

Using Modern Technologies in the Museums' Exhibitions: The Grand Egyptian Museum as a Case Study

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Abstract

Museums are vital for learning about our culture and history. Museums also hire professionals to restore and care for these priceless items so that future generations can enjoy them. We would almost likely lose the concrete ties to our past if museums did not exist. The incorporation of interactive components and modern technology into a museum setting is not a novel notion. Museums have always housed actual items. Audio recordings with explanations, interactive displays, and video pieces have all been used in the past. Virtual Reality / Augmented Reality will certainly continue this trend, but in somewhat different ways separate ways. With the advancement of technology and the existence of Virtual Reality, Augmented Reality, and Mixed Reality technology and its use in museums, it has helped to increase the importance of museums and make better use of them, allowing us to learn more about our history and civilization in a more enjoyable manner.

Keywords: Museum, The Grand Egyptian Museum, Virtual Reality, Augmented Reality, Hologram

Introduction

Museology, sometimes known as museum studies, is the study of museums (Vergo, 1997). Museology as a contemporary science investigates the history and role of museums in society (Maroevic, 1998; Ross, 2004), as well as the activities they do, such as curating, preservation, public programming, and education (McCall & Gray, 2014). Museums are experimenting with new technology to enhance the visitor's experience. 3D technology has the potential to engage museum visitors in innovative and fascinating ways. It can enable people to interact with exhibitions and find virtual artifacts that provide valuable cultural and historical knowledge.

Using the photogrammetry approach, three-dimensional technology may be utilized in museums to scan cultural artifacts and generate virtual and real replications. The scanning must be done with specific lighting and without causing any damage to the objects. With the recent growth of commercial three-dimensional digital scanning technology, 3D scanning, as well as virtual and physical duplication, has become a reality in the field of heritage preservation. 3D scanning creates a high-precision digital

reference document that captures condition, gives a virtual model for replication, and allows for simple digital data mass distribution. (Wachowiak & Karas,2009). A representation for 3D objects in animated sequences is employed, allowing for pixel-accurate and frame-accurate object selection, such that a viewer may select any 3D item to begin movement inside the 3D world, inspect an exhibit in animated form, or play a digital movie or music. The use of precomputed video enables 3D navigation in a realistic-looking space without the need for special-purpose graphics technology (Miller et al., 1992).

Virtual Reality (VR)

It is a method for an individual to see, feel, and touch through information in a computer, where it interacts with the environment in a manner comparable to the actual world through training. The user may observe the three-dimensional scene by specifying its dimensions, whether in closeness, depth, or distance and he can nearly envision the change or difference in the outcomes of the experiment by doing tests, going through buildings, or describing a city, for example (Mandal, 2013).



Using Virtual Reality (VR) in museums

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Importance of virtual reality

1. Clarify facts appropriately and clearly for various milestones and scientific experiments (Mathew, 2014).
2. It enables the user to see objects from a distance (Gamito et al., 2010).
3. One can feel the different dimensions of things (Gamito et al., 2010).
4. The individual has the ability to analyze all visual items (Mathew, 2014).
5. Allows the individual to participate in and interact with the program.
6. It gives the individual the proper chance to interact with it at any moment (Mathew, 2014).
7. It encourages meditation, investigation, and introspection (Gamito et al., 2010).
8. Improve the person's mental and innovative talents by observing environments virtual reality (Mathew, 2014).

Advantages of using virtual reality in education

1. Virtual reality is a powerful tool for instilling self-confidence in both the instructor and the student, as well as breaking down the barrier of fear and dread associated with its use.
2. Its connection with the software allows the learner to use it in education for self-learning. (Seidel & Chatelier, 1997).
3. It is a wonderful instructional instrument and more profound in giving varied educational experiences that cannot be replicated in nature.
4. The learner gains various educational experiences by joining, noticing and conducting scientific experiments (Seidel & Chatelier, 1997).

