various measures have already been carried out to integrate them into masculinized training cycles, mainly related to the industrial sector, as there are usually no female references in this field.

So, gender should not impede being able to perform any type of job. Both men and women have skills that can be very useful in different sectors. Strengthening these skills by incorporating studies, training and evaluations can be a plus so that people can easily integrate into the labor market.

This is a situation that is part of the social dynamics of millennia and can only be changed gradually. To model this phenomenon as reliably as possible, it is necessary to have a mathematical tool that takes into account all aspects of the performance of a society. Within social dynamics, there are no dichotomous patterns of kind of Yes or No, or Black and White. There are areas of uncertainty and indeterminacy that do not allow a narrow look at this subject [1].

For this reason, F. Smarandache developed some ideas for applying Neutrosophy in the social sphere. Among them is NeutroSociology [2, 3, 4]. Another approach to these problems led to the definition of neutrosophic social structures [5, 6, 7]. Neutrosociology is dedicated to the study of sociology with a Neutrosophic view. Sociology is dedicated to the study of social phenomena and Neutrosophy is the branch of philosophy that is related to the neutral, indeterminate, unknown, incoherent, inconsistent, etc. [8, 9]. The union of both knowledge results in a theory where social phenomena are studied incorporating the neutral, indeterminate, unknown, incoherent, inconsistent, etc., as part of Neutrosophy.

On the other hand, a (t, i, f)-Neutrosophic Structure models any structure (e.g., geometric or algebraic structure) with a certain degree of truthfulness, indeterminacy and falsity. That is $(t, i, f) \neq (1,0,0)$, for a set of elements on which certain operations are defined between them and that satisfy certain axioms. However, in classical structures it is $(t, i, f) = (1,0,0)$. This is not true in social structures [10].

The main purpose of this paper is to measure gender inequality at the Universidad Peruana los Andes from 2021 to 2022. For this end, each studied individual was considered with its particularities, since not all of them belong entirely to the university. Moreover, there is more gender inequality in some careers than in others because of its characteristics.

To reach the desired results we use a linguistic measurement scale. This is a phenomenon with a high degree of subjectivity, therefore a linguistic scale is conducive to more reliably expressing what the respondents think and feel. Specifically, we apply a classical statistical method to the results obtained from a 2-tuple neutrosophic model [11]. This is a Computing with Words model where not only the satisfaction of the respondent is taken into account, but also their dissatisfaction and indeterminacy - due to ignorance, indifference, etc. - regarding what is being asked. In this way, more accurate results are obtained, although with greater indeterminacy.

The present work is divided into section 2 which contains the basic notions of neutrosophic social structures and neutrosophic 2-tuple technique. Section 3 is where the details and results of the proposed study are written. Section 4 is dedicated to conclusions.

2. Related Work

A. Some notions on (t,i,f)-structures

A (t,i,f)-structure is composed of one space S endowed with a set of axioms (or laws) acting (governing) on it, such that the space or at least one of its axioms has an indeterminacy. *t* represents the degree of truthfulness, *i* represents the degree of indeterminacy and *f* represents the degree of falseness [6, 10].

Originally, this theory was designed for applications in mathematical branches such as Algebra, Geometry, etc. However, later Smarandache recognized its applicability in other sciences like

DOI: https://doi.org/10.54216/IJNS.240220
Received: October 27, 2023 Revised: February 05, 2024 Accepted: April 22, 2024

sociology. Thus, he said that the different points of view of all the individuals in society have as a consequence complex relationships in society, which causes indeterminacy [12].

Specifically, we are dealing with (t,i,f)-structures. They are defined to represent sociological concepts where there is some degree of indeterminacy or falsity due to the following reasons:

1. Numerical Indeterminacy (or Degree of Indeterminacy), which has the form $(t, i, f) \neq (1,0,0)$, where t, i, f are numbers, intervals or subsets included in the unit interval $[0, 1]$; and it is the basis for the (t,i,f)-Neutrosophic Social Structures.

2. Indeterminate Space due to an unknown element. E.g., the set $\mathrm{NS} = \{2, 3, 5, 7, 14, \mathrm{u}\}$ where u is an unknown element and so the entire set is indeterminate. Thus, neutrosophically we represent every element as $2(1,0,0)$, $3(1,0,0)$, and so on, but $\mathrm{u}(0,1,0)$.

