Incidences of Exploratory Research in Postgraduate University Studies: A Neutrosophic Statistic Approach

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Abstract. Exploratory research corresponds to the first approach of investigative work. This type of research is very useful by allowing researchers to have a first approach or a first idea about the subject to study and will be of great help to become familiar with the method, but without providing conclusive results. It is usually carried out when the problem is in a preliminary phase. It is a process of collecting basic information on a problem that is not clearly defined. It is a very flexible technique, which implies that the researcher is willing to take risks, be patient and receptive. This work aims to define the level of incidence that exploratory research has in university and postgraduate studies and to visualize the level of indeterminacy presented by preliminary research. The use of combined method approaches for precision and baseline for exploratory research is handled.

Keywords: exploratory investigation, neutrosophic statistics

1 Introduction

The exploratory research aims to approach novel phenomena. Its objective is to obtain information that allows understanding them better, although, this is not conclusive. Therefore, exploratory research is essential to carry out a preliminary study before carrying out others that could entail a higher cost [1].

Therefore, what exploratory research does is to take an interest in a topic that has not been studied before or know new aspects of existing knowledge. Thus, when we do not know what we are dealing with, it is best to explore first before carrying out other more expensive analyzes [2]. In addition, exploratory research can be used to formulate which audience to address, what questions to ask, or what response options should be included in the next phase of the inquiry (See Figure 1).
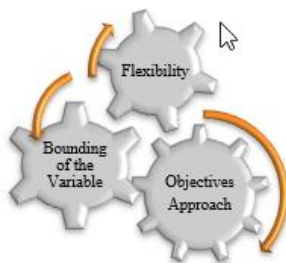

Figure 1. Scope and projection of the exploratory research

This type of research has a series of characteristics that should be known. These allow it to be used in the proper way and when it is necessary (Figure 2).

It is usually carried out when the problem is in a preliminary phase. It is often called a grounded theory or interpretive inquiry approach, as it is used to answer the what, why, and how questions. It is important to mention

that exploratory research is responsible for generating hypotheses that promote a deeper study from which results and a conclusion are drawn [3]
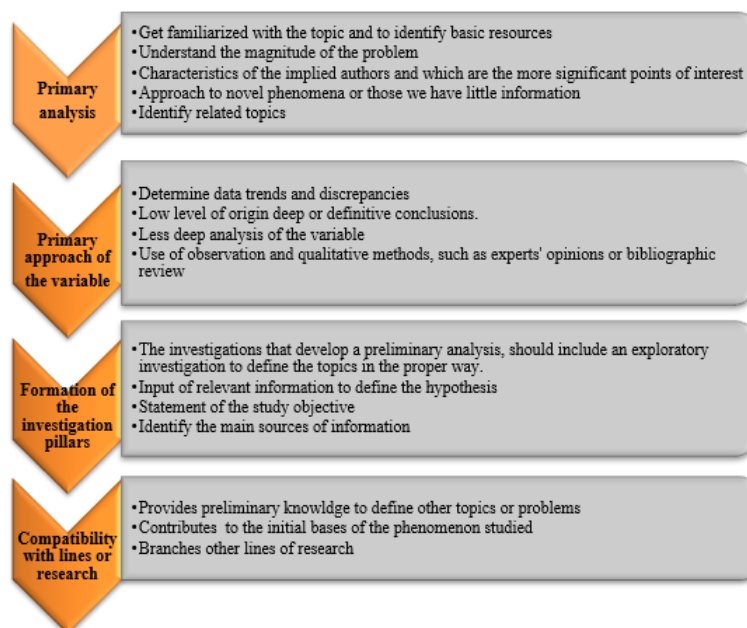
Primary analysis
• Get familiarized with the topic and to identify basic resources
• Understand the magnitude of the problem
• Characteristics of the implied authors and which are the more significant points of interest
• Approach to novel phenomena or those we have little information
• Identify related topics

Primary approach of the variable
• Determine data trends and discrepancies
• Low level of origin deep or definitive conclusions.
• Less deep analysis of the variable
• Use of observation and qualitative methods, such as experts' opinions or bibliographic review

Formation of the investigation pillars
• The investigations that develop a preliminary analysis, should include an exploratory investigation to define the topics in the proper way.
• Input of relevant information to define the hypothesis
• Statement of the study objective
• Identify the main sources of information

Compatibility with lines or research
• Provides preliminary knowldge to define other topics or problems
• Contributes to the initial bases of the phenomenon studied
• Branches other lines of research

Figure 2. Characteristics of the exploratory research

In short, the main objectives of Exploratory Investigations are three: identification of a specific environment or situation, obtaining an initial hypothesis about it, and serving as a basis for future research with methodology [4-9].

