Smart Innovation, Systems and Technologies 209

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Editorial

The International Conference on Tourism, Technologies and Systems is an international forum for researchers and professionals in the tourism sector, which enables the discussion of the latest innovations, trends and concerns in several areas, in the tourism sector, associated with information technologies and systems. It is an event for professionals in the sector, in search of technology solutions, where academics, IT experts and business managers meet to discuss new ideas that help them maximize the potential of tourism business through technology.

The ICOTTS'20 Scientific Committee is composed of a multidisciplinary group of 137 experts who assessed some 190 papers from 28 countries, received for each of the main topics proposed for the conference: a) technology in tourism and tourism experience; b) smart destinations; c) digital marketing applied to tourism and travel; d) mobile technologies applied to sustainable tourism; e) research in the area of tourism to provide innovative solutions to social problems; f) tourism, well-being and hospitality; g) information technologies in tourism; h) digital transformation of tourism business; i) travel for health and well-being; j) information technologies in ecotourism and agrotourism; k) information technologies in food tourism; l) information technologies in education and educational tourism; m) e-tourism and tourism 2.0; n) big data and travel and tourism management; o) robotics in tourism; p) resilience and tourism; q) dark tourism; and r) military tourism.

The papers accepted for presentation and discussion at the conference are published by Springer and will be submitted for indexing by ISI, SCOPUS, EI-Compendex, Google Scholar and SpringerLink.

We thank all those who contributed to the ICOTTS'20 conference (authors, committees, workshop organizers and sponsors). We deeply appreciate your involvement and support, which were crucial to the success of the conference.

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Contents

Could Virtual Reality Substitute the 'Real' Experience? Evidence from a UNESCO World Heritage Site in Northern Portugal

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Abstract. Virtual Reality could be useful for heritage management and preservation by complementing or, even, by replacing the 'real' visitation to more threatened destinations. The objective of this study was to empirically test the level of similarity perceived by a group of students between VR experience and the 'real' visit in a UNESCO World Heritage Cultural attraction in order to assess the capacity of VR to act as a substitute of the 'real' visit. Ridit analysis was conducted in order to rank the level of agreement perceived by respondents concerning to similarity between the VR experience and the 'real' visit. Results revealed that VR experience could act as a complement, rather than a substitute of the 'real' visitation. This is, the feelings and emotions derived from the 'real' visit could not be replaced by the VR experience. VR could be an effective marketing tool to encourage sustainable tourism behaviors, rather than to substitute the 'real' visit.

Keywords: Virtual reality · Heritage preservation · Sustainable tourism behaviors

1 Introduction

Virtual Reality (VR) is one of the most attractive and potentially most effective technologies for the development of the experience economy. In the tourism context, it represents a real opportunity to capitalize on the uniqueness of travel by involving customers from the initial contact and making it possible to build their own experiences [1]. Due to the advancement of information technology, VR systems provides more real-life experiences and enable tourists to be active virtual participants, actually choosing what they want to "experience" [2]. It is expected that VR greatly impacts the tourism industry in the coming years [3].

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Benefits of VR in tourism contexts comprise the areas of planning and management, marketing and promotion, sales and distribution, entertainment, education, accessibility and heritage preservation, among others [4, 5]. Moreover, as VR technology continues to improve, it is conceivable that virtual tourism could either complement or supplant physical journeys or 'real' holidays for some travelers, i.e. for low-income level or reduced mobility [4, 6]. As a complement of physical journeys, VR can enhance visitor experiences, not only in the tourism destination, but also, before visiting it [7]. Additionally, it could be used as a substitute for 'real' holidays to travel to remote, dangerous, inaccessible or threatened locations [4].

Sites listed as UNESCO World Heritage Site may be particularly threatened simply because their World Heritage status can attract increased numbers of visitors to the point of damage. VR could be an effective instrument for heritage management and preservation replacing the real' experiences, thereby diminishing disturbance on the heritage site [4].

The objective of this study is to deepen in the potential of VR to be used as a substitute for the 'real' visit to a world heritage tourism attraction. Specifically, the viewpoint of São Leonardo de Galafura in the Alto Douro Vinhateiro (Alto Douro Wine Region).

2 Virtual Tour Experience

Virtual tour is a type of virtual experience, defined as an experience in a virtual environment using a computer-mediated environment and based upon the concept of "telepresence" [2]. Telepresence is the feeling of being there, and the extent to which users engage with a virtual reality tour may be dependent of their sense of presence or the feeling of being there [8, 9]. Therefore, presence is the key concept that explains the effectiveness of VR in various use contexts [5].

