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Title Page

The impact of Virtual Reality technology on tourists' experience: a textual data analysis

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The impact of Virtual Reality technology on tourists' experience: a textual data analysis

Abstract

This paper is focused on the study of the quality of experience lived by tourists when visiting a cultural heritage destination by using a tourist product based on a virtual tour. The research is justified by the increased demand by tourists to have a memorable experience in a destination as well as the growing offer on virtual reality and augmented reality technologies applied to the tourism sector. The database consists of online comments extracted from those who visited two well-known tourism destinations in Spain, Seville and Barcelona where the Immersive Virtual Reality Technology named Past View is currently used. A total of 119 online comments on the tourists' experience after the use of the Past View smart glasses and posted in the e-WOM community Trip Advisor were valid for the analysis. Using a correspondence analysis of textual data, the results shed light about how virtual reality technologies influence on tourists' quality of experience. The findings drawn from the empirical analysis provide Destination Marketing Organizations suitable and useful information to promote the destination and therefore encouraging entrepreneurs to innovate in tourism sector to attend the desire of tourists to have a memorable tourist experience.

Keyword: Virtual Reality (VR); Immersive Virtual Reality (IVR); Past View; Tourist Experience Quality; Correspondence Analysis.

1. Introduction

Tourists often make decisions under substantial uncertainty regarding the benefits of visiting a particular destination (Vogt and Fesenmaier, 1998; Fesenmaier and Jeng, 2000; Cho, Wang and Fesenmaier, 2002). One reason for this uncertainty is the lack of "objective" criteria (i.e., physical attributes) that can be used to evaluate a particular destination (MacKay, 1995). Nelson (1970) referred to these uncertainties as "experiential attributes" because they can be identified only through users' experiences.

Users' experience was defined by Law et al (2009, p. 719), as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service". Latterly, a high extended users' experience notion was provided by ISO 9241-11. In this notion, users' experience is formulated as consequence of a wide of elements such as: presentation, functionality, system performance, interactive behaviour, assistive capabilities of an interactive system (both hardware and software), user's prior experiences, attitudes, skills, habits and personality. With respect to this notion the mentioned norm broad the usability term by "means of its re-interpretation from the perspective of the users' personal goals, which can include perceptual and emotional aspects" (ISO, 2010, p. 7).

The argument that the best way to examine the experiential attributes of a destination and to form a mental image for it, is to experience the destination by actually visiting the place (Gartner, 1993; Govers, Go and Kuma, 2007) is not novel. However, it is still very difficult to have a direct trial experience in tourism activities due to the unique nature of tourism products and services (Han, tom Dieck and Jung, 2018). Therefore, it is more and more defended that concerning a suitable and reliable understanding on how the tourism products must be provided, practitioners cannot solely rely on their features (i.e. ease of use, immediacy, usability, visual appearance...). Thus, it appears to be necessary the inclusion of other strongly connected topics (Law, 2011) such as user experience, quality of services, user's service experience quality or the use and influence of innovative Virtual Reality (VR) technologies such as Immersive Virtual Reality (IVR) technologies. Accordingly, it is claimed that while usability and quality have been addressed in previous studies of human-computer interaction (Harrison, Flood and Duce 2013; Weyers, Bowen, Dix and Palanque, 2017), however few studies have assessed which and to what extent the tourism elements affect the overall users' quality experience (Han et al., 2018). Likewise, which and to what extent the emerging Information Communication Technologies (ICTs) as IVR influence the overall user experience have not been also studied deeply (Marchiori, Niforatos and Preto, 2017). Therefore, more research relying on user experience within the leisure tourism context is increasingly demanding (Han et al., 2018).

Advances in ICTs have had great impacts on tourism sector ranging from consumer demand to tourism management, transforming it in myriad ways (Buhalis and Law, 2008). In this vein, O'Sullivan and Grigoras (2015) argued that the mobile user experience is the result of an effort carried out by those who strives to optimize the overall users' experience. Nevertheless, given that these changes are evolving faster than the awareness of the tourism sector and its practical implementation, this sector needs a "constant redefinition and requires a continuous reorientation in marketing and management along the way" (Egger and Buhalis, 2008, p. 1). Therefore, many tourist agents are not still prepared enough to adopt and adapt their tourism products and themselves to the new technologies (Guttentag, 2010).

Virtual reality is considered as a significant area of ICT being increasingly applied already in a high number of diverse tourism fields (i.e. hotel, entertainment, restaurants, museums, virtual tours, design, simulation training, cultural heritage ...), since VR technology continues to evolve and, in parallel, VR already has diverse uses within the tourism sector. Virtual experiences using environmental simulations such as sketches, photographs, videos and websites are considered paramount to successfully create and communicate an image of a destination (Cho and Fesenmaier, 2001; Hyun and O'Keefe, 2012; Ihamäki, 2012) beside of providing more real-life experiences (Staats, Gatersleben and Hartig, 1997; Govers and Go, 2004; Bastida and Huan, 2014). Moreover, the emergence of the Internet and VR systems enable tourists to be active virtual participants, choosing what they want to "experience" and how and hence to better assess the destination. Thus, these IVR technologies are increasingly available for the main activities related to tourism in their different fields (world heritage, museums, hotels, restaurants ...) reaching a growing group of tourists (Damala, Stojanovic, Schuchert, Moragues, Cabrera and Gilleade, 2012; Haugstvedt and Krogstie, 2012). Otherwise, this current use of ICTs and especially IVR technologies has evolved and increased thanks to

Comentado [pdi1]: No creo necesario poner el significado del acrónimo aquí ya que lo hemos puesto en las palabras claves, pero bueno, tú decides...

the high familiarity and good predisposition shown by individuals towards new technologies, as well as their fast and comfortable learning in addition to their speed and convenience in use (Fino, Martín-Gutiérrez, Fernández, and Davara, 2013). Besides, a suitable experience of the tourists both concerning to IVR technologies' uses and their quality experiences attributed to their feeling after the visit or the use of each tourist product or service is another factor connected to the good results achieved by using IVR technologies in tourism. Hence, it is relevant to design, develop and to implement tourism products capable to generate pleasant experiences in tourists (Garrett, 2006; Beggs, Ross and Goodwin, 2008; Robinson, 2015). Chitturi, Raghunathan and Mahajan (2008) support the argument that these tourist products that can delight tourists' experience and contribute to enhance a favourable destination image, which in turn is transmitted through positives e-WOM reviews. Therefore, there is little reason to doubt that its use will become more prevalent for the whole society and for the tourism sector. Accordingly, it is widely defended that tourism researchers and professionals should be more active for a deep understanding of the impact of VR technologies on tourists' experience to best prepare themselves to face the challenges and take advantage of the opportunities that these VR technologies presents to the success of their tourism practices (Guttentag, 2010).

