VIRTUAL REALITY: TOWARDS PRESERVING ALEXANDRIA HERITAGE BY RAISING THE AWARENESS OF THE LOCALS

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Keywords
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Abstract
One of the biggest problems facing Alexandria nowadays is the ongoing destruction of historic buildings to accommodate new high-rise residential buildings, carried out by the “construction mafia” with the aid of the landlords and the silence of the locals, to gain considerable financial profit in a remarkably short period of time. Through previous data collection and surveys, it was concluded that most of the residents don’t have an adequate consciousness about the significance of these structures and the destructive actions happening to them. Here arises the role of virtual reality: this research attempts to discuss its impact on increasing this knowledge, enhancing the participatory heritage conservation process and its ability to encourage the residents to save their heritage from destruction.

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INTRODUCTION

According to Calvino, the history of every city worldwide is what differentiates it from other cities, and gives it a distinctive identity (Tung, 2001). Passing by Alexandria’s old town center is like crossing through an open museum that incorporates different architectural styles: Italian, British, Greek and French buildings stand and exhibit Alexandria’s history. Alexandria used to attract famous creative writers such as EM Foster and Lawrence Durrell; in addition to architects and poets like the Greek poet Constantine Cavafy in the 19th and 20th centuries (Heba, 2011). Unfortunately, on a trip through the center it might be noticed that many buildings are found in a deteriorated state or demolished. The decay situation provokes activists to protest to the neglect of the heritage of their city, asking the government to act and save it. According to Desouki (2007) since the end of the 19th century Alexandria was a cosmopolitan city, home to a high number of foreigners who lived together and influenced the city to have a collection of an astonishing variety of architectural styles. The historical importance of cosmopolitan Alexandria’s buildings was classified in the heritage list of Alexandria into four categories: have a unique architectural value; built by a famous international architect; belong to a well-known historical character; and have Moral value (Alexandria Government, 2007).

Before the current use of social media and online sources of knowledge, museums used to act as the primary source of information concerning the heritage and were used to assist the locals to stand against Heritage demolition activities (Gaitatzes, 2001). However nowadays a low quantity of Egyptians visits museums; instead they depend more on social media to gain old or new information - but what if the media is not providing adequate materials that can improve the feel of belonging of the locals towards their heritage? Nagy declared that the concept of open wall museums, which are represented by virtual reality like mobile applications and augmented reality projects, has many advantages in saving heritage through boosting awareness and integrating users (2016). Virtual and augmented heritage projects are easy to access by the citizens, and narrow the gap between the past and the present.
present which enhances the awareness of the public towards the historical origin of a building or a site. The paper will address the role of virtual reality in saving the heritage of Alexandria from being demolished, and the challenges facing the virtual reality approach in developed countries such as the high costs and the unavailability of a suitable amount of equipment, creating obstacles in transferring this technique to many residents in Alexandria. The pertinent question is, can virtual reality contribute in preserving Alexandria’s built heritage from being destructed? This issue is the driving force of the paper, to explain virtual reality as an alternative solution for involving and motivating the locals to care about heritage protection.

THREATENED BUILT HERITAGE OF ALEXANDRIA

Indicators

In Figure 2, the yellow line indicates the greatest height that is permitted by the government in the area and nobody ought to exceed it. The tall structures developed during and after the Revolution are the ones under the red arrows while the ones under the dark arrows are the structures that exceeded the limit of allowed tallness, before 2011. In the Master’s thesis of Borg, two comparative photographs of the Bahary neighborhood skyline before and after the revolution were illustrated to show the high number of the buildings exceeding the allowed height built in this area within the period of two years (Borg, 2013). It also serves as an indicator for the construction companies who have been highly active in constructing these illegal structures throughout and after the political disarray in Egypt (Save Alex, 2012). Al-Raml Station and the Al-Manshia area are the most critical chronicled locales in Alexandria, representing the European city. It is visible downtown of the sea water-front of Alexandria, and has endured evident pulverization activities. It must be questioned: why is such a respected place like the center of Alexandria a victim of these detrimental actions? These blatantly illegal buildings are an indicator of a problem that requires investigation to understand precisely what happened to allow their construction; what similar situations are occurring now; and what situations may arise later, allowing for progress to a better response to this problem.

