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Augmented Reality Applications and their Role in Improving the Tourist Experience: Applied on Travel Agencies in Egypt

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Abstract

This research aimed to understand the role of augmented reality (AR) applications (apps), especially Mobile Augmented Reality (MAR) apps, in improving the tourist experience. For this purpose, the research relied first on the theoretical framework to identify the basic concepts of the research. Second is the analytical framework, which aims to study and analyze the mechanism of AR apps, as well as AR technology opportunities in the tourism sector. The field study included (402) questionnaires that were distributed to tourists who deal with travel agencies in Egypt, provided that they had used one of the AR applications in the tourism field. The various outcomes were obtained by reviewing some applications implemented in the tourism experience in countries other than Egypt that used AR technologies and MAR apps. To assist travel agencies in Egypt in developing innovative ways to use this technology to improve the tourism experience. Some results of the research were represented in the following points: AR applications are used to display important cultural items and locations by superimposing virtual data onto the physical space where they were originally located. Besides, there are a variety of AR devices that can be used in the tourism domain, but smartphones are the most common. Tourists can use AR apps to explore destinations, towns, museums, and historical sites by adding new layers to their reality, creating a new immersive and dynamic experience. Based upon the findings, some recommendations were suggested.

Key Words: Tourist Experience, Augmented Reality, Travel Agencies.

Introduction

As far as it is known, traditional aspects of product and service differentiation for tourists, including price, product, and quality, are no longer enough. As customers are now looking for added value in the form of enhanced experiences tied to the available products and services, Augmented Reality (AR) technology is one of the innovations that will help to satisfy these desires. Tourism in particular has benefited from these technological advances as there are now some companies widely introducing AR technology in marketing for the purpose of improving the tourist experience. However, there has been remarkable little research into how AR can be used to enhance the experience of the tourist.

Research problem

Due the rapid technological advancements, there has been a need to use modern technologies in the tourism field, which increases tourists' desire to learn more about tourist sites. However, AR technology has not been realized and not used yet clearly enough in the tourism field especially in Egypt, perhaps because it is not clear to many who work in this field, or because it needs certain equipment that is not properly available. That will be seen in this research.

Research questions

1. How is AR technology currently being used in the tourism field widely and in Egypt particularly?
2. What are the benefits of using AR technology for tourists and the tourism industry widely and in Egypt particularly?
3. How can AR technology support the three dimensions of the tourism experience (pre-visit, on-site, post-visit)?

Research hypotheses

Based on the researcher's reading about the subject of AR technology, the research hypotheses could be suggested as follows:

Hypothesis 1: There is no relationship between the use of AR apps by tourists and their better understanding of tourist information.

Hypothesis 2: There is no relationship between the use of AR technology by Egyptian travel agencies and the enhancement of the experiences of tourists who deal with them.

Introduction

As far as it is known, traditional aspects of product and service differentiation for tourists, including price, product, and quality, are no longer enough. As customers are now

looking for added value in the form of enhanced experiences tied to the available products and services, AR technology is one of the innovations that will help to satisfy these desires.

- **The Definitions of AR**

There are many terms that were given to AR due to the novelty of its concept, including: added reality, combined reality, expanded reality, improved reality, enhanced reality and augmented reality, all of which indicate augmented reality, which is the most used among them **(الشامي، والقاضي،2017)**. Therefore, there are several definitions of AR, including the following:

- The first and widely recognized definition of AR goes back to Azuma (1997) **(Cranmer, E., 2017)**, who defined AR as "the possibility of merging two-dimensional (2D) or three-dimensional (3D) virtual objects with the real world by adding enhanced information to the human visual perception, when a person uses this technology to look at the surrounding environment around him, the objects in this environment are equipped with cognitive content and objects which complement the image that the person is looking at" **(الشيزاوية، 2018، ص12).**
- The Oxford Dictionary added a definition of AR in (2014), defining it as "a technology that superimposes computer generated images on a user's view of the real world to provide a composite view" **(Cranmer, E., 2017, P9)**

- It has also been described as "a new form of experience, in which the real world is improved by computer-generated content" **(Katoka, H. et al., 2019, p2).**

Based on the above, AR can be defined as: "Merging the real environment with a virtual augmenter by using programming technology, so people can interact with it through dedicated technological tools and devices, which leads to altering and enhancing people's perceptions of their physical surrounding". The following figure illustrates the concept of AR.

