



AUGMENTED AND VIRTUAL REALITY IN Tourism Industry – An Empirical Study

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ABSTRACT- Augmented reality is relatively new technology that allows mixing of virtual and real worlds to achieve a level of immersion that gives an amazing experience to viewer. In recent years, the fleeting development of augmented reality technology has fascinated people towards this highly dynamic area. This chapter focuses on the research and progress of augmented reality in recent years. Also, this chapter will throw light on the key technologies, development tools and application of augmented reality in some fields especially in the area of Social Media marketing of tourism. Furthermore, it needs to be designed to serve a specific purpose for the user, while multi-language functionality, ease of use and the capability to personalize the application are among the main requirements that need to be considered in order to attract tourists and encourage regular use. 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. This 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 as well.

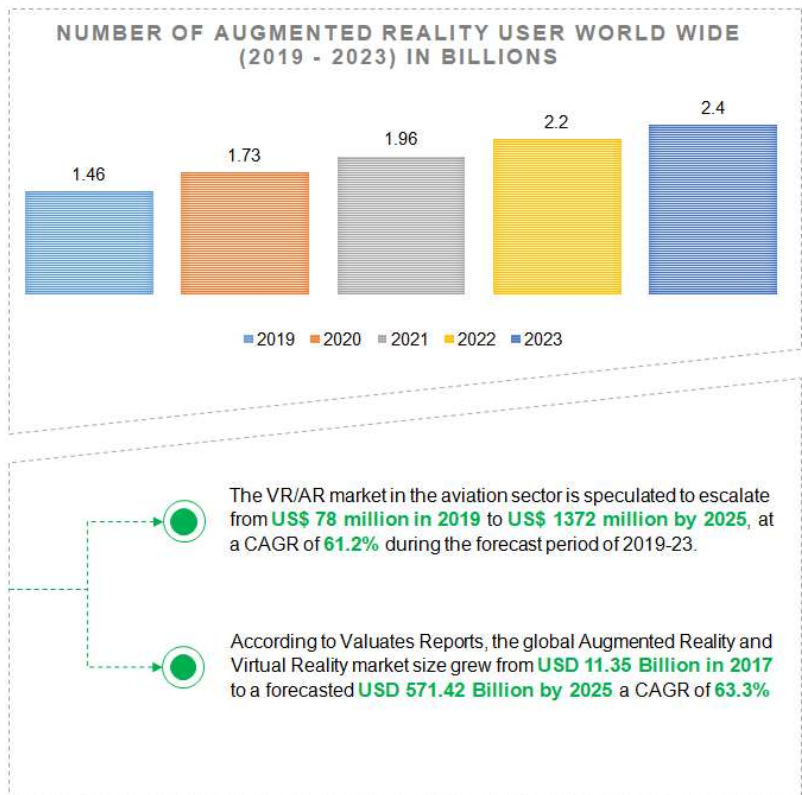
KEYWORDS- Virtual Reality, Augmented Reality, Tourism Industry

I. INTRODUCTION

Augmented reality allows intermingling of real and virtual worlds; in technical means it uses include Multimedia, 3DModelling, Real-time Tracking Sensing and more to give its viewer a great experience with guided intelligence to roam around. The information conveyed by the virtual objects helps a user perform real-world tasks. ARs principle is to apply computer-generated virtual information, such as text, images, 3D models etc., to the real world after simulation. AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. In this way, real world and superimposition of virtual information works in achieving the enhancement of the experiences. Therefore, AR supplements reality,

rather than completely replacing it. Ideally, it would appear to the user that the virtual and real objects coexisted in the same space. Graphic overlays might also be used to remove or hide parts of the real environment from a user gives a new dimension to entertainment industry. AR gives user an authentic experience in the area of interior decoration as well for example, to remove a desk in the real environment, draw a representation of the real walls and floors behind the desk and "paint" that over the real desk, effectively removing it from the user's sight. With the improvement of computing power of computer software and hardware, AR has gradually shifted from research stage of the laboratory to the stage of mass and industry application, and as a bridge between the digital world and the real world, it provides people with a new way to recognize and experience the things around them. Some researchers suggest the AR should be seen as a concept rather than taking it as a technology as it's a new technology giving room to new revelations and discoveries. Some of the fields where AR/VR is being used are:

- **Sciences:** Educational institutions are harnessing the visual and sensory power of VR to teach students subjects such as human and animal anatomy, molecular biology, chemistry and atomic physics. Astronaut and pilot training makes extensive use of the extended reality technology.
- **Tourism:** Virtual tours to historical monuments and archaeological sites in far off places are enriching the learning experience of history, archaeology and political science students. Furthermore, students of arts get first-hand experiences of the world's top museums and the artworks housed therein through VR.
- **Business Studies:** Different business and economic models can be better explained to students through the use of AR/VR. In business education, the real buying selling, the in-store experiences, production line, supply chain etc. could be made visibly understandable and experiential with the use of AR/VR. The technology comes in very handy in making students corporate ready.
- **Architecture & Engineering:** The most widespread use of AR/VR is witnessed in the fields of architecture and engineering. Using VR technology, the designers are able to not just better implement their vision by creating to-scale 3-D models, they are pushing the boundaries of physics and mechanics by creating the most imaginative and innovative designs.



- **Communication Skills:** Across the disciplines, VR tech is being used by students to enhance their communication skills, particularly public speaking abilities. There are VR e-learning virtual speech courses that allow students to choose the size of the crowd being addressed and then practise public speaking and presentation skills.
- **Social Media Marketing:** Social media is all about engagement and interaction, and AR/VR in social media will boost the client's engagement as they can experience a virtual version of what the brand is offering.
The coexistence of virtual objects and real environments allows the viewers to visualize complex repositioned relationships and abstract concepts experience phenomena that creates an amazing real world. To achieve the purpose of this chapter empirical and review studies are observed and examined to know how AR could be incorporated into educational settings.
- **Gaming:** Audio visual effects in gaming are now the bygone of gaming and entertainment industry. The users are evolving and so as the gaming experiences for them. As per Ericsson Consumer Lab insight report March,2019 out of total surveyed data (66 percent) are interested in AR gaming. Almost 4 out of 10 AR gamers agree that AR gaming will be more interesting with better and more immersive games, access to lower cost AR glasses and better batteries.
- **Medical simulation:** - Augmented reality can be used to realistically display how the procedures take place during various kinds of operations. They can be practicing tools for the learners to learn the medical processes instead of the traditional cadaver-based practice. Throughout the process, they can be guided on their next step so as to inculcate the learning process by doing it on their own. Although since human life cannot be left on experiments so AR/VR can be applied for training purposes only.

Literature Review:

The hospitality and tourism sector has experienced significant changes due to technological advancements in recent times (Guttentag, 2010). Over the past two decades, information and communication technologies with various characteristics have been increasingly adopted to create value and provide unique services, enhancing tourists' experiences throughout their journeys (Wei, 2019). Among the most transformative technologies in the digitalized world are augmented reality (AR) and virtual reality (VR), which are being progressively utilized in the hospitality and tourism sector for end-user benefits. These technologies allow for a first-person view of an integrated or simulated world (Soon et al., 2023), catering to tourist expectations (Zarantonello and Schmitt, 2023).

Destination marketers and hospitality and tourism service providers have recognized AR and VR as innovative marketing tools to promote local offerings and tourism destinations (Chung et al., 2018; Scholz and Smith, 2016). AR is characterized by the augmentation of real-life environments with layers of computer-generated images via a device (Guttentag, 2010; Jung et al., 2015), while VR generates a 3D environment where users can navigate and interact, immersing themselves.

The extensive role of mediating and co-creating experiences through technologies generated a new concept in the literature, called 'technology-enhanced experience' (FemeniaSerra &

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 touch points 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).

Before the development of modern ICTs, tourist consumers used to come in contact with destinations through the press, books, and 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 touch points 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).

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VR generates a 3D environment where users can navigate and interact, immersing themselves in real-time simulations (Burdea and Coiffet, 2003; Gutierrez et al., 2008; Guttentag, 2010). Specifically, AR and VR are revolutionizing the way tourists experience destinations by providing immersive and interactive previews (Han et al., 2018). With AR and VR, service providers in the hospitality and tourism sector are developing innovative methods to optimize tourist experiences within resource constraints.