Figure 2. Visual Indicators of the existence of high number of illegal buildings constructed in the historical sites of Alexandria in 2011 (Source: Save Alex, 2013).
The start of heritage demolition phenomenon

The destruction of valuable historic buildings is a global problem found in many societies over centuries. Some of these countries recognized the problem and resolved it while other nations still suffer from endless demolition threats to their architectural heritage. The twentieth century represents a paradigm shift in urban development, not only through enhanced urban expansion, improvement and re-conceptualization but also an era of architectural heritage negligence, destruction and lack of respect for urban planning decisions towards the local culture and community (Tung, 2001). Many countries have experiences acts of demolition actions 1900 and 2000, such as the levelling of a quarter of Amsterdam’s landmarks by its citizens, and the removal of half of Islamic Cairo by the locals. Some countries and cities that have been exposed to the destruction of its heritage are; Turkey, New York, Venice, Moscow, Athens, Japan, and Singapore (Tung, 2001).

Historically, planners applied urban redevelopment in Europe by building many new settlements contiguous to the old districts, with a small level of care and awareness promoted the citizens of how significant these old buildings and neighborhoods were. In more recent times planners have realized that these developments were more influential on the devastation of historic architecture than the consequences of the two World Wars (Tung, 2001).

Many cities throughout the world applied several technological innovations, including dams to pump water into cities; the invention of gas lights for safer streets; an infinite number of government offices and service buildings; widening of the main arterial roads; and factories invading the city (Tung, 2001). Then further innovations followed: using electrical lights instead of the gas ones; the rapid increase of cars and trucks; and the invention of the elevator which caused skyscrapers to be built higher and higher (Tung, 2001). The advances in telecommunications meant industrial buildings moved again out of the city centers to be replaced by high residential towers, enclosing the migrated citizens from the rural areas and signaling the beginning of the mass production era (Tung, 2001).

Through Roman era, the perception of the natives to their culture and heritage primarily concerned its longevity, elegance, and authenticity (Licciardi, 2012). Licciardi said that, through in the 18th century and the Italian Renaissance, the perception of the citizens shifted to how satisfying their city structures mirrored the culture, history, and uniqueness of the city. This opinion underpins the approach of a large number of culture preservation schemes and the issuing of original charters like Venice Charter, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and International Council on Monuments and Sites (ICOMOS) (Licciardi, 2012). However since the start of the modern era the attitude of local people towards their heritage has evolved entirely for several reasons, but primarily rooted in the focus on accelerated economic transformations (See Figure 3). The power of the private sector, the financial system, and globalization are determinants that have forced citizens to perceive their heritage from an economic point of view. The estimate of a historical building’s value is enhanced according to how financially efficient the structure is: if the financial profits are not sufficient enough, then it doesn’t deserve to be protected anymore (Licciardi, 2012). According to Licciardi, in this case, attempts to protect the heritage became complicated; multiple values and stakeholders need address and the process to be honestly managed to achieve a successful sustainable conservation process (2012).

Egypt is one of the oldest known civilizations, distinctive by its extraordinary history which has generated numerous unique architectural styles of buildings and districts: Ancient Egyptian architecture, Islamic architecture through to modern architecture (Afffy, 2000).
Since the end of the 19th century, Alexandria has been a cosmopolitan city home to a high number of foreigners who lived together and influenced the city’s marvelous variety of architectural styles. According to the heritage list of Alexandria, a high percentage of Alexandria’s historically important buildings have a unique architectural value such as cosmopolitan, contemporary and Islamic style buildings, while a lesser but significant amount of the buildings have been built by famous international architects (Alexandria Government, 2007). One of the outstanding examples representative of heritage deterioration actions is Villa Aghion which was constructed in 1923, and it was famous for its Palladian style. Villa Aghion was destroyed gradually through the years until it was demolished completely in 2016. Another case is Villa Ambron, designed by the Italian architect Aldo Ambron in a Baroque style, which has been neglected for several years resulting in it currently being difficult to implement any conservation intervention to protect it from falling apart (Borg, 2013). Also, there are some buildings which belong to well-known historical characters, and a number of buildings which have Moral value, a special memory for the citizen or have played witnessed to significant events. (Desoki, 2013) The political, economic and social situations in Egypt have changed completely from the middle of the 20th century. Rural migration to the city; the movement of foreigners back to their countries; the invasion of concrete and the high-rise building as a solution for the significant increase in population, have all contributed to the historic building destruction phenomenon (Heba, 2011).