Augmented Reality (AR)

It is a direct or indirect real-time view of a physical real-world environment that has been enhanced or augmented by the addition of virtual computer-generated information to it (Furht, 2011; Peddie, 2017). Augmented Reality is both interactive and 3D-registered, combining real and virtual elements (Craig, 2013). Augmented Reality (AR) and Virtual Reality (VR) were developed primarily for entertainment reasons, allowing people to immerse themselves in other worlds brought to life by cameras and computer displays. Since then, the area has expanded into teaching, training, and exploration applications. Archaeological sites are being recreated using immersive technology. VR allows scholars to see how areas looked hundreds of years ago, allowing them to learn about prior

civilizations. It also enables for the conservation and preservation of the archaeological site, as well as facilitating collaborative study in virtual space. Once an AR/VR technology is established in a museum, visitors must be able to easily interact and stay involved with the story line and technology (Seidel & Chatelier, 1997).

With the usage of Augmented Reality / Virtual Reality, it is quite easy for the tourist guide to gain and keep the tourists' attention, and the experience must be convincing, amusing, and informative to do so. By bringing a museum's priceless treasures to life, Augmented Reality and Augmented Reality may enhance interest in them. Augmented Reality, for example, may explain the facts of the past and, as a result, humanize it, allowing for a stronger relationship. Similarly, a 3D tour may help visitors engage with an exhibit by improving their ability to absorb information and assimilate its meaning.

Today's generations' lives are inextricably linked to technology. Museums are still figuring out how to employ new technology. As VR/AR becomes more sophisticated, it will open up new options and immersive storytelling tools for creating impact and experiences that are more tailored to what young people want. (Seidel & Chatelier, 1997).



Using Augmented Reality (AR) in the Egyptian museum

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Hologram

A hologram is an image in three dimensions that is produced using a laser and recorded onto a flat photographic plate. When the plate is lit up by a laser beam similar to the original one used to create the image, the beam will pass through some parts and be

absorbed to different extents in darker areas, ultimately resulting in a combined wave. The final product of this process is both the photographic recording and the displayed hologram artwork (Ma et al., 2012).

Why people visit museum if they can see objects virtually?

Some museums are concerned about being supplanted by virtual reality and virtual platforms. What role do museums play now that people may access collections immersive and from the comfort of their own home? Some perceive the virtual environment as a danger, while others see it as an opportunity to provide new experiences and reach a new audience. It is an enjoyable experience that makes the visitor want to revisit the museum to experience the effects again in a different movie.

Virtual reality can make the impossible possible. From education to entertainment, VR opens up new avenues of opportunity in order to eradicate limitations and practical obstacles. Through technology, museums can bring life to static objects using sounds, visual content and special expansions. AR and VR exhibits are increasingly becoming a main attraction at major museums and art galleries across the globe. But how is this type of interactive technology being used to increase a museum's audience engagement and ultimately help children and adults retaining keep valuable information in an educational atmosphere? Many museums are offering innovative and exciting ways for patrons to enjoy exhibits (Elmqaddem, 2019).

What is the difference between AR and VR in museums?

While both AR and VR have their benefits, the two technologies offer different types of engagement experiences. It's important for a museum guide to understand these technologies in order for children and adults to be fully captivated or immersed in the experience. VR's strength is embodiment and involvement, so instead of looking at a physical display or video screen that recreates a time, place and objects, a user will be able to be inside that time and place. The benefit of using VR in museums means visitors can understand their different viewpoints and get involved in those interactions rather than just observe in a traditional setting. AR is slightly different in that it can overlay information, people and objects on the physical space. Museums and classrooms can be inhabited by a combination of physical spaces or objects and digital representations of information, details or people and objects.

Using AR in museums means that digital experiences can become context-aware based off the user, change for different times of the day, or even adapt to different spaces. Museums often use AR for interactive scavenger hunts that encourage exploration throughout space.



