The Influence of Augmented Reality and Virtual Reality Combinations on Tourist Experience

Asmaa Marzouk[1]   **Azza Maher[1]**   **Toka Mahrous[1]**

[1]Faculty of Tourism and Hotels, University of Sadat City

Abstract

Nowadays, the tourism industry requires continuous investment into new technologies, preferably for mobile use, in order to keep attracting visitors" and therefore, highlighting the need for destinations to be innovative. Therefore, such competitive environment impose the academics to make extra efforts to keep the industry on the track, so this study tries to explore the influence of combining Augmented Reality and Virtual Reality applications on tourist experience and investigate the benefits they get and the difficulties they experience while using such applications. A quantitative method was the most appropriate method for this study; a well-structured questionnaire was designed and distributed in national museum of natural history in Washington Dc. The findings reveal that Augmented Reality and Virtual Reality are promising technologies that can have wide impact on enhancing tourist experience before, and during the visits. This study recommends combining Augmented Reality and Virtual Reality together in order to maximize the exciting of tourists' experience.

Keywords: Augmented reality, Virtual reality, Tourist experience.

1. Introduction

The use of modern technology is becoming a necessity of various destinations to stay competitive, attractive (Ding, 2017) and financially viable, it has been discussed tourist organizations must follow new ways to provide enhanced, enriched and unique experience, while offering value adding services to the new tourist (Cranmer et al., 2017). Technological advances, coupled with a proliferation of inexpensive hardware and software, have made immersive technologies like augmented reality (AR), virtual reality (VR) and mixed reality (MR) more commercially possible than ever (Ding, 2017). Now, an increasing number of tourist attractions have begun to explore the use of AR and VR to enhance visitor interactions with, and opinions of their real-world environment. AR have ability to allow tourists with limited knowledge of an area to truthfully experience it, providing tailored and personalized information and enhance the tourist experience (Cranmer et al., 2017).

AR and VR applications can be used by tourists in real-time, while interacting in the location. The technology can help in terms of increasing the visitor's information of destination's history and culture, but also to become aware of services and attractions that are available during the trip (Giberson et al., 2017). Buonincontri and Micera (2016) also clear how smart technologies can support the tourism experience co-creation among tourists and tourism service providers in a smart destination.

Augmented and Virtual Reality applications are one of the promising technologies that enhance the users' cultural heritage visit experience with the digital content developed for the cultural heritage. Among tourism destination resources, cultural heritage sites and attractions, including museums, monuments, art galleries, theatres, archaeological, historical, and religious sites, cultural festivals and events, can meaningfully benefit from the application of smart technologies.

2. Literature Review

2.1 Virtual reality

Virtual reality (VR) hit the headlines in the mid of 1980s; now we have virtual items (universities, offices, studios, museums, shopping, graveyards, wind tunnels), virtual characters (actors, doctors, pets), and virtual events (exhibitions). The main characteristic of VR is that the users enter a completely immersive world invented by the computer system, without seeing the real world around them. This may display inside a blank room, headset, or other devices that permit the users to experience the virtual environment. Increasingly, VR applications now also offer features like feedback in the form of sound or touch to allow the users to interact with objects and spaces (Ab. Aziz and Gek Siang, 2014).BPP Learning Media (2013) defined virtual reality as a technology that permits a user to enter and interact with images generated on a computer or computerized device: special graphics, video images and stereo sound make the description of places and actions seem real.

Today, it seems perfect that virtual reality will be the next big technology for the industry to embrace. VR is a natural suitable for travel. After all, the technology is all about releasing the user from their physical boundaries. Using virtual reality technology, the tourist can tour places near and far, real or imagined, and even travel through time. After all, the technology is all about travel. Far more than travelogues, still pictures, or even video, a VR experience is the perfect way to increase a "sneak peek" of a tourist destination before so much as packing a bag (Reality Technologies, 2016).Guttentag (2010) recognized six ways in which tourism will be affected by VR including planning and management, marketing, entertainment, education, accessibility and heritage preservation. Industry has mainly focused on implications of VR in tourism including marketing, accessibility, education and entertainment. Though adoption of VR is still comparatively cutting edge, industry is catching on and integrating VR elements into their marketing.

For example, Carnival Cruises is using 360-degree video technology to give potential buyers a purer picture of what to expect and regain control of travelers' preconceived ideas of a trip (Rizzo, 2016).

2.1.1 Applications of Virtual reality

Now, there are many more uses of VR applications than first recognized, such as marketing, entertainment, education, accessibility and heritage preservation (Virtual Reality Society, 2017).

