

Service quality evaluation in the perception of the wine tourist with Fuzzy Logic and Ideal Solutions¹

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Abstract: This article solves a multidimensional problem in order to evaluate the satisfaction of the wine tourist that visited a winery located in the South of Brazil, employing a method based on fuzzy logic. Thus, a synthetic index of satisfaction is calculated for a group of segments in which we are interested, namely, gender and image prior to the visit. The problem of linguistic ambiguity is addressed with the fuzzy sets theory, applying triangular fuzzy numbers (TFN). The synthetic index of satisfaction is based on the concept of the degree of optimality by the technique of similarity of ideal solutions. The results obtained show that the analyzed segments experienced different satisfaction. Our results can be used by the winery directors as well as by the regional planners and managers, in order to improve the competitiveness of this market niche.

Keywords: Fuzzy Logic; Triangular Fuzzy Numbers; TOPSIS; Wine tourism; Satisfaction.

Evaluación de la calidad de servicio en percepción del enoturista mediante la Lógica Borrosa y las Soluciones Ideales

Resumen: Este artículo resuelve un problema multidimensional para evaluar la satisfacción de los enoturistas que visitaron una bodega situada en el sur de Brasil utilizando un método basado en la lógica borrosa. De esta forma, se calcula un índice sintético de satisfacción para un grupo de segmentos en los que estamos interesados, a saber, género e imagen previa a la visita. El problema de la ambigüedad lingüística se aborda desde la teoría de los conjuntos borrosos aplicando números borrosos triangulares (NBT). El indicador sintético de la satisfacción se basa en el concepto de grado de optimalidad mediante la técnica de la semejanza a las soluciones ideales. Los resultados obtenidos muestran que los segmentos analizados experimentan una distinta satisfacción. Nuestros resultados pueden usarse por los directivos de la bodega, así como por los planificadores y administradores de la región, para mejorar la competitividad de este nicho de mercado.

Palabras Clave: Lógica borrosa; Números borrosos triangulares; TOPSIS; Enoturismo; Satisfacción.

1. Introduction

In the global economy, the tourism sector has shown important dynamism, principally due to the significant impacts it has on employment and incomes (World Tourism Organization [UNWTO], 2011). In Brazil, the tourism sector has established itself as an important economic activity. Nevertheless, the sector still needs to advance and a key factor of competitiveness is improving the quality of the service provision (Brida, Lanzilotta, Pereyra, and Pizzolon, 2015). Taking into account that the tourism sector has contributed to the appearance of new destinations, segments and products, in this article we will focus on the “wine tourism” segment.

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According to (Hall, Johnson, Cambourne, Macionis, Mitchell, and Macionis 2004, p. 3), wine tourist can be defined as the market segment in which the principal activity carried out is intrinsically related to visits to vineyards, wineries, wine festivals, as well as to experiencing the characteristics of a wine-making region. In this sense, it is concluded that wine tourist can be understood as the touristic activity based on the movement of people interested in getting to know the world of wine and grapes, and in enjoying and experiencing its cultural traditions.

Over time, the market started to be more competitive. This affected the behaviour of enterprises; especially, in regard to the search for the continuous improvement of performance (Esparon, Stoeckl, Far, and Larson, 2015). This entails adapting somehow, with speed and efficiency, to the changes that arise due to competition (Vila, Darcy and Gonzalez, 2015). In wine tourism, when we speak about adapting to the business dynamics, we are referring to the capacity to offer products and services of increasing quality, according to a process of continuous improvement, and taking into account tourists' expectations (Charters and Ali-Knight, 2002; Getz and Brown, 2006). In this context, it is a great challenge to satisfy the consumer and maintain a degree of service quality since there are several factors (cultural, social, personal and psychological) that can affect a person's behaviour. The quality of the service provision is essential to satisfy the tourists' needs.

The "service quality" has been studied throughout time, but it continues to be an endless source of research. Progress has allowed an evolution in the development of models to measure the service quality, incorporating new dimensions (factors) and providing a better identification of the service attributes (Ho and Yi, 2014). Furthermore, it has been proved that service improvements are a key factor to guarantee optimal business performance and to increase competitiveness.

The concept of service quality was initially addressed by Lewis and Booms (1983). They understood the concept as the difference between the expectations designed around the service and the perceptions about the received services. Parasuraman, Zeithaml, and Berry (1985) recognize that quality is an indescribable construction, difficult to achieve. Hence, its requirements are not well articulated by consumers but its importance is undeniable. Thus, the success of an enterprise lies on fulfilling or exceeding consumer expectations.

Based on this context, the motivation of this study is to try to expand the knowledge about consumers' perceptions of satisfaction about the quality of offered services in wine tourism. Our aim is to provide the sector with valuable information that can contribute to the improvement of the quality of the service provision. Besides, according to Alebaki and Iakovidou (2011), recent studies indicate that the wine tourist sector is not directly linked to wine consumption but to other factors such as gastronomy, rural landscapes, historical contexts and beautiful vineyards. Moreover, in certain regions, the importance of wine tourist is key to the creation of employment and incomes, as this sector systematically integrates diverse economic activities (Blake, Sinclair, and Soria, 2006).

In previous years, we have witnessed an advancement in the research on consumers' behaviour as a fundamental tool to help business decision making processes. Žabkar, Brenčič and Dmitrović (2010) systematically analyze service quality, consumer's behaviour and tourism. They identify how the quality of the destination is measured and the existing relation between different concepts used by different researchers as synonyms; such as the perceived quality, the satisfaction and some behavioural intentions such as loyalty or repurchase. However, in the wine tourist segment there is not much research that analyzes consumers' satisfaction or the service quality of the intervening enterprises. This is despite the fact that applications exist in other sectors such as business management (Cohen, Prayag, and Moital, 2014), the hospitality industry (Benítez, Martín, and Román, 2007), the MICE industry (Meetings, Incentives, Conferences, and Exhibitions) (Uglje, 2010) or the multi-modal journeys for urban transport services (Diana, 2012). However, till presently, satisfaction and service quality has not been deeply studied in the wine tourist sector. Quintal, Thomas, and Phau (2015) is one of the exceptions as the authors analyze the "winescape" concept and its effects on the wine tourism. They introduce a new scale to analyze a behavioural model via a questionnaire implemented in some Australian and US wineries.