Using (VR) & (AR) in the Egyptian museum

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Using technology in museum exhibits

The idea is adding life to static objects in the real world with sounds, visual contents and additional information, and the notion of extending the limits of physical space. AR is a very effective tool for reforming and upgrading the tourist experience. With the help of augmented reality applications, museum visitors may increase their drive for knowledge and enhance their instructive realism-based practices (Jung et al., 2016).

Young generations nowadays don't visit museums as often as older generations. It isn't that the history, culture or art isn't relevant to millennial but rather museum-going experiences don't match their lifestyles and expectations. Museums visitors might use smart devices to access augmented reality (AR) apps and get historical information about artifacts in the form of 3D digital media, videos, and photographs. They simply receive instant, pertinent, and richer information about what they see using AR, which boosts their interest in learning and level of comprehension. AR provides an enhanced combination of various types of multimedia sources and visualizations, such as 3D models, images, texts, videos, animations, and sound, in addition to traditional methods of improving the tourist environment (Sugiura et al., 2019).

It is very important to provide training and workshops on photogrammetry - a 3D scanning method using digital cameras to capture objects. Training for tourist guides and the staff members of the museums about using VR and AR tools is crucial.



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Artifacts can now be brought to life by pointing the camera of a smart phone at a pre-designed poster that includes basic information about these artifacts and reading ancient texts through the smart phone. Users can increase on this information by apply to virtual text, pictures, and three dimension virtual items on top of the poster. Since there are so many artifacts at museums and art shows, it's important to give them a suitable environment to prevent deterioration. This method can assist in controlling the environment to ensure the preservation of these artifacts (Chianese, 2014).

Technology may be used to preserve old, essential, and rare books by showing them on screens where they can be viewed.



Showing books on screens

Retrieved November 20, 2019 from:

<https://barbaradelinsky.com/2013/03/23/to-e-read-or-not/>

The Grand Egyptian Museum

The Grand Egyptian Museum is now one of the world's largest Museum development projects, if not the world's greatest celebration of Ancient Egyptian history. The Grand Egyptian Museum is situated on the first desert plateau out beyond Cairo, viewing the great Pyramids of Giza (Mansour, 2005). It is the world's largest museum of Egyptian objects. The Grand Egyptian Museum Complex is designed to provide a magnificent view of the Pyramids as well as plenty of exhibit space. The Grand Egyptian Museum Complex will house one-of-a-kind and important objects from ancient Egypt's vast archaeological landscape (Shetawy & El Khateeb, 2009).

The Grand Egyptian Museum is one of the world's largest museums, with an area of about 500 thousand square meters and a capacity to exhibit about 100 thousand artifacts. The museum is scheduled to open entirely in 2020. The Grand Egyptian Museum Complex will include a wide range of accessibility and support services to meet the needs of all visitors. It will include a number of restaurants with panoramic views of the Pyramids and a variety of shops on the ground floor of the cultural building (Tuft & Milne, 1999; Ali, 2004). The Grand Egyptian Museum nearby Giza pyramids will feature 5,000 artifacts from Tutankhamun's tomb (Hawass, 2005).

The museum will include galleries dedicated to displaying 100,000 artifacts, children's Museum, museum for people with special needs, 3D cinema (IMAX) and showrooms, Multimedia center, traditional arts and crafts center, theatrical and Opera labs, and education and training center for museums' field (مرففت عبد الغني، 2013).

The Grand Egyptian Museum is distinguished by the most recent technological methods for museum and cultural display, responding to changes in Egyptian technology and communications in the new millennium, to be the first museum of its kind in the use of virtual reality in Egypt, so that visitors can enjoy experiencing reality, the atmosphere, and the places where the exhibits were discovered. The museum serves as a global hub for museum communications, connecting with international and local museums via satellite network. The informational infrastructure is also being provided to purify information and communications, to be the first museum to apply information systems as a basic image structure during construction, in addition to allocating an internal transportation network and electric cars to transport guests from the museum to its various parts (<https://www.investinegypt.gov.eg/arabic/Pages/GEM.aspx>, 2018).