• The Definition of Augmented Tourism

In the field of tourism, theoretical studies did not provide a definition of augmented tourism. Aside from that, Yovcheva et al. stated that augmented tourism (AT) refers to a collection of displays and technologies that can overlay virtual information in real time in tourism-related environments **(Yovcheva, Z. et al, 2013).**

While Yovcheva et al. define the augmented tourism experience itself as "a complex construct which involves the emotions, feelings, knowledge, and skills resulting from the perception, processing, and interaction with virtual information that is merged with the real physical world surrounding the tourist." **(Yovcheva, Z. et al., 2013, p27)**

Based on the definitions of AR that were previously mentioned, an augmented tourism experience can be defined as "a cycle where an innovation can transfer the tourist from his actual situation to an augmented simulation without affecting his actual transmission, by controlling his senses in such a way that he becomes immersed within the augmented experience that he is transferred to, until he

becomes a piece of the encompassing scene through the assistance of a computer model or mechanical devices that control the entire cycle".

- ## A Brief History of AR Apps in the Tourism Field

The first cellular AR system was created by Feiner, it was a touring machine, at Columbia University in 1997. A head-mounted screen device with GPS and directional tracking is used by the tour cruiser. Users create 3D graphics for smartphones. This system is made up of a backpack that contains a computer and various sensors, as well as a primary tablet for input **(Heikal, A., 2021).**

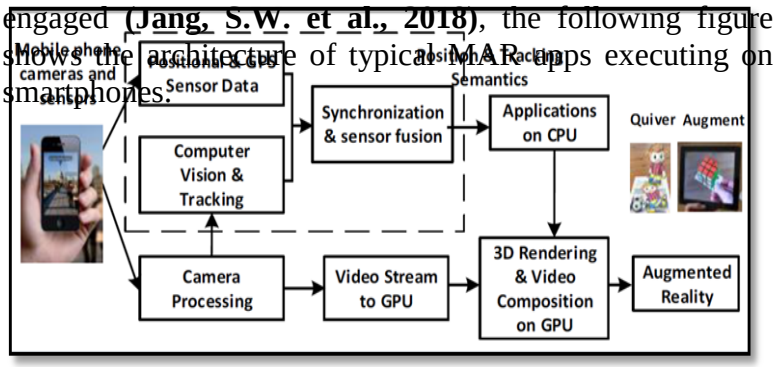
Thus, AR applications in the tourism and cultural heritage fields used the same devices as VR apps. Immersion can be achieved by using devices that view virtual content, such as HMD devices. A camera has been added to these devices that simulates the user's first-person view in real-time. It also enables the implementation of tracking, a tool for determining the location of virtual content within a real-world physical space. Nowadays, these types of HMD devices are practically outdated and have now been largely replaced by mobile devices such as smartphones **(Mesaros, P. et al, 2016**).

- ## The Meaning of MAR

In simple words, MAR is "augmented reality that one can take with him wherever he goes. This means that the hardware needed to implement an AR application is something that a person can take with him wherever he goes" **(Hanna, H., 2018, p.332).** Thus, MAR is "part of AR

with the superimposed virtual object being displayed on a mobile device instead of a personal computer" **(Helwa, H., 2019, P.17)**.

A smartphone, on the other hand, is a truly mobile device. It fits in a person's pocket and is simple to use regardless of where the person is, even if he is walking or otherwise engaged **(Jang, S.W. et al., 2018)**, the following figure shows the architecture of typical MAR apps executing on smartphones.



Source: (Chen, X. et al., 2018, p. 129)

Figure(1): The architecture of typical MAR apps executing on smartphones

According to the previous figure, the MAR application collects data about the real physical world using sensors and cameras first. Then, the tracking process evaluates pose information to align virtual content with physical objects in the real world, either through sensor-based tracking or vision-based tracking. The application uses perceived pose information or object feature information to perform 3D augmentation rendering, which is then mapped onto the display to provide augmented reality.

• The Mechanism of AR

This part of the research will first address the main concept behind creating AR, followed by methods for creating AR, which include clarification of the differentiation between the two methods of creating AR.