Bearing in mind the scarcity of research related to the service quality and the satisfaction in this segment, this research intends to provide more empirical evidence through a methodology suitable for the analysis of the service quality in the wine tourist segment. We would like to contribute in this manner, to a better understanding of this understudied tourism segment.

The objective of this article is to evaluate the service quality in the wine tourist segment, using as a case study, a winery located in Southern Brazil. A global satisfaction index will be determined employing the fuzzy logic theory (Zadeh, 1965) as well as a multi-criteria decision making method – TOPSIS (*Technique for Order Performance by Similarity to Ideal Solution*) (Hwang and Yoon, 1981).

The rest of the article is organized in the following way: section 2 offers an adequate contextualization, according to the existing literature; section 3 describes the questionnaire and the data; in section 4, the methodology is presented; section 5 presents and discusses the results; and section 6 offers some final observations.

2. The wine tourism

In the regions of the world where wine tourist has developed further in recent years, wineries have stopped being simple centers of wine production and sales. They have turned into complex touristic products that require the use of analytical tools from other segments in order to be understood and developed. Not all of the world's wineries are ready to develop touristic products that show their facilities to the tourists neither are they ready to develop an offer that ranges from catering to hospitality. Nevertheless, this segment is increasingly gaining maturity and must be understood as an additional and complementary offer to other offers, that can coexist in the touristic destinations. As we shall see next, the winery's staff's training, which must be adequate to the wine sector, can reach special connotations that go beyond pure professionalism, kindness and empathy as required in other touristic sectors.

McGovern (2003) debunks the myths and preexisting beliefs around the origins of men's wine-making activity; he places it in the Neolithic, in Central Asia. From the Neolithic, due to multiple historical processes related to economic growth and international trade, we reach the present situation; one of balance. This situation presents an industry in which China has gone from being the 15th producer in 2001 to becoming the 5th in 2014 (Anderson and Wittwer, 2015). Thus, we can see how wine tourist trend of being a product with clear European and Mediterranean² connotations might be threatened in a not very distant future. Gastronomy and wine can play a very important role in the image of a touristic destination. Occasionally, they are the principal reason to visit a particular region, and not necessarily a complementary activity to the trip. Marzo-Navarro and Pedraja-Iglesias (2012, p. 134) state that wine tourism, while they visit wineries to participate in wine tastings or in an induction course to the culture of wine, their greatest incentive is the participation in the touristic experience itself. Hall, Sharples, Cambourne, and Macionis (2009) define wine tourist as that activity related to "the visits to wineries, vineyards, wine festivals or exhibitions, in which the principal motivation for the visit consists in savoring/enjoying the regions' wines". Thus, it is undeniable that a satisfactory experience of the visit will be linked to the quality of the wine savored/tasted. Nevertheless, the interaction with the regional experts can also have a great influence. McGovern (2003) shows how expert wine tourism, with a great knowledge of the world of wine, want to learn more historical data about the origins of the variety they are consuming at the time. Each bottle of wine has its own history. Hence, wine tourist produces a great fascination in the imagination of the wine-loving tourist.

Wine tourist produces a series of advantages at the micro and macro levels. From a macro perspective, the development of these products contributes significantly to sustainable regional development (Carlsen, 2004; Gammack, 2006; Sigala, 2014; Skinner, 2000). From a micro perspective, aspects such as the certificate of origin, the continuous quality improvement, the appearance of new commercialization campaigns and the implementation of new distribution channels, are part of the benefits that can be obtained (O'Neill, Palmer, and Charters, 2002; Johnson and Bruwer, 2007; Poitras and Getz, 2006).

Getz (2000) sustains that wine tourist presents a complex sensory experience since it involves the five senses in a more or less complete and intense way. Besides, the tourist does not need to have expert knowledge about the wine industry in order to feel, in a unique manner, the taste of the different varieties, the smell of the wineries, the way of holding a wineglass to air the wine, the smell of the different components of a particular wine; listening to the sometimes over a century-old history of the winery; from its origins up to the present; tracing the most important events that have taken place. It can even be a good time to enjoy some gastronomical products of the region, in perfect union with the wine, of which one can already have a better knowledge. Marzo-Navarro and Pedraja-Iglesias (2010) believe that, from an academic point of view, wine tourist has been analyzed to gain a greater knowledge of the characteristics of the touristic product, the motives and preferences that determine the decision making process of wine tourism. Peters (1997) was one of the pioneers, adapting the concept of "servicescape" to "winescape" to analyze the set of attributes under study in the tourism environment connected to the experience of wine. Nowadays, there is a series of academic publications that make reference to this new concept of "landscape of wine – winescape" (Anderson and Wittwer, 2015; Bruwer and Alant, 2009; Mitchell, Charters, and Albrecht., 2012; Quintal *et al.*, 2015). Despite these works, the literature

on wine tourist is still very fragmented and in its early stages, since there is no theoretic model that adequately sustains the variables that have to be studied to approach the concept. In fact, the studies that analyze the causal relations between concepts are still very limited.

2.1 Wine tourist in South America

Historically and at the global level, Europe has always been regarded as an important actor in the wine tourist segment, due to the secular knowledge attributed to it (Ministerio do Turismo [MTur], 2010). It is observed that the wine tourist experience generates positive results and it is increasingly becoming a relevant economic activity, especially for regional development.

For Barral and Bolio (2001), in South America since the XVIII century, important regions of vineyards have been developed and they have been conquering market share in the global wine production. Hall, *et al.*, (2004) state that the increasing commercialization of wines from the new world in the global market was fundamental to the rise of wine tourist in the region. According to Canalejo and Guzmán (2011), in South America, there is a great tradition of wine tourist in Chile, Argentina and Brazil.