Egypt was ready and willing to use modern technology in the museum's marketing, with a hologram feature and recent video displays of the Tutankhamun mask and throne chair, and an explanation of the contents of the museum from the statue of Ramses II with Augmented reality ", especially given its location in the lobby.

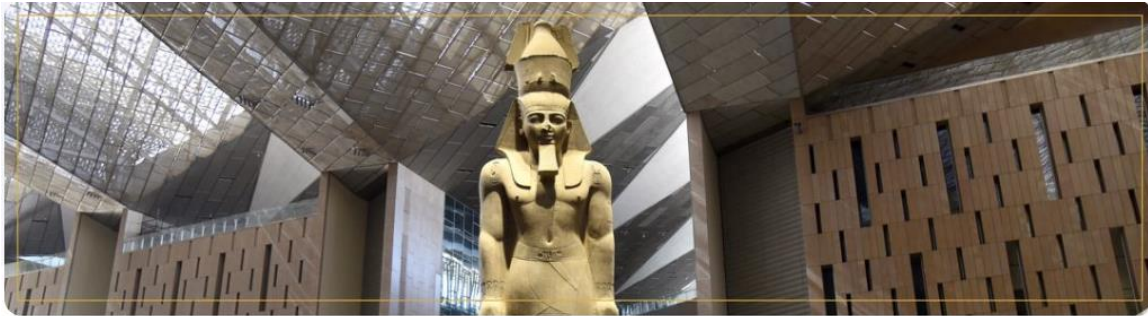
It has been considered in the museum's different buildings to revive the ancient Egyptian language by writing instructions and signs describing the artifacts in English, Arabic and hieroglyphs, so that visitors can learn about the language's vocabulary and experience the atmosphere of the ancient historical past. (مرفت عبد الغني، 2013).



The Grand Egyptian Museum

Retrieved November 12, 2019 from:

<https://www.investinegypt.gov.eg/English/NewsAndEvents/News/Pages/COMINGSOON.aspx>



Statue of Ramses II in the Grand Egyptian Museum

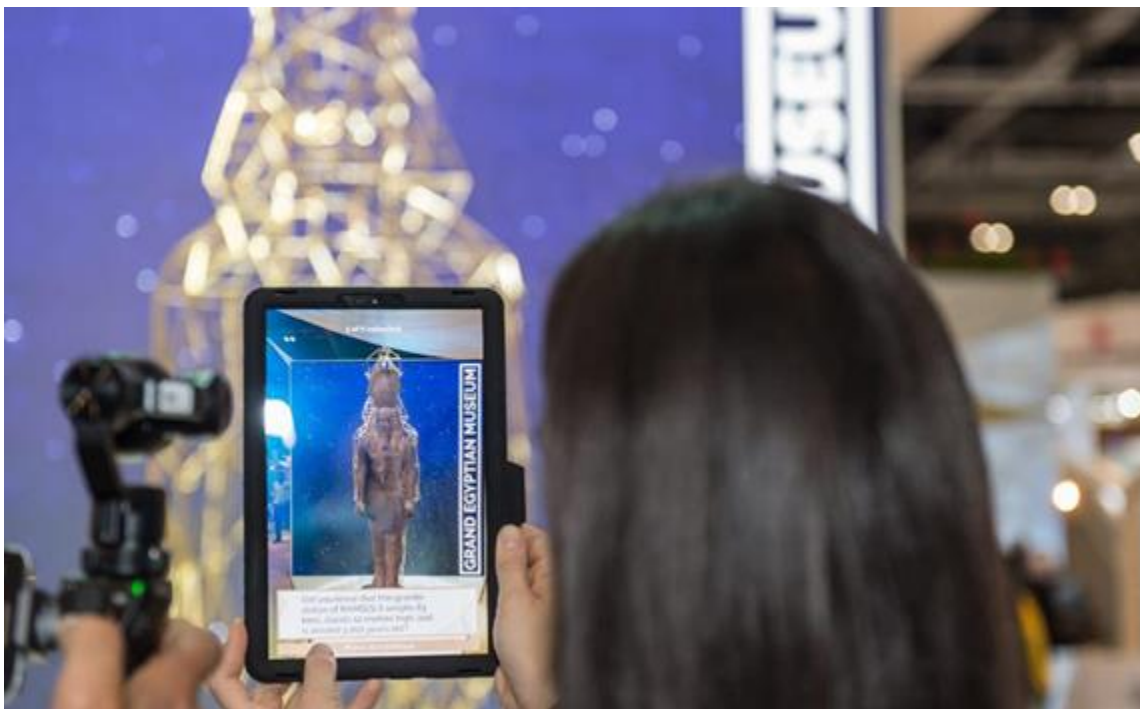
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<https://mota.gov.eg/ar/%D8%A7%D9%84%D8%A2%D8%AB%D8%A7%D8%B1-%D9%88%D8%A7%D9%84%D9%85%D8%AA%D8%A7%D8%AD%D9%81/%D8%A7%D9%84%D9%85%D8%AA%D8%AD%D9%81-%D8%A7%D9%84%D9%85%D8%B5%D8%B1%D9%8A-%D8%A7%D9%84%D9%83%D8%A8%D9%8A%D8%B1/>



