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Handling of the Indeterminacy in the Market Segmentation of the Tourist Destination Patrimonial City of Cuenca - Ecuador

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Abstract. This paper aims to identify the profiles of the different segments of tourists who visit the destination of Cuenca, declared a World Heritage Site by UNESCO in 1999. Methodologically, a quantitative approach with a descriptive scope was used through surveys with systematic random sampling. Several questions were analyzed divided into four groups: demographic characteristics, travel characteristics, aspects related to the service or product, and the evaluation of the satisfaction of the tourist offer. In order to evaluate the factors that motivated the visit, the preferred activities, and the level of general satisfaction and attributes of the destination, linguistic terms associated with sets of neutrosophic values were used, with which subjectivity and the indeterminacy of the answers could be managed.

Keywords: Single Value Neutrosophic Sets, linguistic terms, market segmentation, tourist destination.

1 Introduction

In its definition and practice, tourism is closely related to the movement of people to places other than their habitual residence, who, according to the length of stay, can be visiting hikers, residents, or non-residents. This mobility responds to the human need to move in search of freedom to know the world and interact face to face with other cultures [4],[3] that is satisfied through tourist activity, with which individuals enjoy a wide offer to discover so many places that diversify consumer experiences and that set guidelines in demand [1, 2].

Despite the economic crises that many countries have experienced, tourism in the last decade has maintained a growing development that places it as one of the most important and solid sectors of the world economy, even higher than oil exports. Such is its development that, according to the World Tourism Organization (2017), it contributes 10% of the world's Gross Domestic Product (GDP), generates exports of more than 1.5 trillion US dollars, and constitutes 7% of international trade [18].

In this context, tourism is certainly a social and cultural phenomenon that affects the economy of the visited places; its impact is measured through tourist indicators and statistical data, such as the count of lodging units [3]. Therefore, statistical information on tourism is important for the sustainable management of the destination and is a solid tool for the analysis of current and future trends in tourism, as well as essential for decision-making by local governments [1, 2],[1, 2], [3].

According to [10], the growing development of cultural tourism in recent years is fundamentally due to the growing appreciation of cultural and historical heritage by society, and this growth has been more notable in cities or historical complexes declared Heritage of the Humanity. Therefore, heritage destinations have to rigorously and systematically face those aspects related to the balanced insertion of tourist activity, a consideration that leads to the need to interpret more adequate solutions to problems or needs that interfere with local development [1, 2] [15].

The current scenarios create the need to adopt strategies that allow us to respond to the challenges and demands of dynamic, changing, and complex environments; and orient its action towards the objectives set out in the local development plans [14]; where the enhancement of the natural, cultural, social, architectural and gastronomic heritage of the town is preponderant [16].

The importance of knowing the profile of the users of a destination lies in the possibility of better understanding the reasons for visiting and the use that visitors make of the place [1, 2]. According to [13], it also allows directing the strategic management of tourism marketing and promotion. The determining factors or that condition the decision to travel are grouped according to their nature into economic, relative to the demanding units, marketing

system, and customer satisfaction [1, 2] [1, 2].

The purpose of market segmentation is to find similarities between groups about the product that is being offered to them and to find basic consumer traits so that they will respond in a similar way to the implemented marketing strategies [5][1, 2]. In this way, the offer can better respond to the needs and expectations to achieve greater satisfaction from the different groups [1, 2].

Consumer segmentation is based on the assumption that markets are inherently heterogeneous, and that consumer preferences vary according to their values, needs, desires, restrictions, beliefs, and incentives [6]. Precisely to obtain these profiles or segments, marketing experts use the so-called segmentation criteria [5] that can be very diverse (demographic, socioeconomic, motivational, and psychographic, among others). At the same time, products (including tourist destinations) compete with each other to satisfy the needs and desires of consumers.

In the case of Ecuador, the results of the investigation carried out by [1, 2] for the estimation of demand in the countries of the Andean Community of Nations, reflect that Ecuador is the country with the highest incoming tourist flow and an estimate of international demand. Ecuador has achieved constant growth in the volume of international arrivals, exceeding one and a half million visitors, with an average occupancy rate of over 50% and with revenues amounting to 1,075.5 million USD as of 2016 [18].

All of the above consequently favors the tourism of the city of Cuenca, if we considered that it is the third most important city in Ecuador, which has also seen its income from tourism increased since its declaration as Cultural Heritage of Humanity by UNESCO in 1999. This merit is based on its heritage assets such as churches, historical monuments, squares, parks, and traditional houses. It is one of the most touristic cities in the Azuay province. The "Athens of Ecuador" enjoys a privileged climate for being located within an extensive valley in the middle of the Andean column with a variable temperature between 7 to 15 ° C in winter and 12 to 25 ° C in summer[1, 2].