Booking hotel accommodations is often a critical travel decision due to various risks and uncertainties (Casalo ´ et al., 2015). As such, the information search stage is crucial for potential tourists' satisfaction and their likelihood to repeat visits (Kalantari et al., 2023; Sun, 2014). As decision-makers, tourists seek to assess all available information to make the most appropriate choices (Flavian ´ et al., 2021; Kalantari et al., 2023). AR and VR have transformed hotel operations, aiming to provide superior experiences and encourage repeat usage. AR and VR enable tourists to virtually experience hotel services before encountering them in real life (Bogicevic et al., 2021; Pillai et al., 2021), serving as marketing tools (Loureiro et al., 2020; Yung and Khoo-Lattimore, 2019). Consequently, potential guests can acquire the necessary information to simplify their hotel decision-making processes (Israel et al., 2019).

As AR and VR facilitate hassle-free trips, the number of users has increased. According to a report by Technavio, New York, the metaverse Numerous studies have examined the effectiveness of AR and VR (Bogicevic et al., 2021; Bogicevic et al., 2019; Flavian ´ et al., 2021; Leung et al., 2020; Zeng et al., 2020). However, existing literature has seldom explored the factors guiding tourists to use AR and VR specifically for hotel bookings and their intention to not only stay but also return. While the effect of hedonic behaviour and continued used of AR and VR for travel has been investigated (Kim and Hall, 2019), the impact of its utilitarian counterpart remains underexplored.

Noteworthy, understanding the factors that drive tourists to use AR and VR for hotel bookings and their propensity for repeat usage can enable destination marketers, hoteliers, and hotel booking service providers to develop more user-friendly and appealing AR and VR applications for hotel bookings and enhance the design of hotel rooms in order to better target potential customers, create more engaging experiences, and foster long-term relationships with tourists.

INCORPORATING AUGMENTED REALITY IN TOURISM

As Augmented Reality has been researched, many attempts have been made to give a proper definition. In general, Augmented Reality refers to enhancement of the real environment by computer-generated content, which is up to date mostly supplemented with graphical content

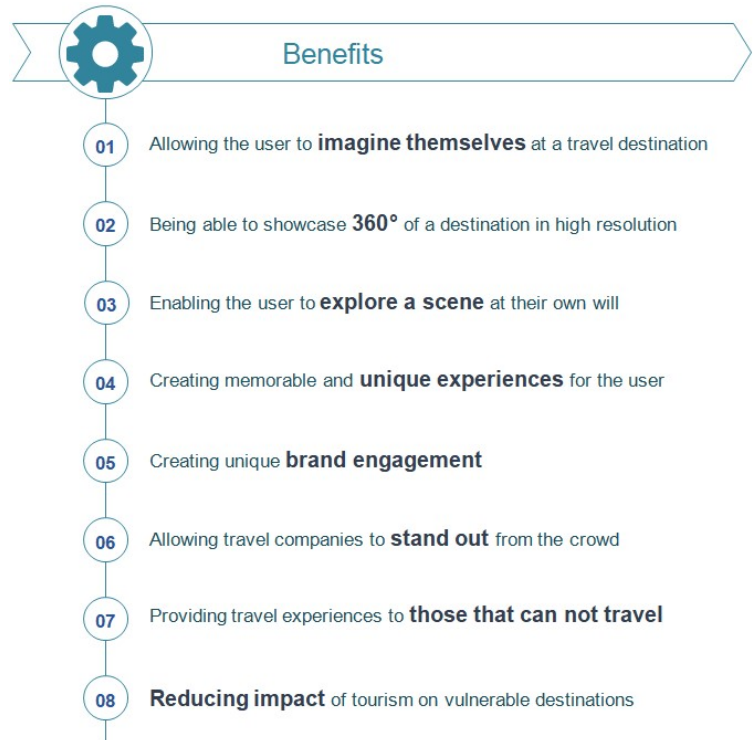


(Hyun et al., 2009). However, although Augmented Reality technology has existed for more than 10 years, it is still a fairly new concept within the tourism industry, it has not yet been fully developed, which leads to a constant challenge to define Augmented Reality properly. Augmented Reality provides significant benefits for many industries due to its nature of mixed environment, or computer enhancement of real world setting (Azuma et al., 2001; Reinhart and Patron, 2003; Van Krevelen and Poelman, 2010). Academics as well as industry practitioners argue that Augmented Reality provides many opportunities for mobile computing

applications, which need to be seized in industries such as tourism, as being linked with the context of the immediate location (Olsson and Väänänen-Vainio-Mattila, 2011). 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.