Figure 3. The perception of the citizens towards the heritage throughout time
(Source: Author based on Licciardi, 2012).

Figure 4. Menasce building court and plan (Source: Vintage Alexandria, 2008).
Analysis and reasons of the destruction phenomenon

One of the most pressing issues today confronting communities with historic preservation laws is restricted proprietors who don’t have the will or the funds to keep up their historic properties. The modern view towards the historical structures is concerned with how financially significant it is. Since the listed buildings in Egypt are not profitable from a financial perspective, the owners are willing to destroy them and construct a new-build that is more financially viable. A key conclusion achieved from a workshop held by the Save Alex initiative in Alexandria was that the second prominent reason for the demolition of built heritage is the lack of proper documentation that can state how important a building is, even if it was destroyed (2013). Another leading cause of the demolition of historical buildings is the lack of awareness of the citizens towards the existence of these buildings, the existence of the listed buildings and their right to the city which includes their objection to the demolition of these buildings (Save Alex workshop, 2013). These reasons form the main causes behind the destruction of built heritage in Alexandria over a relatively short period of time in an ongoing, unstoppable process (Save Alex workshop, 2013).

Figure 5. Diagram shows the main causes and effects that leads to the existence of demolition phenomenon (Source: Author).

Considering the lack of awareness, during a workshop by the Save Alex initiative group, a discussion was arranged among the participants and the stakeholders to determine a level of desire to preserve the city’s built heritage, and also who was keen to destroy it and how influential those people are. In figure 6, an illustration shows that the stakeholders willing to protect the heritage are fewer than those who are willing to demolish it (Save Alex. Workshop, 2013). “The professional themselves refuse the conservation projects and aims to destroy these magnificent structures to benefit from a new high-rise building revenue” (Hosny, Telephone interview, June 11, 2016). The investors want a new construction to invest in, and the owners are the most willing to demolish the listed building they own because of the economic losses they gain from the restrictions applied to it. This willingness of the proprietor to demolish the building is driven by several factors such as the existence of the old rent law; the maintenance of the building; and the lack of awareness of how much it is important to be kept. The next significant category who don’t care for heritage preservation or
demolition is some of the citizens, who don’t know about the existence of the heritage list of Alexandria and how important it is to be preserved. In the 1980s, surveys were conducted by Pokotylo and University of British Columbia students which concluded that the public are highly concerned by protecting the heritage of their cities but they don’t have enough knowledge of the laws, ways and interpretations of heritage conservation. Another survey was done by Pokotylo, D. and Guppy, N., developing a questionnaire for the public about general archaeology knowledge, their opinions about the value they see in the historical sites, their level of interest concerning heritage conservation, how they support it and some demographic data (1999). This survey was handled to a random number of citizens living in the mainland portion in southwestern British Columbia and they collected 963 reliable questionnaires to use. The survey concluded that raising public awareness towards heritage conservation can lead to pressure on the government and the private sector to conserve the heritage and improve it. A new conclusion was discovered within the survey: that the more elderly members of the public have higher awareness about heritage conservation, while the younger citizens are more likely to participate in practical activities related to heritage conservation. In the end of the survey, the researchers summarized that the person who is most responsive to awareness raising activities and also willing to take part in a heritage conservation project would be middle aged or older, finished their postsecondary education, and a female (Pokotylo, 1999).

![Diagram](Image)

Figure 6. Diagram shows the willing of the stakeholders to save or demolish the listed buildings (Source: Save Alex workshop, 2013).