In Zanini and Rocha's opinion (2010), Brazil's case is paradigmatic since there is evidence about wine-related tourism having a great potential to become established, not only as a touristic category but also, as an economic and social development alternative, as it is the case in other parts of the world.

However, one cannot obviate that there exists a great heterogeneity of vineyards in the wine tourist products developed in the South American region; this poses a great challenge to this work. Differences can be understood in terms of the particularities of each country, such as geographic, climatic and cultural characteristics.

In accordance to Wine Enthusiast Magazine (2005), the Route of the Colchagua Valley, located in Chile, was classified as the best wine region in the world. Given its international recognition, the route has become an icon in the South American region. This recognition is due to an integral plan that improved the quality of the wines. Besides, the international recognition has contributed to the development and strengthening of the region (Colchagua Wineries, 2013).

The Chilean success acted as a pull factor for other wineries in the region. In Brazil, diverse economic agents improved the facilities of the wineries and the quality of wines, in order to be able to compete at international level. Hence, the Route of Vale dos Vinhedos occupies a distinguished place in the world. According to Wine Enthusiast Magazine (2013), the route obtained the sixth better position among the ten best wine routes of the world. The interaction between the economic and social actors marked the difference in the success of the route. It was considered to be a differentiating factor that, not only contributed to the development of the route, but also served as a stimulating element which guarantees the identity of the economic activities in the region (Molinari and Padula, 2013). The success of the Vale dos Vinhedos route is linked to a series of actions focused on the quality of the wine. It must be stressed that the route was the first region in the country to receive the Certificate of Origin (D-O) seal in 2012 and the Origin Indication (I.P.) in 2002 (Vale dos Vinhedos Wine Producers Association [APROVALE], 2015a).

The creation of the APROVALE was an important catalyst for the creation of wine tourist in Brazil. Special emphasis was put into developing the route sustainably through this new market segment: wine tourism. The Vale dos Vinhedos route is the most significant in the country in terms of number of visitors. It covers an area of 81.123 km² (26% of which is occupied by vineyards) and it is made up of 3 towns: Bento Gonçalves (60% of the vineyards in total), Garibaldi (33% of the total of vineyards) and Monte Belo do Sul (7% of the total of vineyards) (APROVALE, 2015b).

The route of the Vale dos Vinhedos includes 29 wineries, distributed in the following way: Bento Gonçalves (25), Garibaldi (2) and Monte Belo do Sul (2) (APROVALE, 2015b). The winery subject to study is in the town of Bento Gonçalves and it receives around 200.000 annual visits - 67.81% of all the route's tourists, making it the most important winery of Brazil (Miolo, 2015). Currently, the route of the Vale dos Vinhedos is one of the principal wine tourist destinations in the country.

3. The questionnaire and the data

This article is characterized for being an study of quantitative character; an applied research based on a questionnaire to carry out data collection that enables us to know and analyze the importance satisfaction and expectations about a set of attributes that form the quality of the service offered by a winery located in the South of Brazil.

The object of study is the winery Miolo, located in the South of Brazil. The winery is found in the route of the “Vineyards Valley”. In 2002, the route became the first region of Brazil to be officially recognized under the title of “Geographic Indication (I.G.)” under the category of “Indication of Origin (I.P.)”. In 2012, this certification led to the Certificate of Origin (D.O.) of wines and sparkling wines, the most complex and valuable category of those that constitute a “Geographic Indication (I.G.)” (APROVALE, 2013a). The route receives around 294.966 annual visits (APROVALE, 2015c), and the Miolo winery receives around 200.000 yearly visits, making it the most important winery in Brazil (Miolo, 2015).

3.1 The questionnaire

The survey was developed taking into account the previous works that had developed index in our field of study. The questionnaire, in particular, is adapted following the structure of Sparks (2007), Thomas, Quintal, and Phau (2010, 2011), and Quintal *et al.*, (2015), previous works about service quality evaluation and the global satisfaction of the service for wine tourism. This allowed us to define 59 attributes (Thomas, Quintal, and Phau 2010, 2011; Quintas *et al.*, 2015)³ whose purpose is to estimate the service quality in this field of study. For each attribute, according to the theoretical models developed, we obtained quantitative information regarding two aspects: (1) the degree of importance; and (2) the satisfaction. For these two characteristics, we used a verbal Likert scale ranging from 1 - “not important at all” or “not very satisfied”, to 9 - “very important” and “very satisfied”. In this manner, we can carry out a descriptive analysis of the variables to objectively measure the perceived quality by the wine tourism.

The survey is divided in two parts with a total of seven sections. The first part, with five sections, aims to evaluate the service quality through fifty-nine attributes. The second part, with the two remaining sections, aims to typify the wine tourist adequately. The first section obtains information about the infrastructure and the physical attributes which are fundamental elements in the creation of the destination’s image. The second section collects information related to the perception of the quality of services and the experience the wine tourist have. The third section is more linked to the significant part of the meetings, the attention and the friendliness of the staff. The fourth and fifth sections obtain information about the loyalty, the image and the global quality of the winery. The sixth section obtains socio-demographic data that allows the classification of the tourists. Lastly, the seventh section obtains more general information related to the previous knowledge of the tourists about the world of wine and wine tourism.

3.2 The sample

The sample is made up of a total 385 surveys answered by the tourists who visited the Bodega Miolo between December 2014 and January 2015, the period of greater tourist influx due to the summer holidays. The size of the sample was determined for a level of trust of 95%, with 5% estimation error and 50% estimated prevalence.

The selection of participants was carried out in an aleatory fashion according to the exiting of the winery. The Miolo Winery opens every day of the week; mornings and afternoons. Tourists are welcomed by an oenologist. The reception serves to group the tourists according to the language of the visit, their interests and their previous knowledge of the world of wine. After, a select group of staff, sufficiently trained, is in charge of guiding the winery’s visit which lasts one hour approximately. At the end of the visit, tourists were selected to participate in the satisfaction survey.