Accordingly to previous arguments, many destination-marketing organizations (DMOs) have invested substantially in creating diverse IVR technologies such as Web-based virtual tours, smart glasses ...that make tourists to live and feel experiences through the five senses by being immerse in a virtual parallel reality in a tourist destination. These IVR tourism products and services are increasingly considered as an effective promising strategy, which allow institutions, suppliers and local communities to be involved to create entertainment while protecting and safeguarding wild/cultural destinations.

In this paper, we also strive to address the following aims: (1) Identify the most frequent topics recognized by tourists when experience a virtual visit. (2) Explore the tourist quality experience when using an IVR technology (Past View) during a visit tour by analysing e-WOM comments in two heritage sites. (3) Provides future research avenues to identify attributes related to the IVR technologies' uses and experience within the tourism sector by using unstructured techniques.

The paper structure is commented bellow. After the Introduction section, the Theoretical background and Methodological aspects are presented in detail. Then, the main Results achieved are discussed. Finally, Conclusions, Limitations, Suggestions, Implications and Future research lines are provided as to how tourism organizations could better market their tourism destinations by taking advantages of the use of IVR technologies as essential part of their promotion by means of virtual tour.

2. Theoretical background

2.1. Virtual Reality technology– Immersive Virtual Reality technology in Tourism Sector

There is a co-existence between real and virtual world results by the use of VR technologies (Milgram and Kishino, 1994). The line between the real and virtual is hardly distinguished due to the use of these digital technologies that also offer their users the possibility to increase their level of immersion when living virtual tourism experiences (Jung, tom Dieck, Lee, and Chung, 2016). In this vein, some VR technologies let users the possibility to enhance their own experiences at tourism destinations through their own senses. Moreover, it provides tourists a good image of the tourism destinations capable to influence the final tourist consumer behaviour by means of other tourists' comments regarding the quality of their experiences (Neuhofer, Buhalis, and Ladkin, 2014; Little, Patterson, Moyle, and Bec, 2018). Marchiori, Niforatos and Preto (2017) revealed that VR experience hold the potential to lead to the formation of strong memories, providing a better understanding of the effects of VR technology on consumer behaviour and thereby, leading the possibility to design a more engaging VR content.

There are many definitions regarding to virtual experiences. In the earlier papers, virtual experience is assimilated to the experience of “flow within a virtual environment” (Csikszentmihalyi, 1975; Nakamura, and Csikszentmihalyi, 2009). Latterly, Steuer (1992) established that virtual experience is an experience in a virtual environment using a computer-mediated environment based upon “telepresence”, that is, “the sense of being” in an environment mediated by a communication media. Nowadays, these virtual experiences are reached by the implantation of IVR technologies in the tourism industry.

It is extensively recognized an exponential increase of the investment into IVR technologies that provide many opportunities by tourism sector (Baciu, Opre, and Riley, 2016; Wei, Qi and Zhang, 2019). In this sector, the tourism agents have strived to take advantages of the use of these IVR technologies in order to achieve, mainly, a better tourism quality experience and in turn, a high level of success of their managerial goals (Bloom, 2020; Little, Bec, Moyle and Patterson, 2020). In these terms, the mainstream research lines have been evolved around the two following tourism aims: to preserve cultural values heritage destinations and to engage actual and potential tourists by offering them the possibility of enjoying and experimenting a new way to do tourism. The tourism suppliers take advantages from the improvements on the tourists' experience quality and tourism destination image that the IVR technologies provides when tourists feel transported from the real to the desired world by a limited time. However, in despite of this growing prominence of these novelty technologies in the tourism context, today there are still limited researches that reveal a conceptual clarity about certain questions. For instance, it is well-known the current debate around how culture tourism heritage can be preserved by using IVR technologies or how these heritage places can be transferred to the digital world (Bec et al, 2019). Against the controversy mentioned above, many theorists and practitioners continue defending the benefits from a suitable and real implementation of IVR technologies in tourism sector. Accordingly, IVR is probably one of the most appealing and

potentially effective technologies to serve tourism agents to modulate the cultural offer by structuring different strategic action lines to meet a wide number of different tourist profiles (Carrozzino and Bergamasco, 2010).

In cultural heritage tourism-VR stage. An increasing number of cultural heritage agents are looking for innovative ways to make possible a high participation of tourists through the latest technological innovations related to IVR or Augmented Reality (AR) (Tscheu and Buhalis, 2016). Specifically, from the IVR technologies' implementation they seek to achieve, among others, a suitable quality of tourist experience capable of convincing these tourists of the magnificence or good opportunities to travel to these cultural heritage tourist destinations. Another factor that is favouring the implantation of IVR technologies in cultural heritage are the social and behavioural changes of both tourists and the way of doing business due to the impacts of ICT technologies in the tourism sector. Thus, for example, it is increasingly assumed by tourism agents that the demand and/ or requirements by tourists of these technological resources increases as a greater number of them are accustomed to the use of new technologies along with a greater degree of knowledge and training on their part. In this vein, tourist agents strive to take advantages of these tourists' technological needs, commonly connected to tourists' feelings and desires (the idea to gain facilities, satisfaction, quality experience...) developing and applying novelty IVR devices mainly to enhance these tourists' quality experiences (Leue, Jung and tom Dieck, 2015) and therefore to favour successfully their managerial goals. A high level of quality experience can provide a good destination image and consequently to stimulate its competitiveness. Furthermore, tourism organizations need to carefully explore the potential investments on new IVR technologies since, as argued by tom Dieck and Jung (2017), the satisfaction of tourists and therefore their intention to return reveals a favourable quality of experience which would be spread by positive word-of-mouth posted after the visit. Hence, it is strongly linked to the destination's overall image and hence the tourism destination's promotion and success (Tussyadiah, Wang, Jung, and tom Dieck, 2018).