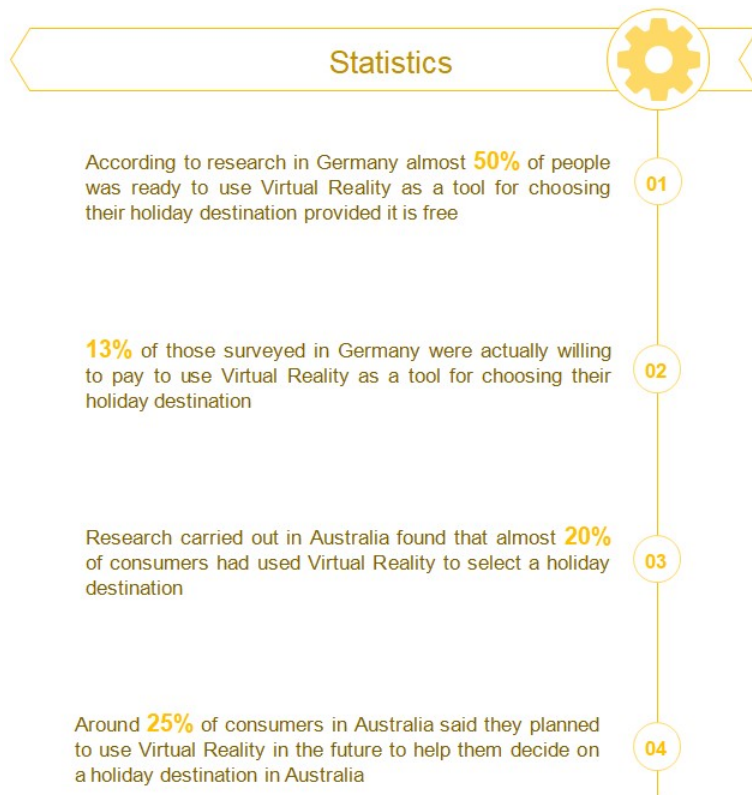
In the field of tourism, the application of augmented reality technology to tourist attractions can restore historical sites by using mobile phone cameras, screen software and other technological means to integrate the real scenes. In addition to viewing scenes, additional information can be obtained. AR technology is often used in archaeological studies to zoom in on relics in real landscapes to ensure that archaeologists can more accurately pinpoint their location. The unique characteristics of mobile technologies, for example ubiquity, flexibility, personalisation and dissemination make it a useful tool for both tourism suppliers and consumers (Kim, Park, & Morrison, 2008). Thus, the number of tourism organisations exploring the potential application of technologies to enhance tourist experiences has risen. The introduction and increased proliferation of technologies has had a significant impact on many industries, especially the tourism sector.

- Technological advancements, such as AR, have impacted and disrupted all tourism organisations. The increased awareness and use of these technologies, have changed travel behaviours by revolutionising the way in which tourists search for information, make decisions (Wang et al., 2016), purchase tourism products and services, find and explore reviews. As the use of technologies in tourism has increased, the distinction between tourist experiences and daily life has become increasingly blurred. This blending has been defined as spill-overs (Wang et al., 2016), and much research explores the impact of AR & spill overs upon travel experiences. For instance, Cranmer et al. took an internal stakeholder perspective to examine the use of AR within the cultural heritage tourism context.
- With regards to the visitor experience, their study revealed AR adds value, by modernising the existing offering. This in turn is expected to make it more attractive for new markets, as well as, retain existing ones. Further, Han et al. (2019) explored how meaningful tourism applications can be developed by including tourists as part of the development and implementation stage. Tourists are happy to escape into known simulated experiences like Disneyland, totally absorbed into staged alternate realities (Cohen, 1979). It can be argued that the application of VR/AR into the tourism experiences merely pushes this alternate reality one step further.
- The studies explored how the increased interactivity and presence of Second Life affected awareness of tourism sites and trip-planning. In general, they found that participants developed



positive feelings and increased awareness toward the destinations. The studies found that students showed increased motivation, with many participants describing the experiences as more interesting and interactive. Similar to the studies on destination marketing, technical difficulties, and uneasiness-of-use were a common concern, specifically for the educators. Nevertheless, the importance of future research into virtual tourism lies in the benefits that it could bring to those who have restrictions on travel, such as physical disabilities, financial difficulties, or social stigma.