Using (VR) & (AR) in the Grand Egyptian Museum

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Using (VR) & (AR) in the Grand Egyptian Museum

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Conclusion

The traditional role of museums is to collect pieces and materials of cultural, religious, and historical significance, conserve them, study them, and show them to the public for educational and recreational purposes and the use of technology in the museum displays enhances the this role.

The optimum use of VR and AR technology in museum exhibits allows the visitor to engage with the artifacts more effectively which, in turn, attracts more tourists and visitors to the museums.

Virtual reality, augmented reality, and hologram technology have the potential to transform the museum experience at the Grand Egyptian Museum. These technologies have the capability of transporting visitors to ancient Egypt, providing interactive information about artefacts, and even bringing ancient Egyptians to life.

References:

- Ali, A. K. (2004). *Silence, Darkness and Light: The Grand Egyptian Museum* (Doctoral dissertation, Virginia Tech).
- Chianese, A., & Piccialli, F. (2014). Designing a smart museum: When cultural heritage joins IoT. In *2014 eighth international conference on next generation mobile apps, services and technologies* (pp. 300-306). IEEE.
- Elmqaddem, N. (2019). Augmented reality and virtual reality in education. Myth or reality?. *International journal of emerging technologies in learning*, 14(3).
- Furht, B. (Ed.). (2011). *Handbook of augmented reality*. Springer Science & Business Media.
- Gamito, P., Oliveira, J., Morais, D., Baptista, A., Santos, N., Soares, F., ... & Rosa, P. (2010). Training presence: the importance of virtual reality experience on the “sense of being there”. *Stud Health Technol Inform*, 154, 128-33.
- Gaskins, S., Miller, P. J., & Corsaro, W. A. (1992). Theoretical and methodological perspectives in the interpretive study of children. *New Directions for Child and Adolescent Development*, 1992(58), 5-23.
- Grand Egyptian Museum (GEM) Authority Prequalification Document for the Facilities Management and Operation of the Grand Egyptian Museum (GEM) complex, 2018, Retrieved November 12, 2019 from: <https://www.investinegypt.gov.eg/arabic/Pages/GEM.aspx>
- Hawass, Z. (2005). A new era for museums in Egypt. *Museum International*, 57(1-2), 7-23.