- **Marketing**

One of the most important implementations of VR in tourism is in marketing. The intangible and inaccessible nature of tourism experiences present challenges for both providers (in convincing travelers to truly visit a destination) and consumers (in making a decision on where to spend a trip). Immersive Virtual Reality provides travel marketers the opportunity to provide potential consumers with the most accurate experience of a destination without necessary physical co-location (Barnes, 2016). When used as a marketing tool, VR can help convey experiences, increase awareness and purchase target, as well as theoretically enhancement destination image (Griffin *et al.,* 2017).

- **Entertainment**

In addition to serving as a tourism marketing tool, VR systems also can purpose directly as marketable, entertaining tourist attractions. (Najafipour *et al.,* 2014).Adoption of VR isn't just limited to theme parks; museums and art galleries are also using VR to include fun and drive traffic, where the technology has been used to gamify exhibitions (e.g., the Museum of Fine Arts in Boston, MA (Bulencea, 2016), and as a medium through which art is presented (e.g., the Palazzo Ducale in Venice). VR can provide a museum or gallery with a point of difference and competitive edge (Izzo, 2017), and offers an attractive form of 'edutainment' (education through entertainment).

- **Education**

As well as simply being entertaining, VR also offers great potential as an educational tool. A VR model can be an effective means of communicating a large amount of information because it leverages the user's natural spatial perception abilities (Najafipour *et al.,* 2014).VR applications can provide a good platform for the transfer of knowledge. In the field tourism, VR mobile applications can be used to bring the history of destinations to life (Butt, 2017).

- **Accessibility**

The visitors' site may be too remote, too expensive, too inhospitable, too dangerous, too fragile, or simply no longer exist. As well as providing a best possible alternative in such scenarios, virtual models also can allow unique interaction with historical objects or other fragile items that cannot be handled in the real world (Najafipour *et al.,* 2014).VR increases the accessibility of destinations, allowing travelers to virtually visit and experience places and activities that are available to the public due to financial or physical limitations. VR can remove some of the obstacles to travel, including safety, cost and physical capabilities. For instance, the recently launched Google Earth VR can take users on a 3D visit almost anywhere from Table Mountain in South Africa to glaciers in Argentina (BusinessLine, 2017).

- **Heritage preservation**

According to Wiltshier and Clarke (2016), the use of technology to view special sites can offset the depredations of the large numbers of visitors that destroy the destination items. In the instance of the Chinese village of Dai Ethnic, the design of an interactive virtual experience allows tourists to be immersed in the cultural heritage without threatening the environment (Peng *et al.,* 2015).

Virtual tourism can contribute to the sustainability of tourism development in a variety of ways (BPP Learning Media, 2013):

- Helping to prepare and educate tourists before they make a tour.
- Replacing a virtual reality experience for a visit a destination which is currently undeveloped, vulnerable, under pressure, already beyond its carrying capacity or closed to tourism.
- Substituting a virtual reality experiences for tourist's actions which are seen to be unethical or unsustainable (such as hunting) or risky (such as off-piste skiing).
- Attracting tourists to declining resorts in need of rejuvenation or redevelopment.

2.1.2 Potential problems of virtual reality applications

A simple browse of the virtual reality applications available on tourist destinations shows problems of hardware and software compatibility. Occasionally the computer used to access these applications cannot open or execute them, or additional software has to be downloaded before the user can experience virtual reality programs. Other areas of problems are related with the impact of virtual reality applications for real-life tourism. It can be imagined that there is no so distant future in which virtual reality technology will be able to provide high-quality, highly-customized tourist experiences. Another challenge to the use of virtual reality in tourism has a strong philosophical and ethical dimension. By constructing re-constructing or copying the reality in virtual reality applications, the specialist can change reality (Gurau, 2008).

2.2 Augmented reality

Augmented reality (AR) is a new technology that allows tourists to combine their experience with technology and place it in real life. It also helps tourism service providers to market their services. This technology can attract more tourism service consumers by enhancing their experiences that leads to increased income (Shabani and Hassan, 2017). AR is also concerned about presenting contextual information and assisting in daily activities, which is particularly helpful when people are unfamiliar with the environment around them. By highlighting interesting features or bringing history to life, moreover, AR provides intuitive means to enhance a touring experience (Bermejo *et al.*, 2017). The widespread of AR came with the use of mobile devices like Smartphones; even that the AR technology has started in 1960's and has become more essential in the last decade of 20th century (Mesároš *et al.*, 2016). Tourists usually request precise and tailored information while exploring a tourist site. They need accurate information about lodging properties, restaurants and tourist attractions, amongst others, in order to make the most of their experience. Mobile Augmented Reality (AR) can help tourists in the process of gaining such information in a very simple way.