3. Indeterminate Space due to partially known element. E.g., $M = \{e_1(1,0,0), e_2(1,0,0), e_3(0.8,0.1,0.1), e_4(0.2,0.3,0.6)\}$, where e_1 and e_2 fully belong to set M, whereas e_3 has 80% of appurtenance, 10% of indeterminacy and 10% of no appurtenance. On the other hand, e_4 has the proportion 20%, 30% and 60%, respectively.

B. 2-tuple linguistic neutrosophic model

The 2-tuple linguistic representation model allows computation processes with words without loss of information, based on the concept of symbolic translation.

Let $\mathrm{S} = \{\mathrm{s}_0, \mathrm{s}_1, \dots, \mathrm{s}_\mathrm{g}\}$ be a set of linguistic terms and $\beta \epsilon [0, \mathrm{g}]$ is a value in the granularity interval of S.

Definition 1 ([13, 14, 15])**:** The *Symbolic Translation* of a linguistic term s_i is a numerical value in the interval [-0.5, 0.5) which expresses the difference of information between a quantity of information expressed by the value $\beta \in [0, \mathrm{g}]$, obtained in a symbolic operation and the nearest integer value $\mathrm{i} \in \{0, \dots, \mathrm{g}\}$, which indicates the index of the nearest linguistic label (s_i) in S.

Based on this concept, a model for the representation of linguistic information was developed, which makes use of a pair of values or 2-tuples. This representation model defines a set of functions that facilitate operations on 2-tuples.

Definition 2 ([13, 14, 15]): Let $\mathrm{S} = \{\mathrm{s}_0, \mathrm{s}_1, \dots, \mathrm{s}_\mathrm{g}\}$ be a set of linguistic terms and $\beta \epsilon [0, \mathrm{g}]$ is a value that represents the result of a symbolic operation. Then the linguistic 2-tuple that expresses the information equivalent to β, is obtained using the following function:

$$\Delta: [0, \mathrm{g}] \to \mathrm{S} \times [-0.5, 0.5)$$

$$\Delta(\beta) = (\mathrm{s}_\mathrm{i}, \alpha) \quad (1)$$

Where s_i is such that $\mathrm{i} = \mathrm{round}(\beta)$ and $\alpha = \beta - \mathrm{i}, \alpha \in [-0.5, 0.5)$and "*round*" is the usual rounding operator, s_i is the index label closest to β and α is the value of the symbolic translation.

It should be noted that $\Delta^{-1}: \langle \mathrm{S} \rangle \to [0, \mathrm{g}]$ is defined as $\Delta^{-1}(\mathrm{s}_\mathrm{i}, \alpha) = \mathrm{i} + \alpha$. Thus, a linguistic 2-tuple $\langle \mathrm{S} \rangle$ is identified with its numerical value in $[0, \mathrm{g}]$.

A *2-Tuple Linguistic Neutrosophic Number* (2TLNN) is proposed to solve problems based on Single-Valued Neutrosophic Sets and *2-tuples linguistic sets* (2TLSs) [13, 14, 15].

A 2TLNN is defined as follows [13, 14, 15]:

Suppose that $S = \{s_0, \dots, s_g\}$ is a 2TLSs with odd cardinality t+1. It is defined for $(s_T, a), (s_I, b), (s_F, c) \in L$ and a, b, c $\in [0, t]$, where $(s_T, a), (s_I, b), (s_F, c) \in$ Lindependently express the degree of truthfulness, indeterminacy and falsehood by 2TLSs. Then 2TLNN is defined as follows:

$$\mathrm{l}_\mathrm{j} = \left\{(\mathrm{s}_{\mathrm{T}_\mathrm{j}}, \mathrm{a}), (\mathrm{s}_{\mathrm{I}_\mathrm{j}}, \mathrm{b}), (\mathrm{s}_{\mathrm{F}_\mathrm{j}}, \mathrm{c})\right\} \quad (2)$$

DOI: https://doi.org/10.54216/IJNS.240220
Received: October 27, 2023 Revised: February 05, 2024 Accepted: April 22, 2024

Where $0 \leq \Delta^{-1}(s_{T_j}, a) \leq t$, $0 \leq \Delta^{-1}(s_{I_j}, b) \leq t$, $0 \leq \Delta^{-1}(s_{F_j}, c) \leq t$ and $0 \leq \Delta^{-1}\left(s_{T_j}, a\right) + \Delta^{-1}\left(s_{I_j}, b\right) + \Delta^{-1}(s_{F_j}, c) \leq 3t$.