- Jung, T., tom Dieck, M. C., Lee, H., & Chung, N. (2016). Effects of virtual reality and augmented reality on visitor experiences in museum. In *Information and Communication Technologies in Tourism 2016: Proceedings of the International Conference in Bilbao, Spain, 2-5, 2016* (pp. 621-635). Springer International Publishing.
- Ma, J., Su, P., Xia, F., Ren, Z., & Liu, T. (2012). Magnification of optical image in holography projection using lensless Fresnel holography. *Optical Engineering*, 51(8), 085801-085801.
- Mandal, S. (2013). Brief introduction of virtual reality & its challenges. *International Journal of Scientific & Engineering Research*, 4(4), 304-309.
- Mansour, Y. (2005). The Grand Museum of Egypt Project: architecture and museography 1. *Museum International*, 57(1-2), 36-41.
- Mansour, Y., Shafik, Z., & Abdel Kader, W. (2004). The Grand Museum of Egypt and the Challenge of Sustainability. In *A paper presented in the First Conference of the Architectural Department, Faculty of Engineering, Cairo University, "Sustainable Architecture & Urban Development"*.
- Maroevic, I. (1998). *Introduction to museology: the European approach*. Vlg. Dr. C. Müller-Straten.
- Mathew, S. (2014). Importance of virtual reality in current world. *International Journal of Computer Science and Mobile Computing*, 3(3), 894-899.
- McCall, V., & Gray, C. (2014). Museums and the 'new museology': theory, practice and organisational change. *Museum Management and Curatorship*, 29(1), 19-35.
- Miller, G., Hoffert, E., Chen, S. E., Patterson, E., Blackketter, D., Rubin, S., & Hanan, J. (1992). The virtual museum: Interactive 3d navigation of a multimedia database. *The Journal of visualization and computer animation*, 3(3), 183-197.
- Peddie, J. (2017). *Augmented reality: Where we will all live*. Springer.
- Ross, M. (2004). Interpreting the new museology. *Museum and society*, 2(2), 84-103.
- Seidel, R. J., & Chatelier, P. R. (Eds.). (1997). *Virtual reality, training's future?: perspectives on virtual reality and related emerging technologies* (Vol. 6). Springer Science & Business Media.
- Seidel, R. J., & Chatelier, P. R. (Eds.). (1997). *Virtual reality, training's future?: perspectives on virtual reality and related emerging technologies* (Vol. 6). Springer Science & Business Media.
- Shetawy, A. A., & El Khateeb, S. M. (2009). The pyramids plateau: A dream searching for survival. *Tourism Management*, 30(6), 819-827.
- Tufts, S., & Milne, S. (1999). Museums: A supply-side perspective. *Annals of tourism research*, 26(3), 613-631.

- Vergo, P. (Ed.). (1997). *New museology*. Reaktion books.
- Wachowiak, M. J., & Karas, B. V. (2009). 3D scanning and replication for museum and cultural heritage applications. *Journal of the American Institute for Conservation*, 48(2), 141-158.
- عبد الغني، مرفت. (2013) "المتحف المصري الكبير مركز عالمي لتواصل الحضارات"، مجلة ابناء الوطن في الخارج، 25 : 38-35

Websites

- <https://www.flickr.com/photos/arselectronica/31838245814>
- <https://eandt.theiet.org/content/articles/2018/04/tutankhamun-to-guide-visitors-around-cairo-s-egyptian-museum-via-ar-headset/>
- <https://eonreality.com/virtual-tour-of-an-egyptian-museum-in-ar-and-vr/>
- <https://barbaradelinsky.com/2013/03/23/to-e-read-or-not/>
- <https://mota.gov.eg/ar/>
- <https://www.investinegypt.gov.eg/arabic/pages/gem.aspx>
- <http://gem.gov.eg/index/AboutGEM.htm>
- https://www.investinegypt.gov.eg/English/NewsAndEvents/News/Pages/COMING_SOON.aspx
- <https://www.investinegypt.gov.eg/arabic/Pages/GEM.aspx>