Complementary techniques	Contributions to the study
Document review	• It allows identifying the scientific literature and other secondary sources developed on the subject, to determine the depth with which the subject has been treated.
Interviews	• The interviews in the qualitative studies allow knowing the perceptions, opinions, and direct knowledge of the actors linked to the subject. ▪ Expert interviews: indicates a high level of confidence which are the main issues related to or direct to existing and reliable sources of information around the problem studied. ▪ Interviews with potential users or beneficiaries: these types of interviews are usually semi-structured to identify how the subjects understand the topic or problem studied and what other topics they relate to.
Surveys (In-person or online)	• They allow having a greater scope or breadth than interviews, although with less depth. • With the low level of resources required for exploratory research, it may be relevant to conduct surveys through social networks to direct them to audiences with particular interests and profiles with high value for research.
Field observation	• It allows the researcher to relate directly to the object of study to identify possible relationships or behaviors where the phenomenon or problem occurs. • As it is a primary analysis, not necessarily many field visits will be carried out, but if any are carried out, the observations must be recorded in the corresponding instrument in the most impartial way possible.

Table 1. Complementary techniques in exploratory research [2, 10]

Exploratory research: is a term used to describe research on a topic that has not yet been well defined. It is sometimes loosely used as a synonym for "qualitative research," although this is not strictly true. Research helps determine whether to move forward with a research idea and how to achieve it, is often flexible and dynamic, and can be based on existing data or literature. Research techniques are applied in marketing, drug development, and the social sciences [11].

Market research of an exploratory type can be very useful because it will allow us to have a general knowledge of the subject we want to deal with to launch products or services in the future since they will give us an approximate and prior idea of something about which there are no previous studies, and they serve as general information and as a basis for future market studies [12].
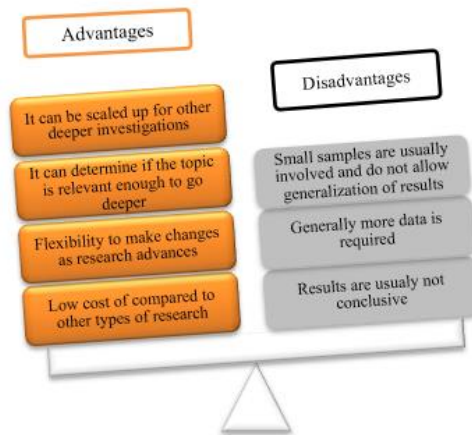

Figure 3. Characteristics of the exploratory research

From the characteristics of the variable and neutrosophic statistical analysis [13-35], this study focuses on:
- The problem situation: low level of precision and coherence when using exploratory research in undergraduate and graduate studies
- Main objective: to define the level of incidence that exploratory research has in university and postgraduate studies.
- Specific objectives:
  - Determine the sciences that most require exploratory research analysis
  - Analyze the effect of exploratory research on research
  - Perform statistical measurement and modeling of the neutrosophic variable
  Present potential alternatives to improve the results of exploratory research
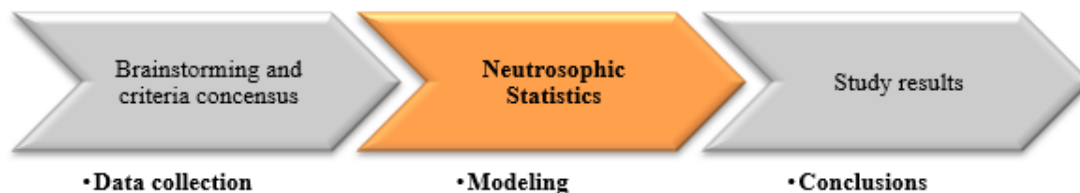Regarding the structure of the study:

Figure 4. Structure of the exploratory research study

2 Materials and methods

Neutrosophic probabilities and statistics are a generalization of classical and imprecise probabilities and statistics. For example, the Neutrosophic Probability of an event E is the probability that event E will occur [36, 37], the probability that event E does not occur, and the probability of indeterminacy (not knowing whether event E occurs or not). In classical probability nsup≤1, while in neutrosophic probability nsup≤3 +.

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

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

Where T (x) represents the probability that the value x occurs, F (x) represents the probability that the value x does not occur, and I (x) represents the indeterminate or unknown probability of the value x.
Neutrosophic Statistics is the analysis of neutrosophic events and deals with neutrosophic numbers, the neutrosophic probability distribution[38], neutrosophic estimation, neutrosophic regression, etc. It refers to a set of data formed totally or partially by data with some degree of indeterminacy and the methods to analyze them.

Neutrosophic statistical methods allow the interpretation and organization of neutrosophic data (data that can be ambiguous, vague, imprecise, incomplete, or even unknown) to reveal the underlying patterns[39].
In short, the Neutrosophic Logic[40] [41], Neutrosophic Sets, and Neutrosophic Probabilities and Statistics have a wide application in various research fields and constitute a new reference of study in full development. The Neutrosophic Descriptive Statistics includes all the techniques to summarize and describe the characteristics of the neutrosophic numerical data.[42]. Neutrosophic Numbers are numbers of the form where a and b are real or complex numbers[43], while "I" is the indeterminacy part of the neutrosophic number N.

$$N = a + bI.$$

The study of neutrosophic statistics refers to a neutrosophic random variable where y represents the corresponding lower and upper level that the studied variable can reach, in an indeterminate interval. Following the neutrosophic mean of the variable when formulating:$X_l \ X_u I_N [I_l, I_u](\bar{x}_N)$

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

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

is a neutrosophic random sample. However, the calculation of neutrosophic squares (NNS) can be calculated as follows