Combined with the information located on the Web, social media and streaming techniques, AR can improve the way users interact with the physical world, adding additional information about people, buildings or places in order to suggest previous memories or complement present stories (Marimon *et al.*, 2010). AR could relate to any human sense, including sight (visual), hearing (audio), touch (haptic AR), smell (Olfactory) and taste (gustatory AR) (Hollerer and Feiner, 2004). Augmented reality applications are used on many mobile platforms such as iPhone, Windows Phone, and Android smartphone.

2.2.1 Augmented reality applications

AR applications provide not only practical information, such as facts about accommodation, attractions, museums and monuments, but also customized information based on the user's preferences and context. With the increasing popularity of smart phones, mobile location-based AR applications have started to play an important role in the tourism industry. These applications help visitors to access context-aware information on locations or tourist attractions that can enhance their knowledge about the area. Mobile location-based AR applications allow users to explore the world by adding new layers of location-based information to their reality and to create lists of their favorite point of interests (POIs) using this information (Chen, 2014).Augmented reality applications in tourism can be summarized as the following (Digital Tourism Think Tank, 2017):

• **An Enhanced Booking Experience**

Readers of the Enquire magazine, Popular Science, or Time can explore additional multimedia content by pointing their Smartphone towards specific pages. This new breed of next-generation promotion could be applied as well to tourism catalogues, brochures, pamphlets, flyers and any other type of paper-based promotion materials. Hotels, casinos, theme parks but also special events or virtual roller-coaster trips could come to reality to provide a better sense and impression of what tourist is looking for (Digital tourism Think Tank, 2017).

• **Augmented Services in the Restaurant**

The AR experience is based on projective AR system. Customers are able to interact with the tabletop and select their own table theme, order items from multimedia rich menu or see a live video-feed from the kitchen. Such augmented applications leverage the abundance of tables and walls, seen as canvases, in order to provide both a physical collaborative space and an interactive computer display of virtual information (Ozdemir and Kilic, 2017).

• **The augmented reality hotel experience**

Augmented experiences can enrich the whole visit to a new destination. While a particularly suitable system for enhanced AR experiences, hotels have been lagging behind in harnessing the true potential of the technology. Hotels are also very suitable venues for the development of AR applications. One of the best-known examples in this regard was developed by Holiday Inn. In this hotel AR application, by using smart devices, the guests can be virtually seen Olympic and Paralympic athletes as if they were in the reception, the saloon, or in their hotel rooms (Buhalis and Yovcheva, 2014).

- **Augmented transportation**

AR systems are ideal tools that could guide tourists through unfamiliar environments. Navigation and way finding was one of the first application areas for AR. Augmented displays have the features needed to reduce the mental effort required for both pedestrian and auto navigation. Navigation and signaling were the first areas of application of Augmented Reality in tourism. (Ozdemir and Kilic, 2018).

- **Augmented reality translation**

Navigation and exploration of unfamiliar surroundings could be significantly influenced by the lack of clear translation of foreign language signs and instructions.

Apart from street signs, AR applications could provide real-time immediate translation of written text on dinner menus, train schedules and newspapers headlines from a foreign to the native for the user language (Digital tourism Think Tank, 2017). There are augmented reality applications that provide translation of the elements in real time, such as, menus, train times and newspapers. These applications translate in real time the language of the country where the tourist is located to his or her native language. Word Lens and Intelligent Eye are two commercial applications of Augmented reality that have the ability to do translations in real time, simply pointing the mobile device to the original text, overlapping it on the device display, the text already translated into the selected language (Pereira *et al*., 2018).

- **Augmented Reality as a Marketing Tool (ARM)**

Augmented reality supports a special type marketing known as augmented reality marketing (ARM). AR is an innovative and latest technology form as adopted by many business enterprises to strategize their marketing campaigns. AR is applied as the combination of both online and print advertising. The application of AR can thus become useful in a far greater way to reach and interact with those audience groups (Shabani and Hassan, 2017).Augmented reality device applications (apps) can appear as having positive effects in marketing in general and as potential campaign of marketing of tourism and hospitality marketing in particular. However, augmented reality as a campaign of marketing needs to be given sufficient attention for its development in terms of, attaining its potential of meeting diverse tourist demands (Celtek, 2015).