Previous studies drawn upon a presence perspective, most of them based on the seminal work of Kim and Biocca [10], aimed to explore how VR can impact tourism experience, the perceived image of a destination and future behaviors. One of them, in the context of Virtual Destination Image Formation (VDIF), found that telepresence influences positively virtual cognitive image and virtual conation [8]. Another study suggested that "positive attitude change" in VR environments, where presence has a significant positive effect, leads to a higher level of visitation intention [5]. One more revealed that the sense of presence perceived by individuals in 360º virtual experience was similar than that perceived by individuals physically at the location [9]. Further study showed that the sense of presence positively affects intention to revisit and recommend cultural heritage sites [11]. An additional study revealed that VR hotel preview induces a stronger sense of presence compared to both 360º and images preview, thereby transforming into enhanced brand experience [12]. Different authors found positive impacts of sense of VR presence on visitors´ theme park intentions to revisit and recommend [3]. Another one found that higher level of telepresence of HMD VR users compared with video users increases the impulsive desire for a destination [13]. Finally, the results of one more study showed that the sense of presence

provided by HMD VR leads to a more positive image of the destination, affective, cognitive and overall [14].

However, no empirical studies were found considering VR as a substitute of the 'real' visit, this is, assessing the level of similarity perceived by individuals between the VR experience and the 'real' visit. The utility of VR for heritage management and preservation derives from its potential to create virtual experiences that tourists may accept as substitutes of the 'real' visitation to threatened sites [4, 7]. So, an empirical study is needed in order to assess the capacity of VR experience to substitute the 'real' visit to threatened sites.

3 Methodology

The study setting considered was São Leonardo de Galafura viewpoint in the Alto Douro Vinhateiro (Alto Douro Wine Region) world heritage site, Fig. 1. Douro region (NUT III) occupies an area of 4100 km^2, around 19% of the total landmass of the Northern Portugal [15], and it is composed by 19 municipalities. It is a rural area, and one of the oldest demarcated wine regions in the world (since 1756), where the world-renowned port wine is produced. The number of visitors in the Douro region has increased during the last years due to Portugal's tourism boom [16].

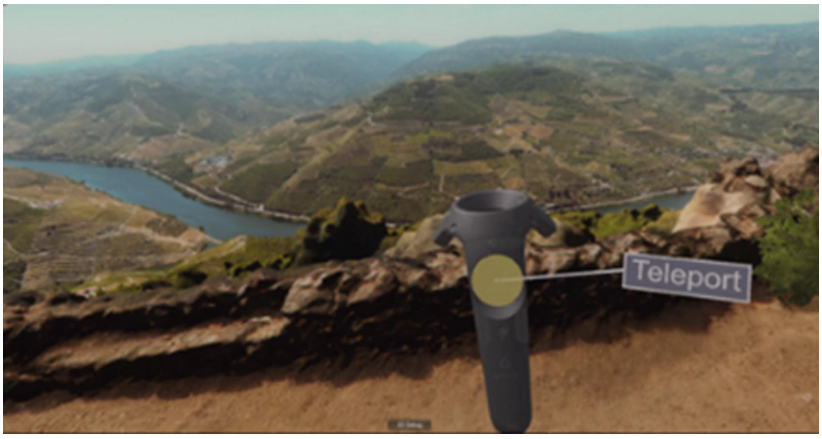

Fig. 1. Screenshot of the VR experience developed by the research team illustrating the teleport feature.

The VR experience was designed to be as close to reality as possible. Thus, instead of creating a 3D replica manually, the research team adopted photogrammetry techniques to recreate an hyper-realist virtual replica of the tourism destination. In the VR environment, participants were allowed to explore the touristic site by using real walking within the tracked area (aprox. 3.5 m × 3.5 m) or by teleporting using the VIVE remote.

The touristic site allowed to be explored in the VR environment was delimited to be coincident with the area that participants could explore in the visit to the real location.

For delivering the VR experience, a computer equipped with an Intel i7-6700 K and a NVIDIA GeForce GTX 1080 graphics card were used. The visual stimulus was delivered using the HTC Vive setup and the audio was delivered via Bose QuietComfort 25 headphones with active noise cancellation.

The items utilized in this study "On site visit I saw things I had not seen before in the VR experience *(reverse)*", "On site visit I didn´t perceive any differences from the landscape I saw previously in the VR experience", "It would have been enough for me to experience VR to know the place visited", "The feeling of visiting the place is better than I had in the VR experience *(reverse)*", "I feel I got a better perception of the place I visited through the VR experience" and "I feel it is more enjoyable to be physically at the place visited than just experiencing it virtually *(reverse)*" rated on a seven-point anchor scale, ranging from 1 (strongly disagree) to 7 (strongly agree), are based in an original study about the use of 360º in tourism experience [17].

