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Evaluating Virtual Interfaces of Archaeological Sites; Case Study of the Roman Sites in Alexandria

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Abstract

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This research aims to provide a better understanding of the effectiveness of existing virtual tours (VT) to induce a favorable attitude toward Alexandria's heritage sites, through the study of the VT of the three Roman sites in Alexandria, and assessing the user's sense of presence, experience and their effect on the attitude change towards the visited archeological sites and towards the Græco-Roman archeology in general. To collect the required data a self-administered online survey was used. The sampling frame included under-graduate students in the Faculty of Hotels and Tourism, Alexandria University. Three identical questionnaires were designed, investigating the research variables. Participants were asked to answer the questionnaire after performing a VT to the designated site provided to them by a link of the website. A quantitative approach was used to examine the validation of the study hypotheses; SPSS V. 24 was used for data processing. The study results supported the study hypotheses, showing that both presence and experience of the VT had an obvious effect on attitude of the visitors towards the visited heritage sites. Despite the increasing importance of the VT of heritage sites, there are few recent studies which investigate the role of these VT on attitude change of the visitors. None of these studies assessed the factors that affect their attitude particularly in the Græco-Roman sites of Alexandria. Thus, this study gives an insight on the effect of both presence and experience of VT on attitude of the visitors.

1. Introduction

When COVID-19 hit the world, governments in many countries implemented restrictions that caused disastrous impact on the travel and tourism industry (Sharma and Nicolau 2020; RTG 2020; WHO 2020). This led to major long-term structural and transformational changes in the tourism eco-system (Gössling, Scott, and Hall 2020; Sigala 2020). These changes induced the introduction of digital technologies to invent an innovative digitized tourism experience through Virtual Reality (VR) a sort of technology which was implemented to stabilize the tourism sector (Sigala 2020; Zeng, Chen, and Lew 2020, UNWTO 2020). Hence, Virtual Tours (VTs) was used on a great scale as a method to explore cultural and heritage attraction. It was regarded a perfect tool to overcome physical barriers, the incompatibility between the facilities, the users' different abilities and the inaccessibility of resources

(Chirisa et al., 2020; Lerario & Maiellaro, 2020). The importance of this technology has increased not only as a medium to improve knowledge and visits for heritage sites, but also as a marketing tool to enhance tourist desire to visit these sites. VR technology offers an extraordinary advantage for the tourists; it allows them to immerse in the experience of visiting the intended destination before even travelling (Huang et al. 2016; Jung et al. 2017; Tromp, 2017; Farid & AbdelHamed 2018; Jung, Lee, Chung, & Tom Dieck, 2018; Liu, Ouyang & Cheng 2019; Chirisa et al. 2020; Vishwakarma et al. 2020).

The main benefit of VR technology is the enhancement of tourism experiences as well as the potential to provide accessible tourism for all tourists (Tromp 2017; Bonetti, Warnaby, & Quinn 2018; Lee, Chung & Dieck 2018) and mainly the creation of a positive attitude towards the site and the increase of the visiting intention. Moreover, the success of the VT in promoting heritage sites, by building a favorable attitude towards these sites, predicts a higher visits rate, depending on a number of factors such as; experience authenticity (Schweibenz, 2019), the VR quality (Lee et al. 2020), sense of presence (Tussyadiah et al. 2018; Bogicevic et al. 2019) and the online experience (Rose & Hair 2012). The mental imagery impact of VT might create a vivid simulation of what it would be like to visit the site, which create positive expectations towards it and increase the desire to actually visit it (Phillips, Asperin, & Wolfe, 2013; Han & Kai 2015; Yeh et al. 2017; Bogicevica et al. 2019; Lee et al. 2020; Alyahya & Mclean 2021; Skard et al. 2021).

Despite the Egyptian archeological sites had been presented in various VT either through desktop or mobile applications, most of the presented sites were either pharaonic or Islamic sites. Despite of the relative weight of Græco -Roman sites in Egypt, particularly in Alexandria, only few sites are represented through VR. Thus, such sites are not commensurate with the importance of the city as a tourist destination rich in its Græco-Roman heritage. Furthermore, the role of these VT in generating positive attitudes towards the presented sites is mandatory to be investigated in order to predict their success as a marketing tool to enhance the visitors' awareness of this heritage sites. This investigation will accordingly help to increase the visits of these sites.

The research aims to study the VT of the three most popular Roman sites in Alexandria, namely Kom-El Shoqafa, Kom el-Dikka and Villa of the Birds. This would be achieved by assessing the user's sense of presence, experience and the attitude change towards the studied archeological sites and towards the Græco-Roman archaeology in general. In addition, the study aims to approach a better understanding of the effectiveness of the designed VT to induce more favorable attitude toward Alexandrian heritage sites. The variables were measured using a quantitative approach, participants were assessed on their sense of presence. Online experience and attitude towards Græco-Roman sites were attested through an online survey.

1.1 Virtual Tours (VT):

Three-dimensional virtual environment gained a remarkable popularity in recent years as a visual representation of heritage. This superb reputation due to its role in combining educational purposes with the capability to emotionally involve visitors which help to promote and preserve cultural heritage (Barbieri, Bruno & Muzzupappa 2017; Latos, Komianos & Oikonomou 2018).

The term “*Virtual Tours*” has several interpretations. For the purpose of this study the following definition will be adopted, “*A virtual tour is made up of one or more “immersive photos”—photographic reconstructions of a scene that the user, virtually placed at its center, can explore in all directions with the aid of the mouse, also performing enlargement and*

reduction functions. The sensation experienced is comparable to the normal experience of “looking around” when being in a given physical place. The production of a virtual tour therefore requires the representation of the real scene (spatial)” (Lerario & Maiellaro, 2020, p. 3). VT may be accompanied by audio guides, sound effects, text containing information and details about the site (Aguilera, Alonso, and Gomez 2014; Komianos & Oikonomou, 2018; Spielmann & Mantonakis 2018) and presents a recreation of the real site through VR technology, to give the visitor the feeling of actually being in “another place” (Berg & Vance 2017; Deng, Unnava & Lee, 2019; Lee et al. 2020).

VTs have many characteristics such as; intuitiveness, ease of use, interactivity and immediacy (Latos, Komianos & Oikonomou 2018). This technology is a computer stimulated interactive environment where users feel that they are present (Diemer et al. 2015). Accordingly, a large number of world heritage sites have adopted the VTs to present cultural heritage or even reconstruct the damaged archeological sites such as; Petra in Jordan, the Hera Temple (Olympia, Greece) and the main Greek and Roman archeological sites around the Mediterranean (Farid & Abdel Hamed 2018).

2. Sense of Presence, Experience and Attitudes

Quality assessment of VTs has always focused on evaluating how real or natural the user's experience was when immersed in the environment (Utcliffe & Gault 2004). Therefore, the persuasiveness and effectiveness of VT are most often attributed to the sense of presence (Tussyadiah et al. 2018).

Psychological literature has defined the sense of presence in the context of technology as the degree to which a person feels immersed in the virtual environment to the point that he feels transported in the virtual environment and does not notice the artificiality of the experience (Slater & Usoh, 1993; Slater & Steed 2000; Schubert, Friedmann, & Regenbrecht, 2001; Lee 2004; Gruter & Myrach 2012). Thus, the level of presence a user experiences through VT is dependent on the extent to which he feels transported from the physical world to the alternative virtual world (Wei, Qi, and Zhang 2019).

To measure the sense of presence Slater, Usoh and Steed (1993; 1994) have designed the SUS Questionnaire that assess the user's sense of being there, the extent to which the VT experience becomes more real than everyday experience, and how the user perceives the VT as a ‘place’ instead of set of images. This scale includes the state of post VT experience not only the mental state during the VT, i.e., how a user remembers the virtual environment. Which explain why Slater (1999) identifies the presence as experiencing the VR as-a-place: people are there, they respond to what is there, and they remember it as a place.

Another critical determinant for creating competitive advantages on the Internet is experience, which is defined as a psychological state manifested as a subjective response to online websites (No & Kim 2014; Rose et al. 2012). In a study conducted in both Hong - Kong and United Kingdom, Tussyadiah, et al. (2018) demonstrated that the high sense of presence has positive consequences on enjoyment of VR experience.

Consumer experience in VT is positively affected by the sense of presence (Rose et al. 2012; Liu, et al. 2016; De Gauquier et al. 2018; Iyaha & Mclean 2021) because users who sense presence seem to fantasize about the real-world experience which enhances experiential value and behavioral intentions (Bogicevic et al. 2019). As the sense of presence defines the individual experience in the virtual environment, the following hypothesis is proposed.

H1: The sense of presence is positively related to the user's experience in the VT:

A very important dimension in determining the success and effectiveness of a VT is its capability to induce positive attitude towards the visited sites. This may lead to increasing the visits to these sites, since attitudes are generally accepted in consumer behavior literature as behavior predictor (Ajzen & Fishbein 1977; Smith & Swinyard 1983; Glasman & Albarracín 2006; Lee et al. 2020).

In their study, Alyahya and McLean (2021) demonstrated that VR has a greater positive effect on attitude towards a destination. Other studies have shown that attitudes toward the VR were viewed as important predictors of customers' likelihood to visit the destination (Hyun & O'Keefe 2012; Fox, Christy, & Vang 2014). This study will focus on the role of both presence and online experience in inducing attitude towards the visited archeological sites.