There are many activities in Cuenca to have fun and keep busy. Nature lovers can walk the peaceful river paths through the diverse and colorful parks or perhaps take a trip to El Cajas National Park, which is just an hour outside the city. It is also easy to make a weekend getaway to a beautiful beach town thanks to its strategic location.

For those looking for activities in the city, Cuenca is generally considered the cultural capital of Ecuador, with many museums, various live music venues, modern art, film festivals, traditional celebrations, exhibitions of artisan products, international cuisine festivals, jazz club, archaeological ruins, and countless arts and crafts fairs that also have specialty groceries and organic products.

The objective set out in this research was to identify the profiles of the different segments of tourists who visit the city of Cuenca tourist destination, through market segmentation. For this, we proposed to use Neutrosophy to treat the elements to be evaluated with a high content of subjectivity.

2 Materials and methods

In this section, the fundamental theoretical supports of neutrosophy are exposed, as well as the description of the research technique and instrument.

2.1 Some basic concepts of Neutrosophy

Neutrosophy is a mathematical theory developed by Florentin Smarandache to deal with indetermination [4-6] [1, 2]. It has been the base for the development of new methods to handle indeterminate and inconsistent information as the neutrosophic sets and the neutrosophic logic and, especially, in decision-making problems [7-9].

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

$$v(p) = (T, I, F) \tag{1}$$

To facilitate the practical application to decision-making problems, the use of single-value neutrosophic sets (SVNS) [10, 11] was proposed, through which it is possible to use linguistic terms, to obtain greater interpretability of the results.

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

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

Where

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

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

The intervals $u_a(x), r_a(x)$ and $v_a(x)$ denote the memberships to true, indeterminate, and false from x in A, respectively. For convenience a Single Value Neutrosophic Number (SVNN) will be expressed as A = (a, b, c), where a, b, c ∈ [0.1] and satisfies $0 \leq a + b + c \leq 3$[12].

Let $\{A_1, A_2, \ldots, A_n\} \in$ SVNS (x), where $A_j = (a_j, b_j, c_j)$ (j = 1, 2, …, n), then, the Single Valued Neutrosophic Weighted Average Operator is defined by [13]:

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

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

Let A = (a, b, c) be a single neutrosophic number, a score function S of a single-valued neutrosophic value, based on the truth-membership degree, indeterminacy-membership degree, and falsity membership degree is defined by[14, 15]:

$$S(A_i) = 2 + a - b - c \tag{4}$$

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

When there is a tie between the scores, the precision function is defined as:

$$T(A_j) = T_j - F_j \tag{5}$$

And then:

If $S(A_j) < S(A_i)$, then $A_j < A_i$

If $S(A_j) = S(A_i)$ and $T(A_j) < T(A_i)$ then $A_j < A_i$

If $S(A_j) = S(A_i)$ and $T(A_j) = T(A_i)$ then $A_j = A_i$

2.2 Technique and instrument applied

The research is quantitative, with a descriptive-correlational approach. The survey technique was applied through systematic random sampling (the first individual is chosen randomly and the rest are conditioned by a fixed number, in this case, every 2 individuals). The methodology proposed by [1, 2] assumes an infinite population to determine the sample size. The variability of the population is estimated at 50% (p = q = 0.5) [16]. A total of 338 valid surveys were collected, representing a sampling error of 4.56% for a confidence level of 95.5%.

A 13-item questionnaire structures the fieldwork and the application of the survey based on previous studies [1, 2] [1, 2] [1, 2] [1, 2] [1, 2], where it is asked about the factors that determine the demand, the client's profile, satisfaction and valuation of the tourist products and services of the territory.

The structure of the questionnaire is made up of four blocks: (I) the demographic characteristics, (II) the characteristics of the trip, (III) related to the service or product, and (IV) the evaluation of the satisfaction of the tourist offer.

Within the demographic characteristics, sex, age, country of residence, and occupation are analyzed. Regarding the characteristics of the trip, it is of interest if it is the main destination, how many people are in the group, through what means of information did they learn about the destination and what factors motivated their visit. In this last aspect, the respondent was asked to classify between totally true and false, the following possibilities, which are not mutually exclusive:

a) Curiosity to know this city

b) Interest in culture and history

c) Interest in architectural heritage

d) Because of the weather

e) Natural attractions, landscapes

f) Prices

g) Recommendation of friends

h) Other causes

For the processing of the results of this question, the scale of linguistic terms associated with SVNS shown in table 1 was used. The general results of each alternative were determined by means of the aggregation function (3) and ordered using the scoring function. (4).