This study procedure is composed of two steps. First, participants arrived at the laboratory at a pre-fixed hour, and they come into a room to experiment São Leonardo de Galafura in a VR scene for five minutes. After that, they were moved to another separated room. This experiment was intentionally designed to participants do not cross during the procedures in Laboratory, in order to not influence other participants' perceptions. Second, after joining a small group, participants were conducted to the 'real' site, São Leonardo de Galafura viewpoint, by car or minibus and were encouraged to explore the site for five minutes. Then, participants were asked to respond to the questionnaire. Finally, participants traveled from the touristic point to laboratory.

For this survey, the sample was selected with a purposive sampling approach between students at university level. The only criteria were that participants belong to Generation Z.

From a total of 200 questionnaires distributed, 192 valid questionnaires were returned. The complexity of the study design has favored this high response rate, 96%, since all the phases of the experiment and data collecting were concentrated on the same day. Within the final sample, 64.1% were national students. The median age was 20.67 years old, being 24 years old for international students and 19 years old for national students. Most of the participants were females (60.4%). The majority of respondents were attending to a bachelor degree (67.7%), Master (29.7%) or PhD (2.1%); namely in the fields of Management, Economics and Tourism (42.2%), Technology (21.9%) and Others (35.9%).

The Ridit (Relative to an Identified Distribution) analysis, proposed by Bross [18] for the first time in the domain of social science research, was adopted in order to rank the level of agreement of the 6 items concerning to similarity between the VR experience and the 'real' visit. It is an alternative method that can be applied to Likert scale data analysis in which conventional methods cannot be used or are ineffective. The Ridit analysis applies a probability transformation according to an empirical distribution taken as a reference class. It is safer for "borderland" data, replacing the usual means and variances in the t-test family of statistical methods. Moreover, Ridit analysis is "distribution free", and there is no need of assumption about the distribution of the population under study. Microsoft excel has been used to test the Ridit model.

4 Results

The results from the analysis can be used to order Likert scale items and explore the relationships among them, for example, in terms of degrees of agreement. Factors influencing the level of similarity between VR experience and the 'real' visit are considered in this study. The respondents were asked to rate each factor based on their level of agreement in a Likert type scale (1–7). The factors are listed in Table 1.

Table 1. Parameters and notations from similarity between VR experience and the 'real' visit

Factor	Items
F1	On site visit I saw things I had not seen before in the VR experience (*reverse*)
F2	On site visit I didn´t perceived any differences from the landscape I saw previously in the VR experience
F3	It would have been enough for me to experience VR to know the place visited
F4	The feeling of visiting the place is better than I had in the VR experience (*reverse*)
F5	I feel I got a better perception of the place I visited through the VR experience
F6	I feel it is more enjoyable to be physically at the place visited than just experiencing it virtually (*reverse*)

Algorithm for Ridit analysis supposes that there are m items and n ordered categories listed from the most favored to the least favored in the scale [19].

Then, the Ridit analysis goes as follows:

1) Compute Ridits for the reference data set, Table 2:

– Select a population to serve as a reference data set. For a Likert scale survey, the data set can be the total responses of the survey, if the population cannot be easily identified.
– Compute frequency *fj* for each category of responses, where $j = 1, \ldots n$.
– Compute midpoint-accumulated frequency *Fj* for each category of responses.
  $F_1 = \frac{1}{2} f_1$
  $F_j = \frac{1}{2} f_j + \sum_{k=1}^{J-1} f_k$ where $j = 2 \ldots n$
– Compute Ridit value *Rj* for each category of responses in the reference data set.
  $R_j = \frac{F_j}{N}$ where $j = 1 \ldots n$
– N is the total number of responses from the Likert scale survey of interest. By definition the expected value of R for the reference data set is always 0.5 (Bross, 1958).

Table 2. Ridits for the reference data set

Factor	SA (7)	−6	−5	NA/ND (4)	−3	−2	SD (1)	π_i
F1	19	14	12	19	35	41	52	192
F2	14	28	18	16	41	35	40	192
F3	18	15	12	11	31	35	70	192
F4	2	3	5	10	26	45	101	192
F5	18	30	28	27	25	34	30	192
F6	0	1	4	9	18	30	130	192
fj	71	91	79	92	176	220	423	1,152
½ * *fj*	35.5	45.5	39.5	46	88	110	211.5	
Fj	35.5	117.5	202	287	421	619	941	
Rj	0.03	0.1	0.17	0.24	0.36	0.53	0.81	

Note: (1) Strongly disagree – (7) Strongly agree

2) Compute Ridits and mean Ridits for comparison data sets, Table 3. A comparison data set is composed of the frequencies of responses for each category of a Likert scale item. As there are *m* Likert scale items, there will be *m* comparison data sets.

