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Research Paper

A multisensory virtual experience model for thematic tourism: A Port wine tourism application proposal

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ABSTRACT

Technological evolution has led to a significant transformation in tourism organizations, particularly in those who focus their activities on particular themes or segments, such as wine tourism. This can be transposed to Portuguese wine tourism organizations because the majority lack the necessary information and communication technologies (and inherent technologies) to become globally competitive. As highlighted in the literature, for a tourism experience to become memorable it must be emotional and immersive in such a way that the tourist becomes fully involved with the existing surroundings. This leads to the notion of using virtual reality experiences as triggers for the development of wine tourism. Considering the relevance of Portugal's Douro Valley to the country's wine tourism segment, a theoretical model that supports the implementation of multisensory (hence more immersive) virtual wine tourism experiences is developed. While considering the international success of Port wine tourism, this paper also presents a conceptualization of a multisensory virtual Port wine experience that includes a conceptual perspective and a technological solution proposal.

1. Introduction

In line with international comparators, Portugal has in recent years begun to view wine tourism as an interesting activity that can foster the country's economy and, simultaneously, trigger economic and social progress in regions with underdeveloped economic and social situations. Despite the existing knowledge on Portuguese high-quality gastronomy, it was not until a few years ago that other wine-related products began to be produced, despite consistent concerns being expressed regarding whether high quality levels can be maintained, the aim being to emulate the successes of Port wine (Correia, Ascenção, & Charters, 2004).

According to Gonçalves and Maduro (2016), some of the most interesting features of the northern area of Portugal are its vineyards, which are typically spread across a steep and rugged landscape that triggers tourists' enthusiasm for both its beauty and its natural resources. In this respect, the Douro Valley (DV) is the most relevant region. Initially demarcated as a wine region in 1756, it currently has a total area of over 250,000 ha, of which almost 15% is occupied by vineyards that are owned and exploited by almost 40,000 wine producers (Brito & Correia, 2006; Sousa, 2013). For tourism experiences to be memorable in these regions, they must generate an emotional connection with the tourist. A good example of such experiences is the one provided by wine tourism, mainly due to the authenticity that is recognized in all things related to wine making, from the harvest to the degustation (Slåtten, Mehmetoglu, Svensson, & Sværi, 2009).

In their research, Fernandes and Cruz (2016) claim that despite the broad scope of elements associated with wine tourism, tourists are most enchanted by wineries due to their physical features and attractive atmospheres. In the majority of cases, this multiplicity of interests is caused by interactions between winery collaborators, tourists and the ambient and physical elements of the wineries themselves, thus creating a holistic tourism experience that expands beyond merely wine tasting.

As argued by Pérez-Calderón, Ortega-Rossell, and Milanés-Montero (2016), Schlüter and Norrild (2015), the process associated with producing wine blends extremely well with touristic activities. However, despite the magnetism that tends to entice tourists to visit the DV region and enjoy the wine-related experiences available, much is yet to be done to provide them a unique and immersive sense of what really exists throughout the region and to align their expectations with what wine tourism has to offer (Quadri-Felitti & Fiore, 2016).

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In order to address the new challenges that exist in all thematic tourism and, in particular, wine tourism, virtual experiences are being created that mimic the reality of tourism destinations and attractions, without requiring the tourists to leave their present location. This paper proposes a theoretical model that supports multisensory virtual tourism experiences and applies it to Port wine tourism. This proposal, while still in the conceptual stage, aims to make a valid contribution towards future developments in this area.

2. ICT applied as tourism experience enhancers

The dynamics of the digital-age society have led many organizatons to embrace information and communication technologies (ICT) as critical tools, not only to support but also to develop their business activities and to reach new customers that would otherwise be very difficult to reach (Gonçalves, Martins, Pereira, Cota, Branco & Gonçalves, 2016). By applying ICT to tourism business activities, these technologies have not only helped organizations to develop, manage and publish their tourism-related products but have also helped customers to search and purchase tourism products and services with a high degree of personalization (Bethapudi, 2013).

As argued by Buhalis and O'Connor (2005), Ye, Li, Wang, and Law (2014), the constant evolution associated with ICT and its growing application to tourism activities (*e*-tourism) have led tourism organizations to change their mindsets and assume that 21st century tourism must be focused on consumer preferences and, at the same time, be supported by consumer-centric technologies, hence ensuring sophisticated and memorable experiences. In parallel, as a result of consumers' desire to collectively and cooperatively describe and rate existing tourism products through the use of online tourism-directed platforms, only those companies that are focused on taking advantage of ICT and all emergent technologies to provide their customers with more dynamic, interesting and immersive experiences are going to be competitive in the existing global tourism market (Ku & Chen, 2015; Pantano & Di Pietro, 2013).

According to Szopiński, Staniewski, and Jansen (2016), the existing internet-based platforms directed at tourism have greatly impacted the majority of tourism organizations, mainly through the possibility of analysing, in a simple and quick manner, customer feedback and other customer preferences and requests. This has led organizations to make considerable changes to their products and services, thus adjusting their offerings according to the customers' desires (Lucchetti & Arcese, 2014).