- **The main concept behind creating AR**

The main concept of AR technology revolves around the creation of virtual items using a computer, such as a video illustration, pictures, sounds, models, or information, storing them in an augmented reality production application's database and linking them to special tags that exist in real life. When the user points the camera of the tablet or mobile phone at the real world, the camera captures these signs and displays them on the tablet's or mobile phone's screen (**زين الدين، 2019**).

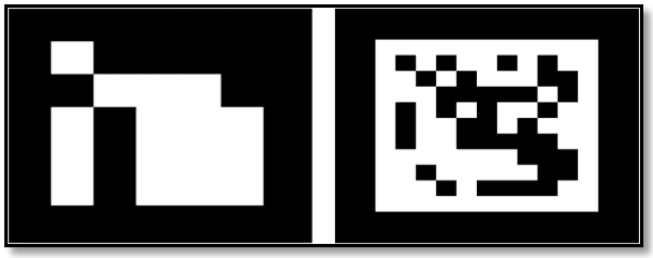
- **Methods for creating AR**

1- Marker-based tracking

Marker-based AR works in two ways as following:

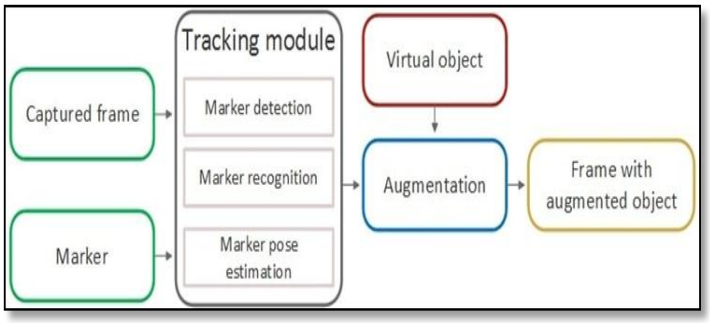
1/1 The use of visual markers

Visual markers like binary markers which designed by ARUCO, and METAIO, as shown in figure (2).



Source: https://cutt.us/vQzMN
Figure (2) Binary Markers: ARUCO (left) and METAIO (right)

According to this method, the marker image must be initially extracted, followed by the subsequent camera frames. Second, the tracking module depicted in the figure serves as the core of the marker-based system. It calculates the camera's relative pose based on the properly detected marker in the scene. The term "pose" refers to an object's six degrees of freedom (DOF), i.e., its 3D location and 3D orientation. Third, the tracking module allows the system to incorporate virtual components into the real scene. Because the camera frames are dealt with in a 2D coordinate system here, projective geometry is required to augment the 3D virtual object **(Calonder, M. et al., 2010)**, as shown in figure (3).



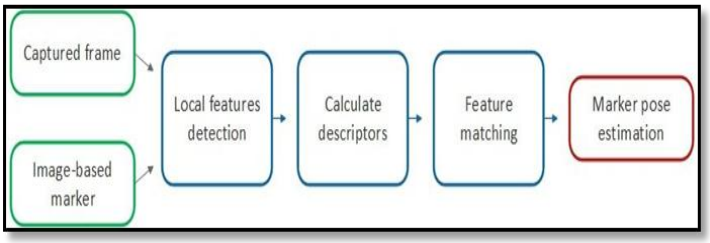
Source: https://cutt.us/vQzMN

Figure (3): Module of Binary Marker-based Tracking System

Following the above steps, the marker candidates are saved for further marker recognition. Moreover, each candidate has been warped to a frontal view and is divided into blocks. The recognition algorithm's task is to extract binary code from the candidate marker and compare it to the code of the true marker. As a matched marker, the candidate with the most similarities is chosen. **(Cukovic, S. et al. 2015)**.

1/2 The use of static image

Static image in this method of tracking is known as a trigger photo. It is the more advanced tracking algorithm that reduces the need to place synthetic binary markers in the scene. It is sufficient to take a picture of a planar object in a real-world scene and use it as a marker. A diagram of such a process is provided in the below figure.