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

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

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

The neutrosophic coefficient (NCV) measures the consistency of the variable. The lower the NCV value, the more consistent the factor's performance is. NCV can be calculated as follows [44].

$$CV_N = \frac{\sqrt{S_N^2}}{\bar{X}_N} \times 100; \ CV_N \epsilon [CV_L, CV_U] \tag{5}$$

3 Results

Data collection

In university studies, postgraduate studies, and other research, exploratory research is applied as previous analyzes to recent phenomena in society, commerce, education, culture, while keeping compatibility with methods of greater scope [45] [46]. When analyzing the method, the experts asked themselves, what was the level of integration of this technique in the investigations? To determine this level of integration, a neutrosophic statistical analysis is carried out on a sample of 100 theses of published research (population) in university repositories and some recent studies published on the WEB [10, 45-63].

To identify the possible relationships or integrations, five groups are established from the analyzed investigations, called factors (Figure 5).
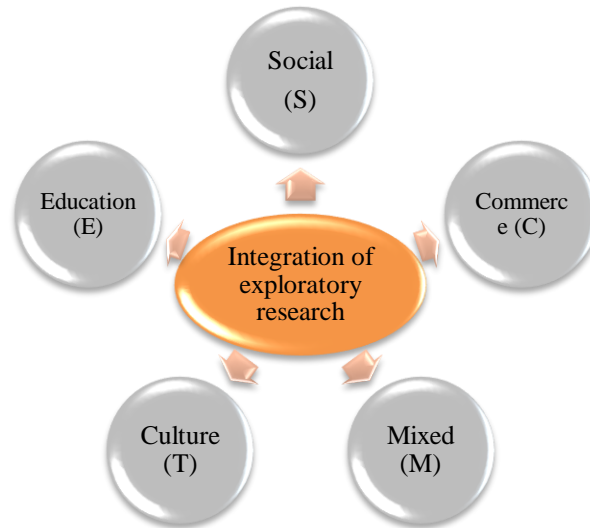

Figure 5. Factors (F_n) interrelated with exploratory research

For the modeling of neutrosophic statistics, it is suggested to code the variable's name and its representation in graphs and tables. The IIE will refer to the integration of exploratory research.

Method development

For the analysis, we proceed to define the variable, code it and determine the scale to start the modeling (Table 2)

Variable	Coding	Sample	Scale
Level of integration of exploratory research in university and postgraduate studies	IIE	100	$[0; 1], \forall F_n$ IIE = 0 (false) IIE = 1 (True) $0 \leq IIE \geq 1$ (Indeterminacy of the level of IIE)

Table 2. Characteristics of the IIE variable

By modeling the variable using neutrosophic statistics, the relative frequencies are obtained to determine the level of IIE in the factors, = in a sample of 100 research projects analyzed (Table 3). It is observed that for there is a higher incidence of occurrence of 77%, that researchers use exploratory research in conjunction with another method for the development of scientific studies. It should be noted that the experts, given the result obtained, ask themselves, what level of IIE for 23% affects the other factors? Moreover, what frequency of occurrence is present to measure the existing indeterminacy? $F_n \{F_s, F_c, F_t, F_e, F_m\} F_m \forall F_n \ desde \ 0 \leq IIE \geq 1$

Research	Cumulative absolute neutrosophic frequencies				
	Social	Commerce	Culture	Education	Mixed
0-100	[0, 10]	[0, 2]	[0, 3]	[0, 8]	[0, 77]

Table 3. Cumulative absolute neutrosophic frequencies.

To obtain the level of IIE in each factor, as the measure of indeterminacy for each investigation on a scale of, it is decided to analyze the variable from the neutrosophic relative frequency $= 0 \leq IIE \geq 1 F_n \{F_s, F_c, F_t, F_e, F_m\}$ (table 4).

Research	Relative neutrosophic frequencies				
	Social	Commerce	Culture	Education	Mixed
1	[0; 0]	[0.02; 0.04]	[0.03; 0.03]	[0.08; 0.16]	[0; 0.77]
2	[0; 0.1]	[0; 0.02]	[0.03; 0.03]	[0.08; 0.16]	[0.77; 0.77]
3	[0; 0]	[0; 0]	[0.03; 0.06]	[0.08; 0.16]	[0; 0.77]
4	[0; 0]	[0.02; 0.02]	[0; 0]	[0.08; 0.08]	[0.77; 0.77]
5	[0; 0]	[0; 0.02]	[0.03; 0.03]	[0.08; 0.08]	[0; 0.77]
6	[0; 0]	[0; 0]	[0.03; 0.03]	[0; 0]	[0.77; 0.77]
7	[0; 0]	[0.02; 0.04]	[0; 0.03]	[0; 0]	[0.77; 1.54]
8	[0; 0.1]	[0; 0]	[0; 0.03]	[0.08; 0.08]	[0; 0]
9	[0.1; 0.2]	[0; 0.02]	[0.03; 0.03]	[0.08; 0.08]	[0.77; 1.54]
10	[0.1; 0.1]	[0; 0.02]	[0; 0.03]	[0; 0]	[0; 0]
11	[0; 0]	[0; 0.02]	[0.03; 0.06]	[0; 0.08]	[0.77; 1.54]
12	[0.1; 0.2]	[0; 0]	[0.03; 0.03]	[0.08; 0.16]	[0; 0.77]
13	[0; 0.1]	[0; 0.02]	[0.03; 0.06]	[0; 0]	[0.77; 1.54]
14	[0; 0]	[0.02; 0.02]	[0.03; 0.06]	[0.08; 0.08]	[0.77; 0.77]
15	[0.1; 0.2]	[0; 0]	[0; 0]	[0; 0.08]	[0.77; 1.54]
16	[0; 0.1]	[0; 0]	[0; 0]	[0; 0]	[0.77; 0.77]
17	[0.1; 0.1]	[0.02; 0.04]	[0; 0.03]	[0.08; 0.08]	[0.77; 1.54]
18	[0; 0]	[0.02; 0.04]	[0.03; 0.06]	[0.08; 0.08]	[0.77; 0.77]
19	[0.1; 0.2]	[0; 0]	[0; 0]	[0; 0.08]	[0; 0]
20	[0; 0]	[0.02; 0.04]	[0; 0.03]	[0; 0]	[0.77; 1.54]
0-100	[4.9; 10]	[0.84; 2]	[1.5; 3]	[3.84; 8]	[36.96; 77]