**PREVIOUS SOLUTIONS AND ITS EVALUATION**

There were some trials conducted to raise awareness and engage the locals more with their built heritage. Most of the activities done to raise awareness were done by the Save Alex initiative with the help of an official committee, who appointed a list of historical buildings of Alexandria in the heritage list, and set new heritage conservation proposals. According to data collected from sources including the Save Alex Facebook group, Wasf Iskendrya and the Committee of Heritage conservation of Alexandria, some of these solutions were illustrated in lectures; updates in the existing museums; assignments in the conservation module taken at the University of Architecture; urban sketching of the historic buildings and districts; articles; walkable guided tours; and workshops. However these interventions didn’t
produce a notable change, mostly because they didn’t reach either different classes of citizens or a big number of them; it wasn’t motivated enough; or it wasn’t interactive enough. These experiments indicated a significant need to seek alternatives to gain the participation of local people in saving the remaining heritage in Alexandria. According to Pokotylo, the result of the awareness survey conducted in British Columbia illustrated that public awareness was highly gained by the citizens through the museums they visited, television programs they watched, traveling and the internet. In comparison public lectures took the lowest percentage in being a successful way to raise the knowledge of the public about heritage conservation (1999).

Examples of the trials

**Guided tours and articles:**

Save Alex represented a huge movement to prevent the destructive practices in the city in recent years. It organized demonstrations and meetings with the public in addition to some workshops to promote the knowledge of locals and students towards the values, stakeholders, and regulations concerning the listed heritage (See Figure 7). Yet the opposing stakeholders, including the landlord, the constructor or anyone who profits from razing the buildings, always have a method to overturn these objections and regulatory barriers, and accomplish their intention of demolishing the historical building in the end (Save Alex, 2013).

The Save Alex initiative further proposes to organize regular walks through old quarters of Alexandria to address various architectural techniques, raise awareness and engage the community in protecting such invaluable historical assets. According to an interview with Mohamed Aboelkhier and Yomna Borg, members of Save Alex applied for an international fund organization so they can execute conservation projects. They declared that it was tough to communicate with the diverse stakeholders running the listed buildings in Alexandria. They also stated that there are complicated loopholes in the law, the procedures, and the duties of each actor which make it even harder to have a feasible, reliable result (Aboelkhier, Telephone interview, 2015) (Borg, Telephone interview, 2016).

![Figure 7](image-url)

Figure 7, a. Walks done by the initiative Save Alex to raise the awareness towards the heritage in Alexandria. (Source: Save Alex Facebook page, 2013) b. Demonstration in-front of a listed building in Alexandria object on the demolition of the villa (Source: Save Alex, 2013).
Sketching workshops
A series of events were organized by Mohamed Gohar, an architect, called Wasf Iskendrya under the umbrella of Urban Sketchers group. This group aims to document Alexandria’s fabulous architecture as it is currently through sketches and drawings before it disappears like the other demolished historic buildings. Photographs are misleading and do not focus on the construction style as the sketches do, as stated Gohar in an article interview. The Gudran organization also has a substantial role in spreading the knowledge of the important unknown heritage of Alexandria, through Al-Cabina, a cultural space managed by them. In Al-Cabina, they hold several cultural activities and lectures; its main aim is to integrate everyone and raise the attachment of the locals with the city (Rollins, 2015).

Lectures
Some architects, urban planners, private institutions and even ordinary people who care for the built heritage of the city have organized several lectures to illustrate the types of heritage found in the city, its importance, how to conserve it and discuss the problems and solutions related to it. Also, a number of round tables were organized with stakeholders including investors and owners to bring the deterioration phenomenon into discussion, and to try to achieve a proper solution that results in a win-win situation for the interested stakeholders to preserve the heritage.

Museums
Alexandria has some museums which are generally in good condition and exhibit valuable historical artefacts. The locals are not interested in visiting these museums, and school trips mostly visit the museums. These trips are very short, not well prepared and don’t usually offer a high quality of information, with the students mostly forgetting what they have learned and not visiting again when they are older. Ultimately, these museums are left neglected and unable to share their knowledge (Gaitatzes, 2001).