Source: https://cutt.us/vQzMN
Figure (4): Module of Image-based Tracking

2- Marker-less tracking

Marker-less AR works by scanning the surrounding environment, and no trigger photo is required to retrieve the AR content. Applications with such features typically instruct the user to locate a flat surface, such as a table or floor, on which to place the AR elements, as the objects will not always make sense floating in the air. The flat surface must be textured for computer vision to detect it. It is difficult, if not impossible, to use on a white background or other single-color surfaces **(Blanco-Pons, S. et al, 2019)**.

Through the aforementioned, it is worth noting that the mechanism and final outcome of AR technology are the same regardless of whether the AR works by tracking a mark or without a mark. In the method of work that depends on the mark, the mark is recognized, and then 3D shapes appear on the surface of the mark. While the surrounding environment is discovered in marker-less AR,

and the digital information is projected onto network coordinates.

- **AR Apps in the Tourism Field**

1. **"Ename 974":** Ename 974 is an archaeological site on the mediaeval boundary between the French kingdom and the German empire. In which a project named Ename 974 was created in (2000) in which several information and communication technology (ICT) applications were designed and implemented as part of the Ename 974 project to help local residents and visitors understand and experience the past. Multimedia applications, AR, VR, on-site kiosk systems, and indoor museum installations are examples of applications that are part of the public heritage display program. The applications are created with great care for scientific accuracy (for example, 3D reconstructions of archaeological sites) in order to capture the interest of visitors. The general idea behind this project is that the devices superimpose real-world scenes with virtual 3D recreations of archaeological monuments, with the results projected through digital screens or head-mounted displays **(Pletinckx, D. et al, 2000).**

2. **Olympia, Greece**: It was about (2001), a large-scale project that investigated the possibilities of AR

systems designed for outdoor use. This location was chosen because of its historical significance as the birthplace of the ancient Olympic Games, its popularity among visitors, and the fact that it is mostly in ruins. Fristlt, a site survey was conducted before implementing the system to collect the necessary data and learn how the devices could be installed. As a second step, aerial photos were collected and fed into a geographic information system (GIS), which was then used to create a digital elevation map. As well, a set of border tiles images were taken for each viewing direction to simulate the user's movement around it. The entire data set was saved in a server database, along with 3D reconstruction models of artefacts designed from architectural drawings and archaeological sources **(Vlahakis, V. et al, 2002).** Finally, to achieve this on the ground, imaging techniques were used and helped create true 3D reconstructions, rather than mobile devices, due to the poor quality parameters of mobile devices at that time. A server device capable of handling data flow via a portable computer connected to the server through a network via Wi-Fi was used in this project. This app used a spatial tracking device that could determine the user's location and orientation as well as pinpoint enough data to interpret digital content in physical space **(Gaitatzes, A. et al, 2005).**

3. **The PRISMA project:** PRISMA's goal is to design, create, and deploy a new 3D visualization device for cultural tourism applications using AR technologies. The core issue of PRISMA is the integration of the well-known concept of tourist binoculars and AR technology. By using these technologies, they were able to optimise the user's experience and provide added value by providing immersive, personalised multimedia about the current view. PRISMA offers a new perspective on tourism, allowing tourists to connect with interactive material **(Fritz, F. et al, 2005).**

According to the previous, it is clear that AR apps were initially used in the tourism field to demonstrate the importance and historical value of archaeological sites. As technology has advanced, this equipment has developed in such a way that it is possible to gather all of the characteristics of these features in the mobile smart phone in the so-called MAR.

- ## Existing MAR Apps for tourism

1. An Application for Tourists in San Sebastian

This app has been proposed to assess the benefits of MAR services for tourists in order to improve their navigation experience in the city. This app aimed to provide personalized and contextual

experiences. Furthermore, this scenario has been used in a social environment, allowing multiple users to interact with one another. Notably, this app has implemented user-generated content features, allowing users to add comments to the system or to add feedback and upload their own photos. A group of 20 Points of interest (POIs) were chosen, including lodging, restaurants, and monuments. On the other hand, buildings and monuments that play an important role in the city's current life and collective memory were chosen. As a result, both residents and visitors can gain a better understanding of the city's major changes over the last century **(Marimon, D. et al., 2014)**.

