

An Empirical Study of Augmented Reality (AR) Technologies Used for Tourism Marketing and Improved Travel Experience

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Abstract

Augmented reality (AR) is fast becoming one of the staples of modern communication, and the tourism industry is potentially one of the most important beneficiaries of this new type of information technology. Its intrinsic characteristics make it very well adapted to mediate and improve the experience of tourists during their visit to various types of destination and attractions. Augmented reality technologies have the potential to help tourism providers promote destinations in more compelling and immersive ways. Our article identifies and discusses various opportunities to use augmented reality in tourism, reviewed the relevant published literature for current AR applications that can be used for tourism marketing, and highlighted research gaps.

Keywords: Augmented reality, tourism industry, tourism marketing.

JEL classification: M31.

Introduction

The tourism industry has faced many changes over time, in terms of how products and services are marketed and how consumers find, use, and share information before, during, and after consumption, as well as in terms of consumer needs and behaviors. These changes were highly influenced by the development of information and communication technologies (ICTs), as they became exponentially used in the twenty-first century for multiple applications (Fritz, Susperregui, and Linaza, 2005), including experiential marketing. According to Breidbach et al. (2014), their most common uses are (1) to facilitate how people search, consume, and use information and help with the decision to purchase a product or service, and (2) to enhance the customer experience before, during, and after the consumption of a product or service. Furthermore, researchers found that in addition to enhancing the customer experience, ICTs can also generally help create brand equity and enhance customer loyalty (Xu et al., 2014).

The extensive role of mediating and co-creating experiences through technologies generated a new concept in the literature, called 'technology-enhanced experience' (Femenia-Serra & Neuhofer, 2018). Co-creation refers to the fact that tourists changed their relation with what they experience, from being passive consumers to being directly involved in creating custom experiences for each individual (Neuhofer et al., 2012).

Many types of ICT are increasingly involved in the process of mediation and co-creation (Orzan et al., 2020). These technologies have a direct impact or can be considered a proxy to guide consumers through all stages of the purchase decision of the product and the consumption

of the product (Pentescu et al, 2014). Neuhofer (2012) gives some examples of technologies that can enhance experiences and mentions virtual life along websites, portable city guides, and others. In the same sphere as virtual life, augmented reality also has an increasing role in creating technology-enhanced experiences.

The literature defines the concept of customer experience as a combination of five types of response to products and services that can be triggered during all stages of the customer journey: cognitive, emotional, behavioral, sensory, and social (Lemon & Verhoef, 2016). Any of these responses can be enhanced, mediated and extended with ICTs (Femenia-Serra & Neuhofer, 2018), through a variety of channels. Having different consumer touchpoints supported by technology is beneficial because nowadays people don't just expect to purchase and use a product, they are looking for experiences that better suit their needs and lifestyle (Krey et al., 2021), and ICTs add that extra value. In addition, the creation and development of multiple channels for gathering information has accustomed consumers to simpler and more entertaining ways to answer their inquiries and perform daily tasks (Fritz et al., 2005).

Although there are many types of tourism products, this article will refer to destinations as the main products marketed in this industry, which is a popular and generally accepted idea among scholars (Fyall and Leask, 2006). Before the development of modern ICTs, tourist consumers used to come in contact with destinations through the press, books, recommendations from recommendations from recommendations from friends and family, or simply through travel agencies. In many cases, there was little to no way around not having agencies as intermediaries between tourists and destinations. This is because, for example, in the past airlines would not sell tickets directly to tourists (Sushchenko & Ekouaghe, 2019). The information received from all these channels was the foundation for building anticipation of traveling and seeing those places. As more technologies developed, new touchpoints were created for tourists, such as movies, TV, as well as the star of the moment, the Internet. All the contact points mentioned are still valid today, but in the last decade the Internet became the most important source of travel inspiration (Orzan et al., 2013).