Education
Recently some educational modules were added to the architecture department of Alexandria University to study heritage conservation and also to allow students to gain some knowledge about historical buildings, and the different historical architectural styles present in Alexandria. This module had a significant impact on the students and brought their focus on to the heritage and conservation field in addition to the computational and conceptual design aspects they were already being taught to consider. A huge number of the neglected buildings in Alexandria need to be reused so the module brought the reality of the situation into their studies and decreased the gap found between what is known and practiced in the work environment and what the architectural students are studying in the university.

LEVEL OF ENGAGEMENT EVALUATION
An assessment of the previously stated solutions was done - present in Table 1 - after looking at each intervention, what happened and the feedback of the users. The assessment was conducted according to how much each activity may contribute to an increase in awareness and knowledge gained by the locals about the already demolished buildings and their willingness to preserve their remaining heritage. In order to drive the citizens to change the existing situation and to be prepared to object to the demolition actions, activities should be introduced to help in enhancing their sense of belonging through a well-managed interactive methodology. The interactive activities should make them aware of how beautiful the urban identity was before and what changes have happened to reach the existing
architecture, which may lead them to believe in and to be motivated by the need to preserve the remaining heritage.

Such avenues of engagement, however, weren’t sufficient to reach broad public groups of local people. They mostly targeted the already interested persons who lack the knowledge but still have a willingness to be informed about their heritage. They also lack mechanisms to increase the motivation of people and the sense of belonging which are essential in encouraging the locals to make some effort to save the built heritage in Alexandria from being deteriorated daily. Even the museum, which is a place expected to offer in-depth knowledge and try to spark the imagination of the visitor, lacked effective engagement and interaction tools. Locals have stopped going to the museum to learn about their culture and heritage; they prefer to experience it through the media, mostly the television or the Internet, and in particular social media. Is the media making use of the fact that the citizens rely on it to gain basic knowledge and news to provide a rich body of information regarding the lost heritage, the listed buildings, and the conservation process? Generally, no, the media doesn’t care enough to discuss this type of issue, which keeps the locals completely oblivious to what is taking place in their city concerning heritage conservation and listed buildings maintenance.

Table 1. Table shows the advantages and the disadvantages of the awareness activities done in Alexandria (Source: Author, 2016).

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Interaction</th>
<th>Enhance the Sense of Belonging</th>
<th>Type of People Involved</th>
<th>Type of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops</td>
<td>+</td>
<td>-</td>
<td>The already interested persons</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Desires it, but usually useful enough to have knowledge</td>
<td></td>
</tr>
<tr>
<td>Lectures</td>
<td>-/+</td>
<td>-</td>
<td>The already interested persons</td>
<td>+</td>
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<td></td>
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<td></td>
<td>Desired, but usually useful enough to have knowledge</td>
<td></td>
</tr>
<tr>
<td>Museums</td>
<td>-</td>
<td>-</td>
<td>The already interested persons</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Desired, but usually useful enough to have knowledge</td>
<td></td>
</tr>
<tr>
<td>Guided tours</td>
<td>+</td>
<td>-</td>
<td>The already interested persons</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Desired, but usually useful enough to have knowledge</td>
<td></td>
</tr>
<tr>
<td>Articles</td>
<td>-</td>
<td>-</td>
<td>Not all the citizens can read the book</td>
<td>+</td>
</tr>
<tr>
<td>Media</td>
<td>-</td>
<td>-</td>
<td>Not all the citizens can read the article</td>
<td>+</td>
</tr>
<tr>
<td>Education</td>
<td>+</td>
<td>-</td>
<td>The specialized students only</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Literally very highly useful information to gain knowledge and to put input before the conservation field of study</td>
<td></td>
</tr>
</tbody>
</table>

VIRTUAL HERITAGE AS A NEW ALTERNATIVE SOLUTION:

The aim of virtual heritage is to convert the physical legacy to a digital version using computer graphics technology to create models that allow some degree of interaction and involvement by the user. To achieve a successful visualization of the heritage site or building, two priorities should intersect: the validity of information and the accuracy of representation...
(Gaitatzes, 2001). Most virtual heritage projects start with examining the previously completed graphical representations of the site and then using GPS, laser scanners, photogrammetry and conventional survey methods to complete the entire mapping of the location (Rüther, 2012). The virtual reality project aims to change the user from being only a viewer of a scene to interacting with the site in a way that drives them to feel that they are located at the time and place of the virtualized scene. The sense of interaction is accomplished by improving the image and sounds used in creating the virtual heritage, which is strongly represented in augmented reality projects.