2. ArtLens 2.0, Cleveland Museum of Art

The Cleveland art museum uses ArtLens 2.0, one of the most significant pieces of software designed and produced by museums. In (2016), the app was released after a 6-month testing period. The application's goal is to use image recognition software to display visitors' desires and interests in 2D. Visitors would also benefit from the ability to explore new roads using the map function, allowing them to get to their desired location faster. It can also alert them when they are getting close to the special work. This application uses Bluetooth technology to display a 40-meter interactive multi-touch wall called "MicroTile wall". The ArtLens 2.0 is free to download and use from Google Play and the App Store **(Ding, M., 2017)**.

3. **MiraAlicante applications:** It was in (2012). This was a mobile app that used AR to promote cultural tourism, as shown in figure (5). It is a mobile app that highlights the city of Alicante's important buildings and monuments, increasing their visibility by displaying the specific characteristics of each content in order to provide information about them and facilitate tourist movement between the city's various relevant locations **(Mesaros, P.et al, 2016).**

Source: (Mesaros, P.et al, 2016, p. 376)
Figure 5. MiraAlicante Application

4. **Arbela Layers Uncovered (ALU)**

It is a MAR system for the ancient site of Arbela in Iraq, which used AR to restore ancient ruins. Mohammed-Amin, Levy, and Boyd developed ALU in the study "Mobile Augmented Reality for Interpretation of Archaeological Sites" proposed

this app to help visitors in understanding archaeological sites that are partially or completely buried or in ruins. This research focused on the design of navigating through a mobile interface, which can be difficult for designers when there is a lot of content to consider. ALU has media to guide visitors and interpret and present the site's complex and diverse history **(Mohammed-Amin, R. et al, 2012).**

5. MARFT project

Mobile Augmented Reality for Tourists (MARFT) is a project funded by the Austrian Federal Ministry of Transport, Innovation, and Technology (BMVIT) and the European Union's EUREKA Eurostars Programme to present the next generation of AR for current mass market mobile phones with enough processing power to create a 3D environment on their monitors in real-time. This project plans to launch an interactive service for tourists visiting a dedicated test area in Upper Styria. The tourist will be able to choose between two options: **(a)** an augmented photo with tourist details such as hiking tours or lookout points, figure (6), or **(b)** a rendered 3D virtual reality view with the same view as the real photo but with tourist objects added.. A new window will appear when the user click the overlay's markers and lines, displaying specifics on the selected tourist information, such as hiking trails, lookout points, and different mountain peaks.

Source: (Luley, P. et al, 2011, p22)
Figure (6): Augmented Landscape with Cartographic Accuracy by the MARFT System

The significant advancement over the (MARFET) application is its ability to augment facts with cartographic precision sets. This is accomplished by using computer vision algorithms to align a locally rendered virtual landscape (virtual 3D view) with the corresponding actual camera picture based on the current location and orientation. **(Luley, P. et al, 2011**).

- **The Potential for AR and MAR in Tourism**

With the advent of AR technology, Tourism organizations and destinations now have the

opportunity to provide a large amount of relevant tourist information in a format other than simply checking online sources. AR technology can influence travel destination marketing and reach more customers. MAR systems, in particular, are ideal for guiding tourists through unfamiliar surroundings **(Kurkovsky, S. et al., 2012).**

MAR can display virtual pathways and directional arrows to aid navigation, for example, the Nearest Tube application. It can also deliver augmented and interactive information about dining, museums, entertainment, and so on, for example, mTrip, Tuscany+, and MobiAR, and can provide real-time direct translation of written text on signs, menus, and so on (e.g., Word Lens).

Furthermore, AR apps have the confidence of creating enjoyable holiday travels through the integration of AR gaming in terms of highly motivated and engaging tourists, thus improving the overall tourism experience (e.g. TimeWarp). These applications allow tourists to become acquainted with unfamiliar areas in a fun and educational way **(Chou, T.L. et al., 2012).**

In this context, AR apps and MAR apps may indeed help destination-marketing organizations gain a competitive advantage by utilizing advanced information technologies. The recent technological character of MAR, which engages and impresses the user, distinguishes it from other context-aware systems and primarily contributes to improving the tourist experience.