The same arguments can be exposed regarding to the actual virtual museums- VR stage. Some research broadens the advantages of using these IVR technologies recognizing that their use can provide certain tourist groups such as elderly people (Jen, Pai and Yeh, 2017), groups with disabilities (mobility, blindness, hearing loss ...), economically deprived individuals among others, with a high level of accessibility and enjoyment of these tourist products similarly to the experience of others. This result is achieved by the whole inclusion of those groups in the virtual tourism experience (Buhalis and Darcy, 2010; Buhalis, Darcy and Ambrose, 2012; Jung and tom Dieck, 2017). The IVR technologies help DMOs to work for a more accessible tourism in all the travel stages from the pre-visit stage when organizing the visit to the enjoyment on site by extending tourism boundaries across the modern entertainment industry (Chang, Backman and Huan, 2014; Huang, Backman, Backman and Chang, 2016).

To conclude, it is extensively recognized that thanks to these fast technological development and progressively implementation in tourism sector, "the level of realism achieved in computer animations generated by virtual reality technology has become almost lifelike" (Jeng et al, 2017, p. 51). This "realism" offered by VR technologies, and specifically, by IVR technologies is a new novelty way to do business that focuses on a suitable promotion of the tourism products

(i.e. destination tourism, museum visits...) being capable to boost a tourists' favourable experience quality gained by their own senses.

2.2. Service Quality and Experience Quality

The importance of service quality has been highlighted in the tourism literature. Earlier paper have postulated that service quality, perceived value, and satisfaction constitute the three major antecedents affecting tourists' behavioural intentions (Baker and Crompton, 2000; Petrick and Backman, 2002; Petrick, 2004), being identified four models from different perspectives regarding those constructs and their relationships (Cronin, Brady, and Hult, 2000). Past studies have suggested that tourist service quality perception and perceived value influence tourist satisfaction and therefore their loyalty and their post-behaviours (Bignie, Sanchez, and Sanchez, 2001; Chen and Tsai, 2007; Chen, 2008; De Rojas and Camarero, 2008). Accordingly, a high degree of satisfaction with the visit leads tourists to not only revisit a destination but also recommend it to others by means of positive opinions about the place. However, on the contrary, a low level of satisfaction is associated to an unfavourable image of the tourist destination that might damage its market reputation (Reisinger and Turner, 2003). Therefore, as noted by Soler and Gemar (2019), it is really relevant to bear in mind to what extent the tourism businesses along with the organisations responsible for tourism management are primarily responsible for the final quality of a tourism destination and thereby, the tourist quality experience. Vollge and Pechlaner (2014) claimed that it was necessary to identify both actual and potential attractiveness of the tourism destination and its strength and weaknesses to provide a suitable tourism product able to meet the tourists' requirements. This allows tourism managers to create new opportunities by adapting their tourism offer to changes in the tourism industry's environment accordingly to the mentioned knowledge to improve the tourists' experience quality and their final satisfaction and thereby, enhancing a good tourism destination image (Dwyer, Edwards, Mistilis, Roman, and Scott, 2009).

Furthermore, it is necessary to deep on the knowledge of other quality topics. Thus, in tourism literature, also appear other related quality issues such as the staff quality (Apostolakis and Jaffry, 2005) and the consumer's experience quality (González-Rodríguez, Domínguez-Quintero and Paddison, 2019; Domínguez-Quintero, González-Rodríguez, and Paddison, 2020). Accordingly, it is highlighted, the benefit that service experience has on final consumer satisfaction (Otto and Ritchie, 2000), the high preferences of consumer respect to high qualified personnel (Apostolakis and Jaffry, 2005), and how a better perceived quality imply a better quality of experience and thereby, a better satisfaction regarding the services per se provided (Chen and Chen, 2010).

As recognized by Suhartanto et al (2019) although experience quality has become an increasing research topic in recent years, however there is still a lack of a widely accepted concept and research focused on this issue. In most of papers, while service quality has been discussed concerning a service performance at the attribute level, however experience quality has been extending to cover psychological outcomes resulting from tourists' participation in tourism activities. Otherwise, while in the former topic the quality of the attributes is under the control of a tourist supplier, however, in the latest, the quality of experience involves these

attributes provided by a tourist supplier plus the ones brought by the visitor. Thus, in tourism literature, researchers explain experience quality as the tourist's psychological and social reaction towards the performance of a tourist attraction (Chen and Chen, 2010). That is, as postulated by these scholars, experience quality refers to "tourists' affective responses to their desired social-psychological benefits" (Chen and Chen, 2010, p. 30) including the contact with people that evolve the transaction and offering a service that contribute to the final quality experience (Chan and Baum, 2007). As part of the service experience, the tourist's experience quality can be articulated by the fun and fantasies of these individuals regarding to the attraction offered (Cetin and Bilgihan, 2016). It implies that the experiences of these tourists are not only related to the degree of attraction of the service, but also, with the experiences they lived when they interact, during the process of co-creation of the experience, with the attraction provided in the tourist destination. Unlike the service quality, the quality of experience includes emotions and feelings (Suhartanto et al, 2019).