Table 4. Relative neutrosophic frequency of the level of IIE in university and postgraduate studies

Of the neutrosophic relative frequencies observed for the IIE, it is necessary that for 100 projects analyzed there is a level of total indeterminacy of, with a level of representativeness, on the days that are registered relatively 1.54, with a higher incidence of 52% for the investigations that use exploratory research in integration with other methods and techniques to complete the study. $s = 5.1, c = 1.16, t = 1.5, e = 4.16, m = 40.04[50\% ; 58\%]$

In the first stage for the results in the modeling, the level of IIE is observed for the study of new phenomena with low reference information (table 5).

For the analysis of the representative mean based on the values of the neutrosophic means are calculated and for the study of the variations of IIE, they are determined by the values of the neutrosophic standard deviation, to determine in which factor there is greater consistency and precision of IIE in university and graduate studies for each. $\bar{x} = \in [\bar{x}_L; \bar{x}_U], S_N \in [S_L; S_U] CV_N \in [CV_L ; CV_U]$

Factors	$\bar{x}_N$	YN	CVN
Social	0.049 + 0.1 I	0.001 + 0.108 I	0.02 + 1.08 I
Commerce	0.008 + 0.02 I	0 + 0.021 I	0 + 1.05 I
Culture	0.015 + 0.03 I	0 + 0.032 I	0 + 1,067 I
Education	0.038 + 0.08 I	0.001 + 0.078 I	0.026 + 0.975 I
Mixed	0.37 + 0.77 I	0.074 + 0.763 I	0.2 + 0.991 I

Table 5. Neutrosophic statistical analysis of the level of IIE in university and postgraduate studies

Table 5 shows the level of incidence of exploratory research in the study of university and postgraduate theses. It should be borne in mind that the Mixed factor is dominant in the use of combined techniques. However, it is required to know in the neutrosophic set IIE what level of representation and indeterminacy in the condition. This means that for the given condition, the factor is by term The medium is the one that most influences the use of exploratory research for the acquisition and compilation of information (interviews, surveys, and field observation) more than the other factors analyzed. About the value of CV, it can be expressed that for the corresponding factors, $\forall F_n,\ [1 - F_m]. F_c CV_{Nm}\ y\ CV_{Ne}$, they are lower compared to the rest.
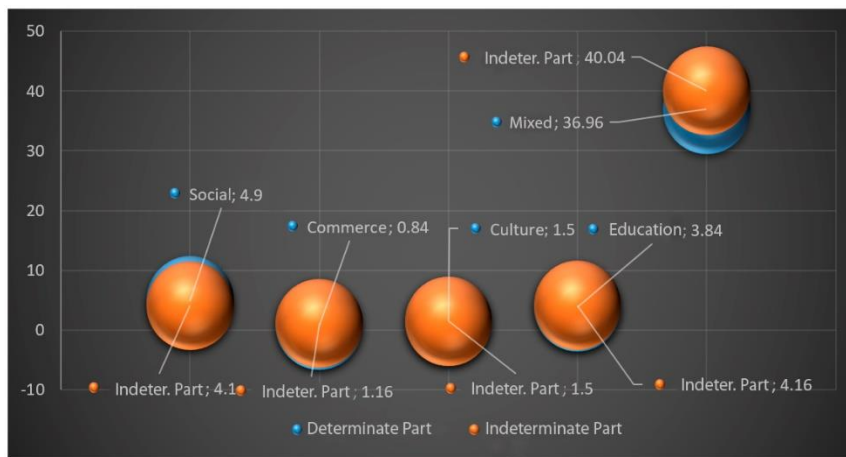
Figure 6. Neutrosophic bubble graph of the IEE level in university and postgraduate studies