- **Re-living historic life and events**

Re-creation of ancient historic destinations is a topic that lends itself naturally to AR with a number of developed prototypical and commercial systems. The first cultural heritage site that benefited from an augmented virtual reconstruction of an ancient temple was Olympia in Greece, where researchers developed the Archeo-guide AR system (Digital tourism Think Tank, 2017).

As every new system and services in the world of tourism, the use of augmented reality also requires investments. Creating the proper software, content or maybe the infrastructure can be costly and in a recent time needs further investment, but the technology evolving rapidly, and the enhanced services can attract more tourists or visitors (Attila, 2017).

2.2.2 Advantages of augmented reality

➢ Making things memorable and eye-catching, sensory-oriented. This is a significant advantage of using augmented reality in marketing, for presentations or trying to reveal more details or specific qualities of the object that could not be done without augmenting the reality (Augmented reality co, 2015).

➢ AR is able to create new value at cultural sites. Visitors can explore the unfamiliar environment in an enjoyable and thrilling way. This represents one of the most significant benefits from a supply perspective because an increasing number of tourists are looking out for unique and memorable on trip experiences (Buhalis and Tscheu, 2016).

➢ Highly specialized hardware is not required, devices can be operated in open and closed areas, presentation quality can be adapted to the device used, full interaction is supported, and more information can be accessed (Deliyiannis and Papaioannou, 2014).

2.2.3 Disadvantages of augmented reality

There are some difficulties in the design of AR scanners in the field of tourism (Yovcheva et al., 2014). Hereunder some disadvantages of using augmented reality (Chavan, 2016):

☒ **Openness:** Other people can develop their own layers of content to display. That could lead to information overload and augmenting without permission.

☒ **Interoperability:** The lack of data portability between AR environments.

☒ **Regarding user experience**, socially using Augmented Reality may be inappropriate in some situations.

☒ **Spam** as it is easy to imagine that spam could overwhelm the augmented world with unwanted advertising or unwanted information of any kind.

☒ **Price** – as the technology is still developing it may be quite expensive to use it in everyday life and it might be less accessible for small businesses.

2.3 Difference between Virtual Reality and Augmented Reality

Despite of the similarities shared between AR and VR (Ong et al., 2008), AR differs from VR as shown in table (1). one of the most significant differences is that while VR completely immerses users inside a Virtual Environment (VE) so that they cannot see the real world around them; AR permits users to see the real world, with two-dimensional (2D) or 3D images overlapped upon the real-world images or videos (Ab. Aziz and Siang, 2014).

Table (1): Virtual Reality vs. Augmented Reality

TECHNOLOGIES	VIRTUAL REALITY	AUGMENTED REALITY
LOCATION	Off-site	On-site
VISITATION	Before and after actual visit	During the visit
PLATFORM	Website	IOS or Android
DEVICES	PC, HMDs, etc.	3G Mobile Devices
CONTENT	Large information (text, animation, video, audio, virtual tour featuring 360-degree panoramic images)	Bite site information (text, animation, video, audio, images of early years, suggestions on where to go next, what to do next)
NATURE	Informative, interactive, immersive	Informative, interactive, immersive
FUNCTIONS	Marketing tool to attract tourists, tour planning prior to visit, informative and educational, virtual visits, post-visit updates	Marketing tool to attract tourists, informative and educational, interactive actual visits, virtual tour guide

Source: Ab. Aziz and Siang (2014).

2.4 Museum and tourist experiences

Experience is a complicated and multi-faceted issue. The source of experiences comes from activities, from the environment and the social contexts embedded in the activities. (Ooi, 2003). Wang and Pizam (2011) define experience as a constant flow of thoughts and feelings that occur during moments of conscious nesses. An experience is a subjective episode that customers live through when they interact with the offered product or service.

On one hand, VR is being used by museums in different ways to create new museum experiences. Museum experiences become memorable when the visitor's needs are satisfied. Personalizing the experience is a way to make the experiences fit the visitors better, when creating new experiences, museums must be careful not to make these experiences just to attract visitors, but also to fulfill their educational goals and take in consideration how the experience can aid the future of the museum (Tan, 2017). Falk (2017) mentioned that here are different uses of VR in museums. A lot of the experiences, however, have no personalization. The difference in the needs of a visitor makes it impossible to satisfy all the visitors with one-size-fits-all experiences.