Expression		SVN Number
Totally True	TT	(1, 0, 0)
Mostly true	MT	(0.85, 0.25, 0.25)
Cannot be determined	I	(0,1,0)
Mostly false	MF	(0.25, 0.25, 0.85)
Totally false	TF	(0,1,1)

Table 1: Scale of linguistic terms associated with SVNS applied to determine the factors that motivated a visit to the tourist destination city of Cuenca.

Regarding what is related to the product or service, you want to know the type of accommodation, the duration of the trip, the total of previous visits, and what activities you prefer to do. To answer about the activities that the respondent prefers to carry out, they were asked to classify the following activities between very satisfactory and

very unsatisfactory:

a) Visit museums and historical sites

b) Visit nearby tourist sites

c) Attend cultural activities and events

d) Go on excursions, hiking

e) City tours

f) Other activities

The scale of linguistic terms associated with SVNS used for this question is shown in table 2. The general evaluation of each activity was determined through the aggregation function of equation (3) and to rank the activities according to the preference of the respondents, the scoring function of equation (4) was used.

Expression		SVN Number
Clearly pleased	CP	(0., 0, 0)
More pleased than unpleased	MP	(0.85, 0.25, 0.25)
Not defined	ND	(0,1,0)
More unpleased than pleased	MU	(0.25, 0.25, 0.85)
Clearly unpleased	CU	(0,1,1)
Contradictory	C	(1,0,1)

Table 2: Scale of linguistic terms associated with SVNS used to determine respondents' preferred activities

Finally, to evaluate the satisfaction of the tourist offer, the respondent is asked to evaluate the attributes of the destination: a) accommodation, b) restaurants, c) culture, d) nature, e) prices, and f) service; according to the scale of linguistic terms associated with SVNS shown in table 3.

Expression		SVN Number
Excellent	E	(1,0,0)
Very very good	VVG	(0.9, 0.1, 0.1)
Very good	VG	(0.8, 0.15, 0.20)
Good	G	(0.70,0.25,0.30)
Regular tending to Good	RG	(0.60, 0.35, 0.40)
Regular	R	(0.50, 0.50, 0.50)
Regular tending to Bad	RB	(0.40, 0.65, 0.60)
Bad	B	(0.30,0.75,0.70)
Very bad	VB	(0.20, 0.85, 0.80)
Very very bad	VVB	(0.10,0.90,0.90)
Extremely Bad	EB	(0; 1; 1)

Table 3: Scale of linguistic terms associated with SVNS applied to determine the level of satisfaction of respondents by tourism attributes.

The evaluation of the level of satisfaction of the respondent with the general offer is obtained through the aggregation of the evaluations of all the previous attributes using equation (3) for each respondent.

4 Results

The results on the main demographic characteristics of the tourists surveyed in the city of Cuenca show a slight majority of adults between 21 and 50 years of age, of both sexes, workers in private companies and from the United States, Canada, Italy, and France, and from Ecuador itself. Table 4 shows a summary of the demographic characteristics of the respondents.

Age range		Sex		Country of residence		Occupation	
0-20	9%	F	49%	Ecuador	31%	Private enterprise	44%
21-35	32%	M	51%	USA	29%	Public sector	27%
36-50	33%			Canada	9%	Student	9%
51-65	16%			Italy	8%	Other	20%
65 or more	10%			France	6%		
				Other	17%		

Table 4. Demographic characteristics of the respondents

Regarding the characteristics of the trip, we obtained that 48% of tourists arrived in Cuenca as their main destination, mostly as a couple and they learned about the destination mainly by having visited it previously, through friends and acquaintances, or the World website Travel Awards. Most of the foreign tourists surveyed declared that they visited Cuenca in passing, complementing the visit to other cities in Ecuador.

To analyze what factors motivate the visit to the city, the proposed alternatives were scored through the

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144

aggregation function (equation 3) and were ordered based on their neutrosophication using the scoring function (equation 4). In this case, the precision function (equation 5) was used to sort the alternatives with the same score. The results are shown in Table 5.

Order	Reasons for visit	Agregate SVNS $P_w(A_1, A_2, \ldots, A_{338})$	Scoring $S(P_{w_i})$	Precision $T(P_{w_i})$
1	Interest in culture and history	(0.81; 0.23; 0.02)	2,561	0.790
2	Natural attractions, landscapes	(0.8; 0.25; 0.02)	2,532	0.784
3	For the climate	(0.79; 0.26; 0.02)	2,513	0.770
4	Recommendation of friends	(0.79; 0.26; 0.02)	2,513	0.776
5	Interest in the architectural heritage	(0.73; 0.3; 0.03)	2,400	0.700
6	Curiosity to know this city	(0.68; 0.46; 0.02)	2,210	0.667
7	Other reasons	(0.61; 0.39; 0.03)	2,192	0.581
8	Religion	(0.6; 0.43; 0.04)	2,135	0.564

Table 5. Order of factors motivating the visit

It was evidenced that the factors that most motivated choosing the city of Cuenca as a tourist destination were the interest in knowing the cultural and historical heritage, natural attractions, the weather, and the recommendation of friends.