Comparative analysis

To determine the associated referent indeterminacy measure for the form of neutrosophic numbers (Table 6). In the results obtained, it is observed that for the values they go from $\bar{x} = \in [\bar{x}_L; \bar{x}_U], S_N \in [S_L; S_U] CV_N \in [CV_L ; CV_U] CV_N 0$ to 0.20 with the indeterminacy measure 79.8%, generated by the Mixed factor and 97.3% in the education factor. Although he needs to use the lowest percentage level of indeterminacy to obtain more precise and more homogeneous results, in this case, it would be for mixed studies or combined with other methods for more robust results. CV_N

However, experts need to know the best option for the indeterminacy in the condition. The analysis focuses on the education factor with 97.3%, where the study projects present better results due to the preparation of this sector in pedagogical issues and method analysis. $\forall F_n, [1 - F_m]$,

Factors	$\bar{x}_N$	YN	CVN
Social	0.049 + 0.1 I; I $\in$ [0; 0.51]	0.001 + 0.108 I; I $\in$ [0; 0.99]	0.02 + 1.08 I; I $\in$ [0; 0.98]
Commerce	0.008 + 0.02 I; I $\in$ [0; 0.60]	0 + 0.021 I; I $\in$ [0; 0.100]	0 + 1.05 I; I $\in$ [0; 0.100]
Culture	0.015 + 0.03 I; I $\in$ [0; 0.50]	0 + 0.032 I; I $\in$ [0; 0.100]	0 + 1,067 I; I $\in$ [0; 0.100]
Education	0.038 + 0.08 I; I $\in$ [0; 0.52]	0.001 + 0.078 I; I $\in$ [0; 0.98]	0.026 + 0.975 I; I $\in$ [0; 0.97]
Mixed	0.37 + 0.77 I; I $\in$ [0; 0.51]	0.074 + 0.763 I; I $\in$ [0; 0.90]	0.2 + 0.991 I; I $\in$ [0; 0.79]

Table 6. Neutrosophic forms with indeterminacy measure for IIE in investigations

Partial solutions

The analysis of the exploratory research method defines guidelines for studying phenomena that are poorly documented or lacking in information. In addition, the result defines the use of research combining exploratory research and methods related to the results to be achieved; however, for previous studies, it is recognized that the level of relative frequency that a study project has in exploratory research as a single topic is of very low level, due to the high levels of indeterminacy in the information obtained.

As a partial solution for investigations with a low level of depth, it is recommended that the researcher draws on guides, manuals, reference texts that explain the scope, designs, and types of exploratory research as has been obtained in universities when using this method, by making the information more homogeneous and accurate. Although the experts and the arrival of the processed data selected these factors, the use of this method in other areas to be studied is not considered an error, on the contrary, its application and its use are considered in the neutrosophic probabilities, it only requires a higher level of information acquired so as not to be subject to indeterminacies.

Conclusions

Exploratory research is aimed at studies with implications of a specific problem, in search of the most interesting aspects to be addressed in an investigation. The investigation process begins with an exploratory action;

where the researcher does not know in depth the topic to be developed or needs to visualize the scope. Exploratory research corresponds to that first approach to the correct use of the object of study.

Neutrosophic statistics reveal a more direct approach to the use of exploratory research in undergraduate and graduate studies, considering two starting points. The first that the effectiveness of the study requires a deeper scope, from the combination of different methods with an existing level of indeterminacy and as a second approach for studies that require a partial exploratory analysis, take into account that the levels of indeterminacy, present high levels that are only specified in sectors with a certain level of information and good use of the applied tools, as shown in the education factor, with a lower value of CV for.$\forall F_n, [1 - F_m]$

As a tool, it presents a characteristic of homogeneity with other methods, and its results will always require a more in-depth subsequent study to corroborate the first deductions and, in some cases, open new lines of investigation.

References

[1]   P. Cazau, *Introducción A La Investigación En Ciencias Sociales*. Buenos Aires, 2006.

[2]   M. d. l. Investigación, "Metodología de la Investigación. Tipos de investigación: Exploratoria, Descriptiva, Explicativa, Correlacional," ed, 2016.

[3]   M. Namakforoosh, *Metodología de la Investigación*. Mexico: LIMUSA, 2005.

[4]   Stebbins, Robert A. Exploratory research in the social sciences. Vol. 48. Sage, 2001.

[5]   C. Contreras and M. Anahis, "Proceso de titulación, pertinencia en la carrera de comunicación social de la facultad de ciencias jurídicas sociales y de la educación en la universidad técnica de Babahoyo," Babahoyo: UTB, 2018, 2018.

[6]   G. Á. Gómez, J. V. Moya, J. E. Ricardo, and C. V. Sánchez, "La formación continua de los docentes de la educación superior como sustento del modelo pedagógico," *Revista Conrado,* vol. 17, pp. 431-439, 2021.

[7]   J. E. Ricardo, J. J. D. Menéndez, and R. L. M. Manzano, "Integración universitaria, reto actual en el siglo XXI," *Revista Conrado,* vol. 16, pp. 51-58, 2020.

[8]   J. E. RICARDO, *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.

[9]   J. E. Ricardo, 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.