Personalization is needed to satisfy the needs of the visitors and give them a memorable museum experience. VR has the advantage that it is able to show the user things without others seeing it too. For example, if one user would like to see the labels near the paintings, but another user would like to just see the painting itself without any additional information, VR can satisfy both visitors at the same time (Tan, 2017).

On the other hand, an increasing number of tourist attractions have begun to explore the use of AR to enhance visitor interactions with, and perceptions of their real-world environment. AR also has the ability to allow tourists with limited knowledge of an area to naturally and realistically experience it, providing tailored and personalized information and enhance the tourist experience (Cranmer et al., 2017). Moreover, the integration of AR into the tourist experience illustrates a noteworthy entertainment factor for tourists', positively influencing and increasing the educational effect at the same time (Jung and Han, 2014). A lot more museums are using AR apps or apps with AR feature as an engagement tool inside exhibition spaces. For instance, the Smithsonian's National Museum of Natural History's AR app- "Skins and Bones", exposed the story behind the skeletons using AR. Some museums have not created AR apps by themselves but have utilized free AR apps developed by technology companies in order to attract and engage visitors in Temporary exhibitions (Ding, 2017).

3. Methodology

This study set out primarily to explore the influence of combining VR and AR applications on the tourists' tour experience, and therefore identifying the benefits and challenges of using such applications. A well-structured questionnaire was designed and distributed to the visitors of national museum for natural history in Washington Dc. The reason why the questionnaire is distributed to those visitors is because this museum is depending on enhancing the visitors' tours by adopting the smart technology apps (AR and VR), in addition, the selected museum is the fourth most visited museum in the world in 2016 with 7.1 million visitors (Travel + Leisure, 2018). Augmented reality (AR) technology is revolutionizing the traveler's experience by making the planning journey much more seamless, interactive, and simple 166 copies of questionnaire were distributed to visitors of the national museum for natural history in April 2018, only 158 were completed with a response a rate (95.18) with valid number (150). The Cronbach alpha was computed for the questionnaire sections and the results showed that the reliability coefficient for all the sections were above 0.70 which indicates that the instrument is reliable for being used.

The questionnaire used for this study included three questions concerning the respondents' demographic characteristics and other relevant information. The respondents were asked about their gender, age, educational and occupational status. This information was useful in understanding the profile of the respondents. It was found that out of the 150 respondents, (64%) were females and (36%) were males. Only 34 (22.6%) of the respondents were over 40 years old, 23(15.33%) belong to the 30-40 years old group, and the majority 74 (49.33%) were belong to 30-40 years old, while 19 (12.66%) were less than 20 years old. In addition, only 111 (74%) of the respondents are employed and 39 (26%) are self-employed, only 11 (7.33%) having master degree and 2 (1.33%) having Ph.D. degree, while the majority of the respondents 137 (91.33) having a good level of education.

Such information provides the study with the fact of the museum captures the young and educated visitors, this may be because of the nature of the museum' collections where the museum's collections contain over 126 million specimens of plants, animals, fossils, minerals, rocks, meteorites, human remains, and human cultural artifacts which offers both the entertainment and educational opportunities for the visitors.

Tourists who completed the questionnaire at national museum for natural history showed significant differences concerning the question "Please rank the most important Augmented Reality and Virtual Reality applications for you?" Figure 1 shows the ranking of different purposes that stand behind using the tourists the VR and AR applications.
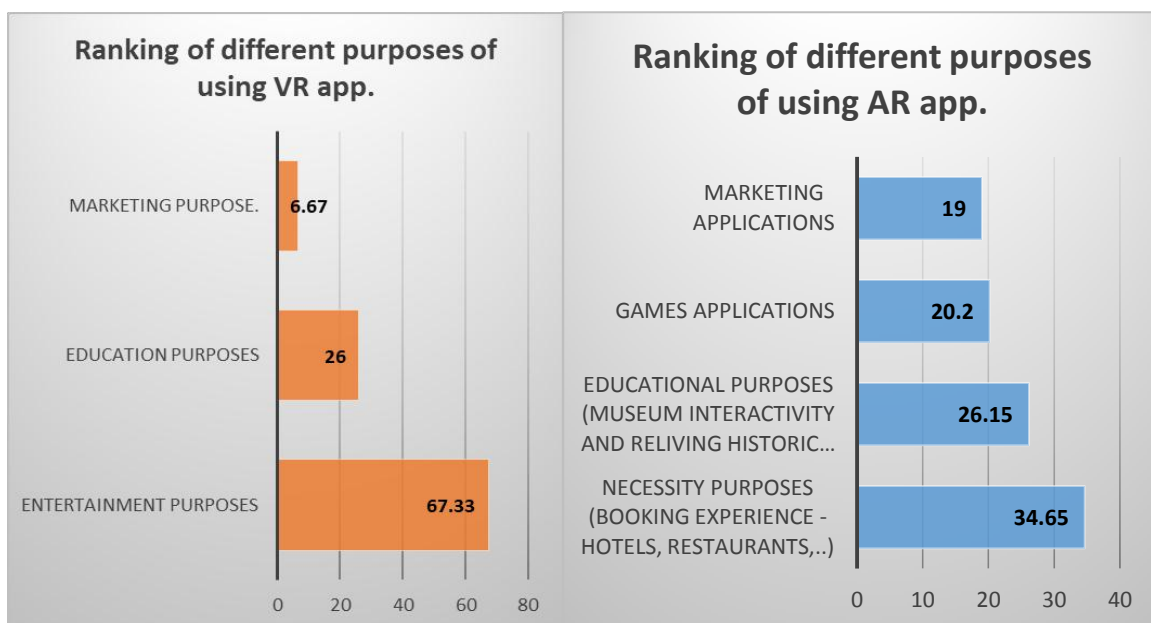
Figure (1): Purposes of using the VR and AR applications