3.3 The profile of the survey respondents

Table 1 shows the socio-demographic aspects of the tourists. It can be seen that Sao Paulo (37%) was the more represented province in the sample. The vineyard is located in the South of Brazil; region made up of three provinces: Rio Grande do Sul (6.90%), Santa Catarina (7.40%) and Paraná (30.1%). In total, the tourists from these provinces represented the 15.60%. The largest number of tourists were men (55.22%) with an average age of 40-49 years (48.22%), married (59.14%) and with an average income of R\$ 2.501 -R\$ 5.000 (43.65%)⁴. Tourists with secondary education (48.22%) and university education (31.73%) were the most representative groups (79.95%). Regarding occupation, the wage-earners (59.39%) and civil servants (21.57%) were the most important groups. To sum up, it can be said that the socio-demographic profile of the wine tourist who visited the winery corresponds to the profile observed in other cultural destinations: higher educational level and larger income.

Table 1: Socio-demographic profile of the survey's respondent in percentage (%)

Province of origin		Marital status	
Rio Grande do Sul	6.90	Single	21.32
Santa Catarina	7.40	Married	59.14
Paraná	1.30	Living with partner	16.24
São Paulo	37.00	Divorced	0.51
Rio de Janeiro	12.00	Widowed	2.28
Other	35.50	Other	0.51
Sex		Occupation	
Male	55.22	Wage-earner	59.39
Female	44.78	Civil servant	21.57
		Liberal Professional	9.90
		Retired	6.60
Age		Student	1.27
Less than 30 years	8.63	House-wives	1.02
30 – 39 years	15.99	Unemployed	0.25
40 – 49 years	48.22		
50 – 59 years	16.24		
60 or older	10.91	Monthly family income	
		Until R\$: 2.500,00.	15.48
Education		R\$: 2.501,00 - R\$: 5.000,00	43.65
Primary Education	9.90	R\$: 5.001,00 - R\$: 7.500,00	23.35
Secondary Education	48.22	R\$: 7.501,00 - R\$: 10.000,00	8.88
University Studies	31.73	R\$: 10.001,00 - R\$: 12.500,00	3.30
Postgraduate Studies	9.39	R\$: 12.501,00 - R\$: 15.500,00	1.78
Other	0.76	> R\$: R\$: 15.501,00	3.55

Source: Own elaboration

Table 2 presents some additional data about the tourists' profile with regard to the variables related to the visit of the winery and their knowledge of wine and wine tourism. This aspect is important because we can later analyze what internal factors of demand intervene as the determining ones when ranking the quality of experience. The great majority of those surveyed (82.23%) had little knowledge of wine and in fact, it was their first time at a vineyard (72.84%). Furthermore, it was possible to prove that this type of tourism is more practiced by couples (67.69%). The principal reasons to visit the vineyard were holidays (53.05%) and activity related to business trip near the vineyard (36.80%). With regard to the publicity and knowledge of the vineyard, the category: friends/other (65.48%) represents the most efficient promotional method. Lastly, in the context of wine tourism, it was observed that the most important aspects for tourists were expanding their knowledge of the world of wine (72.84%) and getting to know the world of wine (72.84%).

4. Fuzzy Logic and Ideal Solutions

In this study we have employed fuzzy logic methodology, which has been applied in the field of business administration (Hutchinson, 1998; Viswanathan, 1999; Xia, Wang, and Gao, 2000), and which is gaining great acceptance in the analysis of service quality (Tsaur, Chang, and Yen, 2002; Yeh and Kuo, 2003; Benitez *et al.*, 2007). Fuzzy logic is an alternative to classical logic. It allows us to capture subjectivity and imprecision in a mathematical model. It does so by considering intuitive concepts such as the degree of satisfaction, comfort or adjustment, and converting them into numerical format.

Table 2: Tourist's profile: additional data in percentages (%)

Knowledge about the world of wine		First visit to a vineyard	
Whitout knowledge	11.42	Yes	72.84
Little knowledge	82.23	No	27.16
Moderate knowledge	4.82		
Good knowledge	1.52	Reason of the visit to the vineyard	
Expert	0	Holiday	53.05
		Business trip in the region	36.08
Number of companions		Family/friends visit	1.78
Alone	2.82	Local leisure	3.55
1	67.69	Relax	4.82
2 – 4	11.79		
5 – 7	3.08	Knowledge of the vineyard	
> 8	14.62	Friends/ other	65.48
		Leaflets/Broucheres	12.94
Most important aspect related to enotourism		Internet	7.61
Getting to know the world of the wine	22.34	TV, newspapers, magazines,..	1.52
Expanding knowledge about the world of the wine	72.84	Other	12.44
Wine tourism: secondary objective of a trip in the last years	4.57		
Wine tourism: main purpose of a trip in the last years	0.25		

Source: Own elaboration

Fuzzy logic is a technique based on degrees of truth. The focus is partial reasoning (the value of truth can vary between the intervals of completely true to completely false). The principal characteristic of this methodology is based on the inaccuracy of decisions; given that human knowledge is uncertain, incomplete and inexact. As it can be inferred, this approach differs from the classical view in which decisions are based on fixed and precise reasoning (true or false).

Fuzzy logic forms complex, non lineal systems through linguistic variables, to create sets of numbers. The linguistic variables are characterized by the value being expressed in a natural and colloquial language through words and sentences. According to Dolnicar (2013), one of the biggest challenges that social researchers face, is the lack of guidelines or good practices when it comes to: (1) How to define what we want to measure? (2) How many questions are necessary? (3) How to ask these questions? (4) How to let interviewees answer? Our article centers on representing the information of the quality perceived by the wine tourism, who answered following a Likert verbal scale through triangular fuzzy numbers that are determined by the membership function (Pedrycz and Gomide, 2007; Kahraman, 2008; Zadeh, 1973). For instance, the winery's facilities are represented in a Likert scale from 1 to 9, in which 1 and 9 respectively signify: "not at all" and "very satisfied".