[10]   M. Rojas Cairampoma. (2015) Tipos de Investigación científica: Una simplificación de la complicada incoherente nomenclatura y clasificación. *REDVET*. 1-14. Available: http://www.veterinaria.org/revistas/redvet http://www.veterinaria.org/revistas/redvet/n010115.html

[11]   McNabb, David E. Research methods for political science: Quantitative and qualitative methods. Routledge, 2015.

[12]   P. Ulin, *Investigación Aplicada En Salud Pública. Family Health Internacional*. Washington: Family Health Internacional 2006.

[13]   U. N. Abierta, "Técnicas de Documentación e Investigación I," Universidad Nacional Abierta, Caracas, 2000.

[14]   A. S. Molina, W. A. C. Calle, and J. D. B. Remache, "The application of Microsoft Solution Framework Software Testing using Neutrosophic Numbers," *Neutrosophic Sets and Systems,* vol. 37, pp. 267-276, 2020.

[15]   A. Abdel-Monem and A. Abdel Gawad, "A hybrid Model Using MCDM Methods and Bipolar Neutrosophic Sets for Select Optimal Wind Turbine: Case Study in Egypt," *Neutrosophic Sets and Systems,* vol. 42, pp. 1-27, 2021.

[16]   M. E. Á. Tapia, D. C. M. Raúl, and C. N. M. Vinicio, "Indeterminate Likert Scale for the Analysis of the Incidence of the Organic Administrative Code in the current Ecuadorian Legislation," *Neutrosophic Sets and Systems,* vol. 37, pp. 329-335, 2020.

[17]   C. E. Ochoa Díaz, L. A. Colcha Ramos, M. J. Calderón Velásquez, and O. Pérez Peña, "Knowledge-based Hiring Recommender Model for Occasional Services in the Public Sector," *Neutrosophic Sets and Systems,* vol. 37, pp. 176-183, 2020.

[18]   F. d. R. Lozada López, M. E. Villacreses Medina, and E. C. Villacis Lascano, "Measure of Knowledge in Students at Uniandes, Ecuador, on the Manifestations of Oral Cancer," *Neutrosophic Sets and Systems,* vol. 37, pp. 151-159, 2020.

[19]   C. A. Escobar Suárez, R. Oliva Torres, and L. Espinoza Freire, "Neutrosophic Analysis of Complications Generated by Hypothyroidism during Pregnancy," *Neutrosophic Sets and Systems,* vol. 37, pp. 141-150, 2020.

[20]   A. D. M. Manzano, J. Y. V. Villegas, L. M. O. Escobar, and L. T. Jiménez, "Neutrosophic Analysis of the Facultative Vote in the Electoral Process of Ecuador," *Neutrosophic Sets and Systems,* vol. 37, pp. 355-360, 2020.

123

[21] C. C. Guillot, D. R. M. Medina, and M. A. B. Ávalos, "Neutrosophic Evaluation of Depression Severity," *Neutrosophic Sets and Systems,* vol. 37, pp. 242-249, 2020.

[22] J. L. R. Villafuerte, L. D. T. Torres, and L. T. Jimenez, "Neutrosophic Hypothesis to validate a modification for Article 630 of the Integral Organic Criminal Code of Ecuador," *Neutrosophic Sets and Systems,* vol. 37, pp. 260-266, 2020.

[23] P. E. D. P. Franco, A. J. P. Palacio, and I. A. C. Piza, "Neutrosophic Hypothesis to validate a Reform Project to Article 87 of the General Organic Code of Processes of Ecuador," *Neutrosophic Sets and Systems,* vol. 37, pp. 316-322, 2020.

[24] N. V. Q. Arnaiz, N. G. Arias, and L. C. C. Muñoz, "Neutrosophic K-means Based Method for Handling Unlabeled Data," *Neutrosophic Sets and Systems,* vol. 37, pp. 308-315, 2020.

[25] A. J. P. Palacios, L. B. Bustamante, V. C. Armijo, and V. S. N. Luque, "Neutrosophic multicriteria method to evaluate the com-petencies of mayoral candidates," *Revista Asociación Latinoamericana de Ciencias Neutrosóficas. ISSN 2574-1101,* vol. 11, pp. 17-24, 2020.

[26] I. Pimienta Concepción, E. Mayorga Aldaz, L. Gabriel Flores, and E. González Caballero, "Neutrosophic Scale to Measure Psychopathic Personalities Based on Triple Refined Indeterminate Neutrosophic Sets," *Neutrosophic Sets and Systems,* vol. 37, pp. 61-70, 2020.

[27] G. A. Gómez, J. F. G. García, S. D. Á. Gómez, and F. Smarandache, "Neutrosophic Sociogram for Group Analysis," *Neutrosophic Sets and Systems,* vol. 37, pp. 417-427, 2020.

[28] P. A. Mena Silva, A. Romero Fernández, and L. A. Granda Macías, "Neutrosophic Statistics to Analyze Prevalence of Dental Fluorosis," *Neutrosophic Sets and Systems,* vol. 37, pp. 160-168, 2020.

[29] P. A. M. Silva, A. R. Fernández, and L. A. G. Macías, "Neutrosophic Statistics to Analyze Prevalence of Dental Fluorosis," *Neutrosophic Sets and Systems,* vol. 37, pp. 160-168, 2020.