Beyond the notion of experience quality, the academic literature has been also worried to establish a proper and reliable measure. It has been mainly motivated by the fact that different tourism segments may perceive experiences differently because they have different motivation to consume (Cetin and Bilgihan, 2016). Accordingly, Otto and Ritchie (1996) developed an experience quality scale with four factors (peace of mind, hedonics, recognition and involvement) based on a survey conducted on three tourism service sectors (airlines, hotels and tours and attractions). These authors establish that Peace of mind is linked to the need for both physical and psychological safety and comfort. Hedonics is referred to affective responses (i.e. memorability, enjoyment or excitement). Recognition is connected to the value and confident tourists' feeling while they are being taken seriously. And Involvement is linked to the desire to have a choice and control of the service offered beside of the requirement to be trained, informed and imbued with a sense of mutual cooperation. Lately, Kao, Huang and Wu (2008), used the following four factors (surprise, immersion, fun and participation) while focusing on a theme park. In this study, Surprise is concerning to the specialty, the uniqueness or the freshness perceived by the tourists during the service offering. Immersion appears related to the involvement of consumers during consumption, which leads them to put more emphasize on the consumption process against consumption results. Fun refers to the relation between the enjoyment and happiness feeling when tourists receive the service offered. In addition, Participation connects the interaction between tourists and the product (service) received. Their results confirm, once again, that experience or experiential quality influence positively on satisfaction and satisfaction furthermore influences visitors' behavioural intentions positively (Chen and Chen, 2010). In this vein, Jeng et al (2017), after conducting an study on elderly' behavioural intentions with regard to a virtual reality leisure activities experience, revealed, not only that these behavioural intentions were effectively predicted by the experiences value, but also, that there was a mediating effect exerted by these experiences value on the relationship between experience quality and behavioural intentions. Based on these results, Jen et al (2017) not only confirmed the significant value of giving users a satisfactory experience but also claimed that experience quality and experience value have a positive relationship which in turn influence behavioural intentions.

There is a widespread literature focused on service quality and a continuous effort make by tourist agents to increase visitors' positive behaviour intentions by providing them with high quality and satisfying experiences to be perceived as a good value during a visit (Lee, Petrick, and Crompton, 2007). However, there is not enough research focused in the tourism sector to shed light on the experience quality of a specific tourism participation such as heritage visitation (Chen and Chen, 2010) or through the use of IVR' technologies when visiting a heritage or natural site. Hence, to cover this gap, this study focuses on the tourists' experience quality drawn from e-WOMs posted on a tourism website after experienced a virtual tour in a heritage destination where an IVR technology (Past View) was used. The research model in Figure 1 is proposed. We agree with Chen and Chen (2010) that a better understanding of the experience quality can provide heritage practitioners insights into how to adjust their services to meet visitors' needs.

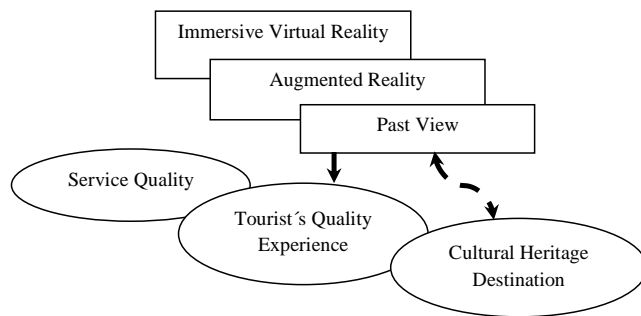


Figure 1. Research model

3. Methodology

3.1. Data Collection

Virtual tour is a topic increasingly used in Tourism sector, mainly regarding to tourism destination (Cho, Wang and Fesenmaier, 2002). Cho, Wang and Fesenmaier (2002, p. 4) noticed that “virtual tour refers to a particular type of virtual experience that includes a computer-mediated experience while visiting a travel destination”.

In this context, Past View can be regarded as a particular technology, due to its immersive dimension. This product offers a guided tourist route with the support of smart glasses: wearable information glasses that provide the experience to be in a recreated past space and, even, to interact with past characters, with the purpose to know better the history of historic cities. This is possible through different space and motion sensors and a GPS system, to geolocate the user's location. The software inside this tool allows accessing other contents, as information of monuments or images of augmented reality.

The users are accompanied by a tourist guide, with the twin purpose to help with technological aspects and to provide a complete destination picture. The company's aim is achieving quality service.

Currently, Past View Routes are operating in Seville and Barcelona, two important heritage cities in the south and north of Spain. Online reviews about these routes were collected from the e-WOM community Trip Advisor, from the feedback section. The study focuses on local-language (Spanish) opinions, given the needed to ensure the homogeneity of the words used (in fact, opinions in other languages were residuals).

The 119 shared reviews were collected for each one of these two destinations, as it's shown in Table 1. Trip Advisor displays, for each opinion, the assessment of the experience, the title and the body of the message as well as two quality variables: target traveller and experience time of year.

Table 1. Summary of quantitative and qualitative variables. Number of posts breakdown

Destination	Rating	Target traveller	Time of year
Barcelona: 24	Min.: 1.000	Pairs: 39	Dec-feb: 36
Seville: 95	1 st Qu.: 4.000	With friends: 30	Mar-may: 31
	Median: 5.000	With family: 27	Jun-aug:26
	Mean: 4.555	Business: 4	Sep-Nov: 26
	3 rd Qu.: 5.000	Single: 4	
	Max.: 5.000	No reply: 15	

These opinions cover the period between November 2017 until December 2019 (Barcelona) and March 2013 until January 2020 (Seville).

3.2. Correspondence analysis of data

Correspondence analysis (CA) is a method to analyse free text answers, proposed by Jean-Paul Benzécri in the 1960s. The main goal in applying this technique to a set of terms (grouped in different documents) is “to visualize the proximity between documents, the proximity between words, and associations between documents and words” (Bécue-Bertaut, 2019, p. 18).

Two documents are close if they use similar words. Similarly, two words are close when they are equivalently distributed. To review this information, a lexical table that contains the frequency of words in the different documents is required. CA extracts implicit structures from the detected co-occurrences that are derived from the lexical environment.

This technique requires a pre-processing of collected documents. Pre-processing and CA in itself were performed using Xplortext, a package in R. The version of this programme was

3.6.2., available at <https://cran.r-project.org/>. One of the main advantages of Xplortext package is that some pre-processing tasks are automated, as:

- To convert the set of words into lowercase letters.
- To define some symbols to be considered as punctuation marks.
- To remove the irrelevant numbers for the research.

Besides, Xplortext package allows the automatic elimination of stop-words: in the context of this paper, these are very typical Spanish words or another frequently used words that do not aggregate information, as, for instance, Barcelona or Seville (it notes the use of lowercase letters).