The theory of fuzzy sets has been used as a tool to create flexible mathematical models initially made up of variables of subjective nature or of imprecise attributes. Fuzzy sets are represented by diffuse membership functions which determine the degree of membership of each element described by a number between 0 and 1. The 0 degree of membership indicates that the value does not belong to the set while 1 belongs with total certainty. Intermediate values provide the degree of certainty about the possible membership. The most widely used membership functions are: triangular, trapezoidal, Gauss and Sigmoïdes (Pedrycz and Gomide, 2007; Zadeh, 1965).

This article is based on the use of the fuzzy sets more utilized in scientific contexts: triangular fuzzy numbers (TFN). TFNs are represented by the triplet of real numbers are defined by a triplet (a_1, a_2, a_3) of real numbers and are denoted by \tilde{A} . Each linguistic term is characterized by a TFN in order to represent its range of approximate value between 0 and 100⁵, and is denoted as (a_1, a_2, a_3) where $0 \leq a_1, \leq a_2, \leq a_3 \leq 100$.

Where α_2 is the most probable value of the linguistic term, and α_3 and α_1 are the upper and lower levels used to reflect the ambiguity of the term. Awasthi, Chauhan and Goyal (2011) show in detail the theory of fuzzy sets, in particular the TFNs, extending the previous works of Zadeh (1965), Bellman and Zadeh (1970) and Yang, Ji, Gao, and Li, (2007).

Therefore, considering the use of fuzzy logic, and taking into account the peculiarities of this research, the service quality is going to be analyzed for a set of attributes which represent the concept studied with TFNs. Table 3 shows the representation of this verbal Likert scale of 9 points in the TFNs. It can be said that it has followed a conventional model of symmetry of the points with the exception of the extreme values, as it has been the case in other previous research. (Chen, 2000; Benítez *et al.*, 2007).

Table 3. Triangular Fuzzy Numbers. Likert's verbal index of 9 points

Verbal Index	TFN
Not satisfied at all (1)	(0,0,20)
(2)	(10,20,30)
(3)	(20,30,40)
(4)	(30,40,50)
(5)	(40,50,60)
(6)	(50,60,70)
(7)	(60,70,80)
(8)	(70,80,90)
Very satisfied (9)	(80,100,100)

Source: Own elaboration

In general terms, the measurement of the perceived quality of services is a complex topic and no general and universally accepted model exists. Following Payne (1980), the first part of the battle when determining the satisfaction of the wine tourist or the service quality of the winery, consists in identifying these concepts in a way that we ourselves can understand them. Hence, we would have to define them clearly. Once we are confident that the definition is clear, we can start putting it into words that the interviewees can understand unequivocally. However, the employed concepts are clearly multidimensional as they are abstract and exist only in the imagination of the researchers. Bagozzi (2011) states that the theoretical meaning of a construct or concept should be defined in terms of its structure, specificity, reach, ambiguity, vagueness and transcendence regarding its presence; taking into account both its possible antecedents and its consequences. However, judging by Dolnicar (2013), there is no clear guide to achieve this. After all, antecedents and consequences can never be known before carrying out a study. Following Rossiter (2011), when the object and attributes are abstract, the following elements have to be specified: (1) the evaluator; (2) the object; (3) the object's dimensions; (4) the attributes and (5) the components of the attributes. In our case, the evaluators are the wine tourists who have visited the winery (1); the satisfaction of the wine tourist is the analyzed object (2); we analyze three dimensions: tangible, experiences and interactions with the staff (3); we analyze 31 attributes (4); and 31 unidimensional components (5)⁶.

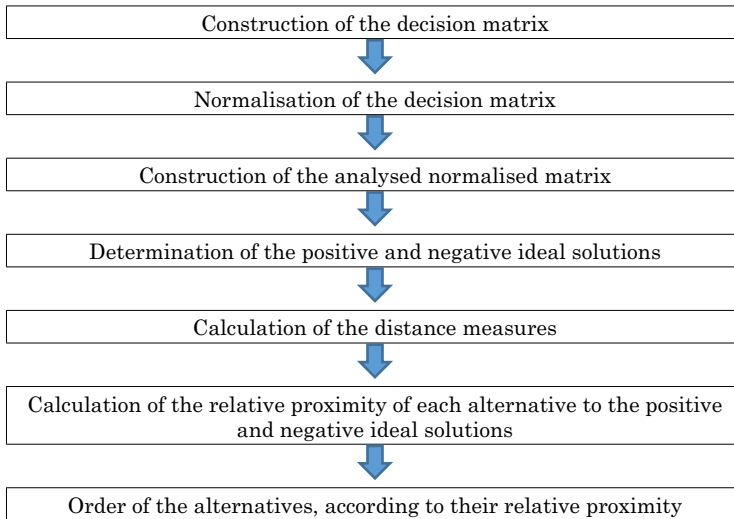
Following Roy (1996), there are various multi-criteria Decision Making methods (MCDM) that can be used in the decision making process. The MCDMs are important tools to help managers in situations of uncertainty, complexity and contradictory objectives (Wang, 2010). Vincke (1992) subdivides the MCDMs according to the North-American or European school. Another classification corresponds to Figueira, Greco and Ehrgott (2005) and Kahraman (2008). They separate methods between Multiple Attribute Decision Making (MADM) methods and Multiple Objective Decision Making (MODM) methods.

Taking into account the diverse existing methods, in this work we have employed the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method, which was proposed for the first time by Hwang and Yoon (1981). The basic principle of TOPSIS is to choose the alternative that is as close as possible to the positive ideal solution, according to a coefficient of similarity that measures

the similarity between the alternatives. This method has been widely used to deal with the decision making process (Dymova, Sevastjanov, and Tikhonenko, 2013; Yue, 2011).