This AR functionality provides advanced marketing-related capabilities to applications that conform to MAR design guidelines, which, when used correctly, can result in superior destination branding and reaching more tourists. Dublin's AR project is an example of a destination that uses AR to improve the overall tourist experience. The use of AR in Dublin arose from the desire to support Dublin's brand development as an "innovative city" in Europe. During this project, they created a mobile AR app for the tourism industry that will be used on tourist trails throughout the destination, taking into account various tourism interested parties **(Kourouthanassis, P. et al., 2014).**

Research methodology

In order to achieve the research aim, different nationalities who are clients of travel agencies in Egypt and who have previously used AR technology in their tourism experience in another country were surveyed. A total of 450 questionnaires were distributed randomly in the investigated TAs from May to July 2022. Only 402 forms (89.3%) were valid to analyze. The questionnaires were returned and the results were then analyzed. The questionnaire consisted of two sections. The first section is intended to reveal the tourists' demographic data. The second section is intended to determine the tourists' experiences with AR technology. The respondents were asked to answer this question by using a three-point Likert-type scale (yes = 3, yes to some extent = 2, and no = 1) to determine the levels of agreement with the departments investigated. The Statistical Package for the Social Sciences

(SPSS) version 26.0 was used to analyze and compute the collected data. The range of each level of agreement was calculated as follows:

Table1: Questions Answered Scale

Category	**No**	**To some extent**	**Yes**
Code	**1**	**2**	**3**

- **Mean Rank:**

1= 1:1.66 2=1.67 : 2.34 3= 2.35 : 3.00

Reliability Analysis

Table 2: Reliability Analysis

Number of Questions	Alpha
10	0.93

Table 2 indicated that alpha coefficient of the questionnaires dimensions was 0.83 (higher than 0.70). This result indicated to the reliability and validity of the questionnaires for using in the research.

Results and Discussion

The results involved two main stages. Descriptive analysis was used to discover participants' responses, and correlation analysis was conducted to examine the relationship between independent variables and the dependent variable. The results obtained were computed and analyzed in the following tables.

Table 3: Demographic Data of tourists

Demographic Data	Attribute	Statistics		Rank
		Freq.	%	
Gender	Female	184	45.8	**2**
	Male	218	54.2	**1**
Age	Less than 25 years	74	18.4	**3**
	From 25 – 45 years	175	41.5	**1**
	More than 45years	153	38.1	**2**
Educational level	Average Degree	71	17.7	**3**
	University Degree	227	56.4	**1**
	Postgraduate Degree	104	25.9	**2**
Income level	Less than Average	27	6.7	**3**
	Average	106	26.4	**1**
	High	269	66.9	**2**
Total		402	**100%**	

As it can be observed from the previous table, (54.2%) of the respondents were male, and there were (45.8%) female respondents. The result shows that the AR is preferred by both males and females, where the percentage between male and female tourists was similar. According to age group, among the 402 tourists, (41.5 %) fell into the age group of (25-45) years; this was followed by the age group of more than 45 years by 38.1%. The age group of less than 45 years was the smallest group and was represented by

(18.4%). This result indicated that the majority of tourists were from the young age group. With respect to the educational level variable, a high proportion of the tested sample (56.4 %) has a university educational degree; this was followed by a postgraduate degree (25.9%). Meanwhile, guests with postgraduate degrees were the smallest group and were represented (17.7%). This result can be utilized in focusing on young people with university educational degrees during the fulfillment of the marketing of AR in Egypt. According to tourists' income level, the results show that the majority of them have a high income (66.9%). This was followed by tourists with an average income level (26.4%). Meanwhile, guests with less than average income levels were the smallest group and represented (6.7%). This finding suggests that tourists with a high income level would benefit from using AR technology. Finally, it was noticed that the respondents who participated in the research were from various countries and nationalities. They were from Arab backgrounds such as Egypt, the UAE, Saudi Arabia, Iraq, Kuwait, Tunisia, and Morocco. In addition, foreign tourists participate in the research, such as Italians, Russians, British, Americans, Ukrainians, Austrians, Spanish, Japanese, Chinese, Turkish, and Irish.