The impact of AR in this industry is a topic that was researched in many contexts, such as heritage sites (tom Dieck & Jung, 2015; Chung et al., 2015; Martnez-Graa et al., 2013; Lee et al., 2015), museums (Jung et al., 2016), educational tourism (Fritz et al., 2005; Furata et al., 2012; Kazmierczak et al., 2021), tourism management and destination marketing (Fyall & Leask, 2006). However, the topics revolved mostly around AR as a complementary tool for enhancing an experience during a visit at a destination, and research about how AR shapes the tourist experience in pre-holiday mode is very rare. Although this may be due to the subject's interdisciplinary character, there is still an urgent need for analyzing the uses of the technology in each step of the process to identify future research directions.

The use of AR in the tourism industry

Emerging ICTs, such as virtual environments (VE), are tools that are being increasingly used to improve the customer experience. The term virtual environment can have many valences, but it is mostly known as an umbrella term for technologies such as augmented reality and virtual reality.

By definition, augmented reality is a technology that superimposes context-aware virtual elements on the real environment of a user (Azuma, 1997; Cranmer et al., 2020). In other words, AR has the ability to enhance the real world. It is interactive and implies that it is adaptive to changes in the surrounding environment, in real time. Depending on the application of AR technology, the overlay elements can be images, videos, graphics, or other types of elements, such as navigational data. Azuma (1997) even considered virtual reality to be the same concept as virtual environments, and augmented reality to be a variation of virtual reality,

but as the technologies matured over the years, it is safe to say that both deserve their own category. The main differences between augmented reality and virtual reality are as follows:

(1) Pricewise, AR is more easily accessible to the general public through smartphones and tablets (Azuma, 1997), while VR requires special hardware equipment, which still has a high price tag for most people.

(2) Unlike VR, AR enhances the real world rather than replacing it (Fritz et al., 2005).

(3) Researchers argued that VR can actually be a threat to tourism, as it can substitute certain experiences (Cheong, 1995), but AR is mostly complementary to the process of choosing and experiencing a destination (Kazmierczak et al., 2021).

Although augmented reality (AR) is not a new technology, in its early days it was used mainly in research and development fields and was rather inaccessible to the general public. That was mostly because the hardware and software compatibility of the technology was mostly limited to head-mounted displays (HMDs) and, in some cases, to monocular systems, monitor-based interfaces (Azuma, 1997), or other types of visualization-enabling device. In addition, the applications for the usual consumers were very limited due to the technology still being in development. Things started to change with the evolution of mobile devices, such as smartphones and tablets, and with a dramatic increase in their usage. Their ability to support augmented technology led to the creation of several apps that have AR-based functionalities. Ultimately, these AR integrations brought the technology into the eyes of the general public (Martínez-Graña et al., 2013), gaining traction and maintaining an ascending trend to this day.

Enhancing the customer experience with AR

● *in the pre-holiday stage*

Promoting destinations with AR to tourism consumers can happen for the following reasons: to increase awareness about the destination, to shape opinions and create higher interest, to increase sales, or to provide more information after purchase. Of course, tourism providers can target more than one reason at a time.

Brakus et al. (2009) states that in the pre-purchase stage, either consumers can meet a product physically, virtually or in an advertisement and in all cases the interaction becomes part of the product experience. Because experiences can happen, regardless of whether people have or do not have prior knowledge of a product, existing interest, or a personal connection with it, AR can also be used to increase the level of awareness about it. The experience can be enhanced by providing valuable information that can help potential consumers in their discovery and decision-making process. Additionally, a part of the product experience is the additional information gathered after purchase, but before actual consumption. Various technologies can easily be used to mediate these communications and experiences, but very few can achieve an experience so close to reality compared to AR (Sporea et al., 2020). Using AR benefits not only the tourism suppliers but also the consumers.