– Compute Ridit value r_{ij} for each category of scale items.

$R \cdot \pi_{ij} = \frac{\mathrm{Rj} \times \pi_{ij}}{\pi_i}$ where $i = 1 \ldots m$,

π_{ij} is the frequency of category j for the i^{th} scale item, and π_i is a short form for the summation of frequencies for scale item i across all categories, that is:

$\pi_i = \sum_{k=1}^{n} \pi_{ik}$

– Compute the mean Ridit for each Likert scale item.

$\rho_i = \sum_{k=1}^{n} r_{ik}$

Table 3. Ridits for the comparison data sets

Factor	SA (7)	−6	−5	NA/ND (4)	−3	−2	SD (1)	ρ_i
F1	0	0	0.01	0.02	0.06	0.11	0.22	0.44
F2	0	0.01	0.01	0.02	0.07	0.09	0.17	0.4
F3	0	0	0.01	0.01	0.05	0.09	0.29	0.49
F4	0	0	0	0.01	0.04	0.12	0.42	0.62
F5	0	0.01	0.02	0.03	0.04	0.09	0.12	0.34
F6	0	0	0	0.01	0.03	0.08	0.55	0.68

In Ridit analysis, if upper value of any scale variable or component is more than 0.5, that component or the variable will be having greater probability to be ignored by the existing distribution channel partners. A relative less value of ρ_i is favored over a greater value of ρ_I because a less value of ρ_i specifies a high probability of being considered as a very agreement item in the reference set relating to respondents´ preferences.

A direct categorization of mean Ridit's in terms of the probability of being in agreeing propensity gives the following sequence: $F_5 > F_2 > F_1 > F_3$ and $F_4 > F_6$. Compared to the reference data set, respondents have less probability of disagreeing with scale items F_5, F_2, F_1, F_3, and higher probability of disagreeing with the scale items F_4, F_6, as showed in Table 3. Therefore, the Ridit analysis indicates that respondents are more likely to perceive the VR experience in a cognitive way, in other words, from a rational point of view: "I feel I got a better perception of the place I visited through the VR experience", "On site visit I didn't perceive any differences from the landscape I saw previously in the VR experience", "On site visit I saw things I had not seen before in the VR experience *(reverse)*" and "It would have been enough for me to experience VR to know the place visited". On the other hand, respondents are less likely to perceive VR experience in an affective way, or from an emotional point of view: "The feeling of visiting the place is better than I had in the VR experience *(reverse)*" and "I feel it is more enjoyable to be physically at the place visited than just experiencing it virtually *(reverse)*".

5 Discussion and Conclusion

Threatened destinations, as heritage sites or crowded places, can benefit from the use of VR technologies for their management and preservation. The utility of VR for heritage management and preservation is given from its potential to create virtual experiences that tourists may accept as substitutes of the 'real' visit to this threatened sites [4, 7].

The objective of this study was to empirically test the level of similarity perceived by a group of students between the VR experience and the 'real' visit in a UNESCO World Heritage Cultural attraction in order to assess the capacity of VR to act as a substitute of the 'real' visit.

Results showed that VR experience could act as a complement, rather than a substitute for the 'real' travel. This is, the feelings and emotions derived from the 'real' visit could not be replaced by the VR experience. On the other hand, VR could be enough to understand the destination from a rational or cognitive point of view.

It is the first study, from an empirical point of view, focused in the potential of VR as a substitute of the 'real' travel by comparing the perceptions of respondents after VR experience and after the 'real' visit. However, this study has some limitations derived from the sampling method. It's suggested that sociodemographic characteristics of the sample, as age, gender, nationality, level of study, and type of tourism could influence the VR experience in a different way [4]. So, further studies taking into account a sociodemographic perspective are needed.

Practical implications of this study are related with the utility of VR experience in order to complement the 'real' experience by providing more knowledge about a destination, namely related with the physical characteristics of the place, but not as a substitute of it.

It has been suggested that an attempted VR substitute could have the exact opposite effects of its desired preservationist impact, in fact, it could increase users´ desire to visit the real place [4]. The tourism industry and academics disclosed, even before the actual pandemic, that the overdependency of tourism experiences on digital technology had to be managed carefully, by limiting its use or by creating more meaningful instances of use [20].

Media representations influences the decision making-process, but also influences tourist experiences and practices by creating a rhetoric of the tourist experience, eventually imitated by tourists once the destination has been chosen [21]. In fact, it has been observed that VR directly influences viewer´s attitudes and could be used to trigger potential visitors' intention to practice sustainable tourism in a heritage destination [22]. Therefore, VR could be used to encourage sustainable tourism behaviors, better than substitute the 'real' travel.

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