In the destination marketing context, presence leads to a positive image of the virtual destination (Hyun & O'Keefe 2012) and raises the intention to visit the real-life destination (Choi, Ok, & Choi 2015; Han & Kai 2015). Several studies throw the light on the sense of presence as a crucial factor driving users' attitudes and behaviors toward the virtual environment (Animesh et al. 2011; Jung 201; Faiola et al. 2013; Lombard & Snyder-Duch 2013). Spielmann and Mantonakis (2018) showed that the relationship between online virtual tours and attitudes towards the objects are mediated by telepresence. To examine the relation between presence and attitude within VT in heritage sites the following hypothesis is suggested.

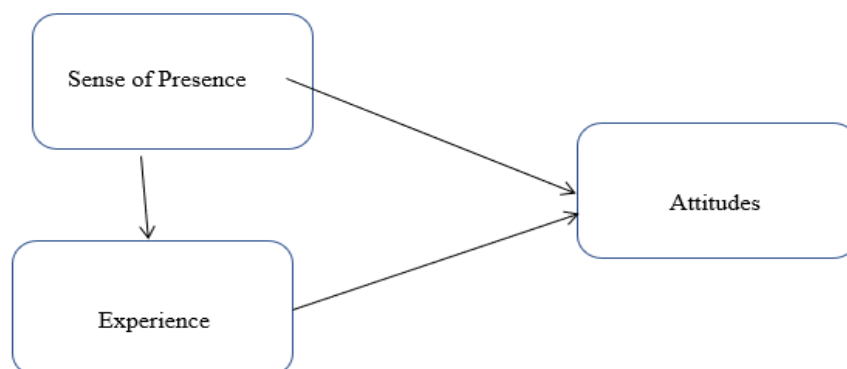
H2: the sense of presence has a positive relation with attitudes towards the visited site:

Prior VR research identified how VR experience led to customers' positive responses, such as; enriched experiences (Yim et al., 2017), favorable attitude (Chung et al., 2015), satisfaction (Jung et al., 2015) and behavioral intentions (Huang et al., 2013). Hence, attitudes toward the VR are based on customers' subjective evaluations of the overall VR experience (Nambisan & Watt, 2011; Xia, Zhang & Zhang, 2018; Lee et al., 2020).

In addition, previous studies revealed that a positive online experience has an obvious effect on forming attitude toward the visited site. In their study about the VTs launched by the Egyptian Ministry of Tourism and Antiquities, El Saied and Aziz (2021) stated that online experience is significant predictor to user's attitudes. Accordingly, the following hypothesis was developed.

H3: The VT experience is positively related to the user's attitude:

3. Conceptual Model



3.1. The Græco-Roman Sites of Alexandria

Alexandria was founded in 331 BCE and became one of the largest cities in the ancient world (Scheidel 2004). The demographic features of the ancient city of Alexandria were presented by Fraser who stated in his massive volumes that the development of the city is still not clear (Fraser 1972; Tkaczow 2013).

Due to its remarkable geographical location, Alexandria became one of the earliest premodern metropolitan cities. The growth of the city was a part of great construction program undertaken around the world, and paralleled to the establishment of other great cities such as; Antioch in Syria and Pergamon in Asia Minor (Scheidel 2004). Among these important sites, this study will focus on the three sites that were found to be represented in VTs: The Catacomb of Kom el-Shokafa, and the Kom el-Dikka including the Roman Odeon, the Study Halls and the Villa of the Birds in particular.

3.1.1. The Catacomb of Kom El-Shokafa

It was known that the Ptolemaic tombs of Alexandria were vertically cut in the limestone bedrock outside the city's walls. They incorporated burial places and spaces for performing funerary rituals. Their design began with a rock-cut staircase leading to a spacious open court that in turn gives access to the public parts of the tombs. The open court was centered with an altar to preserve the ashes or the bones of the last sacrifice. In addition, a well or a fountain were found; an element necessary to provide water used in the cultic rituals. Surrounding the court, burial rooms with rock-cut *klinae* and *loculi* holes are found. The deceased's body was placed upon the *kline* to symbolically share in the funerary banquet or to practice the various the funerary rituals. The walls of the tombs were either painted or carved in relief (Venit 1999).

Alexandria was the cradle of this tomb design which spread along the Mediterranean coast and reached as far as Cyprus and Rhodes. This monumental tomb design even spread by the Roman period and developed later to the Christian catacombs in Rome. Both Ptolemaic and Roman Alexandrian tombs represent classical and Egyptian stylistic art to create an innovative way of expression. Greek architectural features were clearly obvious in the earliest tombs of Alexandria. Nevertheless, by the third century BCE, incontrovertible Egyptian elements appeared in the tombs of Alexandria. For instance, the wingless sphinxes with the traditional *nemes* headdress flanked the entrance of tombs for protection (Venit 1999).

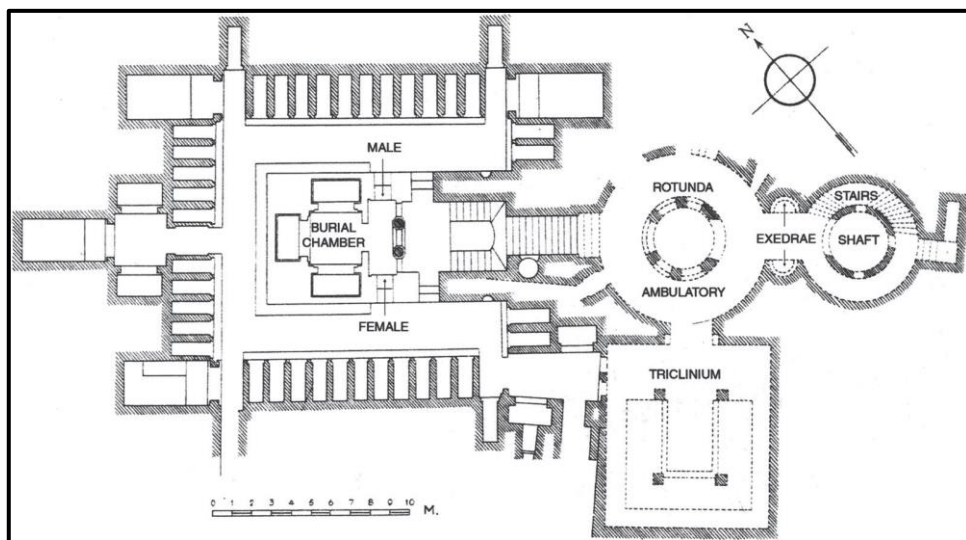
This catacomb was discovered on the 28th of September in 1900. Group of scholars believe the discovery of the tomb was due to the accidental falling of a donkey dragging a cart into a fissure. This fall resulted in discover the tomb (Breccia 1922; Empereur 1995). On the other hand, Venit believes that the previous-mentioned story is a local tale. She rather states that the tomb was discovered by the Alexandrian Sayed Aly Gibrah who broke out the vault of the subterranean tomb while quarrying for stone (Venit 2002; Kitat 2015). Before the discovery of this tomb in 1892, Botti marked Kom El Shokafa as a center of archaeological research in Alexandria (Venit 2002; Botti 1902; Kitat 2015).

Kom el-Shokafa of the (hill of sherds) comprises now Roman tombs. Both the catacomb of Kom el-Shokafa and the hall of Caracalla are accessed now by the entrance which was dug by the tomb robbers in the bedrock (Venit 2002; Venit 2016; Shipley 2018). The tomb belongs to the Catacomb style; a carved rock cut tomb of more than one subterranean level. This type of tombs was commonly used by the Christians during the religious oppression that was practiced by the Roman emperors. The Christian catacombs of Rome considered to be a distinctive example (Robertson 1933; Rowe 1941-1942; قنادوس ١٩٩٨; Haas 2004) This does

not mean that this tomb was used by the Christians because no Christian symbols were found there (فادوس ١٩٩٨; Haas 2004).

The catacomb of Kom el-Shokafa is accessed by a deep spiral stairway that gives access to a small corridor flanked by two *exedrae* each covered by a Tridacna-shell-shaped half dome. This decorative motive is invoked in Egypt by the Ptolemaic period and used till the Roman times and was never attested during Pharaonic period. Passing from this small vestibule, we enter the Rotunda which played the same physical and visual role of the central courts in the Ptolemaic tombs in Egypt (Venit 2002; Venit 2016; Shipley 2018). The catacomb consists of a of three underground levels. The first level comprises the entrance, the staircase, the vestibule, the rotunda, the Triclinium, the hall of Nemsis, and the hall of Caracalla. The second level consists the main burial chamber, a cistern, and a surrounding corridor of loculi holes. As for the third level, it is unfortunately inundated with water (Venit 2002; Kitat 2015; Shipley 2018) (fig.1).

Fig.1. The main plan of the catacomb of Kom El-Shoqafa



After: Venit 2016, p. 66, fig. 2.14

In the southwest corner, the catacomb gives access to a banquet hall that takes the shape of a Triclinium Hall used for celebrating funerary feasts, namely the *silicernium* (Venit 2002; Venit 2016). The main burial part of this tomb takes also the Triclinium design and takes rather the plan of the Greek temple or temple-tomb comprising a naos (the main burial chamber) preceded by a pronaos (the anteroom) (Venit 2016). The façade of the pronaos is flanked by two columns and two engaged pillars. The capitals of the columns and the piers took the composite Egyptianized shape. The reliefs on the architrave shows the winged sun disc flanked of Horus falcons on both sides. Two life-size statues are placed in two niches flanking the entrance to the main burial chamber. The two members, one for a male and the other for a female were probably the patrons of the tombs and bear the Roman style of art (Bising 1901; Venit 2002; Kitat 2015, p. 90-107; Venit 2016; Shipley 2018). On the lateral sides of the gateway to the burial room, there is a carving for the Agathodaemon in high relief. Entering the main burial room, the interior wall of the doorway is engraved with the shape of the Egyptian Anubis in the Roman military costumes (Bising 1901; Venit 2002; Kitat 2015; Venit 2016) (fig.2).