2.1. Multisensory virtual systems

A common goal of virtual reality (VR) applications is to transport users to a virtual environment (virtual environment, VE) and have them experience that environment as though it were real. The feeling of 'being there' increases significantly the effectiveness of VR applications and enables their use in many applications, such as training and certification. Among the scientific community, the 'transportation' of users to the VE is widely measured through the level of presence felt by the users (Schubert, Friedmann, & Regenbrecht, 2001; Slater, Usoh, & Steed, 1994; Witmer & Singer, 1998). Due to the nature of VR applications, they can be valuable for promoting tourism because tourism is based on discovering new places and having new experiences. Indeed previous work has already addressed the topic of virtual tourism for marketing/promotional purposes and showed that it is effective (Cho, Wang, & Fesenmaier, 2002; Hyun, Lee, & Hu, 2009).

Several studies have confirmed this, as they revealed that the more human senses that are engaged in a VE, the more immersive is the experience and the better is the performance of the subjects (as in real environments) (Dinh, Walker, Hodges, Song, & Kobayashi, 1999; Feng, Dey, & Lindeman, 2016; Slater & Wilbur, 1997). Therefore, the closer to reality the VR system is, the greater will be its effectiveness as a marketing tool for tourism. As humans sense the surrounding environment through the five senses, multisensory cues are important to achieve a high level of presence in VEs. Multisensory integration seems to be based on the principles of Bayesian decision theory, incorporating maximum-likelihood estimation (MLE) (Deneve & Pouget, 2004; Ernst & Banks, 2002; Ernst & Bülthoff, 2004; Knill & Richards, 1996). There is also evidence showing that adding a supplementary sensory modality to a display may affect the way participants respond to a given stimulus but not their actual experience (Gallace, Ngo, Sulaitis, & Spence, 2012).

Since an early stage of VR technology there has been work that has addressed multisensory stimulation, such as Sensorama (Heilig, 1961, 1998). Sensorama was, to the best of the authors' knowledge, the first multisensory VR system to be proposed. It consisted of a set of equipment arranged in a structure with a seat that allowed viewers to sit and enjoy a multisensory experience. This system was capable of displaying 3D stereoscopic images, reproducing stereo sound, simulating wind, and delivering aromas. The results have had an impact on society but the system was not widely adopted because it consisted of a large apparatus and the technology did not satisfy the standards for creating a credible experience. The VR systems that have been developed since then have therefore been simpler, and the majority of the available VR applications still rely only on visual expression and presentation, occasionally complemented with sound as an additional sensory input (Agapito, Mendes, & Valle, 2013).

With the evolution of VR-related technologies, there has been a push forward in the current state of the art for multisensory systems where several senses are stimulated at the same time, and users are presented with 'real experiences' designed in virtual worlds. Some good examples of such systems are the Multimodal Floor (Law et al., 2009), the multisensory management and visualization system for multisensory content (Freitas, Meira, Melo, Barbosa, & Bessa, 2015), the 7D interactive cinema system (Shuqee, 2016), and the LaparoscopyVR system (Healthcare, 2016). The Multimodal Floor consists of a multimodal interface that simulates a given floor and offers users immersion in virtual-reality and augmented-reality environments. The platform is able to simulate natural floors such as snow or ice and consists of 36 panels with a set of sensors that stimulate the users' vision, audition and haptics as though they were in the real-world scenario. The multisensory system proposed by Freitas et al. (2015) allows for the management and delivery of visual, auditory haptic and olfactory feedback. The management of the stimuli is conducted through an interface that allows the producer of the experiment to define the moment of the virtual experience at which each sense should be stimulated and the intensity of the stimulation. The visual stimulus consists of 360-degree videos delivered via a head-mounted display; the auditory stimulus is stereo and is delivered with a pair of headphones; the haptic feedback is achieved through simulation of wind, which is produced using a fan; and the olfactory feedback is delivered using a smell dispenser. The interactive 7D Cinema consists of an interactive stereo attraction, set in a cinema room, that makes use of 3D film technology and simulates the surrounding environment by stimulating the visual, auditory, haptic and olfactory senses. To achieve this, the setup includes a projection system, a 3D sound system, a motion chair, a set of air-related equipment (compressor, dryer, etc.), water sprays, a strobe lamp, a bubble machine and a snow machine. The interaction is achieved using multiplayer interaction technology that is prepared to receive input from a series of differently themed amusement equipment that is associated with the 3D simulation to be depicted. The LaparascopyVR system consists of a laparoscopic surgical simulator designed for teaching and training surgical students to perform minimally invasive laparoscopic procedures. It has proven to be a valuable tool, as it facilitates medical training and allows for risk-free training in a realistic environment through force feedback, which provides accurate tactile, visual and auditory responses to mimic the feel of real procedures.