Research has shown that consumers prefer to try before they buy when it comes to products with certain characteristics, such as a high price (Breibach et al., 2014) or a product with a high associated risk. Unfortunately, because a destination is an intangible product, it cannot be fully experienced before the decision to purchase takes place. It is well known that intangibility negatively influences the ability to assess the quality of products and, inherently, the perception of risk by consumers by consumers by consumers (Laroche et al., 2004). A way for marketers to support intangible goods and reduce perceived risk is by creating informational or promotional content with visualization techniques such as photos, videos, maps, and so on. The scope is to aid the consumer mind to create mental imagery of the product and to make it as close as possible to reality.

Another opportunity identified for AR to promote destinations is the use of bogus windows in places like bus stations, travel agencies, embassies, airports, malls, and so on. These devices are actually screens that resemble regular glass windows (Scholz & Smith, 2016). Just like filters, these windows can augment the self, the environment or both. Although this technique was successfully used to promote consumer goods, brands or TV shows, we did not find examples of it being used to promote destinations and consequently no research on this topic either.

Tourists also use mobile apps created for virtual tours prior to their visit, to evaluate the touristic potential of a destination. Martínez-Graña et al. (2013) proposed the use of virtual itineraries to provide users with information needed to evaluate Las Quilamas Natural Park prior to a visit. This example is a little different from the others presented in this paper, because the augmentation does not happen in real time, at the location of the user, but instead over a digital copy of a geological site from Google Earth.

● *during holiday stage*

When tourists are visiting destinations, they do a lot of research on attractions, restaurants, cultural and historic information, etc. For many of these travel-tasks, people use mobile apps to complete them because they make the process easier and save time. When it comes to travel apps that use augmented reality, not only the enjoyment component comes into play, but also the tasks can be performed better, thanks to the attributes of the technology.

Compared to other tourist stages, the actual visit to a destination benefited the most attention, both from tourism providers and scholars alike, as shown in Table 1. The researchers have validated the acceptance of AR technology at the destination in a number of studies over the years. An example is the study by Tom Dieck & Jung (2015), conducted in the context of urban heritage tourism. They used an AR mobile app for a heritage trail in Dublin and found that information quality, system quality, costs of use, recommendations from other users, personal innovation, privacy concerns, and facilitating conditions (hardware availability, battery life) are the dimensions that can influence the use of the app. Similar studies have been created in the context of using an AR mobile app for a museum (Chung et al., 2015; Lee et al., 2015) or for a city in the form of a virtual travel guide (Kourouthanassis et al., 2014).

The first category is location-based AR. This AR technology comes in the form of an interactive map with superimposed virtual elements to help users discover nearby attractions, search and display information, create itineraries, and more. It usually tracks the user's location with GPS, which is why this type of AR is widely integrated in mobile apps. Han et al. (2017) researched the use of a navigational AR-based app for an urban heritage trail in Dublin.

Because augmented reality and virtual reality are two closely related technologies, a study by Jung et al. (2016) investigated how both influence the tourists' experience in a museum context. To investigate the impact of augmented reality, a mobile AR app was used. The paper found that the sense of presence when using either technology has a positive influence on creating memorable experiences. Another study conducted in a museum in Romania by Nechita & Rezeanu (2019) also researched the implications of using AR and VR technologies together to increase the attractiveness of the museum to younger audiences. Entertainment and empathy were also found to have a strong impact on the experience of visitors for both technologies. Augmented reality systems that provide informational and educational value can be used not only on land, but also for marine tourism. Kazmierczak et al. (2021) propose that using an app to provide tourists with information about their environment in an entertaining way can help alleviate the monotony that might occur during long sea voyages, therefore enhancing both the experience and knowledge of water tourists. The app is only in the development stage, and further research is needed to validate the hypothesis.

Besides superimposing normal elements like text or videos to provide more information to tourists, another application mentioned in the research literature is the ability to reconstruct historical places to see them reconstructed (Azuma, 1997; Fritz et al., 2005; Wang et al., 2012).