It is a method that evaluates the performance of alternatives where there are multiple attributes and chooses a positive ideal solution. Then, this result is presented in a ranking which contains all the best reachable values of the alternatives. The ideal solutions occupy a prominent place in the method, and they are obtained by maximizing (minimizing) the benefit criteria and minimizing (maximizing) the cost criteria (Kahrman, 2008). Table 4 shows the steps to follow in order to carry out a TOPSIS method.

Table 4: Sequential development of the TOPSIS methods.



This article uses thirty one attributes to evaluate the satisfaction of the wine tourist who visited a winery in the south of Brazil. Being an abstract concept and thus, multidimensional, it is fundamental to understand the existing relation between the satisfaction and its respective attributes. Mainly, because this information is very relevant for the winery's managers. Based on the supposition of the functional dependence, it was possible to calculate the elasticity value of the satisfaction with respect to each one of the attributes. The elasticity is a standard measure of the sensitivity of a variable due to the changes in another variable. It is expressed as the relation of the percentage variation of said variables (Coyle, Buxton, and O'Brien, 2003). In this context, the calculation of elasticity is an important tool as it can indicate the degree in which a variable changes according to the behaviour of other variables. Elasticity is one of the most important economic concepts and it has its origins in Physics.

5. Results

This section is divided in two parts with the aim of improving the understanding of the results. The first part analyses the ideal solutions, which are essential to calculate the synthetic indicators through the TOPSIS method. The second part focuses on analyzing the synthetic indicators of satisfaction for a determined segment of the wine tourist in accordance to the vineyard's image they had prior to the visits well as the elasticity value for this segment.

5.1 Ideal Solutions

Table 5 shows the ideal solutions, both positive and negative, of the analyzed wine tourism. It can be seen that the table contains six columns. In the first one, the denomination of each one of the 31 analyzed attributes appears. The second and third columns present, respectively, the vector of the positive ideal solution and the segment that obtained the best evaluation. In similar fashion, columns

4 and 5 present the negative ideal solution and the segment that received the worst evaluation. Finally, the 6 column presents the percentage of variation between the best and the worst observations.

Table 5: Ideal Solutions

Idsection	Apos	Obs	Aneg	Obs	Perc-var
A1 Access to the vineyard	95	'D10S4'	40.00	'D1S5'	137.50%
A2 Reception facilities	95	'D8S5'	50.00	'D1S5'	90.00%
A3 Winery facilities	95	'D11S5'	40.00	'D1S5'	137.50%
A4 Shop facilities	95	'D8S5'	55.00	'MStat6'	72.73%
A8 Toilet facilities	95	'D7S3'	40.00	'D1S5'	137.50%
A9 Accessibility for the disabled	95	'D7S3'	50.00	'D1S5'	90.00%
A10 Cleaning of the vineyard	95	'D8S5'	50.00	'D1S5'	90.00%
A11 Decoration/Architecture of the vineyard	95	'D11S5'	50.00	'D1S5'	90.00%
A12 Presence of the natural environment in the vineyard.	95	'D10S3'	50.00	'D1S5'	90.00%
A14 Wine awarded (national/international)	95	'D8S5'	50.00	'D1S5'	90.00%
A15 Organized wine routes	95	'D10S3'	50.00	'D1S5'	90.00%
A16 Region's climate suitable for wine tourism	95	'D8S5'	50.00	'D1S5'	90.00%
B1 Buying products related to the vineyard	95	'D10S1'	50.00	'D1S5'	90.00%
B2 Purchase odd wines	95	'D10S1'	63.23	'D11S8'	50.24%
B3 Buying wines at reasonable prices	95	'D10S1'	32.50	'D1S5'	192.31%
B5 Participation of the oenologist (wine expert) in the visit	95	'D1S5'	70.00	'D10S2'	35.71%
B9 Eating and drinking traditional products	95	'D10S1'	50.00	'D1S5'	90.00%
B11 Planned trips (groups, thematic visit, tasting, etc.)	95	'D10S2'	50.00	'D1S5'	90.00%
B12 Presence in the shop/outdoor markets of regional products and handicrafts	95	'D8S4'	50.00	'D1S5'	90.00%
B17 To participate in the area's cultural tourism	95	'D8S4'	50.00	'D1S5'	90.00%
B18 Getting to know the historical and cultural heritage of the vineyard	95	'D10S2'	50.00	'D1S5'	90.00%
B19 Getting to know the world of wine	95	'D10S1'	50.00	'D1S5'	90.00%
B20 Wine tasting	95	'D7S3'	40.00	'D1S5'	137.50%
B21 Getting to know the system of production of the grape	95	'D10S1'	50.00	'D1S5'	90.00%
B22 Getting to know the production process of wine	95	'D7S3'	50.00	'D1S5'	90.00%
B24 Visit at a fair price and value	95	'D10S1'	50.00	'D1S5'	90.00%
C1 Friendly and kind staff	95	'D8S5'	50.00	'D1S5'	90.00%
C2 Professional Staff	95	'D8S5'	50.00	'D1S5'	90.00%
C3 Staff with the adequate personal image (hygiene and appearance)	95	'D8S5'	60.00	'D1S5'	58.33%
C4 Staff with command of languages	95	'D8S5'	50.00	'D1S5'	90.00%
C5 Competent staff	95	'D8S5'	40.00	'D1S5'	137.50%
D1. Image of the vineyard prior to the visit D7. Price with relation to the perceived quality D8. Authenticity and originality of the vineyard	D10. Possibility of returning to the vineyard D11. Possibility of recommending it to friends or relatives MStat. Marital Status				