Fig.2. The façade of the main burial tomb, catacomb of Kom El-Shoqafa

Photographed by Sara Kitat

The burial room takes the shape of a triclinium design. It comprises three rock cut Roman garland sarcophagi forming a cruciform-shaped room. The walls are engraved with extraordinary Egyptian funerary scenes which are unique in Alexandrian tombs. The rear wall of the central hall reveals a scene which was frequently found in the Alexandrian Roman tombs; the scene of a lying mummy on a lion-headed bed and flanked by both Thoth and Horus. The embalming god Anubis appears here a jackal-headed man standing behind it. Beneath the funerary bed, three of the four canopic jars are depicted with their lids that indicate the four sons of Horus. As for the two rear walls of the two lateral sarcophagi, they reveal an unidentified Roman emperor who venerates Apis bull in the presence of goddess Isis (Venit 2002; Kitat 2015; Venit 2016).

The original entrance of the hall of Caracalla begins with a staircase that leads to a corridor with a large room. The walls of this room comprise loculi holes. Another small corridor house two sarcophagi facing each other. Every one of them is topped by the shape of the pediment. The back wall of the sarcophagus beside the passage is decorated with two scenes. The upper register of this wall represents a purely Egyptian mummification scene. On the contrary, the lower register shows the abduction of Persephone. Passing the two sarcophagi, we face the altar of this hall. It was rebuilt by the first archaeologists who discovered this part of the catacomb. Sacrifices were once made here in the honor of the deceased. This altar stands just under the shaft of the hall that illuminates the inner parts of the tomb (Venit 2002; Haas 2004; Kitat 2015; Venit 2016).

The high relief elaborate decoration of this Kom el-Shokafa catacomb suggest owners of high economical statues and prestigious position in the society during that time (Venit 2002; Venit 2016). According to Alan Row (1942), he believed that this catacomb was rather a Serapeum rather than a tomb complex. Despite this interpretation is not clear, Row's opinion depends on the sophisticated design and decoration and the clear Alexandrian style devoted to Serapis (Row 1942; Venit 2002).

3.2.The Site of Kom El-Dikka

Kom El-Dikka is situated in the center of Alexandria; the ancient city and the modern one. It occupied the area of two large quarters to the south of *Via Canopica* (Kolątaj et al. 2007;

Majcherek 2018). It is now nearby to the Main Masr Railway Station (Kolątaj et. al. 2007). The majority of the excavated monuments date back to the Roman era. The site of Kom El - Dikka comprises a Roman Odeon, porticos, imperial Roman baths, cisterns, houses and complex of auditoria and stores (Majcherek 2018). Along the centuries, these monuments were covered with dust and turned into a mound which was used by the Napoleonic expedition in Egypt as a small fort. By the 19th century, excavations were carried out in this site and covered an area of 40,000 square meters (Kolątaj et al. 2007) (fig.3).

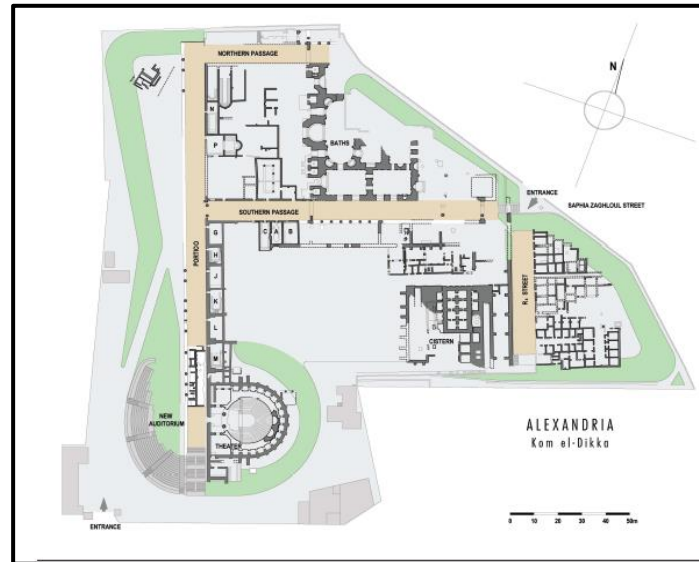


Fig.3. General plan of the area of Kom el-Dikka, Alexandria,

After: Kiss 2007, fig. 1

3.2.1. The Roman Odeon

In 1960, the Polish Center of Mediterranean Archaeology began their excavations in the area of Kom El-Dikka in Alexandria. The excavation team was led by Michalowski and work lasted there for years. Beneath layers of Mamluk brick remains and pottery ruins which date back to the 12th- 13th centuries, the Roman Odeon was discovered in 1963. Thirteen rows of marble benches were excavated in the site revealing an horse-shaped building used for welcoming the audience. The marble and granite columns of the portico along the top of the building are found collapsed. On the lateral sides of the building, there are two huge pedestals. In 1966, the Polish Wojciech Kolataj began the process of restoration. His team raised the columns on the top of the audience place (Tkaczow 2000; Kolątaj et. al. 2007; Kiss 2007; Tkaczow 2013).

The whole rows of seats are built on rows of arches called *vomatoria* of the interior wall which is supported by the exterior wall. The exterior wall is made of red bricks and big sized lime stone blocks. The diameter of the exterior wall measures ca. 33.5 meters. Seventeen limestone columns are found within the body of this wall. In addition, four stone buttresses are found within this wall; two in the northern side and the other two in the southern side. Based on the dimension of the used blocks, this wall dates back to the Roman period, particularly to the 3rd century AD. Concerning the interior wall, its diameter is 13.5 meters. It is made of big-sized blocks having the same size of the blocks used in building the exterior wall but without the usage of red bricks. Thus, this wall was built in the second phase of the construction during the Byzantine period (Kolątaj 1975; قادوس ١٩٩٨; Tkaczow 2013; Kitat 2015) .

After its discovery, the building was wrongly known as the Roman Theatre. However, it was used as an Odeon meaning a hall for listening to music and attending poetic performances and recitations. Together with the discovered Baths, the Odeon dates back to the 4th century AD. Although, archaeological evidence confirms that the Roman Odeon was completely rebuilt by the 6th century AD. A dome was added, and its function was transformed into an auditorium. According to the graffiti and inscriptions found on the building, the building maintained in used during the reign of Heraclius and was abandoned with the coming of the Arabs (Tkaczow 2000; Kiss 2007; Tkaczow 2013).

Many scholars believe that the Roman Odeon function as a study hall after its reestablishment in the 5th -6th centuries AD. In other words, this building became a part of the educational complex of halls which were established in the same period. Elias in (*Isag.* 21.30.) mentioned the word *diatribai* as a school building with classrooms that take the shape of theatrical rounded plans to enable the student as well as the tutor to see and interact with each other. Furthermore, more spacious education institutions were designed in the shape of auditoria. For instance, Theodosius mentioned in his edict in 425 AD the establishment of a university in Constantinople. The edict describes the auditorium in Capitolio which comprised 32 auditoria for orators, philosophers, law teachers and linguists (Tkaczow 2000; Majcherek 2010; Tkaczow 2013) (fig.4).



Fig.4. Overview of the Roman Odeon, Kom el-Dikka, Alexandria

Photographed by Sara Kitat

3.2.2. Study Halls

In 1980 -1983, the Polish mission excavated three small study halls to the west of the baths. Another three halls were revealed in 1986-1987. In 2003, further study halls were revealed by the Polish team led by Majcherek. They are located to the west of the public baths, between the southern portico of the bath and the theatre building. The discovered lecture halls formed a university complex in the area of Kom el-Dikka (Kiss 2007; Derda et al. 2007; Majcherek 2010). The discovery of a series of auditoria on the Kom el-Dikka site reveals the educational importance of Alexandria in the late Antique World (Majcherek 2010).

Along the monumental portico, a series of twenty auditoria were excavated so far. These buildings are obviously divided into two groups through a passage leading to the public bath in the site. With the exception of two halls, all discovered auditoria are oriented north- south.

The halls are occupied with stone benches forming a horseshoe plan of each hall which usually faces an *exedra* in the southern parts of the room. The benches had the capacity of about 20 to 30 attendants. A distinctive feature of these halls is the platform occupied in the central parts of the benches. This dais takes the shape of a higher step usually reached by number of steps. This high chair forms a *thronos*; a distinguished feature used by teachers and philosophers in ancient Antiquities. Furthermore, a pedestal of one stone block is excavated in the central floor of almost all the rooms (Rodziewicz 1984-1985; Derda et al. 2007; Majcherek 2010) (fig.5).



Fig.5. One of the study halls at Kom el-Dikka

Photographed by Sara Kitat

The southern halls adjoining the Roman Odeon are obviously the earliest part of this complex. The northern rooms were certainly added after that. Overall, this educational center dates back to the late 5th century to the first 6th century AD, mainly to the same period of rebuilding the Roman Odeon and the bath complex. Thus, the establishment of this such study halls might confirm the redesigning of the whole area in a civic context. Unlike the majority of the study halls, two halls (O and R), which are bigger in space, are occupied with a solemn row of benches. The design of the two rooms; an apse, *synthronon*, the existence of row of benches might refer to their function as a church. Despite of this similarity, there are no traces of an altar to confirm this hypothesis (Derda et al. 2007; Majcherek 2010; Kitat 2015).

3.2.3. Villa of the Birds

In the 1970s and the early 1990s, excavations were carried out in the area to the east of Street R4. A late Roman and Early Byzantine district was uncovered comprising number of which once functioned as a habitation quarter and industrial and commercial centers. These buildings date back to the fourth-seventh centuries AD (Kolątaj et al., 2007; Kitat 2015).