4. Results and discussions

4.1 The visitors' perceptions of using VR system

For measuring the visitors' perceptions of using VR system, two sections were conducted (perceived usefulness and ease of use) as shown in Table 2. The two sections' statements were tested by using mean differences with 95% confidence interval of the differences as illustrated below.

According to the Table 2, it seems that the visitors' perception of the perceived usefulness of using the virtual reality system in the museum is satisfying, as they consider the navigation of the museums' exhibits and halls and exploring the museums' collections through a virtual tour gives them a good amount of information (m= 3.96). In addition, they consider the information displayed on the screen is consistent (m= 4.02). Accordingly, the percentage that they gave to the statement "I am more likely to know more about historical places and destinations that interests me" is 3.40. Hence, the visitors agree that the VR application is useful for them with mean (3.63) in the context of entertainment and education.

While, for measuring to what extent it's easy to use the VR application, three statements were used as shown in Table 2. The VR application's users expressed their overall experience in the context of the easiness of reading and understanding the information displayed on the screen (4.10) and the clear presentation of the information (un chaotic displayed information) (3.69) and this translates their agreement on that the interacting process with the VR application does not require a mental effort (4.35).

Table (2): Descriptive statistics of all measured variables

VARIABLE NAME	SD 1	D 2	N 3	A 4	SA 5	Mean	SD
PERCEIVED USEFULNESS OF VR APP							
Mean = 3.63							
I think the amount of information displayed on screen is informative.	13	16	11	33	77	3.96	0.72
By using the app: I am more likely to know more about historical places and destinations that interests me.	21	24	15	53	37	3.40	0.68
I found useful being able to browse different historical ages with this application.	19	36	20	51	24	3.16	0.43
I think that the information on screen is consistent.	9	12	9	56	64	4.02	0.71
EASE OF USE OF VR APP							
Mean = 4.15							
I think that interacting with this application does not require a lot of mental effort.	14	33	8	30	65	4.35	0.63
I think that the information displayed on screen is easy to read.	6	27	7	61	49	4.10	0.82
I think that the information displayed on screen is not confusing.	11	19	3	78	39	3.95	0.74

SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

4.2 The visitors' perceptions of using AR application

For measuring the visitors' perceptions of using AR application, two sections were conducted (perceived usefulness and ease of use) as shown in Tables 3. The two sections' statements were tested by using mean differences with 95% confidence interval of the differences as illustrated below.

According to Table 3, it seems that the visitors' perception of the perceived usefulness of using the augmented reality system in the museum is satisfying, as they consider exploring the collections of the museums' exhibits and halls and identifying the museums' collections through an augmented tour by reality gives them a good amount of information (m= 3.6), in addition, they consider the information displayed on the screen is consistent (m= 3.5).