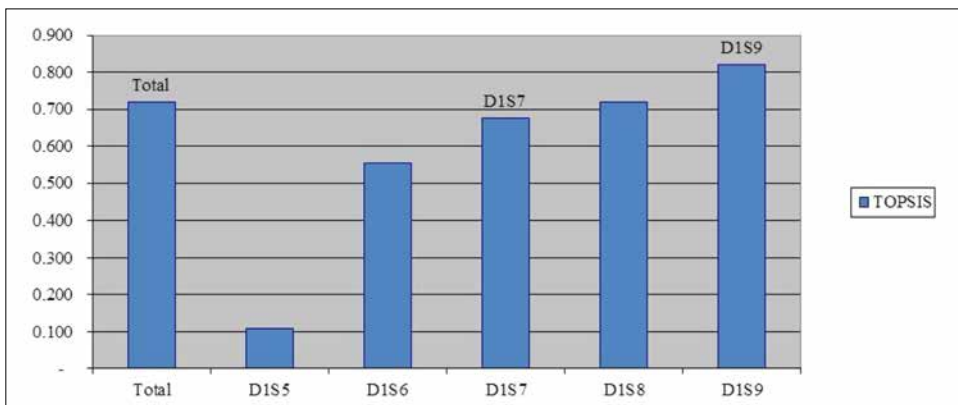
If we analyze the table for the different attributes, the first thing that can be observed is that from all the socio-demographic variables of segmentation, the only one that intervenes in the calculation of the ideal solutions is the civil status. It can be seen that the individuals with a different civil status from the anticipated one, present the worst evaluation of the shop's facilities. The rest of the segmentation

variables that influence the ideal solutions are related to the image, the experience and the loyalty. To be precise, the variables that intervene are: the vineyard's image prior to the visit, the price in relation to the perceived quality, the authenticity and originality of the vineyard, the possibility to return to the vineyard and the possibility of recommending it to friends or relatives. Observing the positive ideal solution, it can be seen that there has always been a segment which has evaluated as "very satisfied" all the attributes included in the measurement of the satisfaction of the wine tourism. While if we observe the negative ideal solution, it can be seen that this behaviour is not symmetrical and that the attributes which have been ranked worst by some of the segments (in the majority of cases, the wine tourist that have evaluated the image of the winery prior to the visit as a 5) are: the access to the vineyard, the winery's facilities, the toilet facilities, the purchase of wines at reasonable prices, the wine tasting and the competent staff. For obvious reasons, these same attributes are the ones that present a higher heterogeneity of results between the two extreme ideal solutions.

5.2 Synthetic Indicators of Satisfaction and Elasticity

Figure 1 shows the results obtained after obtaining the synthetic indicator of satisfaction TOPSIS considering the variable D1 of segmentation⁷, which represents the image of the vineyard prior to the visit, as well as the general result for all the wine tourist that participated in the analysis. It can be seen that the synthetic indicator of satisfaction presents a behaviour with a tendency to grow, between the image and the satisfaction perceived. Besides, as it could not be otherwise, the value of global satisfaction for the group of all the wine tourist is an average value between the values obtained for the analyzed segments. This result is quite coherent, and it has already been obtained in the literature following other kind of methodology. For example, Liat, Mansori, and Huei, (2014) analyzing the hospitality industry in Malaysia, find that there is a positive link between the quality of the service, the client's satisfaction, the corporate image and the loyalty of the client. It can be concluded that to the extent that the image of the winery is better, the satisfaction experimented by tourists is higher. Thus, the winery should make an effort to improve the image that the tourists have prior to their visit; through informative leaflets, talks or advertising campaigns at places of interest within the region.

**Figure 1: Synthetic Indicator of satisfaction TOPSIS.
(D1 – Image of the vineyard prior to the visit.)**



Finally, Table 6 shows the obtained results in the elasticity of the satisfaction with regard to each of the attributes that intervene in the total of wine tourist and the segments differentiated by gender; meaning the group of the men and the one of the women. At a general level, it can be seen that all the calculated elasticity show that the global satisfaction is inelastic with regard to all the attributes. However, looking at the magnitude of the values, it is concluded that the satisfaction is more elastic with regard to the attributes of experience such as, for example, the purchase of odd wines and at reasonable prices as well as being able to eat and drink traditional products. On the other hand, it can

be seen that satisfaction is more inelastic with regard to the shop facilities, the region's climate and the participation of oenologists or staff specialized in the world of wine.

Table 6: Elasticity of the satisfaction by attribute. Total, Male, Female.

Attribute	Total	Male	Female
A1 Access to the vineyard	0.070	0.068	0.075
A2 Reception facilities.	0.068	0.069	0.067
A3 Winery's Facilities	0.074	0.076	0.072
A4 Shop facilities	0.061	0.062	0.059
A8 Toilet facilities	0.075	0.076	0.075
A9 Accessibility for disabled people.	0.081	0.080	0.081
A10 Cleaning of the vineyard.	0.080	0.082	0.076
A11 Decoration / Architecture of the vineyard	0.082	0.083	0.080
A12 Presence of the natural environment in the vineyard	0.074	0.074	0.074
A14 Wine with awards (at local level/international level)	0.083	0.081	0.086
A15 Organized wine routes	0.078	0.078	0.078
A16 Regional weather suitable for wine tourism	0.057	0.058	0.056
B1 Purchase of products related to the vineyard.	0.080	0.079	0.081
B2 Purchase of odd wines	0.096	0.094	0.096
B3 Purchase of wines at reasonable prices.	0.094	0.092	0.099
B5 Participation of the oenologist (wine expert) in the visit.	0.056	0.057	0.054
B9 Eating and drinking traditional products.	0.093	0.089	0.100
B11 Planned trips, groups, thematic visit, tastings, etc.)	0.079	0.079	0.079
B12 Presence of regional products and handicrafts inn the shop/outdoor market	0.082	0.081	0.083
B17 To participate in the area's cultural tourism	0.076	0.076	0.076
B18 Getting to know the historical and cultural heritage of the vineyard	0.084	0.082	0.086
B19 Getting to know the wine world	0.072	0.075	0.068
B20 Wine tasting	0.082	0.084	0.078
B21 Getting to know the production system of the grape	0.073	0.071	0.075
B22 Getting to know the production process of wine	0.075	0.077	0.072
B24 Visit at a fair price and value	0.074	0.076	0.071
C1 Friendly and kind staff	0.073	0.076	0.067
C2 Professional Staff	0.073	0.076	0.068
C3 Staff with the adequate personal image (hygiene and appearance)	0.066	0.069	0.061
C4 Staff with command of languages	0.073	0.076	0.067
C5 competent staff	0.079	0.083	0.074