The results of the analysis of what is related to the product or service, allowed us to determine that mostly tourists between 36 and 50 years old prefer to stay in hotels, while a significant percentage of those between 21 and 35 years old stay in hostels and finally the group ranging in age from 50 to 65 prefer boutique hotels. The days of stay oscillate in a range between 2 and 14 days, being more frequent than the trips of 3 and 4 days. 49% of those surveyed had already visited the city at least once and 67% visited it for the third time.

When analyzing which activities they prefer to carry out, it was found that those tourists were usually pleased with all the proposed activities, the best evaluated being visits to museums and historical sites, the tours for the city, and the cultural activities and events. Table 6 shows the activities ordered by preference according to the aggregation and score of the respondents' answers.

Order	Activities	Aggregate SVNS $P_w(A_1, A_2, \ldots, A_{338})$	Scoring $S(P_{w_i})$	Precision $T(P_{w_i})$	Evaluation
1	Visiting museums and historical sites	(0.95; 0.05; 0.01)	2,899	0.949	CP
2	City tours	(0.57; 0.31; 0.06)	2,191	0.503	MP
3	Attend cultural activities and events	(0.54; 0.34; 0.05)	2,145	0.487	MP
4	Go on excursions, hiking	(0.49; 0.38; 0.04)	2,065	0.450	MP
5	Other activities	(0.34; 0.32; 0.08)	1,938	0.256	MP
6	Visit nearby tourist sites	(0.39; 0.41; 0.06)	1,926	0.337	MP

Table 6. Order of activities preferred by tourists in Cuenca city destination

The results of the evaluation of the respondents' satisfaction about the particular attributes of the tourist destination are shown in table 7.

Order	Tourist destination attributes	Aggregate SVNS $P_w(A_1, A_2, \ldots, A_{338})$	Scoring $S(P_{w_i})$	Precision $T(P_{w_i})$	Evaluation
1	Nature	(0.78; 0.18; 0.22)	2,370	0.554	VG
2	Restaurants	(0.73; 0.23; 0.27)	2,231	0.464	VG
3	Culture	(0.73; 0.24; 0.27)	2,216	0.451	VG
4	Lodging	(0.64; 0.33; 0.36)	1,949	0.281	G
5	Service	(0.54; 0.43; 0.46)	1,654	0.086	RG
6	Prices	(0.43; 0.59; 0.57)	1,267	-0.143	RB

Table 7. Order and evaluation of satisfaction with the attributes of the tourist destination of the city of Cuenca

According to the satisfaction evaluations provided by the respondents, the most valued attributes of the destination are nature, restaurants, and culture, while the worst evaluation is the prices. The results of the evaluation

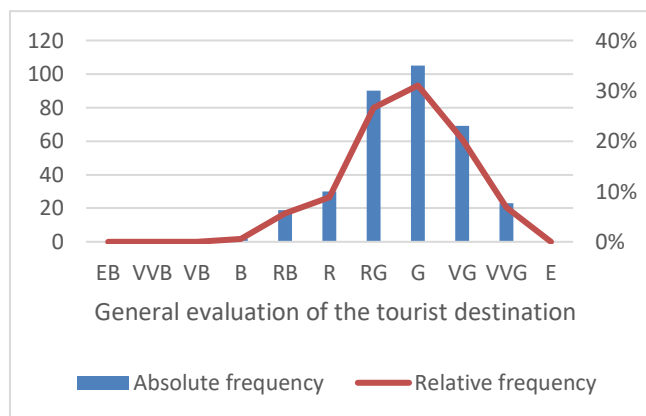of tourist satisfaction with the destination, in general, are shown in Figure 1.

Figure 1. Absolute and relative frequencies of the general evaluation of the city of Cuenca as a tourist destination.

According to these results, 57% of those surveyed expressed a high level of satisfaction with the tourist destination, offering a general evaluation of good, very good, or very very good. Less than 5% evaluated it from fair tending to bad, this being the lowest rating.

Conclusions

The segmentation of the tourist market in a Heritage city such as Cuenca is important because strategic projections are needed to improve the offers and the country's tourism system. It is worth mentioning that the city has weak tourist statistics.

Through the study carried out, it was defined that the city receives visitors mainly from nationals and the United States, Canada, Italy, and France. The predominant age range is between 35 and 50 years old and hotels and hostels are preferred as a form of accommodation. Generally, the reason for the visit is interest in the cultural and historical heritage and the activities of visits to museums and historical sites are preferred. The level of satisfaction with the destination, in general, is high, with the attributes of nature, restaurants, and culture being the most valued.

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