Virtual heritage can be useful for users in several ways: it engages the user to a level that can then promote their sense of belonging to the site. It presents the information accurately to the user by seeing, listening and interacting. Virtual heritage projects also allow access to a no longer existing site which can’t be done in another way, and presents different perspectives of the location according to the user’s point of view (Gaitatzes, 2001). The heritage virtual reality project can be also uploaded online where they are then called Online Virtual Exhibitions (VEs) which can overcome the space, time and location restrictions that can occur on the physical site, preventing the users from imagining how space was in the past. The users who live in a different city or a distant location can, with the VEs, access the historical site easily and gain knowledge while sitting in their home. Mobile phone applications are another platform for virtual reality projects that can be accessed and are easy to use (Richards-Rissetto, 2013).

Table 2. Table shows the advantages and the expected disadvantages of virtual reality as an awareness tool (Source: Author, 2016).

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Interaction</th>
<th>Enhance the Sense of belonging</th>
<th>Type of People Involved</th>
<th>Type of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual reality</td>
<td>It shares in rethinking the users through the story</td>
<td>High interaction between participants and the heritage site</td>
<td>It may enhance the sense of belonging as it makes the user feel as if they are actually inside the place they passive through every step but with the original virtual fabric</td>
<td>It can be accessible to all types of virtual, because it can be used in the site and it can be used in museums and sites that are accessible to the public</td>
</tr>
</tbody>
</table>

The successful virtual heritage projects should provide not only a 3D modelling of the heritage site but also a healthy environment for participation, interaction and collaboration, which according to previous studies may lead to ‘Holi constructivism’; a new paradigm shift. It should achieve a high level of interpretation by including social aspects represented in the feel of the physical environment and allow the user to explore the site as if they were there at the time it was constructed. Virtual reality must offer a social exchange because in reality the user doesn’t experience the site individually but in groups, discussing and experiencing the culture heritage the site has. There are several examples of already existing live museums making use of digital tools to enhance public integration more with the heritage of the city, like Colonial Williamsburg in Virginia. Another example of an institution currently using virtual data is represented in the augmented reality platform for the sculptures found in the museum in FBK Trento in Italy.

Nevertheless, virtual heritage projects face many challenges to achieve the desired environments. The complexity of the multiple variables that should be taken into consideration when designing the virtual heritage environment make it challenging to create it in a reasonable time or high quality. The Culture Presence of the environment created is another challenge: the old building can be 3D printed in the virtual reality through its pictures and details, while the Culture Presence is hard to be accurately aware of when it refers to a
long gone time. The best way to create an accurate experience is to consult literature to understand the historical culture of the place and then it can be designed in the virtual environment. It also can’t be developed by a foreign expert: in the aforementioned surveys when the response team didn’t include locals, it became difficult to achieve accurate Culture Presence (Pujol, 2012). In the next case study, the advantages and the challenges of virtual heritage projects will be illustrated through discussing the case study steps.

Greece began to experience fewer museum visitors and decided to design virtual heritage projects to encourage the citizens to revisit the museum; they identified various advantages and challenges (Gaitatzes, 2001). The Foundation of the Hellenic World (FHW) had a significant role in spreading the idea of virtual heritage by establishing a forum for specialist architects and urban planners to exchange their knowledge about the Hellenic cultural heritage and their visualization data related to it (Gaitatzes, 2001). It created a department of virtual reality to create their education and exhibition project within an innovative environment, to develop its infrastructure and establish a collaborative base between it and another institute. To achieve its goals, the FHW opened two 10 to 20 minutes virtual projects exhibits in existing museums. The first project received around 5000 visitors daily and the second received about 100,000 visitors during the whole period of its exhibition (Gaitatzes, 2001). The participants could explore the city by both visiting the architectural sites and diving to view the ancient sunken city in the harbour. Through their exploration, they could view their surroundings from different perspectives and feel the proportion, see architectural details, experience the scale and the characteristics of spaces designed by their grandparents (Gaitatzes, 2001).