Between 1972 and 1980 Rodziewicz and his team directed their excavations in the habitation quarter at Kom El-Dikka. 4th -7th centuries dates houses and workshops were discovered in the area. The workshops comprised a typical Roman *pistilla* which was used for grinding food as well as kitchens (Majcherek 2019). Furthermore, a complex of public buildings was revealed in this site to the west of street R4 and to the east of the habitation quarter (Kiss 2007, p. 119). This complex was accessible through a street in the south of the excavated area. The side street led to a narrow vestibule which is divided by two pilasters into two units of buildings (Majcherek 2019).

The discovered houses formed spacious and luxuries structures which were once furnished with mosaic floors including the most famous villa, namely Villa of the Birds (Kiss 2007, p. 119; Majcherek 2019). Despite of the damage caused by the underwater threats and salt migration; the conservation of the mosaic pavement now displayed in the Villa of the Birds was carried out by the Polish mission in 2018. The conservation was for a black and white geometrical mosaic pavement which was discovered 1970s and was discovered in the Roman House MA. After conservation, this mosaic pavement is planned to be displayed in the mosaic shelter of the Villa of the Birds (Majcherek 2019).

The Polish mission carried out a conservation program to repair the northern main entrance to the mosaic shelter of this magnificent villa in 1999. Thus, the security glass door and window were dismantled. The damaged concrete threshold was remanufactured from scratch. Majcherek 2019, 40. The conservation of this building was carried out with the cooperation with the American Research Center in Cairo through three successive phases; conservation of the mosaic pavements, establishing the shelter, and finally landscaping the surrounding place (Kolařaj et al. 2007).

Among the excavated habitation quarter at Kom el-Dikka, this magnificent house, namely “*Villa of the Birds*,” presents a perfect example of the domestic architecture in Roman and Byzantine Egypt. This is due to its unique design as well as magnificent interior decoration. The house covers an area of about 110 square meters. Its floor is covered with four magnificent pieces of mosaic pavement which offer examples of various decorative techniques of the Imperial Era. Thus, Villa of the Birds presents the solemn examples of permanent mosaic floors in situ in Alexandria (Kolařaj et al. 2007).

The conservation of the mosaic floors of this Villa was funded by the American Research Center in Egypt (ARCE) under the Egyptian Antiquities Project (EAP) which is funded by the United States Agency for International Development (USAID). Furthermore, other additional works were accomplished with the Polish-Egyptian Preservation Mission such as; landscaping of the area and establishing the visitors' routes leading to the Villa (Kolařaj et al. 2007).

Villa of the Birds, also known by scholars as Villa Alpha begins with a southern entrance that leads to a triclinium hall (dining room), and Room 3 on the same axis of the building. The triclinium room is the most spacious room in this house. (7.60* 6.20 meters). The other rooms are obviously smaller in size, and their function is still obscure. A small bathroom was excavated in the eastern wing of the villa. Thus, the rooms occupying the eastern wing, namely Room 5 and Room 6, served as a dwelling (Kolařaj et al. 2007).

The first mosaic floor is of *opus tesellatum* style and covers the floor of Room 2 (ca 2.90*4 meters). The pavement represents a blooming rosette of black color on a white background. This decorative element is bordered by a large square. The corners of this square are cut off by small black filets forming the shape of an octagon. Surrounding the square, small shapes of crosses are executed of a quincunx of squares. This motive is similarly compared to a pavement of an early Roman house excavated beneath the Theatre Portico and dates back to the second century AD (Kolařaj et al. 2007) (fig.6).



Fig.6. First mosaic pavement, Villa of the Bird, Kom el-Dikka, Alexandria

Photographed by Sara Kitat

Concerning the second floor, it covers the area of Room 3 and comprises two types of mosaic pavements, *opus sectile* and *opus tessellatum*. The latter types surround the borders of the mosaic carpet decorated with black tesserae on a white background. repetitive patters of crosslets in black on a white background. The crosslets are executed on a parallel row from a zigzag border. The central design is made of *opus sectile* and forms the shape of big panels set at an oblique angle. Four of them contain discs surrounded with wreaths of white cordiform motifs. Inside each of the discs, there are further rings of black and white lines. Similar examples were not found in Egypt but rather excavated in North Africa and Cyrenaica (Kolątaj et al. 2007; Kitat 2015) (fig.7).



Fig.7. Second mosaic pavement of the dining room, Villa of the Bird, Kom el-Dikka, Alexandria

Photographed by Sara Kitat

The third piece of mosaic is the most magnificent one. This polychrome pavement covers the floor of Room 5 and consists of a border of gematrical decoration flanking the main panels of birds' figures. The geometrical pattern is executed with black and white tesserae forming four rectangles surrounding small squares and extends in the form of a triple black fillet. The central scene in the panel is a polychrome field of nine squares which are separated from each other by a symmetrical guilloche border on a black background. Every square panel represents a magnificent shape of various bird species on a white ground; quail (or partridge), parrot, purple gallinule, duck (Teal), peacock, and pigeons. In the central square, two pigeons are depicted drinking from a kantharos cup (Kolątaj et al. 2007; Kitat 2015) (fig.8).



Fig.8. Third mosaic pavement representing different shapes of birds, Villa of the Bird, Komel-Dikka, Alexandria

Photographed by Sara Kitat

During the excavations of 1970-1971, another mosaic pavement of *opus vermicilatum* was uncovered in Room 6 of the villa. The central theme is a polychrome square surrounded by a band of five rows tesserae forming the shape of acanthus scroll on a white background. Inside every loop, flower sprouts as well as pomegranates and ivy leaf shaped element, namely the *hederae*. This square is ornamented with the shape of an animal, apparently a panther in profile. The whole scene is bordered by a series of quarters circles forming poised concave squares. The panther was a decorative motive which was rarely found in the Egyptian mosaic pavements (Kolątaj et. al. 2007; Kitat 2015) (fig.9).



Fig.9. Fourth mosaic pavement, Villa of the Bird, Kom el-Dikka, Alexandria

Photographed by Sara Kitat

In 2002/ 2003, the Polish Mission excavated a remarkable 2nd -3rd century AD mosaic pavement in a deep trench behind the Roman Odeon. It represents a well-preserved multi-colored *opus tessellatum* mosaic representing shapes of geometrical shapes; patterns of squares, lozenges and trapezes. There is a shape of a rope-patterned cross in the central part of the pavement. It bears the Greek word 'ΚΑΛΩΧΗΚΕΙΩ' which means 'Welcome'. Thus, this pavement was designed as *atabula ansata* framing a greetings inscription for the visitors. At the top of this pavement, there is a multi-colored *opus vermicilatum emblema* depicting the head of a bearded man holding a cup (Dionysus-Bacchus) (Liddel, Schott and McKenzie 2008; Majcherek 2004) (fig.10).



Fig.10. The mosaic pavement discovered nearby the Roman Odeon representing Bacchus holding a cup and a braided cross

Photographed by Sara Kitat

4. Empirical Study

The studied VTs represented three sites from of the Roman sites located in Alexandria: Kom-El_Shoqafa (egy monuments.gov.eg), Villa of the Birds (arce.org) and Kom el-Dikka (3dmekanlar.com). The three VTs has the same technical characteristics, they all offer 3D views of the site with a floor plan. Virtual visitors can orient themselves using navigational aids (i.e. mouse) to move in a marked pathway, the view in all 3 VT is comparable to experience of “*looking around*”. There are no informative texts, nor audio narration in all 3 VTs.

Kom-El Shoqafa VT was available on <https://my.matterport.com/show/?m=ui3dfrQDqB2&mls=1&minimap=1>. It is the official site of the Egyptian Ministry of Tourism and Antiquities in cooperation with the Ministry of Communication and Information Technology. Promoting for the cultural tourism in Egypt, this web site focuses on the most well-known sites and monuments of Egypt. The virtual tours of the sites are designed by Matterport editor in cooperation with ShaikhTech in the Middle East. It presents a simple package with intriguing features that enables an innovation exploration to the site from the comfort of the home.

Concerning Alexandria, it gives a very brief introduction about the history of the city. But only a solemn example for a virtual tour to one of the Græco-Roman sites in Alexandria is presented on the site: the catacombs of Kom El-Shokafa. In spite of the professional design of the VT, it is not supported with by information concerning the site itself.

The site of Kom-El-Dikka was available on 3dmekanlar.com which is interested in the international most famous sites with religious, architectural or artistic value. The website presents a virtual tour as well as panoramic wallpaper and screensaver images remarked with high resolution (1600+). The website is available in three languages; Turkish, English and Arabic. Additionally, the website offers an application for Android that enables visiting the sites in VR designed by the Turkish Ercan Gigi, and is available on Google play store as “*Sites in VR*”.

The website presents a 3d virtual tour to the area of Kom el-Dikka, panorama shootings for Kom el-Dikka were done in the year 2010, using a Nikon D90 digital camera. More than 48 pictures were taken. The pictures that are taken for different angles are later combined using a computer to form a full 360-degree panoramic view, surrounding the viewer both horizontally and vertically. Despite of the panoramic VR site to the area of Kom El-Dikka, nor the site neither the application presents any information about the area of Kom El-Dikka. Furthermore, the VR to Kom el-Dikka covers only the Roman Amphitheatre and one of the study halls which is unfortunately titled as “*ruins*”.