Analyzing the particularities of every segment, we observe that the general pattern is sustained since we deal with a segmentation that separates the wine tourist in only two groups. Nevertheless, there is a difference worth stressing in the magnitude of values. Thus, for example, it can be seen that women turn out to be more inelastic with regard to all the attributes related to the winery's staff, while they present a greater elasticity in the attributes of experience that turned out to be more elastic. The

recommendation for the directors is clear: they have to intervene in those variables of experience with a greater emphasis on the female segment. Hence, it is suggested that the winery should highlight more the varieties which are harder to find in the rest of the world, offer competitive prices and a greater diversity of local gastronomic products that highlight the experience of the visit as a whole. These outcomes are comparable to those obtained in previous works. Thus, for instance, Dodd and Gustafson (1997) and Bruwer and Alant (2009) observed that the affordable prices on the winery's door have a positive influence in the wine tourism's attitude. In a similar manner, Roberts and Sparks (2006) conclude that the value for money in the purchase of wine is an essential attribute to strengthen the competitiveness of an wine tourist region. With reference to the complementary gastronomic products, the same authors conclude that the combined tasting of wine and local products such as olives and cheese, enhance the wine tourism's experience.

6. Conclusions and Final Observations

This study intends to provide greater empirical evidence about how to calculate the satisfaction of wine tourism, through a questionnaire based on previous studies which clarified in a conceptual manner the definition and components of what is known as "winescape". Bearing this objective in mind, we built a synthetic indicator of the satisfaction of the wine tourist experience, based on 31 different attributes that corresponded to three groups of dimensions: tangible, experience and personal. Through the analysis of the different segments based on the socio-demographic, image and loyalty variables, it was possible to build the ideal solutions. These ideal solutions are essential in order to apply our multi-criteria method based on the similarity of the different alternatives to the positive ideal solution (TOPSIS). The empirical application is based on the visit of the wine tourist to the Miolo winery, one of the most important in the South American region.

Our results can contribute to assist the development of improvement programs that allow the winery to obtain better results in the future. Thus, it was shown that the attributes of experience such as, for example, the purchase of odd wines at reasonable prices as well as being able to eat and drink traditional products, are the attributes that present greater elasticity. Hence, these are the key factors that can improve the satisfaction of the wine tourist and the improvement plans need to have a direct impact on them. These results are not transferable to other contexts. For example, Quintal *et al.*, (2015) found, in the case of a US winery, that the wine seemed to be the most remarkable attribute of the experience and that the complementary products had a negative effect. However, our outcomes are more in agreement with the ones obtained by authors in Australian wineries. There, the complementary products seem to contribute to a better global experience.

In an analogous way, the shop facilities, the region's climate and the participation of oenologists or staff specialized in the world of wine, turned out to be attributes that presented the more inelastic values. Hence, to focus on them might not be advisable. Once again, our results were in line with the ones from other works in which it was shown how the shop facilities in the New World's wineries do not have the same degree of cultural heritage as it can be the case in the wineries of the old continent; such as in Spain, Italy or France. It seems as if the wine tourist had already internalized this intrinsic characteristic of the winery and they would not ask for what they can demand in other territories.

With reference to the analysis carried out about the winery's image the tourists had prior to the visit, it was observed that there was a growing trend in relation to the satisfaction and the image of the winery. Thus, it is advised that the winery directors establish marketing plans to strengthen the image of the winery prior to the visit. A lot of wine tourist lack previous experience of the world of wine and cannot appreciate in a professional way the quality of the wines. However, the existence of a professional oenologist seems not to improve the satisfaction of the wine tourism. Hence, more imaginative approaches are required to discuss the wine's properties.

Focusing on the analysis of the sensitivity of the different attributes by segment, there was a general trend with regard to those that presented a greater and minor elasticity, while the magnitude of the men and the women could be differentiated. In particular, it was observed that the key attributes were reinforced in the case of the women, while the opposite happened with the attributes related to the staff.

With reference to the transfer of knowledge, it can be said that our method contributes to the state of the art in the wine industry, being perfectly applicable. Wineries can adapt the questionnaire that we have employed, taking into account the environment, to be able to evaluate the satisfaction of their visitors. As the winery directors can influence the majority of the attributes included, the results can

be used to establish plans of continuous improvement to help the winery gain a greater presence and competitiveness within this market niche.

Regarding the limitations of the study, it can be mentioned that the results are based on only one winery of the South of Brazil and therefore, they might not be representative neither transferable to other geographic environments. Besides, we have taken a micro approach that might not be valid for bigger campaigns in an already consolidated wine region in the old Europe, such as La Rioja or Bordeaux. Less problems might arise when comparing our results to other wineries of the same geographic area, such as Chile, Uruguay and Argentina. In any case, the results could be compared in order to see which attributes can serve to homogenize or differentiate the product.

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Notas

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- ² France, Italy and Spain are the three bigger wine producers in the world.
- ³ Thomas *et al.*, (2010,2011) and de Quintas *et al.*, (2015) questionnaire had a total of 20 attributes divided in 7 dimensions:(1) general; (2) atmosphere; (3) wine quality; (4) wine value; (5) complementary products; (6) sign-spacing; (7) personal. Nevertheless, some of the recommendations were followed in regard to having greater diversity in the winery's workforce as well as in the offer of complementary products.
- ⁴ On 2nd January 2015, the value of the Euro was 3.24 R
- ⁵ Other ranges such as (0-7) or (0-10) are also valid.
- ⁶ The attributes are unidimensional due to the object of study being clearly determined, following Rossiter's guide.
- ⁷ This segmentation is interesting since it was one of the most influential in the calculations of the ideal solutions.

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