The scoring and accuracy functions allow us to rank 2TLNN [13, 14, 15].

Let $l_1 = \{(s_{T_1}, a), (s_{I_1}, b), (s_{F_1}, c)\}$be a 2TLNN in L, the scoring and accuracy functions in l_1 are defined as follows, respectively:

$$S(l_1)=\Delta\left\{\frac{2t+\Delta^{-1}\left(s_{T_1},a\right)-\Delta^{-1}\left(s_{I_1},b\right)-\Delta^{-1}(s_{F_1},c)}{3}\right\}, \Delta^{-1}(S(l_1)) \in [0,t] \quad (3)$$

$$H(l_1)=\Delta\left\{\frac{t+\Delta^{-1}\left(s_{T_1},a\right)-\Delta^{-1}(s_{F_1},c)}{2}\right\}, \Delta^{-1}(H(l_1)) \in [0,t] \quad (4)$$

Definition 3. Given a 2TLNN, $l_j = \langle\left(s_{T_j}, a_j\right), \left(s_{I_j}, b_j\right), \left(s_{F_j}, c_j\right)\rangle$ (j = 1, 2,…, n) with vector of weights $w_i = (w_1, w_2, \dots, w_n)^T$, which satisfies the conditions $w_i \in [0,1]$ and $\sum_{i=1}^{n} w_i = 1$. Then the following two aggregation operators are defined, which are called the *Weighted Arithmetic Mean of 2-tuples linguistic neutrosophic numbers* and the *Weighted Geometric Mean of 2-tuples linguistic neutrosophic numbers*, respectively [13, 14, 15]:

$$WAM(l_1, l_2, \dots, l_n) = \sum_{j=1}^{n} w_j l_j \quad (5)$$

$$MGM(l_1, l_2, \dots, l_n) = \prod_{j=1}^{n} l_j^{w_j} \quad (6)$$

3. The proposed study

For the study carried out in this paper, the entire population was included, which is made up of all the graduates of the Universidad Peruana los Andes from 2021 to 2022. This consists of 4,691 graduates from the different faculties that belong to this university. .

The details of the survey that is applied to graduated students are shown in Tables 1 and 2.

Table 1: Survey proposed for the study of Labor Insertion at the Universidad Peruana los Andes

ITEM
1. The graduate finds employment to develop professionally. 2. The graduate looks for new job opportunities to develop professionally. 3. The graduate has the self-efficacy to search for employment.
4. The graduate improves their professional skills to respond to job needs. 5. The graduate is professionally qualified to respond to job needs. 6 The graduate enhances their professional skills at a high level to respond to job needs.
7. The graduate develops skills for effective performance in the professional field. 8. The graduate has skills to be transferred to the world of work. 9. The graduate enhances new skills for effective performance in the professional field.
10. The graduate acquires the technical knowledge necessary for job placement. 11. The graduate acquires the humanistic knowledge necessary for job placement. 12. The graduate accesses programs to update their knowledge on job placement issues.
13. The graduate develops skills to respond to job demands. 14. The graduate masters job search skills to strengthen job opportunities.

DOI: https://doi.org/10.54216/IJNS.240220
Received: October 27, 2023 Revised: February 05, 2024 Accepted: April 22, 2024

15. The graduate empowers his (her) transversal skills to respond to job demands.
16. The graduate has a job profile for easy access to the labor market. 17. The graduate adapts his (her) resume to respond to the characteristics of the job offers. 18. The graduate highlights his (her) professional qualities to attract companies.