- The advent of AR has also opened doors for several industries to enrich their customer experience. According to a Statista report, the Augmented Reality market is predicted to grow from 5.91 billion to 198 billion U.S. dollars by the year 2025. Like every industry that is leveraging the benefits of AR, the travel and tourism industry has also witnessed tremendous growth with this emerging technology. AR is playing a crucial role in transforming the tourism landscape and boosting travel experiences for tourists.



Due to the potential of enhancing the immediate surroundings, Augmented Reality has been considered to be of high potential for the tourism industry (Fritz et al., 2005). A tourist is a person who typically has “little or no knowledge of the environment” (McKercher and du Cros, 2003) Thus, such a location-based device, which can be used to access information in the immediate surroundings, would greatly benefit this industry. As tourists in general are interested in their environment, the use of Augmented Reality devices have the potential to create the next generation of computerized tourist guide (Olsson and Väänänen-Vainio-Mattila,(2011). According to Höllerer and Feiner (2004), the

user interface should not only be able to pinpoint the user’s location, but also provide background information of the area that might be of interest. This idea has led to a great interest in inventing tourism application for mobile utility (Cheverst et al., 2000). Such applications are continuously being modified in order to improve efficiency to be fully functional. The city of Vienna provides a tourist guide application, which is able to guide the user to certain locations via navigation, as well as is able to provide location-based information on nearby places, which can be selected at will (Cheverst et al., 2000). Thus,it is multiple-user friendly, which allows various users to share

information, while constantly being mobile supporting the trend of social networking. The tourism industry requires constant investment into new technologies, preferably for mobile use, in order to continue attracting visitors. It was argued that this is a great challenge for many destinations around the globe that lack sufficient funding opportunities (Fritz et al., 2005). As of 2013, the majority of smartphones provide navigation, GPSmap based systems, which are able to pinpoint the user's exact location. The literature states that mobile phones are able to access up to date content, flexibly to deliver text, image and video data and can provide additional information on a map-based system (Yovcheva et al., 2012). However, such applications are still being improved, as their functions are very limited and do not allow multi-user usage (Gazzard, 2011).

Current implementations of AR in tourism lack effective engagement of the user and provide an enhanced experience to the tourist. Furthermore, it has not yet been made flawless, and includes many bugs, which need to be overcome before offering it to the public. Another challenge is the acceptance and adoption to such devices, as many tourists still prefer traditional sources, such as travel books and other sources of media. Nonetheless, Augmented Reality shows high potential in becoming a main-stream technological tool in tourism in the near future due to its practical usefulness, which can be employed indoors as well as in outdoor environments (Fritz et al., 2005).

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.



Applications that makes a Museum live

An AH application named **Story of the Forest** created by the **National Museum of Singapore**. Visitors can search for different plants and animals with this app. Users not only get entertained but also learn about where different plants grow and where certain animals live.

Museum of Natural History enriched their ever-lasting exhibition of skeletons with an AH application. Now visitors, who downloaded the **Skin and Bones app**, can overlay the phone over the carcass and see what the animal looked like when it was alive.

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 the communications and learnings, but very few actually can achieve an experience so close to reality compared to Augmented Reality. 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 (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,



Applications for the Travel Organizations



Thomas Cook travel company offers digital content with a **marker-based AR app**, in addition to printed materials. Some companies are developing AR apps, which allow tourists to enhance physical locations and tourist attractions. This may allow a user to point their smartphone at a building or landmark and learn more about it, in real-time.

Skyline is an example of a great AH tourism application for **hiking and camping** enthusiasts. It guides through the phone camera recognizes the view and labels mountains, hills, rivers with their names. secondly, it can show the way to the destination point in a real-life mode.

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.

- **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.

Compared to other tourist stages, the actual visit to a destination benefited the most



An obvious example here is **Google Translate**. A few years ago it offered a feature of instant translation. As a person points a camera to a foreign phrase, the application translates it into English or any other available language.



AH application **Kabaq** shows the restaurant guests a detailed mouthwatering **3D images of the food**. When one sees how beautiful that steak is, it is impossible not to order it.

attention, both from tourism providers. 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. 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.

CONCLUSION

AR/VR is the emerging field which will give its user amazing experience. Metaverse has been explored as a new technique of amalgamation of AR VR. While it is important to understand the ways in which metaverse tourism is helping to change the industry, business owners and other decision-makers also need to have an awareness of the tangible benefits. The use of AR/VR in the area of tourism will not only give a great experience to its users but also will increase the turnover of tourism industry of that country.

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 behaviour 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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