The VT of the Villa of the Birds is available on the official web site of the American Research Center in Cairo <https://my.matterport.com/show/?m=GrbHTsV2U38> that presents a virtual tour to one of the important monuments in the site of Kom el-Dikka, namely Villa of the Birds.. The website presents a brief introduction about the design and restoration of the Villa. Concerning the virtual tour, it is designed by Matterpot editor. Unlike the VR tours of the Catacomb of Kom el-Shokafa, this tour presents brief and accurate description for various parts of the Villa.

5.1 Measures

The current study adopted previously validated scales from the literature to measure different variables. The sense of presence was measured with 5 items adopted from the SUS developed by Slater, Usoh, and Steed (SUS) ,1999 to measure the respondent’s sense of being in the virtual environment, the extent to which he perceived the VT as real, if the user remembers the VT as images or a place and the visual memory of the respondent.

The online experience was measured with 5 items adopted from the Questionnaire for User Interaction Satisfaction (QUIS) (Staton et al., 2005; Karoulis, Sylaiou & White 2006) to assess how the user describe his experience and the ease of use of the site. The attitude formation was measured by 4 items adopted from the study of Kyrilitsia et.al. (2020) , users were asked to assess how the VT motivated them to visit the real site ,to know better about the visited site, to know better about Græco -Roman sites in Alexandria , and to visit other Græco -Roman sites.

5.2 Data Collection

To collect the required data for the current study, a self-administered online survey was used, which is considered as an appropriate data collection method to evaluate a VT (Huang et al. 2013; Huang et al. 2016). The questions were translated into Arabic and were revised by two specialized professors with a high mastery of both Arabic and English languages; some amendments in the wording have been made upon their request. The questions were rated on a 7-point graphic scale.

Three versions of the questionnaire were delivered to each respondent, each version assessed the research variables in one of the three studied VTs, A link of the websites were provided to respondents, and they were asked to answer each questionnaire directly after visiting the relevant VT.

5.3 Reliability

Cronbach's Alpha values for all constructions are presented in Table (1). Based on the data in the table and the Cronbach's Alpha value of 7, there is sufficient evidence to suggest that the constructs' reliability was good. Consequently, it is assumed that the scale has high levels of internal consistency and is considered to be extremely reliable, with Cronbach's Alpha values of less than .864. As a result, all the constructs included in this study are based on well-established instruments with high reliability ratings, and each construct has a high level of internal consistency.

Table (1) Reliability levels of the instrument – Cronbach's Alpha

<i>Variables</i>	Cronbach's Alpha	No. of items
<i>User's sense of presence</i>	.886	5
<i>User's experience</i>	.864	5
<i>User's attitude</i>	.890	4

5.4 Sampling

A convenience sampling technique was employed, and the sampling frame included 230 under-graduate students in the faculty of hotels and tourism, Alexandria University. he students were selected as a sample as they have a basic knowledge about archeology, have basic technological skills to use the computer, All students have never visited the used websites before. Participants were naïve to the purpose of the experience, they were assessed on their sense of presence, online experience and attitudes towards the visited sites. Before filling the survey, participants were asked to visit the VT from the designated website, the site link was given to them in the introduction part of the survey. After the collection of surveys 200 were retrieved and analyzed.

5.5 Data Analysis

SPSS V. 24 were used to examine the study data: Cronbach Alpha to evaluate reliability, frequencies, percentage, mean, standard deviation, Kruskal-Wallis test, correlation by Spearman, Simple Linear Regression, and multiple regression.

6. Results:

6.1. The Comparison between the three VTs

When comparing the mean and the standard deviation of each construct the results came out as shown in Table (2): For user's sense of presence; The results highlight the high mean of user's sense of presence in the three sites, where the mean in Bird's Villa, Kom El-Dikka and Kom El-Shoqafa reached 5.62, 5.23, and 5.25, respectively. From the results it is clear that the user's sense of presence was the highest in Bird's Villa (mean = 5.62), followed by Kom el-Shoqafa (mean = 5.25), and finally Kom el-Dikka (mean = 5.23).as for user's experience; The results highlight the high mean of user's experience in the three locations, where the mean in Bird's Villa, Kom el-Dikka and Kom el-Shoqafa reached 5.71, 5.37, and 5.35, respectively. From the results it is clear that the user's experience was the highest in the Bird's Villa (mean = 5.71), followed by Kom el-Dikka (mean = 5.37), and finally Kom EL-Shoqafa (mean = 5.35).the results concerning user's attitude showed the high mean of the user's attitude in the three locations, where the arithmetic mean in Bird's Villa, Kom el-Dikka and Kom el-Shoqafa was 6.02, 5.89, and 5.89, respectively. From the results it is clear that the user's attitude was highest in Villa of the Birds (mean = 6.02), followed by Kom el-Shoqafa (mean = 6.00), and finally Kom el-Dikka (mean = 5.89).

Table (2) Mean and SD for variables

Variables	Villa of the Birds		Kom el-Dikka		Kom el-Shoqafa	
	Mean	SD	Mean	SD	Mean	SD
user's sense of presence	5.62	1.11	5.23	1.41	5.25	1.16
user's experience	5.71	1.15	5.37	1.30	5.35	1.07
user's attitude	6.02	1.04	5.89	1.21	6.00	1.05

For more accuracy, the study used Kruskal-Wallis test that is to indicate differences among more than two groups to clarify differences between the user's sense of presence, experience and attitudes according to the VT variables.

Table (3) The differences among user's sense of presence, experience, attitude towards according to the site

	Sites	Mean Rank	Chi-Square	Sig.
user's sense of presence	Villa of the Birds	115.64	2.123	.021
	Kom El-Dikka	96.15		
	Kom el-Shoqafa	102.14		
Experience	Villa of the Birds	121.52	4.957	.044
	Kom El-Dikka	110.13		
	Kom el-Shoqafa	101.18		
Attitude	Villa of the Birds	113.81	2.663	.008
	Kom El-Dikka	98.87		
	Kom el-Shoqafa	107.15		

Regarding the results of differences in the user's sense of presence according to the sites (Villa of the Birds, Kom el-Dikka, and Kom el-Shoqafa). Table (3) clarifies that there are statistically significant differences between the user's sense of presence and sites variable, where the p value was .021 and was less than 0.05. According to the mean rank; the significant differences were for Bird's Villa, followed by the Kom el-Shoqafa, and finally the Kom el-Dikka. This means that the user's sense of presence was the highest in Bird's Villa, while it was the lowest in Kom el-Dikka.

The results of differences in the user's experience according to the sites (Villa of the Birds, Kom el-Dikka, and Kom el-Shoqafa) as shown in table (3) depict that there are statistically significant differences between the user's experience and sites variable, where the p value was .044 and was less than 0.05. According to the mean rank; the significant differences were for Bird's Villa, followed by the Kom el-Dikka, and finally the Kom el-Shoqafa. This means that the user's experience was the highest in Bird's Villa, while it was the lowest in Kom el-Shoqafa.

As for the differences in the user's attitude according to the sites (Bird's Villa, Kom el-Dikka, and Kom el-Shoqafa); table (3) concludes that there are statistically significant differences between the user's attitude and sites variable, where the p value was .008 and was less than 0.05. According to the mean rank; the significant differences were for Bird's Villa, followed by the Kom el-Shoqafa, and finally the Kom el-Dikka. This means that the user's attitude was the highest in Bird's Villa, while it was the lowest in Kom el-Dikka.

6.2. Hypotheses Test

H1: the sense of presence is positively related to the user's experience in the VT

Table (4) shows the results that there is a significant and positive correlation between user's sense of presence and experience in the three sites. By the value of the correlation, It is clear that the value of the correlation between user's sense of presence and experience was stronger in the Bird's Villa site ($r= 0.875$), followed by the relationship between user's sense of presence and experience at the Kom el-Shoqafa site ($r= 0.837$), and finally the relationship between user's sense of presence and experience in the Kom el-Dikka site ($r= 0.803$). The table also depicts that the effect of user's sense of presence on experience was higher at Bird's Villa site ($R^2= 0.765$), then the effect of user's sense of presence on experience at Kom el-Shoqafa site ($R^2= 0.701$), and finally the effect of user's sense of presence on experience at Kom al-Dikka site ($R^2= 0.645$). As a result, H1 is supported.

Table (4) The impact of user's sense of presence in VR tours on the user's experience

	r	T	Sig.	R²	F	Sig.
Villa of the Birds	.875	15.638	.000	.765	244.539	.000
Kom el-Dikka	.803	11.126	.000	.645	123.793	.000
Kom el-Shoqafa	.837	11.869	.000	.701	140.863	.000

H2: the sense of presence has a positive relation with attitudes towards the visited site

The results in Table (5) highlight that there is a significant and positive correlation between user's sense of presence and attitude in the three sites. By the value of the correlation, it is clear that the value of the correlation between user's sense of presence and attitude was stronger in the Bird's Villa site ($r= 0.676$), followed by the relationship between user's sense of presence and experience at the Kom el-shoqafa site ($r= 0.672$), and finally the relationship between user's sense of presence and experience in the Kom El-Dikka site ($r= 0.466$). The table also reveals that the effect of user's sense of presence on attitude was higher at Bird's Villa site ($R^2= 0.457$), then the effect of user's sense of presence on attitude at Kom el-shoqafa site ($R^2= 0.451$), and finally the effect of user's sense of presence on attitude at Kom el-Dikka site ($R^2= 0.217$). Therefore, H2 is supported.