Table 4: The most tourism sector does tourists prefer to use AR apps

Variables	Freq.	Per.%	R
Accommodation	119	29.6	3
Transportations	68	16.92	4
Restaurants	147	36.57	2
Tourist Attractions	247	61.44	1
Total	**581**	**145%**	---

* choosing more than one answer allows in this question

As it can be observed from the previous table that, among the 581 responses, (61.4%) of them prefer to use AR apps in tourist attractions (Museums, Mosques, Churches, etc.); this was followed by restaurants with (36.6%), then accommodation (29.6%). Finally, tourists prefer to use AR apps in transportations with 16.9%.

Table 5: The Tourists' Experiences and Perceptions towards Using AR technology

Statements		3-Point Likert – Scale			Statistics		
		1	2	3	Mean	SD	R
Are you interested in technological development in tourism?	Freq.	34	111	257	2.56	0.884	4
	%	8.46	27.61	63.93			
Are you having a previous knowledge of the concept of AR?	Freq.	93	237	72	1.95	0.524	6
	%	23.13	58.96	17.91			
Is it was simple to learn how to use the app?	Freq.	41	138	223	2.45	0.829	5
	%	10.2	34.33	55.47			
Is the app	Freq.	12	89	301			1

involved you in an enjoyable experience?	%	2.99	22.14	74.88	2.71	0.501	
Do you prefer the use of mobile devices over other devices such as glasses?	Freq.	32	73	297	2.66	0.589	3
	%	7.96	18.16	73.88			
In AR apps, do you understand the tourist information presented by the app better and found it more interesting?	Freq.	9	107	286	2.69	0.739	2
	%	2.24	26.62	71.14			
Average Mean					2.50	-	-

According to the results shown in Table 5, the respondents agreed on five questions from all questions about experiences and perceptions towards using AR technology, which are arranged according to their means as follows:

- The result that "the app involved the tourists in an enjoyable experience" has got the highest percentage of agreement from the respondents at (Mean= 2.71). The tourist experience during the trip can be enhanced in a variety of ways, resulting in fresh, memorable, thrilling, and all-encompassing experiences **(Yovcheva, z. et al., 2013).**

- The tourists understand the information presented by the app better and found it more interesting at (Mean= 2.69).
- The tourists prefer the use of mobile devices over other devices such as glasses at (Mean= 2.66). This result agreed with **(محمد، 2019)** who noted that it is sufficient for the user to have a mobile device on which the customized application is installed to access all that information.
- The tourists interested in technological development in tourism at (Mean= 2.56). This result is in agreement with (**Chris. et al., 2012)** that AR technology and its applications are widely used in tourism today and it is employed in the tourism industry to improve the visitor experience.
- The tourists found that it was simple to learn how to use the app at (Mean= 2.45).

On the other hand, the tourists to some extent have a previous knowledge of the concept of AR " at (Mean= 1.95). This indicates that the term "AR" is becoming more widely known on a global scale. This result is in agreement with Chris et al. (2012) that AR technology is widely known to some extent today. From this result it could concluded that, the tourists have a positive experiences and perceptions towards using AR technology (AV Mean= 250).

Table 6: The tourists' intention towards using AR technology

Statements		3-Point Likert - Scale			Statistics		
		1	2	3	Mean	SD	R
Do you intend to deal with travel agencies in Egypt that will use AR apps in their activities?	Freq.	63	167	172	2.27	1.138	3
	%	15.67	41.54	42.79			
Do you encourage your friends to deal with travel agencies that use AR apps in their activities?	Freq.	13	239	150	2.34	0.998	2
	%	3.23	59.45	37.31			
The use of AR technology is a competitive advantage for a travel agency?	Freq.	22	54	326	2.76	0.418	1
	%	5.473	13.43	81.09			
Average Mean					2.46	-	-

According to the results shown in Table 6, tourists believed that the use of AR technology is a competitive advantage for a travel agency, with an average mean 2.76. Meanwhile, tourists were to some extent intent on encouraging their friends to deal with travel agencies that use AR apps in their activities, with an average mean 2.34 and the standard deviation was 0.998. Furthermore, tourists were to some extent intent on dealing with travel agencies in Egypt that will use AR apps in their activities, with an average mean 2.27 and the standard deviation was 1.138.