Comentado [pdi2]: Rosa, no sé por qué da error gramatical

One of the most important properties of CA is to visualize the clouds of documents and words on the axes of maximal dispersion or inertia (the inertia of a point is the product of its weight and its squared distance to the centre of gravity of the cloud). The analysis of the lexical table is very complex in a n -dimensional space, being this dimension n the smallest dimension of the table minus 1 (because the sum of the coordinates of the rows or the columns of the lexical table is always one). So, the projection of the clouds onto a sequence of orthogonal axes of maximal inertial (these are called factorial axes) is needed. The calculation of factorial axes is equivalent to a matrix diagonalization, being the first factorial axis, the eigenvector corresponding to the largest eigenvalues.

Based on the above arguments the words, which are frequently used in the same reviews and in the same way will be very close together on the factorial axes. CA displays close words when they are used in the same context: this allows better detection of synonyms. Lastly, the simultaneous representation of documents and words enables the identification of links between different groups or clusters.

3.3. Results

3.3.1. Correspondence analysis of titles

The proposed methodology was applied, on a preliminary basis, to the collected data, considering only the titles of the posts. This allows us to focus on the most intense perceptions of the users. Two sets of stop words have been used in all the analysis: those provided by Xplortext in accordance with the language and others introduced manually.

Figure 2 shows the 25 most frequent words in the titles (these are the translations of the Spanish words to English). Most of them are nouns, as the word “recommendable”, the most relevant. The five most frequent words emphasize the innovation of the service, through words like “different” or “novel”.

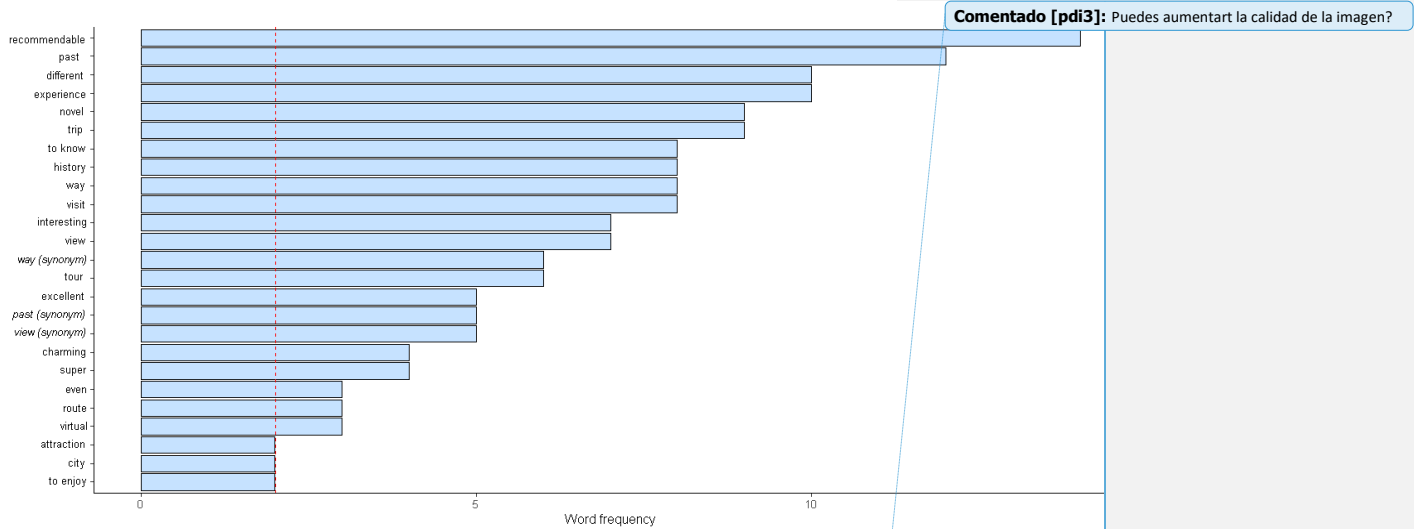


Figure 2. Words frequency without automatic and manual stopwords (only titles)

Comentado [pdi4]: Es junto o separado stop words? Mira texto

CA allows the construction of aggregate lexical tables (ALT) from contextual variables. For instance, you can get this table when you analyse all the texts corresponding to a given category, as target traveller. ALT can be computed through the row profile, dividing the frequency of each item by its total, or, similarly, through the column profile.

Table 2 details the row profiles related to the indicated variable. It is noticed how the persons who travel with friends highlight the “method” of Past View, while single users stand out words as “different” or “history”.

Table 2. Aggregate lexical table (row profile). Category: target traveller

	To know	Different	Experience	History	Method	Novel	Past	Recommendable	Travel	Visit	Sum
Pairs	7.89	10.53	13.16	10.53	2.63	5.26	13.16	15.79	13.16	7.89	100.00
With friends	5.56	5.56	11.11	5.56	16.67	11.11	11.11	16.67	5.56	11.11	100.00
With family	9.09	4.55	9.09	4.55	9.09	18.18	18.18	9.09	13.64	4.55	100.00
Business	0.00	0.00	25.00	25.00	0.00	25.00	0.00	0.00	0.00	25.00	100.00
Single	0.00	50.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
No reply	16.67	25.00	0.00	0.00	16.67	0.00	8.33	25.00	0.00	8.33	100.00
Av.-profile	8.33	10.42	10.42	8.33	8.33	9.38	12.50	14.58	9.38	8.33	100.00

The last row -average profile- provides a measure of attraction or repulsion towards a specific word. For instance, users who travel with friends apply the word “different” less than average, so you can say that they repel it. This reasoning applies to the opposite situation.

Table 3 shows the aggregate lexical table through column profile, which allows to identify words that are used more or less than average in each category.