Table (5) The impact of user's sense of presence in VR tours on the user's attitude towards the archeological site

	r	T	Sig.	R²	F	Sig.
Villa of the Birds	.676	7.948	.000	.457	63.167	.000
Kom el-Dikka	.466	4.342	.000	.217	18.856	.000
Kom el-Shoqafa	.672	7.023	.000	.451	49.318	.000

H3: The VT experience is positively related to the user's attitude

Table (6) indicates that there is a significant and positive correlation between user's experience and user's attitude towards the archeological site in the three sites. By the value of the correlation; It is clear that the value of the correlation between user's experience and user's attitude towards the archeological site was stronger in the Kom el-Dikka site ($r= 0.750$), followed by the relationship between user's experience and user's attitude towards the archeological site at the Bird's Villa site ($r= 0.654$), and finally the relationship between user's experience and user's attitude towards the archeological site in the Kom el-Shoqafa

site ($r= 0.510$). Additionally, the table clarifies that the effect of user's experience on attitude was higher at Kom El-Dikka site ($R^2= 0.563$), then the effect of user's experience on attitude at Bird's Villa site ($R^2= 0.428$), and finally the effect of user's experience on attitude at Kom el-Shoqafa site ($R^2= 0.290$). Hence, H3 is supported.

Table (6) The impact of user's experience in VR tours on the user's attitude towards the archeological site

	r	t	Sig.	R ²	F	Sig.
Villa of the Birds	.654	6.699	.000	.428	44.878	.000
Kom el-Dikka	.750	9.821	.000	.563	96.450	.000
Kom el-Shoqafa	.510	4.889	.000	.290	23.907	.000

6.3. The impact of user's sense of presence and user's experience on user's attitude towards the heritage sites

The study also shows that there is a significant and positive correlation between both user's sense of presence, experience and attitude in the three sites. By the value of the correlation, It is clear that the value of the correlation between both presence, experience and attitude was stronger in the Bird's Villa site ($r= 0.751$), followed by the relationship between both presence, experience and experience at the Kom el-Shoqafa site ($r= 0.692$), and finally the relationship between both presence, experience and experience in the Kom el-Dikka site ($r= 0.519$). The table also reveals that the effect of both presence and experience on attitude was higher at Bird's Villa site ($R^2= 0.564$), then the effect of both presence and experience on attitude at Kom el-Shoqafa site ($R^2= 0.479$), and finally the effect of both presence and experience on attitude at Kom el-Dikka site ($R^2= 0.269$). As a consequence, we can state that both sense of presence and online experience in VT affects user's attitude towards the visited archeological sites.

Table (10) The impact of user's sense of presence and experience on user's attitude towards the heritage sites

	r	T	Sig.	R ²	F	Sig.
Villa of the Birds	.751	5.423	.000	.564	47.913	.000
Kom el-Dikka	.519	5.753	.000	.269	12.329	.000
Kom el-Shoqafa	.692	4.312	.000	.479	27.152	.000

7. Conclusion and Discussion:

The comparison between the three VTs was focused on three main aspects, namely, participants' sense of presence, user experience, and attitudes towards archaeology, the results showed that the villa of birds offered the user the highest sense of presence and the best overall experience which was reflected in a high generation of attitude towards the visited site, this could be due to the vividness of color in the VT, the ease of navigation, The high accuracy of representation of the site details, and the provision of information about the site before beginning the VT.

The study also showed that the strong sense of presence leads to a better online experience; this result is in line with the previous research (Novak, Hoffman, & Yung, 2000; Rose et.al., 2012;Liu et.al.,2016;). Further, the finding of this study has proven this relation in the context of VT of archeological sites same as it has been outlined as a critical factor in influencing attitudes and behaviors in a virtual environment in hotel industry (Bogicevic et al.

2019), tourist destination (Tussyadiah et.al.2018; Alyahya&McLean,2021) and advertisement (Lombard & Snyder-Duch, 2013) .

Additionally, the results showed that VT experience affect the attitude towards the visited site, as was found by M. Lee et al. (2020) who stated that VR experiences was a significant predictor of users' attitudes and intentions to travel to the destination afterward. Both presence and experience has been found to affect attitudes towards the visited heritage as shown in the study of Kyriltsias et. al.2020 of VT In the digitally reconstructed site of Choirokoitia in Cyprus.

Generally, the studied showed that there is a positive relation between the sense of presence and experience of VT and attitudes towards the visited archeological sites and the Graeco-Roman archeology.

8. Implications

The results of this study provide destination marketers, site managers and official tourism authorities with validation that VTs of archeological sites which can be an enjoyable and productive experience that draws the user into involvement and participation and help the promotion of the actual site. The sense of presence is the key feature for effective VT, findings demonstrate that a high sense of reality during a VT enhance the online experience and generates positive consequences on attitudes towards the visited site. Hence, VTs' designers must give stronger interest in improving the user's sense of presence. They should also make more efforts towards enhancing the VT experience by making it accessible for people from different backgrounds and with various levels of computer literacy. Navigation in the VTs should be designed to be as simple as possible, an orientation or tutorial might be included at the start of the tour. On the other hand, VTs could be enriched with more elements such as, texts and audio that make them more attractive, enjoyable and informative to induce positive attitudes towards the site and to increase the intention to visit it.

8. References

- Aguilera, J, Alonso, F, and Gomez. J 2014. 'Generating Three- Dimensional Virtual Tours from Two-Dimensional Images.' United States Patent No. US 8,705,892 B2. Viewed July 25, 2020).<https://patents.google.com/patent/US8705892B2/en>
- Ajzen, I and Fishbein, M 1977, 'Attitude-behavior relations: A theoretical analysis and review of empirical research,' *Psychological Bulletin*, 84(5), pp. 888-918.
- Alyahya, M, McLean ,G 2021, 'Examining Tourism Consumers' Attitudes and the Role of Sensory Information in Virtual Reality Experiences of a Tourist Destination', *Journal of Travel Research*, pp. 1-16, DOI: 10.1177/00472875211037745
- Animesh, A, Pinsonneault, A, Yang, S-B, & Oh, W 2011, 'An odyssey into virtual worlds: Exploring the impacts of technological and spatial environments on intention to purchase virtual products', *MIS Quarterly-Management Information Systems*, 35(3), p. 789.
- Barbieri, L, Bruno, F, Muzzupappa, M 2017, 'Virtual museum system evaluation through user studies', *Journal of Cultural Heritage* 26, pp 101-108
- Berg, L P, & Vance, J M 2017, 'Industry use of virtual reality in product design and manufacturing: A survey', *Virtual Reality*, 21(1), pp. 1-17.
- Bissing, F. W von 1901, *La catacomb nouvellement decouverte de Kom el Chougafa (Les bas-reliefs de Kom el Chougafa). (Drawings be E. Gilliéron)*. Société archéologique d'Alexandrie. Munich: J. B. Obernetter.

- Bogicevic, V, Seo, S. Kandampully, J, Liu, S and Rudd, N 2019, 'Virtual Reality Presence as a Preamble of Tourism Experience: The Role of Mental Imagery', *Tourism Management* 74: pp. 55-64.
- Bogicevic, V, Seo, S., Kandampully, J A, Q. Liu, S and Rudd N, A. 2019, 'Virtual reality presence as a preamble of tourism experience: The role of mental imagery', *Tourism Management* 74, pp. 55-64
- Bonetti, F, Warnaby, G and Quinn, L 2018, 'Augmented reality and virtual reality in physical and online retailing: A review, synthesis and research agenda', in T Jung and M T Dieck (eds.), *Augmented reality and virtual reality*, Springer, Cham, pp. 119-132,
- Botti G 1902, 'Rapport adressé par le Dr. G. Botti III-La découverte du grand hypogée de Kom el Hadid', *Le Musée Gréco-Romian d' Alexandrie en 1900 et 1901*, A. Mourès (Alexandrie), pp. 6-12.
- Breccia, E V 1922, *Alexandria Ad Aegyptum: A Guide to The Ancient and Modern Town, and to its Graeco –Roman Museum*. Bergamo: Istituto Italiano d'Arti Grafiche.
- Haas, Ch. 2004, ' Hellenism and Opposition to Christianity in Alexandria ', in W.V. Harris and Giovanni Ruffini (eds.), *Ancient Alexandria between Egypt and Greece*, Leiden: Brill, pp. 217-229.
- Innocent, Ch, Tafadzwa, M, Marcyline, Ch, Miriam, M, Mthokozisi, S, Blessing, M, Tapiwa, M, Elias, M, Roselin N, and Dorothy, Z, 2020, 'Scope for Virtual Tourism in the Times of COVID-19 in Select African Destinations', *Journal of Social Sciences*, pp.1-13
- Choi, J, Ok, C, and Choi, S, 2015, 'Outcomes of destination marketing organization website navigation: The role of telepresence', *Journal of Travel & Tourism Marketing*,33(1), pp. 1-17.
- Namho, C, Heejeong, , Youhee, J, 2015, 'Tourists' intention to visit a destination: the role of augmented reality (AR) application for a heritage site', *Computers in Human Behavior* 50, pp. 588-599.
- Derda; T, Markiewicz, T, and Wipszycka, E 2007, Alexandria: Auditoria of Kom el-Dikka and Late Antique Education, *Journal of Juristic Papyrology.*, *Supplement v. 8*, University of Warsaw: Fundacja im. Rafała Taubenschlaga.
- De Gauquier, L, Brengman, M, Willems, K, and Van Kerrebroeck, H 2018, 'Leveraging Advertising to a Higher Dimension: Experimental Research on the Impact of Virtual Reality on Brand Personality Impressions', *Virtual Reality* 23 (3), pp. 235-53.
- Deng, Xiaoyan, H., Unnava, Rao, Lee , Hyojin L 2019, 'Too true to be good?' when virtual reality decreases interest in actual Reality', *Journal of Business Research* 100, pp. 561-570
- Diemer, J, Alpers, G W, Peperkorn, H M, Shiban, Y, and Mühlberger, A 2015, ' The impact of perception and presence on emotional reactions: A review of research in virtual reality', *Frontiers in Psychology*, 6, p. 26.
- El-Said, O, Azizm H 2021, 'Virtual Tours a Means to an End: An Analysis of Virtual Tours' Role in Tourism Recovery Post COVID-19', *Journal of Travel Research*, pp. 1-21, <https://doi.org/10.1177/0047287521997567>
- Empereur, J-Y 1995. *A Short Guide to the Catacombs of Kom el Shoqafa Alexandria*. Translated by C. Clement. Sarapis Publishing, Alexandria, Egypt.
- Faiola, A, Newlon, C, Pfaff, M, and Smyslova, O 2013, 'Correlating the effects of flow and telepresence in virtual worlds: Enhancing our understanding of user behavior in game-based learning', *Computers in Human Behavior*, 29(3), pp. 1113-1121.
- Farid, M A, Ezzat A 2018, 'The Cultural and Economical Impacts of Using Virtual Heritage in Archeological Sites in Egypt', *International Journal on: Proceedings of Science and Technology*, pp. 1-11. DOI: 10.21625/resourceedings.v1i2.335