Tourists' comments on this question emphasized that the incorporation of augmented reality technology into the work of travel agencies in Egypt must be supported by providing price advantages, discounts, or offers on tourism programs that will use augmented reality technology, and that tourists are also drawn to this technology through strong marketing methods. Besides creating incentives for tourists to prefer AR technology in their tourism experiences, especially for tourists who are hesitant to try new experiences,

Table 7: Correlation Coefficient between the use of AR apps by tourists and their better understanding of tourist information

parametric Test			use of AR apps	understanding information
Person	use of AR apps	Correlation Coefficient	1	.773**
		Sig. (2-tailed)		.000
		N	402	402
	understanding information	Correlation Coefficient	.773**	1
		Sig. (2-tailed)	.000	
		N	402	402

*Correlation is significant at the 0.05 level and less

According to the results in the previous Table it could be concluded that there is a positive correlation between the use of AR apps by tourists and their better understanding of

tourist information. When the correlation coefficient of Person was 0.773 at the 0.000 level, it is a positive correlation. This positive correlation indicates that; if use of AR apps by tourists increased, the more the better understanding of tourist information and the opposite is true. Therefore, it could be reject H0 and accept the hypothesis that there is a relationship between the use of AR apps by tourists and their better understanding of tourist information.

Table 8: Correlation Coefficient between the use of AR technology by Egyptian travel agencies and the enhancement of the experiences of tourists who deal with them

parametric Test			the use of AR technology	enhancement of the experiences
Person	the use of AR technology	Correlation Coefficient	1	.691**
		Sig. (2-tailed)		.000
		N	402	402
	enhancement of the experiences	Correlation Coefficient	.691**	1
		Sig. (2-tailed)	.000	
		N	402	402

*Correlation is significant at the 0.05 level and less

According to the results in the previous table, it could be concluded that there is a positive correlation between the

use of AR technology by Egyptian travel agencies and the enhancement of the experiences of tourists who deal with them. When the correlation coefficient of a person was 0.691, the correlation significant level is less than 0.05 and it is a positive correlation. This positive correlation indicates that the more the use of AR technology by Egyptian travel agencies increased, the more the enhancement of the experiences of tourists who deal with them increased, and the opposite is true. Therefore, it could be rejected H0 and accepted that there is a relationship between the use of AR technology by Egyptian travel agencies and the enhancement of the experiences of tourists who deal with them.

Recommendations

Based upon both the literature reviewed and the findings, the following recommendations could be suggested:

1. Recommendations for the Ministry of Tourism in partnership with the Ministry of Communications and Information Technology

- The need for the Ministry of Tourism to assist travel agencies and provide AR technology training programs for their employees.
- The importance of establishing an effective technological structure in order to support the success of incorporating AR technology into the

work of Egyptian travel agencies and provide value to the target tourists.

- The necessity of adopting supportive policies for the implementation of AR technology and new technological patterns
- The necessity of having a department specific to modern technology as a condition for obtaining a license to establish a new tourism company, in addition to encouraging policies and providing facilities for existing businesses to establish a technology department
- The importance of creating a mobile service platform based on MAR technology for Egypt's tourism industry. Its role is to provide a platform for overlaying tourism-related information, rebuilding and reviving historical stories, and supporting the tourists' experience.
- - The importance of not ignoring privacy and security concerns when developing augmented reality applications.
- The importance of involving travel agencies in various plans or programs that are related to the introduction of technology in Egypt's tourism sector
- The importance of using the recommendations of studies on technology within the activity of tourism companies' work

2. Recommendations for Travel Agencies in Egypt

- In the event that the company adopts AR technology, traditional programs that do not rely on technology must not be removed. Instead, the travel agency must keep it, and tourists can choose between two types of programs: augmented reality and traditional methods.
- When Egyptian travel agencies adopt AR technology, they must concentrate on its application in the fields of tourist attractions (Museums, Mosques, Churches, etc.), accommodation, and transportation, as these are organized based on the preferences of the tourists sample.
- It is important to focus on young people with university educational degrees during the fulfillment of the marketing of AR in Egypt.
- Tourists with a high income level should have priority attention from Egyptian travel agencies when designing promotional and marketing plans for AR technology.
- The importance of dealing with specialized and experienced firms in creating AR applications, since the effectiveness of AR apps is determined by how well they are designed
- The necessity of supporting AR apps by providing price advantages, discounts, or offers on tourism programs that will use AR.

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