The i-mareculture project is an important ongoing project that aims to raise the awareness of the public towards European underwater maritime archaeology, through storytelling, game scenarios, and realistic representations of environments. The game is designed to make the user sail and dive between the ancient sunken monuments for a high level of interaction and time reduction between the game and the reality. The Underwater Archaeological Park of Baiae in Naples, Mazotos shipwreck in Cyprus and Xlendi shipwreck in Malta are three sites that were selected to participate in this project. The project started by collecting detailed archaeological documentation through active sensors used to record underwater life in 3D, including Time-of-Flight (ToF), LiDAR techniques, triangulation scanners and structured light systems. The sounds of the underwater archaeology site were recorded by the Multibeam Echo sounders (MBEs), the Side Scan Sonar (SSS) and the Sub Bottom Profiler (SBP) (Bruno, n.d.).
One of the most critical challenges the projects faced was the high cost of the VR equipment needed to create the projects, and the costs required to pay the team working on the project. This lead the team to choose more readily available VR equipment with less cost to be able to represent different projects to the visitors (Rüther, 2012). In other cases, specialists were needed in the 3D scanning of the virtual heritage projects such as architects and conservators to check all the architectural details. The team may have another challenge which is the ability of the designers and the curators to understand the virtual software that they should apply the architectural details on, which makes it necessary for them to be involved with the project from the beginning to be familiar with this software before starting. In other cases, challenges occur against the timeline the team should meet to finish the project, especially if an international institute funds this project. These problems are highly present in the ability of the 3D laser equipment to capture a huge site in a high-quality virtual heritage environment project, and the permissions to photograph such important historical sites may also form a challenge (Rüther, 2012).

The advantages of Virtual Reality projects can be summed by their ability to increase immersion and interaction for the users. The users can be immersed in the surrounding digital environment and experience the space and sounds like they are in the real place and time, interacting with this environment to create their own experience (Roussou, 2010).

CONCLUSION

Additional challenges to the ones mentioned in the paper occur when trying to implement the virtual reality project in Alexandria. Alexandria is a city in a developing country which makes it more difficult for the locals to be aware of the term “Virtual reality” itself, adding the need to raise awareness of the concept of virtual environments to the challenges. In Alexandria, it is difficult to visit the museums to see new visual heritage environment projects. The locals in Greece went to visit the museum to see the new project and to have fun exploring the historic city because they were aware of what virtual reality means. It is much expected that the locals in Alexandria won’t visit the museum even after the launching of the virtual projects, which means there should be another additional step to address this before the launch of the projects in the museum, such as an on-site experiment of the virtual reality by the citizens in the street. The cost is another challenge which makes it nearly impossible to be done without a full fund from an international institute.

The awareness of the citizens around their heritage is an essential aspect to protect the historic built environment from being regularly demolished. The activities tackling the increase of knowledge of the citizens occurred in several forms: workshops, tours, lectures and social media. These outreach activities have been met with ignorance and inefficiency towards raising the knowledge of citizens, building the will power to save the heritage of the city, and deepening the understanding of their rights to the city. According to the case study, virtual reality can be a successful alternative for these activities to raise awareness. Although virtual reality has a lot of advantages, it may bring some challenges to achieve the necessary knowledge level in the context of Alexandria. Resultantly it is better to bring the virtual reality to the citizens on the site rather than expecting the locals to go to a place like a museum to experience the virtual project due to their lack of awareness about the meaning of virtual reality. Additionally the project needs to be accompanied by a detailed proposal to gain full funding from international institutes to implement it without delays parallel to the achievement of the required awareness level goal.
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