Table 2: Survey proposed for the study of Social Inequality at the Universidad Peruana los Andes

ITEM
19. The graduate has equal employment opportunities for their professional development. 20. The graduate claims his (her) rights without distinction of gender to access a job opportunity. 21. The graduate must promote gender equality to access a job position.
22. The graduate experiences egalitarian labor policies for their professional development. 23. The graduate guides the promotion of labor policies to overcome the observed inequalities. 24. The graduate seeks equal employment opportunities for professional growth.
25. The graduate does not experience gender differences in the impact on salary compensation. 26. The graduate receives equal income to minimize the gender pay gap. 27. The graduate promotes equality in salary remuneration without gender reasons.
28. The graduate does not perceive salary differences to affect labor participation. 29. The graduate seeks positions with a fair salary for active participation in the labor market. 30. The graduate demands equal salary offers for his (her) subsequent professional participation.
31. The graduate does not experience gender stereotypes for job targeting. 32. The graduate makes his (her) gender prevail for job targeting. 33. The graduate must not break gender stereotypes for their career focus.
34. The graduate does not experience significant barriers to accessing good working conditions. 35. The graduate does not face a gender difference in access to a job. 36. The graduate seeks job positions without gender distinction for their full training.

The reliability of the survey was evaluated with Cronbach's alpha coefficient, which was at least 0.936 for both surveys, which is why the reliability is evaluated as very high [16].

Each of the respondents does not have the same degree of access and commitment to the university. Some of them participate fully in face-to-face courses, others partially in semi-in-person courses, while a third group studies remotely. That is why the degree of training of the graduate is taken into account according to their membership in each of these three modalities. Therefore, the following neutrosophic valuations are associated with them:

DOI: https://doi.org/10.54216/IJNS.240220
Received: October 27, 2023 Revised: February 05, 2024 Accepted: April 22, 2024

1. (1,0,0) when the graduate studied all his (her) years of studies at the Universidad Peruana los Andes.

2. (0.8,0.1,0.1) when the graduate completed all his (her) years of studies at the Universidad Peruana los Andes in a semi-in-person manner. When the graduate spent most of his (her) career years at the Universidad Peruana de los Andes in face-to-face courses and the rest at another university.

3. (0.6,0.1,0.3) when the graduate completed all his (her) years of studies at the Universidad Peruana los Andes with the "Distance" modality. When the graduate spent most of his (her) career years at the Universidad Peruana de los Andes semi-in-person and the rest at another university.

4. (0.4,0.1,0.5) when the graduate spent most of his (her) years of studies outside the Universidad Peruana los Andes.
Each of these values is converted to numerical weight values using Equation 7:

$$\mathfrak{s}(w) = \frac{2+t-i-f}{3} \qquad (7)$$

Where $w = (t, i, f)$.

These weights indicate the belonging of each student to the group of graduates of the Universidad Peruana los Andes.

Specifically, the set will be counted, $\mathrm{G} = \{\mathrm{g}_1, \mathrm{g}_2, \cdots, \mathrm{g}_{4691}\}$ each of which will weigh the survey equal to w_i for $i = 1,2,\cdots,4691$. These weights are normalized using formula 8.

$$\overline{w}_i = \frac{w_i}{\sum_{i=1}^{4691} w_i} \qquad (8)$$

The second scale is $S = \{s_0, \ldots, s_4\}$ such that its components mean:

(i) Never (s_0),

(ii) Hardly ever (s_1),

(iii) Sometimes (s_2),

(iv) Almost always (s_3),

(v) Always (s_4).

Each of the respondents is asked to give their opinion on a triad of linguistic values on the scale S. The first value denotes the degree of agreement with the item, the second one the degree of indeterminacy and the third one denotes the degree of disagreement.

For example, $(\mathrm{s}_3, \mathrm{s}_2, \mathrm{s}_0)$ means that the respondent agrees that the item is "Almost Always" true, he (she) is not sure if it is "Sometimes" true, and he (she) is sure that it is "Never" false.

Finally, the procedure to follow is summarized in Table 3:

Table 3: Procedure followed to process the survey data

PROCESSING PROCEDURE OF DATA OBTAINED FROM THE SURVEY
Input: Each respondent has an associated weight $\overline{w}_i$ $(i = 1,2,\cdots,4691)$ of belonging to the university, according to their years spent at this university and its modality. Each respondent gives an opinion for each item in a triple of values according to the scale S. That is, for each respondent there is a pair $\overline{w}_i$ and $\mathrm{l}_{\mathrm{ik}} = \langle(\mathrm{s}_{\mathrm{T_j}}, \mathrm{a_j}), (\mathrm{s}_{\mathrm{I_j}}, \mathrm{b_j}), (\mathrm{s}_{\mathrm{F_j}}, \mathrm{c_j})\rangle$. Where $\mathrm{k} = 1,2,\cdots,36$. The values $\mathrm{k} = 1,2,\cdots,18$ are the job insertion items and the others are the gender parity items.

