Augmented Reality at Gedung Sate Museum: Bring The Past To The Present

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Abstract. The purpose of this study is to collect and explain the importance of applying Augmented reality technology to museums to increase the visitors' space experience. The method used is descriptive qualitative, which is supported by a literature review. The author will collect the various advantages of using augmented reality technology in museums with visitors' experience when this technology is seen from previous studies. The Cultural History Museum is a facility that presents cultural heritage. These artifacts and cultural heritage are sometimes presented in incomplete form, and historical stories are sometimes written or told in a rather dull form. AR is a technology that can be a solution so that cultural heritage and artifacts from the past can be presented in a more interactive and fun form. Gedung Sate Museum is one of the museums that uses AR technology for one of its exhibition spaces, discussed in this paper. From observations, there are two kinds of spaces enjoyed by visitors, namely the actual exhibition space and the virtual space presented on the screen. When a visitor looks at the screen, what is visible is an enhanced visual. The situation from the past is represented in a visual form that is combined with the actual state of space to present the past presented on a virtual screen and support from the atmosphere of the room, which is also essential to evoke emotions, memories, and thoughts of visitors. The results of this study can be used to add references to the application of Augmented reality technology, which is suitable to be applied in cultural history museums in Indonesia.

Keywords : *interior design, museum design, augmented reality, cultural historic museum*

1. Introduction

Indonesia is a country that has many Museums of Cultural History. According to data from the Ministry of Education and Culture in 2018, is 435 museums. These museums are spread across 33 provinces in Indonesia. Almost 90% of the museums are museums of cultural history, and the rest are museums of science, science, technology, and art.[1]Museums as facilities that have tasks in education, study, and pleasure must be considered for quality and quantity. Quality museums play an essential and strategic role in preserving heritage and national identity. The Cultural History Museum is a museum that presents much information about past cultures, which are sometimes considered ancient and boring when presented conventionally. One way to improve the quality of a museum is to develop a way of presenting its collections so that visitors can well receive the information. One of the latest ways that can be done is by using digital technology. Several types of digital media can be applied to museums to provide information in an attractive, informative, and interactive way for users, one of which is

augmented reality (AR). Augmented reality is a technology that combines a natural environment with a virtual world in the form of three-dimensional images presented on a screen. The utilization of digital media to deliver information to museums can increase the value of education and attract visitors to study history in a fun way.[2]

AR technology has been around for the last twenty years and is used in various fields, especially education and tourism. Furthermore, this technology is growing day by day and is still widely used today, and is one way of presenting information in museums. The development of this technology in the world is relatively rapid, but its use in museums in Indonesia is still minimal. Some several studies and journals have discussed the use of AR technology in museums, including research from Jung et al., who conducted a study on the effects of using Virtual Reality and Augmented Reality on the experience of museum visitors, the result of this study is that AR affects awareness and experience social and historical and geological knowledge.[3] Loureiro, S discussed that Augmented Reality is one way to optimize the presentation of the natural world environment, using a computer that can eventually produce perceptual information. The use of digital devices, especially AR, needs to be explored to improve the visitor experience at the museum. The purpose of this article is to understand more about the use of augmented reality technology in museums, which aims to illustrate the importance of using augmented reality in tourism and to provide examples of the application of augmented reality technology to museums.[4] Meanwhile, the application of AR in art museums was discussed by He Z et al. This study examined the evaluation of visitors through experiments using AR facilities and their effects on museum visitors' experiences and their next arrival intention.[5] Moorhouse et al. discussed the use of AR for children's learning in museums. In a study that has been conducted, it was revealed that museums that facilitate learning experiences for school children, when optimized with Augmented Reality (AR) applications, school children can benefit from a more exciting and interactive learning experience. It was found that the learning experience of school children in museums that were integrated with AR applications could further increase the acquisition of knowledge, and school children could identify their preferred learning style. Besides, those school children were more motivated to continue learning while in the museum.[6]

The use of AR at the Cultural Heritage Museum can optimize the experience felt by visitors. The use of digital technology in museums makes the information presented to visitors more attractive to enjoy, and the information conveyed can be remembered by visitors better. In Munzer's article, it is stated that augmented reality can improve and optimize the delivery of information and improve several aspects of the visitor experience at the Museum.[7] In another article, Fenu C writes about the application of storytelling techniques to the design and evaluate augmented reality experiences intended for visitors to literary museums. The AR project was initiated by the Museum's management to improve the accessibility of its collections and to improve the visitor experience, the majority of which are adults and the elderly.[8] While Pedersen et al. developed research on the use of augmented reality technology, in this study, it was found that AR technology can make users engage two senses (seeing and gesturing), which can be seen through the interface in the form of a hologram. This hologram seems to be able to "revive" artifacts from historical times virtually through gestural interactivity.[9]