Table 3. Aggregate lexical table (column profile). Category: target traveller

	To know	Different	Experience	History	Method	Novel	Past	Recommendable	Travel	Visit	Av.-profile
Pairs	37.50	40.00	50.00	50.00	12.50	22.22	41.67	42.86	55.56	37.5	39.58
With friends	12.50	10.00	20.00	12.50	37.50	22.22	16.67	21.43	11.11	25.0	18.75
With family	25.00	10.00	20.00	12.50	25.00	44.44	33.33	14.29	33.33	12.50	22.92
Business	0.00	0.00	10.00	12.50	0.00	11.11	0.00	0.00	0.00	12.50	4.17
Single	0.00	10.00	0.00	12.50	0.00	0.00	0.00	0.00	0.00	0.00	2.08
No reply	25.00	30.00	0.00	0.00	25.00	0.00	8.33	21.43	0.00	12.50	12.50
Sum	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

CA applied to the aggregate lexical table provides the eigenvalues associated with the factorial axes. The total inertia of the cloud is 0.384: this value can be decomposed in the different axes, as seen in Table 4.

Table 4. Eigenvalues and percent of variance

	Variance	% of variance	Cumulative % of variance
dim 1	0.155	40.469	40.469
dim 2	0.126	32.849	73.318
dim 3	0.060	15.530	88.848
dim 4	0.033	8.714	97.562
dim 5	0.008	2.438	100.00
	0.384		

Figure 3 shows how the variance of the eigenvalues gradually decreases.

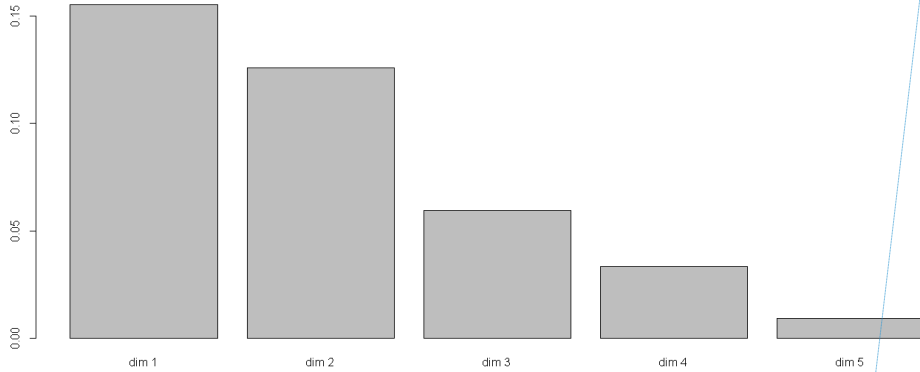


Figure 3. Variance of eigenvalues

Xplortext package provides the coordinates of the reviews and the words in these factorial axes.

This approach is complemented by the computation of Cramér's V coefficient. This statistic relates the total inertia of the cloud with its theoretical maximum value. When Cramér's V coefficient is 0 it is assumed that documents and words are independent. The opposite happens when $V = 1$. In this research, Cramér's V coefficient is 0.277.

Figure 4 displays the word representation in the two first factorial axis. This allows us to identify the contrasts between different words, as they have positive or negative coordinate values. In this case, "history" and "different" are located far away from the rest of words.

Comentado [pd15]: Se puede mejorar la calidad de las imágenes en el texto? Puedes hacer algo Miguel angel?

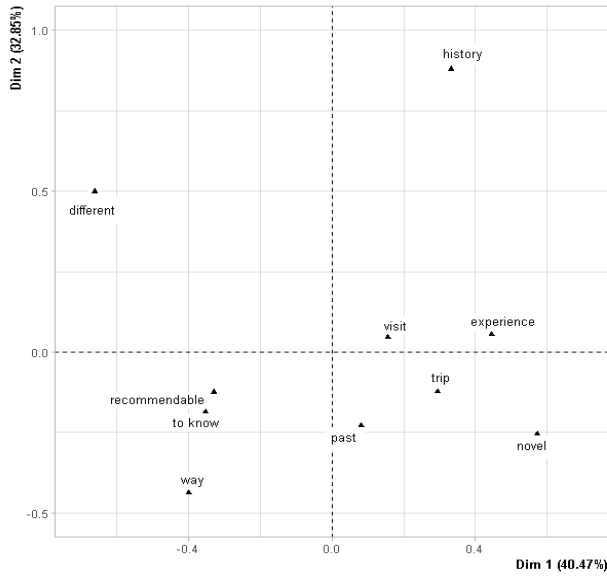


Figure 4. Word representation

3.3.2. Correspondence analysis of titles and posts

The second research considers titles and reviews of the users, so it's possible to expand and to examine the lexical environment. Figure 5 shows the 25 most frequent words in the collected word, without stopwords.

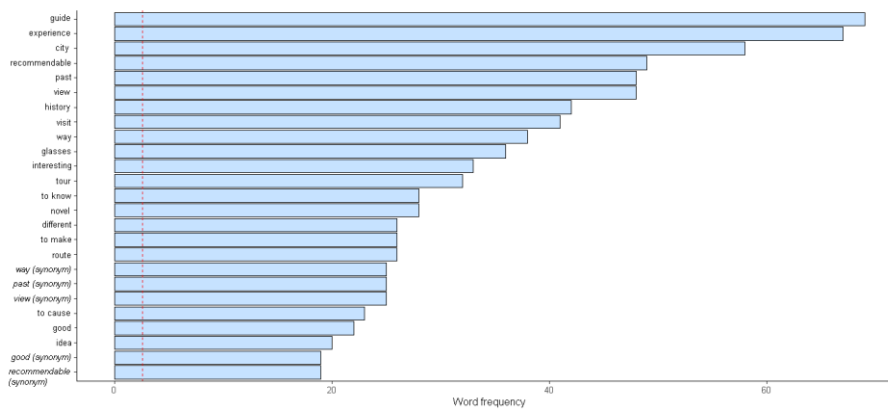


Figure 5. Words frequency without automatic and manual stopwords (titles and reviews)

You can see how a word that was irrelevant in the titles (“guide”) is now the one most quoted. There are new words in this set, as “city”, “view” or “glasses”, associated to a closer description of the tour’s experience.

It is interesting to evaluate repeated segments because “they give partial information about the context of words, and thus provide information on their meaning” (Bécue-Bertaut, 2019, p. 12). Table 5 details the 10 more common segments.