- Fox, J, Christy, K R, and Vang, M H 2014, The experience of presence in persuasive virtual environments. In G. Riva, J. Waterworth, & D. Murray (eds.), *Interacting with presence: HCI and the sense of presence in computer-mediated environments*, De Gruyter open, pp.164-178. <https://doi.org/10.2478/9783110409697.11>.
- Fraser, P M 1972, *The History of the City under the Ptolemies*, volume I, Clarendon Pres, Oxford.
- Glasman, L R, and Albarracín, D 2006, 'Forming attitudes that predict future behavior: A meta-analysis of the attitude-behavior relation', *Psychological Bulletin*, 132(5), pp. 778-822.
- Gössling, S, Scott, D, and Hall, C 2020, 'Pandemics, Tourism and Global Change: A Rapid Assessment of COVID-19', *Journal of Sustainable Tourism*, pp. 1-20.
- Gruter, M, and Myrach, T 2012, 'Understanding virtual experience and telepresence-a review and synthesis of literature', *Proceedings from European conference on information systems (ECIS)*.
- Han, S, and Kai, T 2015, 'Audience's telepresence to advertisement and attitude on tourist destination: Experiment based on website banner and online video advertisements', *Tourism Tribune*, 30 (12), pp. 66-73.
- Huang, Y-C, Backman, S J, Backman, K F, DeWayne, M 2013, 'Exploring user acceptance of 3D virtual worlds in travel and tourism marketing ', *Tourism Management* 36 issue C, pp. 490-501.
- Huang, Y-C, Backman, K F, Backman, S J, and Chang, L L 2016, 'Exploring the Implications of Virtual Reality Technology in Tourism Marketing: An Integrated Research Framework', *International Journal of Tourism Research* 18 (2), pp. 116-128.
- Hyun, M Y, and O'Keefe, R M 2012, 'Virtual destination image: Testing a telepresence model', *Journal of Business Research* 65, pp. 29-35.
- Jung, T, Tom Dieck, M, Moorhouse, C, and Natasha, Tom Dieck, D 2017, 'Tourists' Experience of Virtual Reality Applications', *The 2017 IEEE International Conference on Consumer Electronics (ICCE)*, 8-10 January, Las Vegas, Las Vegas, NV, USA, pp.1-3 [Doi.org/10.1109/ICCE.2017.7889287](https://doi.org/10.1109/ICCE.2017.7889287)
- Jung, T H, Lee, H, Chung, N, and Tom Dieck, M 2018, 'Cross-cultural differences in adopting mobile augmented reality at cultural heritage tourism sites', *International Journal of Contemporary Hospitality Management*, 30(3), pp. 1621-1645.
- Jung, Timothy Hyungsoo, Lee, Hyunae, Chung, Namho, Claudia tom Dieck, M.(2018). Cross-cultural differences in adopting mobile augmented reality at cultural heritage tourism sites. *Int. J. Contemp. Hosp. Manage.* 30 (3), 1621–1645.
- Jung, T, Chung, N, and Leue, C, 2015, 'The determinants of recommendations to use augmented reality technologies: the case of a korean theme park', *Tourism Management*, Elsevier, vol. 49(C), pp.75-86. DOI: 10.1016/j.tourman.2015.02.013
- Jung, Y 2011, 'Understanding the role of sense of presence and perceived autonomy in users' continued use of social virtual worlds', *Journal of Computer-Mediated Communication*, 16 (4), pp. 492-510.
- Karoulis, A, Sylaiou, S, and White, M 2006, 'Usability Evaluation of a Virtual Museum Interface', *Informatica* 17, no. 3, pp. 363-380.
- Kiss, Z 2007, 'Alexandria-past research', in E. Laskowska-Kusztal (ed.), *Seventy Years of Polish Archaeology in Egypt*, University of Warsaw, Warszawa, pp. 115-124.
- Kitat, S 2015, *Græco-Roman Sites of Ancient Alexandria*, El – Fath. Alexandria.
- Kolątaj, W 1975, 'Polish Excavations at Kom el-Dikka in Alexandria 1967; Report on the Reconstruction of the Theatre', *BSAA* 43, pp. 80-97.

- Kolataj, W, Majcherek, G, and Parandowska, E 2007, *Villa of the Birds; the Excavation and Presevtation of Kom al-Dikka Mosaics*, Cairo: Mercian Research Center.
- Latos, A, Komianos, V, and Konstantinos, O 2018, 'Interaction and Information Communication in Virtual Museums', *IOP Conf. Series: Materials Science and Engineering* 364 (1), p. 012038 doi:10.1088/1757-899X/364/1/012038
- Lee, K M 2004, *Presence, explicated. Communication Theory*, 14 (1), pp. 27-50. <https://doi.org/10.1111/j.1468-2885.2004.tb00302.x>
- Lee, M, S. Lee, M, Jeong, M, and Oh, H 2020, 'Quality of Virtual Reality and Its Impacts on Behavioral Intention', *International Journal of Hospitality Management* 90, p. 102595.
- Lee, M, Lee, S A, Jeong ,Miyoung, Haemoon O, 2020, 'Quality of virtual reality and its impacts on behavioral intention', *International Journal of Hospitality Management* 90 (2020) 102595
- Lerario, Antonella, Maiellaro, Nicola (2020) , Virtual Touring for the Puglia Regional Museum Directorate ,*International journal of Geo-Information*, 9, 741 doi:10.3390/ijgi9120741 ,1-30
- Liddel, H. G, Schott, R., and McKenzie, R 2008, *A Greek and English Lexicon with a Revised Supplement, A Simplified Edition A Simplified Edition*, by Didier Fontaine , by D.Fontaine, www.areopage.net
- Liu, Y, Pu, B, Guan, Z, and Yang, Q 2016, 'Online customer experience and its relationship to repurchase intention: An empirical case of online travel agencies in China', *Asia Pacific Journal of Tourism Research*, 21(10), pp. 1085-1099.
- Liu, Y, Ouyang, Z, and Cheng, P 2019, 'Predicting Consumers' Adoption of Electric Vehicles during the City Smog Crisis: An Application of the Protective Action Decision Model', *Journal of Environmental Psychology* 64, pp. 30-38.
- Lombard, M, and Snyder-Duch, J 2013, 'Interactive advertising and presence: A framework', *Journal of Interactive Advertising*, 1(2), pp. 56-65.
- Majcherek, G 2004, 'Alexandria Kom el-Dikka. Excavations and preservation work, 2002/2003 ', *Polish Archaeology in the Mediterranean* 15, pp.25-38.
- Majcherek, G 2010, 'The Auditoria on Kom el-Dikka: A Glimpse of Late Antique Education in Alexandria', *Proceedings of the Twenty-Fifth International Congress of Papyrology*, Ann Arbor 2007 American Studies in Papyrology (Ann Arbor), pp. 471-484.
- Majcherek, G 2018, 'Crumbs from table-archaeological remnants of Hellenistic Alexandria', in *Hellenistic Alexandria: Celebrating 24 centuries. Papers persrented at; celebrating the conference held on December 13-15, 2017 at the Acropolis Museum*, Athens, Oxford, Archeopress, pp. 71-84.
- Majcherek, G 2019, 'Alexandria Kom el-Dikka. Excavations and preservation work in the 2018 season', *Polish Archaeology in the Mediterranean* 28/2, pp. 21-42.
- Nambisan, P, & Watt, J H 2011, 'Managing customer experiences in online product communities', *Journal of Business Research* 64 (8), pp. 889-895.
- Novak, T P, Hoffman, D L, & Yung, Y-F 2000, 'Measuring the customer experience in online environments: A structural modeling approach', *Marketing Science*, 19(1), pp. 22-42.
- Phillips, W J, Asperin, A, and Wolfe, K 2013, 'Investigating the effect of country image and subjective knowledge on attitudes and behaviors: U.S. Upper Midwesterners' intentions to consume Korean Food and visit Korea', *International Journal of Hospitality Management* 32, pp. 49-58.