2. Method

The method used is descriptive qualitative, which is supported by a literature study. The author collects the various advantages of using augmented reality technology in the Cultural History museum concerning the visitor experience. Gedung Sate Museum will be the object of discussion in this paper, as a museum that has used augmented reality technology in one of its showrooms. Researchers observe space, both virtual space and real space, so that it will be seen how Augmented Reality can combine past visuals with the present (real-time) in one presentation room. This article will show the actual space conditions in the History room using AR facilities. The user who is the object captured by the camera and the results of the natural and virtual space combination generated is displayed on the screen.

3. Results and Discussion

An exhibition facility and a museum object are a form of scientific, cultural, and historical artifacts, which are often designed and used as information, data, and knowledge, which help educate and

communicate. Exhibitions and museums are designed to evoke memories, thoughts, and feelings. They are also a tool to bring back a form of atmosphere, objects, and characters from the past.[10] The museum wants to bring the history of cultural heritage in the past with visitors. Museum managers use various methods, starting from conventional methods to the latest ways, especially using digital technology to attract younger visitors. History plays an essential role in the cultural representation of each place as a heritage that reflects previous eras' traditions, arts, and culture. The passage of time causes historical places to experience a decline in quality from lack of maintenance and damage due to time. Technology to become essential and a solution to preserve history and its artefacts. Museums play a role in preserving history and culture, but museums cannot provide insightful and interactive displays in the existing general. The need to provide engaging and interactive information and insights have led to the need for researchers to develop platforms that can demonstrate in-depth visualization of the incredible past evolutionary story. This past story can be presented through technological advances in recent years, such as mobile computing technology, virtual reality, and augmented reality. Even AR makes it possible to visualize the transmission of historic architecture into multi-dimensional modeling in natural environments.[10] The concept of AR is to show virtual objects in a natural environment by creating multi-dimensional media and inserting them into the real-time world. Augmented reality has been widely used in various fields such as education, travel, astrology, medicine, archaeology, and other fields. AR can facilitate the ease of demonstration of an object because it creates the illusion of a real-world that is easier for the viewer to understand.[11]

Digital AR technology can attract attention and increase visitors' engagement, making it more interactive and exciting. In addition, AR allows users to remember better the information submitted. The experience of using digital technology in museums can enhance the visitor experience. It was revealed that visitors could enjoy exhibitions that evoke project and imagination it into the past, self-projection (empathy), engage the senses and understand the relationship between past events and the environment with the current situation. These are the criteria for the expectations of visitors. The experience of using AR in museums also has an impact on user engagement, particularly how content displayed in AR can contribute to the visitor experience and how a combination of physical environment and augmentation can increase user engagement.[7] AR has been proven in several writings to add to the visitor experience by being more interactive and enjoying their visit. AR can bring museums that were previously "dead" to life more alive [12]. In addition, Augmented reality can be applied to rebuilding historical objects or buildings to have a realistic view of time. It allows users to understand historical objects using a multi-dimensional view. In Figure 1, visitors as users of AR applications see in the gadgets they use historical figures or architectures that in real life do not exist or are hard to be intact anymore. In figure 1, the actual space is still captured by the camera, and objects are visible on the screen. However, it is enhanced by AR technology by adding objects that previously did not exist into complete objects in virtual form.

Figure 1 Example of Application of Rebuilding historical object in AR Application
(https://www.youtube.com/watch?v=QlN9S_bjGOY&t=17s)

AR applications in museums can facilitate visitors' sensory and emotional engagement by using visual and auditory sensors to enjoy the museum. The audio and visuals delivered allow visitors to listen and be touched by the story or memory. [8] Augmented reality is a digital technology capable of displaying