Table 5. Most frequent segments

Segment	Frequency	Long (in Spanish)
from the history of	7	4
a different manner of	7	4
the history of the city	5	5
the history of seville	5	4
a different way of seeing	5	5
way to know seville	4	4
virtual reality glasses	4	4
the guide that	4	4
the truth is that	4	4
part of history	4	4

Table 6 and 7 detail the aggregate lexical tables (row and column profile):

Table 6. Aggregate lexical table (row profile). Category: target traveller

	City	Experience	Method	Glasses	Guide	History	Interesting	Past	Recommendable	View	Visit	Sum
Pairs	14.36	13.33	5.13	5.13	11.79	8.21	6.67	10.77	8.72	9.23	6.67	100.00
With friends	9.76	14.63	12.20	4.88	15.45	8.94	6.50	8.94	5.69	6.50	6.50	100.00
With family	9.23	10.77	6.92	11.54	12.31	8.46	5.38	7.69	9.23	9.23	9.23	100.00
Business	5.56	11.11	5.56	0.00	5.56	11.11	16.67	11.11	16.67	5.56	1.11	100.00
Single	10.00	15.00	10.00	10.00	10.00	10.00	5.00	0.00	10.00	10.00	10.00	100.00
No reply	6.98	9.30	2.33	6.98	18.60	0.00	2.33	9.30	18.60	16.28	9.30	100.00
Av.-profile	10.96	12.67	7.18	6.81	13.04	7.94	6.24	9.07	9.26	9.07	7.75	100.00

Table 7. Aggregate lexical table (column profile). Category: target traveller

	City	Experience	Method	Glasses	Guide	History	Interesting	Past	Recommendable	View	Visit	Sum
Pairs	48.28	38.81	26.32	27.78	33.33	38.10	39.39	43.75	34.69	37.50	31.71	36.86
With friends	20.69	26.87	39.47	16.67	27.54	26.19	24.24	22.92	14.29	16.67	19.51	23.25
With family	20.69	20.90	23.68	41.67	23.19	26.19	21.21	20.83	24.49	25.00	29.27	24.57
Business	1.72	2.99	2.63	0.00	1.45	4.76	9.09	4.17	6.12	2.08	4.88	3.40
Single	3.45	4.48	5.26	5.56	2.90	4.76	3.03	0.00	4.08	4.17	4.88	3.78
No reply	5.17	5.97	2.63	8.33	11.59	0.00	3.03	8.33	16.33	14.58	9.76	8.13
Sum	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 8. Eigenvalues and percent of variance

The total inertia, considering all the texts, is reduced until 0.086. Cramér's V coefficient is 0.131 (the variance is narrower). Table 8 and Figure 6 show these results:

	Variance	% of variance	Cumulative % of variance
dim 1	0.037	43.649	43.649
dim 2	0.022	25.058	68.707
dim 3	0.013	15.142	83.849
dim 4	0.011	12.800	96.649
dim 5	0.003	3.351	100.00
	0.086		

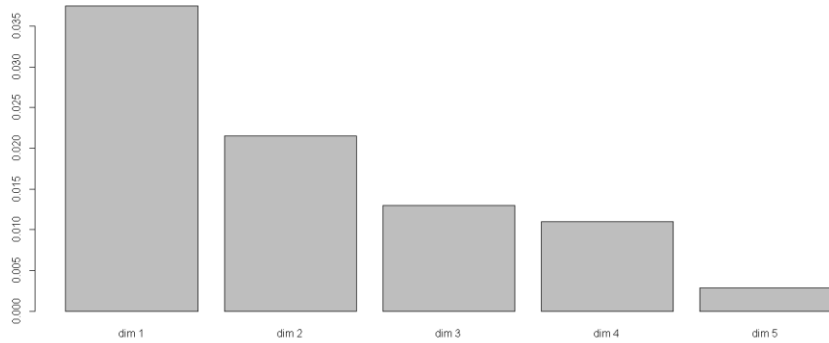


Figure 6. Variance of eigenvalues

The word map in Figure 7 reveals which words nearest to the first axis are: “view”, “visit”, “guide”, “experience” and “history”. They have very close meanings. The picture shows the importance attached to the user service.

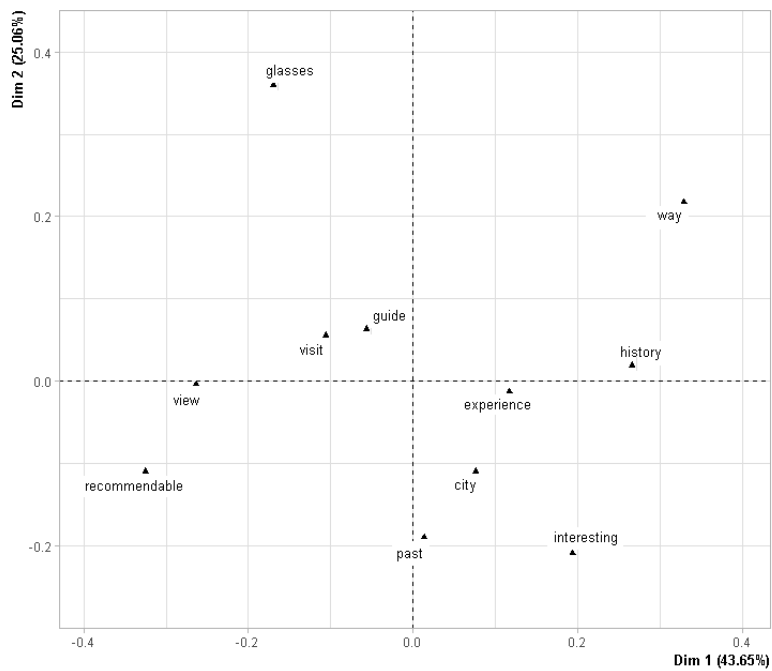


Figure 7. Word representation. Dim 1 vs Dim 2

Plotting the words on different factorial axes other groupings can be obtained. They are displayed in Figure 8. It can be noticed that “guide” is a relevant word, near to axes 1. Furthermore, a set of terms around the perception of the service is observed.