DOI: https://doi.org/10.54216/IJNS.240220
Received: October 27, 2023 Revised: February 05, 2024 Accepted: April 22, 2024

1. For each item, Equation 5 is applied with each weight and each evaluation. Let us denote it by: $A_k = \langle (s_{T_j}, a_j), (s_{I_j}, b_j), (s_{F_j}, c_j) \rangle$.

2. To evaluate job placement, formula 5 is used with weights equal to $\omega_r = \frac{1}{18}$ and A_k for $k = 1,2,\cdots,18$. Let us call it *L*, which is the collective opinion on this variable.

3. To evaluate gender parity, formula 5 is used with weights equal to $\omega_r = \frac{1}{18}$ and A_k for $k = 18,19,\cdots,36$. Let us call it *P*, which is the collective opinion about this variable.

4. Furthermore, for each respondent it is calculated from $l_{ki} = \langle (s_{T_j}, a_j), (s_{I_j}, b_j), (s_{F_j}, c_j) \rangle$, the weights are $\omega_r = \frac{1}{18}$ for $k = 1,2,\cdots,18$. Let us call it l_{Li}.

With the weights $\omega_r = \frac{1}{18}$ for $k = 18,19,\cdots,36$, Equation 5 also applies. Let us call it l_{Pi}.

In this way, for each respondent, there is also a pair (l_{Li} and l_{Pi}).

5. For each pair (l_{Li}, l_{Pi}) there is a numerical pair calculated by Equation 9:

$$N = n_T - (4 - n_I) - n_F \qquad (9)$$

E.g., if the elements of the ith respondent are for one variable ("Job Insertion" or "Gender Parity"), it is the triad: $l_{Li} = \langle s_4, s_3, s_0 \rangle$ then the value associated with this respondent for that variable is 4-(4-3)-0=3. In this way, for each respondent, there is a pair of numerical values, where one element corresponds to "Job Insertion" and the other corresponds to "Gender Parity".

These pairs can be processed statistically with classical methods to measure correlation, e.g., Spearman's Rho coefficient.

The results obtained in the study following the procedure indicated in Table 3 were the following:

The variable of Labor Insertion in the graduates at this university resulted in the triple, $\langle (s_3, 0.1634), (s_4, -0.1658), (s_0, 0.0008) \rangle$. This is interpreted as: "almost always" the labor insertion of graduates is positive, "never" is negative and tends to be positive "always".

Gender Parity variable in the graduates at this university resulted in the triple $\langle (s_3, -0.3226), (s_2, 0.2468), (s_0, 0.0008) \rangle$ that is interpreted as "sometimes" gender parity for graduates behaves positively, "never" is negative and "almost always" it tends to be positive.

Let us now see the behavior of the correlation between both variables using Spearman's Rho coefficient that it is $r_s = 0.538$ [17]. This is interpreted as there is a medium positive correlation between both variables.

4 . Conclusion

The study of labor insertion and gender parity is of great importance for the social development of any modern society that desires economic prosperity and the well-being of its citizens. This paper showed the study developed by the authors on the behavior of job placement and gender parity in graduates of the careers studied at the Universidad Peruana los Andes in the province of Huancayo. The study was carried out through a survey of 36 items applied to all graduates of this university between the years 2021-2022. It was determined that although job placement is almost always satisfactory, the same result does not occur with gender parity, which is satisfactory only sometimes. To capture the thinking of the respondents as reliably as possible, we used a 2-tuple linguistic neutrosophic model. In this way, we take advantage of having linguistic scales that are the most appropriate to capture the opinion of human beings, who evaluate daily with the help of language

DOI: https://doi.org/10.54216/IJNS.240220
Received: October 27, 2023 Revised: February 05, 2024 Accepted: April 22, 2024

rather than with numerical scales. The use of neutrosophy made it possible to include the indeterminacy and doubts inherent to all decision-making. Additionally, an evaluation of the students on a neutrosophic scale according to the Smarandachean theory of neutrosophic social structure was taken into account. In this way, the evaluation of each student is taken into account according to their degree of commitment and training concerning this university. In future works, we propose to study the phenomenon with other tools that allow us a different vision of the situation. Furthermore, we propose to repeat the result several times in the remaining years to determine if there has been any evolution in these aspects.