computer-generated content in multimedia such as motion (animation), audio, two-dimensional images, 3D models, and even historical and archaeological information into the natural environment. Furthermore, this technology can better optimize the visitor experience.[13]. AR technology is beneficial for museums that cannot display information contained in the form of artefacts or atmospheres that cannot be brought into the real world. For example, fragile artefacts and having limited contact with visitors or restored historical images may be challenging to enjoy again. In addition, presentations based on Augmented Reality technology allow museum visitors to interact with the content intuitively and more engagingly.[13] Figure 2 shows the use of AR technology in a prehistoric museum that displays a collection of extinct animals. These animals are found in fossils, which means they are found in an incomplete state. This technology can display these extinct animals as if they were back alive and in this era. The exhibition presentation with AR technology supports the formation of perceptions as if visitors are in the past. Spatial planning to form the atmosphere of the space is also needed to optimize the visitor experience. For example, the arrangement of trees in the room, lighting, and interior design application can create a space atmosphere as if visitors were in ancient times.
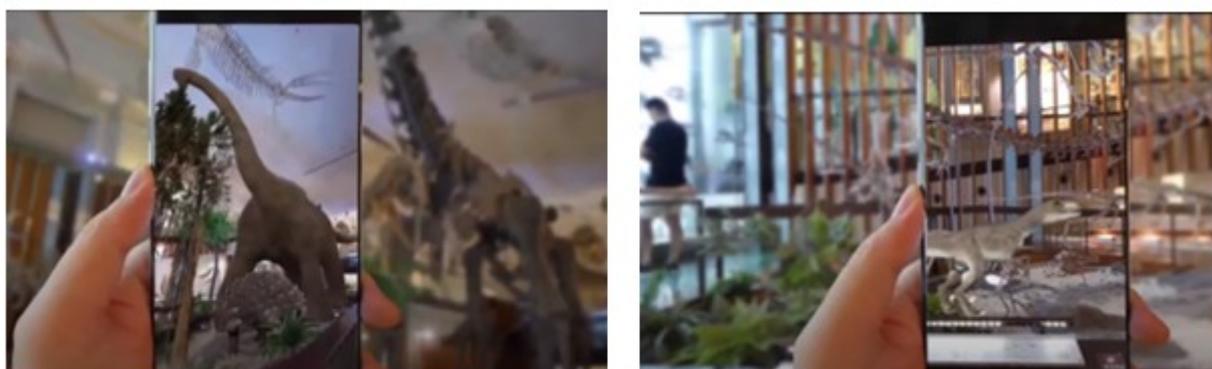

Figure 2 Example of Application of AR: Refining Fossils or artefacts that are not intact (https://www.youtube.com/watch?v=yiwG4BND5PQ&list=PLKOPgWIkUApB9jBQ8Rtxv_rsX6rYW-jaV)

Each country has its history and cultural heritage, which can be from incomplete artefacts and fossils. Furthermore, has technology in the form of digital content in the form of images, sound, video, charts, text, 3D objects with the help of technology such as smartphones, monitors, and projectors, can combine these two aspects. In the past two decades, the IT and hardware fields have made something that previously only existed in science fiction films into a reality.[13] The technology is referred to as Augmented reality, which combines a natural environment with the virtual world in the form of three-dimensional images presented on the screen.[2] Unlike virtual reality, AR creates an existing environment and overlays new information on it. AR is a technology that combines two-dimensional and or three-dimensional virtual objects into a natural three-dimensional environment. These objects are projected in tangible form, or it can be said that AR is an addition to existing objects. An AR App can create a discontinuity of cultural heritage artefacts that connect us to previous generations and provide links to previous worlds beyond our reach. [9] Figure 2 shows a visual blend of real-life/circumstances with the virtual world. Shown in the form of 2D and 3D objects, and also equipped with other media such as audio and motion.

Gedung Sate Museum in Bandung, Indonesia, is a cultural history museum that uses several digital technologies to present information and its collections. One of the technologies used in Augmented Reality in one of the presentation spaces. *Gedung Sate* is a historic building located in the city of Bandung, West Java Province, Indonesia. The building was designed in 1920 in a neoclassical style combined with elements of authentic Indonesian culture. This building was designed by J. Gerber, an architect from the Netherlands. After its construction in 1924, this building served as the Dutch East Indies Department of Transportation, Public Works and Water Management. Currently, the Gedung Sate building serves as a place for the Governor of West Java Province. With such a long history, the

Gedung Sate Museum is a protected cultural heritage and has been turned into a museum. The parties involved in the procurement of museum facilities include the government, the idea implementation team, the development implementation team, the museum concept drafting team, the planning team, the information technology team, the 3d track record team, the antiquities department, the data analysis team, the architecture team, the team design team, field implementation team, film production team, and supervision team and assisted by the design community. Augmented reality technology in this museum is one way of presenting historical information that is quite interesting.