- Robertson, R R 1933, *The Christian Catacombs of Rome. The Expository Times*, 45(2), pp. 90-94. doi:10.1177/001452463304500208 ;
- Rodziewicz, M 2012, 'Excavations at Kom el-Dikka in Alexandria 1980-1981: Preliminary Report', *ASAE* 70 (1984-85), pp. 233-2245
- Rose, S, Clark, M, Samouel, P, and Hair, N 2012, 'Online customer experience in e-retailing: An empirical model of antecedents and outcomes', *Journal of Retailing* 88(2), pp. 308-322.
- Rowe, A 1942, Excavations of the Graeco-Roman Museum at Kom el-Shukafa 1941-1942, *BSAA* 35, Alexandria.
- RTG 2020, *Rainbow Tourism Group Statement on Coronavirus (Covid-19)*, Rainbow Tourism Group. From <<http://rtgafrica.com/>> (Retrieved on 23 December 2021).
- Scheidel W 2004, 'Creating a Metropolis: A Comparative Demographic Perspective', In W. V. Harris and G. Ruffini (eds.), *Ancient Alexandria between Egypt and Greece*, Brill, Leiden- Boston, pp. 1-32.
- Shipley, L A 2018, *A Phenomenological Approach to the Kom el-Shiqafa Catacombs*, A Thesis Presented to the Faculty of the Graduate School of Cornell University In Partial Fulfillment of the Requirements for the Degree of Master of Arts in Archaeology, Cornell University (Viewed April 2022), https://ecommons.cornell.edu/bitstream/handle/1813/59340/Shipley_cornell_0058O_103_01.pdf?sequence=1
- Schubert, T, Friedmann, F, and Regenbrecht, H 2001, 'The Experience of Presence: Factor Analytic Insights', *Presence: Teleoperators and Virtual Environments* 10 (3), pp. 266-281.
- Schweibenz, W 2019, 'The Virtual Museum: An Overview of Its Origins, Concepts, and Terminology', *Museum Review* 4 (1), pp. 1-28.
- Sharma, A, and Nicolau, J 2020, 'An Open Market Valuation of the Effects of COVID-19 on the Travel and Tourism Industry', *Annals of Tourism Research* 83, p.102990.
- Sigala, M 2020, 'Tourism and COVID-19: Impacts and Implications for Advancing and Resetting Industry and Research', *Journal of Business Research* 117, pp. 312-321.
- Skard, S, Knudsen, E S, Sjøstad, H, Thorbjørnsen, H 2021, 'How virtual reality influences travel intentions: The role of mental imagery and happiness forecasting', *Tourism Management* 87, pp. 104-360
- Slater, M 1999, 'Measuring presence: A response to the witmer and singer presence questionnaire,' *Presence: Teleoperators and Virtual Environments* 8(5), pp. 560-566.
- Slater, M., and Steed, A 2000, 'A virtual presence counter,' *Presence: Teleoperators and Virtual Environments* 9(5), pp. 413-434.
- Slater, M, Usoh, M, 1993, 'Representations Systems, Perceptual Position, and Presence in Immersive Virtual Environments', *Presence: Teleoperators and Virtual Environments* 2 (3), pp. 221-233.
- Slater, M, Usoh, M, and Steed, A 1994, 'Depth of presence in virtual environments', *Presence: Teleoperators and Virtual Environments* 3, pp. 130-144.
- Smith, R E and Swinyard, W R 1983, 'Attitude-behavior consistency: The impact of product trial versus advertising', *Journal of Marketing Research* 20 (3), pp. 257-267.
- Spielmann, N, Mantonakis, A 2018, 'In virtuo: How user-driven interactivity in virtual tours leads to attitude change', *Journal of Business Research* 88, pp. 255-264
- Spielmann, N and Mantonakis, A 2018, 'In Virtuo: How User- Driven Interactivity in Virtual Tours Leads to Attitude Change,' *Journal of Business Research* 88, pp. 255-264.

- Stanton, N. A., Salmon, P., Walker, G. H., Baber, C., and Jenkins, D P 2005, *Human Factors Methods: A Practical Guide for Engineering and Design*. Ashgate Publishing Ltd.
- Sutcliffe, A, Gault, B, 2004, 'Heuristic evaluation of virtual reality applications', *Interacting with Computers* 16, pp. 831-849
- Tromp, P 2017, *How virtual reality will revolutionize the hospitality industry*. Retrieved 02.09.19. from: <https://www.hospitalitynet.org/opinion/4080737.html>.
- Tussyadiah I, Dan, W, Jung, Tom Dieck, M. C 2018, 'Virtual reality, presence, and attitude change: Empirical evidence from Tourism', *Tourism Management* 66, pp. 140-154
- Tkaczow, B. 2000, 'The Historical Topography of Kom el-Dikka. Notes on Plans XII–XV ', in Z. Kiss, G. Majcherek, H. Meyza, H. Rysiewski, B. Tkaczow (eds.), *Fouilles polonaises à Kom el-Dikka (1986–1987), Alexandrie VII, Varsovie, Alexandrie VII*, pp. 131–143.
- Tkaczow, B. 2013, 'Historical Topography of Ancient Alexandria ', *Études et Travaux XXVI*, Intitut des Cultures Méditerranéennes et Orientales de l'académie Polonaise des sciences, pp. 685-697.
- UNWTO (United Nations World Tourism Organization). 2020. "UNWTO World Tourism Barometer May 2020. Special Focus on the Impact of COVID-19." <https://webunwto.s3.euwest-1.amazonaws.com/s3fs-public/2020-05/Barometer%20-%20May%202020%20-%20Short.pdf> (accessed 18february 2022).
- Vishwakarma, P, Mukherjee, S, Datta, B 2020, 'Travelers' intention to adopt virtual reality: A consumer value perspective', *Journal of Destination Marketing & Management* 17, pp. 100-456
- Wei, W, Qi, R, and Zhang, L 2019, 'Effects of Virtual Reality on Theme Park Visitors' experience and Behaviors: A Presence Perspective', *Tourism Management* 71, pp. 282-93.
- WHO 2020, *Coronavirus Disease 2019 (Covid-19) Situation Report 67*. Geneva: World Health Organization.
- Xiaa, M, Zhang ,Y, Zhang, C 2018, 'A TAM-based approach to explore the effect of online experience on destination image: A smartphone user's perspective', *Journal of Destination Marketing & Management* 8, pp. 259-270
- Yeh, C-H, Wang, Y-S, Li, H-T, and Lin, S-Y 2017, 'The effect of information presentation modes on tourists' responses in Internet marketing: The moderating role of emotions', *Journal of Travel & Tourism Marketing*, 34(8), pp. 1018-1032.
- Yi-Cheon, Y, M, Shu-Chuan, C, and Sauer, P L 2017, 'Is Augmented Reality Technology an Effective Tool for E-Commerce? An Interactivity and Vividness Perspective', *Journal of Interactive Marketing, Elsevier*, vol. 39(C), pp. 89-103, DOI: 10.1016/j.intmar.2017.04.001
- Venit, S 1999, 'The Stagni Painted Tomb: Cultural Interchange and Gender Differentiation in Roman Alexandria ', *JEA* 103, no. 4, pp. 641-669.
- Venit, S 2002, *Monumental Tombs of Ancient Alexandria*. Cairo: American University Press.
- Venit, S 2016, *Visualizing the After Life in the Tombs of Græco-Roman Egypt*, Cambridge University Press,
- Zeng, Z, Chen, P, and Lew, A 2020, 'From High-Touch to High-Tech: COVID-19 Drives Robotics Adoption', *Tourism Geographies* 22 (3): 724–34.
- قادوس ، عزت ١٩٩٨ ، آثار الأسكندرية القديمة. الأسكندرية، دار المعرفة الجامعية.



تقييم الجولات الافتراضية للمواقع الأثرية- دراسة حالة للمواقع الرومانية بالإسكندرية

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الملخص

معلومات المقالة

يهدف البحث لمعرفة تأثير الجولات الافتراضية لخلق موقف سلوكي محبب تجاه المواقع التراثية بالإسكندرية ، و يتم ذلك من خلال دراسة حالة للجولات الافتراضية المصممة لثلاث مواقع أثرية رومانية بالإسكندرية. كما يهدف البحث لتقييم شعور المستخدم بتجربة هذه الجولات الافتراضية و تأثيرها في تغيير موقفه السلوكي تجاه هذه المواقع الأثرية التي تمت زيارتها و تجاه الآثار اليونانية الرومانية بشكل عام. تم استخدام استبيان عبر الانترنت تتم إدارته ذاتيا من أجل الحصول على المعلومات اللازمة. وتمثلت العينة في طلاب مرحلة البكالوريوس بكلية السياحة و الفنادق جامعة الإسكندرية. و قد تم تصميم ثلاث استبيانات متماثلة تهدف للتحقق من متغيرات البحث. و قد طلب من كل طالب الإجابة على أسئلة الاستبيان بعد تجربة الجولة الافتراضية لكل موقع أثري ، و تم تزويد الاستبيان برابط للجولة الافتراضية لكل موقع على حده. تم استخدام النهج الكمي للتحقق من صحة فرضية الدراسة ، و قد تم استخدام برنامج SPSS V. 24 لمعالجة البيانات. جاءت نتائج البحث مدعمة لفرضيات البحث ، لتؤكد أن لكل من الوجود و الخبرة للجولات الافتراضية تأثير على الموقف السلوكي تجاه مناطق التراث المزارة. بالرغم من الأهمية المتزايدة للجولات الافتراضية لمواقع التراث على مستوى العالم ، إلا أن هناك عدد قليل من الدراسات السابقة التي تناولت تأثير الجولات الافتراضية على الموقف السلوكي للزائرين. كما أن هذه الدراسات لم تتناول تقييم العوامل المؤثرة على موقف الزائرين السلوكي و خاصة لمواقع الآثار اليونانية الرومانية بالإسكندرية. و بذلك فإن هذه الدراسة تهدف إلى إلقاء الضوء على تأثير الوجود و الخبرة للجولات الافتراضية على الموقف السلوكي للزائرين.

الكلمات المفتاحية
الجولات الافتراضية
؛ الوجود ؛ السلوك ؛
الخبرة ؛ الإسكندرية.

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المجلد ٢٣ ، العدد ٢ ،
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