Table (3): Descriptive statistics of all measured variables

VARIABLE NAME	SD 1	D 2	N 3	A 4	SA 5	Mean	SD
PERCEIVED USEFULNESS OF AR APP							
Mean = 3.45							
I think the amount of information displayed on screen is informative.	18	28	5	41	58	3.6	0.84
Skin and Bones met my interest for knowing about the animals.	21	17	26	57	29	3.3	0.96
I think that the information displayed on screen is consistent.	13	26	11	62	38	3.5	0.50
I think the amount of information displayed on screen is interested and entertaining.	14	28	23	51	34	3.4	0.71
EASE OF USE OF AR APP							
Mean = 3.7							
I think that interacting with this application does not require a lot of mental effort.	23	25	11	37	54	3.5	0.66
I think that the information displayed on screen is easy to read.	22	28	10	33	57	3.9	0.53
I think that the information displayed on screen is not confusing.	21	29	14	35	51	3.8	0.25

SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

Accordingly, the percentage that they gave to the statement "Skin and Bones met my interest for knowing about the animals." is 3.3. Also, they considered the information displayed on screen is interested and entertaining (3.4). Hence, the visitors' perception of AR usefulness is 3.45 which mean that the augmented reality system that the museum provides is useful for the visitors in the context of entertainment and education. While, for measuring to what extent it's easy to use the AR system, three statements were used as shown in Table 3. The AR application's users expressed their overall experience in the context of the easiness of reading and understanding the information displayed on the screen (3.9) and the clear presentation of the information (un chaotic displayed information) (3.8) and this translates their agreement on that the interacting process with the AR application does not require a mental effort (3.5).

Hence, the respondents' perception of the usefulness of augmented reality system is tending to the positive side (m= 3.45), also they feel that the application is easy to use with a significant tendency toward recognizing of its easy use (m= 3.7). Generally, such positive perception of users about the system push the researcher to identify and measure the influence of using VR and AR combination on tourists' experience, as discussed in the following section.

4.3 The visitors' experience with using AR and VR combination

Tourist is increasingly demanding information that is "informative, interactive, and consistent". They are expecting to enjoy their journey by exploring their destination in a real manner. The previous sections gave the green light to identify how the visitors experience was with using the AR and VR applications. Measuring the effect of VR and AR combination on the tourists' experience is based on three statements capturing the degree of enjoyment and exciting resulting from using the combination, and then the extent to which the AR and VR combination enriched their tour experience by combining the virtual and real life during their visit.

As shown in Table 4, the AR application's users expressed their overall experience (3.98); in detail the respondents feel that using AR system enrich their tour by providing valuable information during their visit (4.25). In the same line, they enjoyed using the system (3.93) especially the AR system makes their tour experience exciting (3.76). Hence, the respondents' experience while using AR application during their tour is tending to the positive side (m= 3.98).

According to Table 4, the VR application's users expressed their overall experience (3.21); in detail the respondents feel that using VR system enrich their tour by providing valuable information during their visit (3.43). In the same line, they moderately enjoyed using the system (3.16). Also, VR system makes their tour experience exciting (3.06) as shown in table 5.19. Hence, the respondents' experience while using VR application during their tour is tending moderately to the positive side (m= 3.21).

Table (4): Descriptive statistics: the visitors' experience of using AR and VR combination

VARIABLE NAME	SD 1	D 2	N 3	A 4	SA 5	Mean	SD
THE VISITORS' EXPERIENCE WITH USING AR SYSTEM							
Mean = 3.98							
The "AR" application enriches my tour experience through providing me valuable information during my visit.	0.00	0.00	11.3	55.3	33.3	4.250	0.675
I enjoyed using the "AR" application.	0.00	0.00	23.3	60.0	16.7	3.933	0.639
I found the "AR" application exciting.	0.00	3.3	30.0	53.3	13.3	3.766	0.727
THE VISITORS' EXPERIENCE WITH USING VR SYSTEM							
Mean = 3.21							
The "VR" application enriches my tour experience through providing me valuable information during my visit.	0.00	20.0	23.3	43.2	13.5	3.433	0.971
I enjoyed using the "VR" application.	0.00	10.0	49.0	26.7	14.3	3.166	0.592
I found the "VR" application exciting.	0.00	27.2	20.0	33.3	19.5	3.066	0.907

SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

Finally, the tourists were asked to mention the most satisfying characteristics of using VR and AR applications. Conversely, they also were asked to list the application' characteristics that make them unsatisfied when using the apps. The following Table 5 shows that the most favorable characteristics that the VR and AR applications' users valuate, in addition to the difficulties they experience while using the applications.