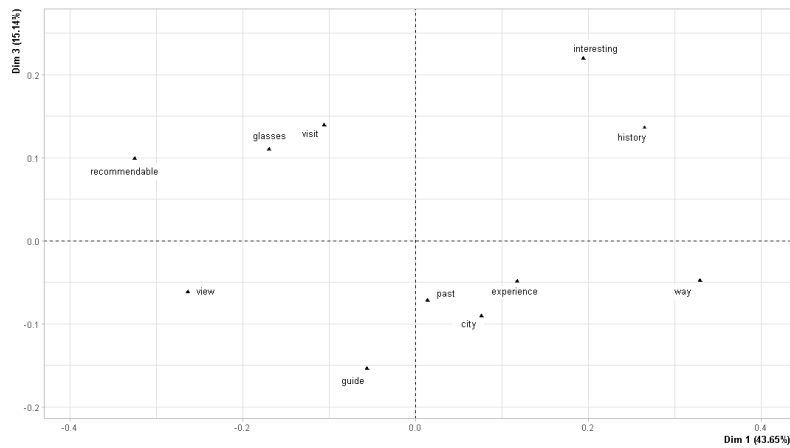


Figure 8. Word representation. Dim 1 vs Dim 3

Lastly, the conjoint representation of the qualitative variable (traveller target) against the three most used words (Figure 9) reveals how “guide” and “experience” are closest to the centre of gravity. They are applied by “Family”, “Single”, “Pairs” and “Friends” with a similar relative frequency.

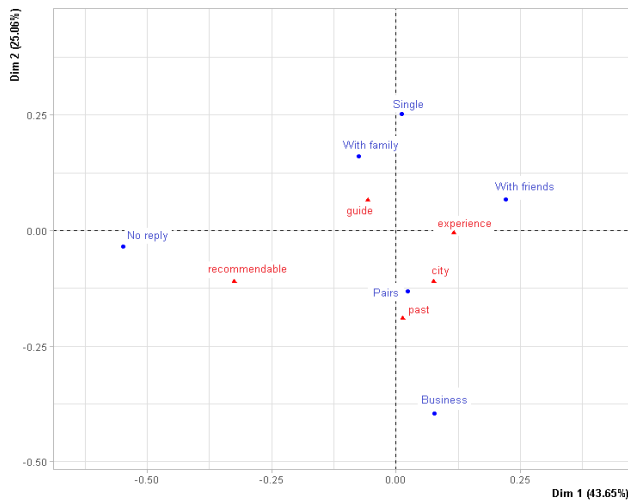


Figure 9. Conjoint representation of traveller target and most used words

The empirical analysis also allows the identification of future research avenues on the influence of IVR technologies on tourists' quality experience. (1) Using supplementary elements will enrich the results. In this context, the repeated segments to identify possible synonyms could be analysed. The plot of these elements on the factorial axes would help to understand the results. It appears also relevant to divide the reviews into clusters, characterized by similar lexical profiles. Two approaches appear interesting based on the sample size: divisive hierarchical clustering and agglomerative hierarchical clustering. (2) Examining in depth the reviews' content to establish a corpus of emotions derived from the use of IVR technologies. These reviews could be analysed with CA techniques.

Conclusions

This paper was motivated to respond for a recent call in the academic literature to analyse unstructured data from a tourist experience based on IVR technologies in a cultural heritage tourism destination. Due to a fast development of ICTs and accordingly the large investment of these technologies in the tourism sector, a better understanding of the role played by quality service and quality of experience derived from the use of these technologies are necessary (Bec et al., 2019).

In general, the main research goals address a better understanding about the tourists' experience when visiting a tourism destination and using an IVR technology. The present study extends the actual theoretical body concern to user's experience, by including the potential influence of IVR technologies. Based on an empirical analysis focused on tourism sector, the paper provides findings that confirm that there is a relationship between tourists' quality experience and tourist product features belonging to a tourist destination, as recognized by researchers such as Han et al (2018) and Beck et al (2019). The findings also reveal the potential influence of IVR technologies on tourist quality experience and therefore to achieve a memorable tourist experience which in turn enhance the favourable destination image.

Particularly, the empirical results allow us to identify the topics most frequently used by tourists through e-WOM comments posted in Trip Advisor. The topics related to service quality, quality of experience, IVR technology (smart glasses) and staff who provides the tourism product (virtual tour) stand out from others.

Overall, the paper constitutes an initial phase of a broader research process in which we find ourselves immersed in the five axes of an intelligent tourist destination, namely, accessibility, sustainability, innovation, technology and governance. Thus, future research avenues would be conducted in order to not only meet these ambitious goals in research but also to cover the potential gaps in the design and the implementation of innovative tourist products. In fact, as recognized by Andria, diTollo and Presenti (2019, p. 4027), "Smartness" and "sustainability" are gaining growing attention both practitioners and politician institutions being considered as "topic of crucial importance for directing, in a systemic perspective, the decision-making process toward sustainability and smart growth objective".

Enhancing a visitor's experience quality is relevant for DMOs when design heritage sustainable and accessible strategies. In fact, tourist experience is a generally accepted key topic

in cultural heritage promotion since tourist satisfaction is derived from the overall experience in the tourism destination. The growing demand of tourists to have a memorable experience when visiting a tourism destination and accordingly the large investments on IVR technologies by tourist suppliers justifies the relevance of this research. The results provide knowledge that can be useful particularly for tourist agents since the tourist products can be improved to meet the tourists expectations. In this vein, IVR technologies appear to be a great potential instrument to spread and enhance the value of a cultural heritage destination. Thus, IVR technologies become a useful resource for the knowledge of cultural heritage destination by recalling the past and living experience through the senses.

Compliance with Ethical Standards

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Conflict of Interest: Author M. Rosario González-Rodríguez declares she has no conflict of interest. Author M. Carmen Díaz-Fernández declares she has no conflict of interest. Author Miguel Angel Pino-Mejía declares he has no conflict of interest.

Ethical approval. This article does not contain any studies with human participations or animals performed by any of the authors.

Informed consent: non applicable

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