Funding: This research received no external funding

Conflicts of Interest: The authors declare no conflict of interest.

References

[1] Smarandache, F. Neutrosophic social structures specificities. SSERR, 2(1), 3-10, 2015.
[2] Smarandache, F. (2019). Introduction to Neutrosophic Sociology (Neutrosociology). Craiova: Infinite Study.
[3] Arias, N.G., Arnaiz, N.Q., Villamarín, S.G., & Cleonares, M. Neutrosociology for the Analysis of the Pros and Cons of the LIFE Series in UNIANDES, Ecuador. NSS, 34, 177-182, 2020.
[4] Tapia, M. E. Á., Cabrita, M. M., Flores, D. F. C., & Tapia, C. G. R. Neutrosociology for Analyzing Public Procurement in Ecuador around the Health Emergency. NSS, 44, 333-341, 2021.
[5] Smarandache, F., Gifu, D., & Teodorescu, M. Neutrosophic elements in discourse. SSERR, 2(1), 25-32, 2015.
[6] Gutiérrez-Gómez, E., Moscoso-Paucarchuco, K.M., Beraún-Espíritu, M.M., Moreno-Menéndez, F.M., Fernández-Jaime, R.J., Paco-Huamani, W.F., Vásquez-Ramírez, M.R., & Sandoval-Trigos, J.C. Study of the Pampay Mass (burial of offering) at the summit of the Andean snow-capped mountain as an example of (t, i, f)-Neutrosophic social structure, NSS, 60, 21-28, 2023.
[7] Martínez, C. R., Hidalgo, G. A., Matos, M. A., & Smarandache, F. Neutrosophy for Survey Analysis in Social Sciences. NSS, 37(1), 403-411, 2020.
[8] Smarandache, F. (2000). Neutrosophy. arXiv Mathematics e-prints, math-0010099.
[9] El-Hefenawy, N., Metwally, M. A., Ahmed, Z. M., & El-Henawy, I. M. A review on the applications of neutrosophic sets. Comput. Theor. Nanosci., 13(1), 936-944, 2016.
[10] Smarandache, F. (t, i, f)-Neutrosophic Structures &/-Neutrosophic Structures (revisited). NSS, 8, 3-10, 2015.
[11] Fan, J., Yan, F., & Wu, M. GLDS method for multiple attribute group decision making under 2-tuple linguistic neutrosophic environment. J. Intell. Fuzzy Syst., 40(6), 11523-11538, 2021.
[12] Esther, E. H., Alcides, F. H., & Estalin, P. P. Neutrosophic Statistics for Social Science. IJNS, 19(1), 250-259, 2022.
[13] Hernández, N. B., Vázquez, M. Y. L., Caballero, E. G., Cruzaty, L. E. V., Chávez, W. O., & Smarandache, F. (2021). A new method to assess entrepreneurship competence in university students using based on plithogenic numbers and SWOT analysis. International Journal of Fuzzy Logic and Intelligent Systems, 21(3), 280-292.
[14] Liu, H. Performance evaluation of family business strategic transition based on the 2-tuple linguistic neutrosophic number multiple attribute group decision making. J. Intell. Fuzzy Syst., 44(2), 3271-3283, 2023.
[15] Lin, J., Yu, R., & Xu, X. Grey relational analysis method for building material suppliers selection based on the 2-tuple linguistic neutrosophic number. J. Intell. Fuzzy Syst., 44(3), 4185-4196, 2023.
[16] Kennedy, I. Sample size determination in test-retest and Cronbach alpha reliability estimates. BJCE, 2(1), 17-29, 2022.
[17] Yu, H., & Hutson, A. D. A robust Spearman correlation coefficient permutation test. Commun. Stat. - Theory Methods, 53(6), 2141-2153, 2024.

DOI: https://doi.org/10.54216/IJNS.240220
Received: October 27, 2023 Revised: February 05, 2024 Accepted: April 22, 2024