[30] C. R. Martínez, G. A. Hidalgo, M. A. Matos, and F. Smarandache, "Neutrosophy for Survey Analysis in Social Sciences," *Neutrosophic Sets and Systems,* vol. 37, pp. 409-416, 2020.

[31] D. V. G. Mayorga, E. d. P. A. Escobar, and O. F. S. Montoya, "Neutrosophy Used to Measure the Legal and Socioeconomic Effect of Debtors," *Neutrosophic Sets and Systems,* vol. 37, pp. 295-301, 2020.

[32] J. M. Macías Bermúdez, G. K. Arreaga Farias, and L. Torres Torres, "Profiles of Human Trafficking Violence in Regions of Ecuador," *Neutrosophic Sets and Systems,* vol. 37, pp. 200-207, 2020.

[33] L. Wong Vázquez, Cueva Moncayo, María Fernanda., and L. P. Advendaño Castro, "Risk Factors Prioritization for Chronic Obstructive Pulmonary Disease," *Neutrosophic Sets and Systems,* vol. 37, pp. 49-60, 2020.

[34] D. Coka Flores, J. R. Cadena Morillo, C. G. Rosero Martínez, and W. Ortiz Aguilar, "Selection of Experts to Validate a Research Proposal Using a Neutrosophic Method," *Neutrosophic Sets and Systems,* vol. 37, pp. 71-80, 2020.

[35] A. Romero Fernández, E. Labrada González, and D. Loyola Carrasco, "Study on the Level of Knowledge in Dental Medical Emergencies of Dentistry Students through Neutrosophic Values," *Neutrosophic Sets and Systems,* vol. 37, pp. 90-107, 2020.

[36] S. H. S. Al-Subhi, I. Pérez Pupo, R. García Vacacela, P. Y. Piñero Pérez, and M. Y. Leyva Vázquez, "A New Neutrosophic Cognitive Map with Neutrosophic Sets on Connections, Application in Project Management. ," *Neutrosophic Sets and Systems,* vol. 22. , pp. 63-75, 2018.

[37] M. L. Vázquez, J. Estupiñan, and F. Smarandache, "Neutrosofía en Latinoamérica, avances y perspectivas," *Revista Asociación Latinoamericana de Ciencias Neutrosóficas. ISSN 2574-1101,* vol. 14, pp. 01-08, 2020.

[38] F. Smarandache, *An introduction to the Neutrosophic probability applied in quantum physics*: Infinite Study, 2000.

[39] W. B. Vasantha, I. Kandasamy, and F. Smarandache, "Algebraic Structure of Neutrosophic Duplets in Neutrosophic Rings < Z U I>,< Q U I> and < R U I.> " *Neutrosophic Sets and Systems, ,* vol. 23, pp. 85-95, 2018.

[40] E. J. H. Antepara, *Competencies Interdepencies Analysis based on Neutrosophic Cognitive Mapping*: Neutrosophic Sets and Systems, 2017.

[41] Pérez-Teruel, Karina, and Maikel Leyva-Vázquez. "Neutrosophic Logic for Mental Model Elicitation and Analysis." Neutrosophic Sets and Systems 2, (2014)

[42] F. Smarandache, *Neutrosophy, a new Branch of Philosophy*: Infinite Study, 2002.

[43] W. V. Kandasamy and F. Smarandache, "Fuzzy Neutrosophic Models for Social Scientists.," *Education Publisher Inc.,* (2013)

[44] F. Smarandache, "A Unifying Field in Logics: Neutrosophic Logic. Neutrosophy, Neutrosophic Set, Neutrosophic Probability: Neutrosophic Logic. Neutrosophy, Neutrosophic Set, Neutrosophic Probability: Infinite Study.," 2005.

[45] Á. D. Corengia and P. D. Ravela. (2016). *Un estudio exploratorio - descriptivo de las identificaciones que construyen los alumnos en los procesos de evaluación de la educación secundaria en dos instituciones educativas de la Ciudad Autónoma de Buenos Aires Investigación exploratoria descriptiva acerca del crecimiento de un grupo social que nace del individualismo: Mujeres neo-solteras de 36 a 45 años en Guayaquil*. Available: http://hdl.handle.net/10469/8509

[46] D. J. M. Farías, "Nuevas Formas de Representación Social: Una Investigación Exploratoria-Descriptiva del Fenómeno del Graffiti Hip Hop en Santiago," Facultad de Ciencias Sociales Escuela de Sociología, UNIVERSIDAD DE CHILE Santiago de Chile, 2006.

[47] S. N. M. MORÁN, "FOMENTO DE LA CULTURA TRIBUTARIA SOBRE LAS INVERSIONES DE EXTRANJEROS EN EL ECUADOR CON DOMICILIO EN LA CIUDAD DE GUAYAQUIL.," TESIS PRESENTADA COMO REQUISITO PARA OPTAR POR EL TITULO DE INGENIERÍA EN TRIBUTACIÓN Y FINANZAS, FACULTAD DE CIENCIAS ADMINISTRATIVAS, UNIVERSIDAD DE GUAYAQUIL, GUAYAQUIL, 2015.