Table 1. Overview of AR research in tourism

Article	Authors	Research method	Context	Location of the study	AR tool	Tourist stage	Use of AR
A virtual tour of geological heritage: Valourising geodiversity using Google Earth and QR code	A.M. Martínez-Graña, J.L. Goy, C.A. Cimarra	Qualitative analysis	Geological heritage site	The Las Quilamas Natural Park, Spain	AR mobile app / QR code	Prior to visit/During visit	Navigational/Informational/Educational
User experience model for augmented reality applications in urban heritage tourism	Dai-In Han, M. Claudia tom Dieck & Timothy Jung	Focus group (5 focus groups with 49 participants in total)	Heritage trail	Dublin, Ireland	AR mobile app	During visit	Navigational/informational
A mobile application system for sightseeing guidance using augmented reality	Hitoshi Furata, Kyosuke Takahashi, Ken Ishibashi, Mami Aira, Koichiro Nakatsu	Experiment (5 participants)	Tour	Takatsuki city, Japan	AR mobile app	During visit	Navigational/informational
Effects of Virtual Reality and Augmented Reality on Visitor Experiences in Museum	Timothy Jung, M. Claudia tom Dieck, Hyunae Lee, and Namho Chung	Questionnaire (163 participants)	Museum	Cornwall, UK	AR mobile app	During visit	Informational
Augmenting Museum Communication Services to Create Young Audiences	Florin Nechita and Catalina-Ionela Rezeanu	Questionnaire (400 participants)	Museum	Brasov, Romania	AR mobile app	During visit	Informational/Experiential
Using AR Technology in Tourism Based on the Example of Maritime Educational Trips—A Conceptual Model	Rafał Kązmińczak, Agnieszka Szczepńska, Cezary Kowalczyk, Grzegorz Grunwald	Development/Questionnaire (248 participants)	Cruise	-	AR mobile app	During visit	Informational/educational

The determinants of recommendations to use augmented reality technologies: The case of a Korean theme park	Timothy Jung, Namho Chung, M. Claudia Leue	Questionnaire (241 participants)	Theme park	Jeju Island, South Korea	AR book	During visit	Informational/experiential
Enhancing Cultural Tourism experiences with Augmented Reality Technologies	F. Fritz, A. Susperregui and M.T. Linaza	Development	Skyline	San Sebastian, Spain	AR binoculars	During visit	Informational
Embodiment of Wearable Augmented Reality Technology in Tourism Experiences	Iis P. Tussyadiah, Timothy Hyungsoo Jung, and M. Claudia tom Dieck	Questionnaire (211 participants)	Museum	UK	Google Glass	During visit	Informational

Conclusions

Augmented reality is a multivalent technology that allows users to interact with their environment along with other computer-generated elements. The compatibility of smartphones with this technology has led in recent years to increased interest in implementing it for tourism purposes. This paper identified current and possible uses of AR to improve the experience of tourists before holidays and during the holidays.

In the pre-holiday stage, AR can be used to promote a destination and to help tourists with decision making in two ways. First, by catching their attention by differentiating from typical advertisements in the form of text, images, and videos. Second, by reducing the perceived risk associated with tourism products, especially destinations. Although AR is a highly effective tool to help tourists discover destinations and decide to visit them, its use is still limited. So far, not many tourism providers have integrated AR into their marketing strategy, although tourists have a high rate of adoption of the technology. Research is also scarce when it comes to using AR as a marketing tool, which is why there is a stringent need for scholars to create frameworks and investigate user adoption and behavior in different contexts.

On the holiday stage things are looking a little more optimistic. We have several examples of AR systems that are integrated into the visit to destinations and studies that validate their impact on the overall experience of tourists. However, there are also many research gaps that need to be filled. For example, scholars can further investigate what barriers technology adoption poses for some users and how they can be overcome. In addition, there is a need to create better guidelines for creating AR systems that are enjoyable enough and have utilitarian value for tourists, to enhance their experience even more.

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