Table (5): Satisfying and dissatisfying VR and AR characteristics

VR CHARACTERISTICS			
Satisfying characteristics		**Dissatisfying characteristics**	
The 24 hours access	**43%**	Don't give a whole experience.	**67%**
Low cost	**36%**		
Providing browsing before purchasing	**15%**	No interactive with the real world.	**33%**
Convenience	**6%**		
AR CHARACTERISTICS			
Satisfying characteristics		**Dissatisfying characteristics**	
Providing interactive with real world.	**49%**	Cumbersome to use the application – bad design, small screen size, battery life.	**57%**
Using AR is easy and understandable.	**37%**	The private information needed to operate the application (privacy issue).	**39%**
AR can make things easier.	**14%**	Data usage on the network.	**4%**

The results of satisfying and unsatisfying factors show that combining AR and VR is required for the integration purpose. So, combining the two elements will result in enhancing the applications and consequently improving their performance that will led to increasing the satisfaction level of the users.

4. Conclusions and recommendations

4.1 Conclusion
In this globalized innovative digital era, new smart strategies and initiatives are indispensable to stay in the race of innovative change in Tourism, travel and hospitality industries, as these industries are the most influenced by its very service concept and direct contact with the tourists. Here are the main results of the study;

- The study revealed that the main purpose of using VR applications is entertainment while the main purpose of AR applications is necessity purpose,
- Using VR and AR applications are easy to use and useful as they do not need mental efforts in addition, the content displayed consistent and informative,
- The AR applications enrich the tourists experience by providing valuable information during their tour by letting them to back to history, while VR applications enrich tourists experience before their tour by giving them a holistic view about their destination,

- Combining the Augmented Reality and Virtual Reality are promising technologies that can have wide impact on many domains also those not commonly associated with computer technologies. Hence, combining the "AR and VR" applications together will make the tour experience of the tourists different. According to Table 5, it proves that each application fill the gaps of each other. Combining the applications together enrich the tour experience of the tourists compared to using each application individually.

4.2 Recommendations

The impact of AR and VR in tourism are significant and is expected to grow exponentially in the coming years through the development. AR and VR applications can be maximized by little efforts; if the destination management could to provide updated and timely information in terms of texts, images and videos, the visitors/users will be highly satisfied.

Generally, AR and VR applications' combination should support the following points to be effective:

- Overcoming the privacy issues,
- Enhancing the features and options of the applications (bad design, small screen size, battery life),
- Enable access to variable content which is timely and updated (Enhancing the value of content),
- Provide interactive annotations that are integrated with map services and additional information.
- Active and continuous developing to collect feedback and adjust components of the apps accordingly.

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أثر الدمج بين الواقع المعزز والإفتراضي على تجربة السائح

أسماء مرزوق[1]   عزة ماهر[1]   تقي محروس[1]

[1] كلية السياحة والفنادق، جامعة مدينة السادات

الملخص العربى

تتطلب صناعة السياحة الآن وبشدة الإستثمار فى التكنولوجيا الحديثة –خاصة تلك التى تعتمد على الموبايل كبيئة تشغيلية – من أجل المحافظه على زوار المقاصد السياحية المختلفة بل والعمل على جذب المزيد منهم وهذا يتطلب من إدارة المقصد السياحى أن يتبع الأسلوب الإبتكارى فى الإدارة. مثل هذه البيئة التنافسية تفرض على الأكاديمين أن يبذلوا مجهودا من أجل بقاء الصناعة على المسار الصحيح بمثل طرح مثل تلك الموضوعات التكنولوجية التى أصبحت أحد الضروريات التى يريدها السائح فى مقصده، فهذه الدراسة إستكشاف تأثير الدمج بين الواقع الإفتراضى والواقع المعزز على تجربة السائح بالإضافة إلى التعرف على الفوائد التى تعود على السائح من وراء إستخدام مثل هذه التطبيقات التكنولوجية وكذا الصعوبات التى تواجههم عند الإستخدام. إستماره الإستقصاء كانت هى الأداه الأنسب لهذه الدراسة من أجل قياس أراء زوار أحد المتاحف التى تتبنى تطبيق تكنولوجيا الواقع الإفتراضى والواقع المعزز (المتحف القومى للتاريخى الطبيعى بالعاصمه الأمريكيه واشنطن). وخلصت نتائج الدراسه إلى ان هناك بعض الفجوات فى تطبيق كلا التطبيقين، أيضاً تم الوصول إلى أن دمج الواقع الإفتراضى والواقع المعزز سويا يجعل من تجربة السائح للمقصد السياحى تجربة ثرية وممتعة ومن ثم يمكن القول أن تكنولوجيا الواقع الإفتراضى والواقع المعزز تكنولوجيا واعدة فى صناعة السياحة حال التغلب على نواقصها التى تؤثر على تجربة السائح.

الكلمات الدالة:الواقع المعزز، الواقع الإفتراضى، تجربة السائح.