[48] E. Rodriguez. (2017) La dirección escolar en Ecuador breve investigación exploratoria. *Revista Ciencia UNEMI*.

[49] E. R. Revelo; and I. J. O. Aguirre, "Formación pedagógica para el profesorado de la Facultad de Ciencias Matemáticas y Físicas de la Universidad de Guayaquil: estudio exploratorio," Doctora en Ciencias de la Educación. Máster en Planificación, evaluación y acreditación de la Educación Superior. Docente de la Facultad de Ciencias Matemáticas y Físicas 2020.

[50] C. V. M. Elvira, "Estudio exploratorio sobre la articulación de la educación media y superior desde las políticas públicas en cuatro instituciones educativas de Bogotá," Facultad de Educación, Pontificia Universidad Javeriana, 2015.

[51] M. E. Cuesta Lauret, "La gestión administrativa y su incidencia en el compromiso laboral de la Policía Nacional del Ecuador," Licenciada en Administración Policial, USFQ, Universidad San Francisco de Quito, Quito, 2015.

[52] J. A. Benítez Astudillo, S. L. Guillén Sánchez, and G. d. l. Á. Jara Pacheco. (2015). *Análisis de la incidencia de los sistemas de información gerencial en las operaciones de comercialización de las microempresas de Milagro*. Available: http://repositorio.unemi.edu.ec/handle/123456789/2802

[53] Valencia-Moreno, José Manuel, et al. "Exploring Breast Cancer Prediction for Cuban Women." International Conference on Information Technology & Systems. Springer, Cham, 2020.

[54] L. A. G. Azpeitia, "Un estudio exploratorio acerca de las concepciones que referentes al comportamiento variacional de funciones elementales tienen los profesores de bachillerato," Área académica de matemática educativa. Instituto de Ciencias Básicas e Ingeniería, Pachuca hidalgo, Universidad Autónoma del Estado de Hidalgo, 2002.

[55] J. A. Sánchez, "Influencia de la aplicación Grapher Free, en el proceso de enseñanza-aprendizaje de Funciones, en el segundo año de Bachillerato General Unificado, en la Unidad Educativa "Rincón del Saber" (UERS), ubicada en la parroquia Chillogallo del Distrito Metropolitano de Quito," CARRERA DE MATEMÁTICA Y FÍSICA, FACULTAD DE FILOSOFÍA, LETRAS Y CIENCIAS DE LA EDUCACIÓN, UNIVERSIDAD CENTRAL DEL ECUADOR, Quito, Ecuador, 2018.

[56] Hervás, Raquel, et al. "Predictive composition of pictogram messages for users with autism." Journal of Ambient Intelligence and Humanized Computing 11.11, 2020.

[57] J. M. O. Aguilera;, T. A. S. Gallegos;, and M. S. S. Ortega, "Estudio exploratorio acerca de las Concepciones del Profesorado de Ciencias en Formación sobre la Evaluación de Aprendizajes Científicos y Resolución de Problemas Científicos Escolares.," FACULDAD DE CIENCIAS DE LA EDUCACIÓN ESCUELA DE PEDAGOGÍA EN BIOLOGÁ Y CIENCIAS, FACULTAD DE CIENCIAS DE LA EDUCACIÓN Santiago, Chile, 2011.

[58] A. P. Muñoz, "Un modelo explicativo procesual dela pobreza desde la psicología social comunitaria y el enfoque de los DDHH," FACULTAD DE PSICOLOGÍA UNIVERSIDAD COMPLUTENSE DE MADRID, Madrid, España, 2013.

[59] Polit, Denise F., and Cheryl Tatano Beck. Nursing research: Principles and methods. Lippincott Williams & Wilkins, 2004.

[60] D. A. N. Garcés;, M. S. P. Cruces;, and F. J. V. Pinuer, "DISEÑO DE UN MODELO COMO HERRAMIENTA PARA EL PROCESO DE GESTIÓN DE VENTAS Y MARKETING," Seminario para optar al Título de Ingeniero Comercial, Mención Administración, Facultad de Economía y Negocios, UNIVERSIDAD DE CHILE Chile, 2011.

[61] A. Belén, "Estudio exploratorio descriptivo del segmento adulto mayor su oferta turística y diseño de estrategias de intervención en la ciudad de Quito," Tesis de grado previo a la obtención del grado de magister en gerencia empresarial Facultad de ciencias administrativas, Escuela politécnica nacional, Ecuador, 2014.

[62] S. V. Sanhueza, M. C. Friz Carrillo, and S. Quintriqueo Millán. (2014) Estudio exploratorio sobre las actitudes y comportamiento del profesorado de Chile en contextos de escolarización de alumnado inmigrante. *REDIE*. 14-162. Available: http://redie.uabc.mx/vol16no3/contenido-sanhueza-friz-.html

[63] M. T. Paredes, M. C. Álvarez, L. I. Lega, and A. Vernon. (2008, enero-junio, 2008) Estudio exploratorio sobre el fenómeno del "Bullying" en la ciudad de Cali, Colombia. *REDALYC*. 295-317. Available: http://www.redalyc.org/articulo.oa?id=77360110