This AR technology is applied to the History Room. The History Room is a room that informs about the history of the construction of Gedung Sate during the colonial period. This information is displayed in the form of a room that is made as if the visitor is in the past. This AR presentation media uses a real-time camera that is connected to a computer to visualize and combine visitors with video on the monitor screen as if the visitor is entering a video that displays and describes the simulation of the situation when the Gedung Sate construction project takes place, AR technology combines the real environment into the virtual world of three dimensions (3D), so that visitors can enter the virtual world.
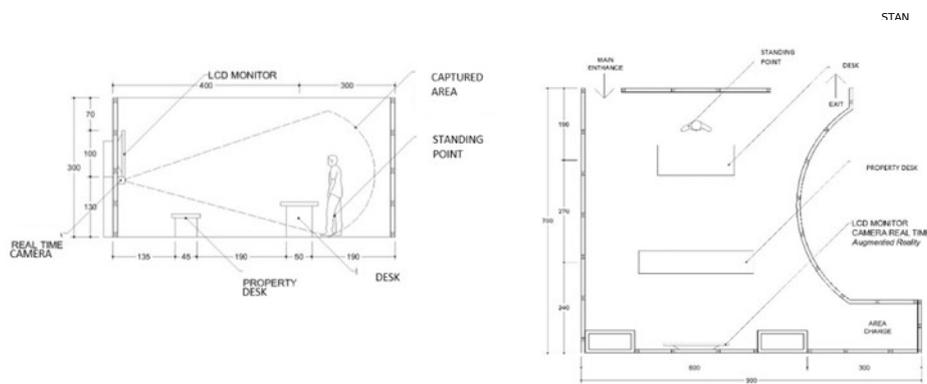
Figure 3 Section Augmented Reality Area
(Nazhar R and Rosid Y, 2020)

Figure 3 shows the position of the visitor and his image-taking technique. Visitors must be at a predetermined point, precisely behind the table. Then visitors see themselves on the TV screen, and when visitors enter the virtual world unite with characters and objects from the past. In this AR Facility, the visitor becomes one of the objects identified by AR and enters the virtual space, uniting with a virtual image that depicts the past. Viewers can see themselves on the screen and act as if they were interacting with the objects and people.
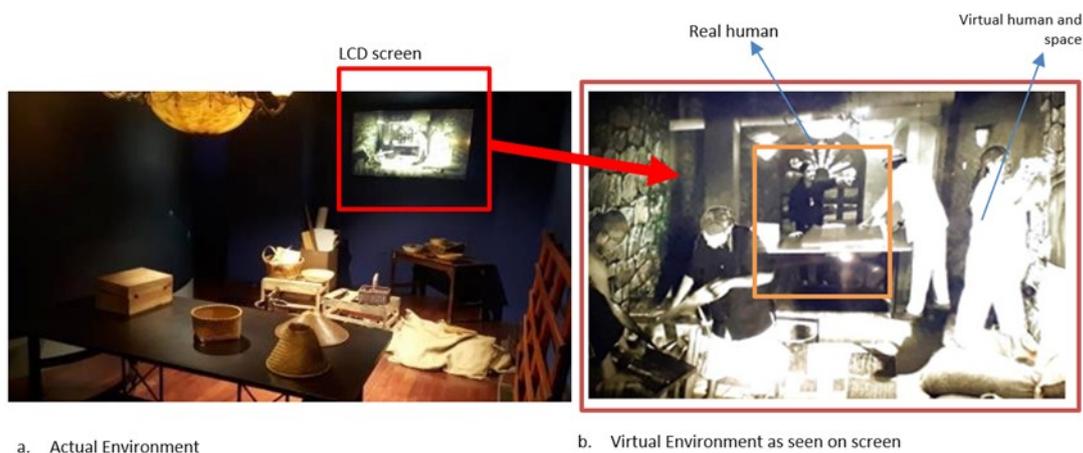
Figure 4 Gedung Sate Museum Augmented Reality Area
(Nazhar R and Rosid Y, 2020)

Figure 4a is the actual environment in the Gedung Sate History exhibition area. This room is equipped with properties related to the past. In Figure 4b, we can see the figure of a visitor enjoying an AR application. Visitors can see themselves in a virtual world space that is enjoyed through the LCD screen. Visitors see themselves as if they are in a room still under construction, with dark conditions, narrow, dim lighting, surrounded by unfinished walls of buildings, with an atmosphere like in the colonial era.
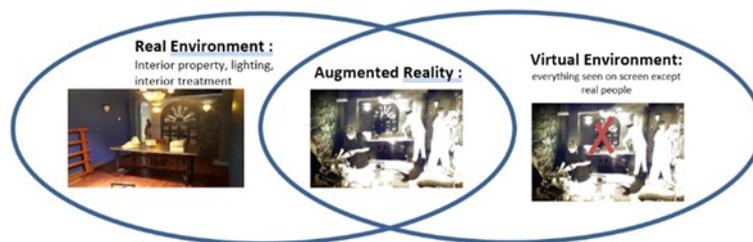
Figure 5 Relationship Between Real environment, Augmented Reality, and Virtual Environment

In Figure 4 and 5, a visual change occurs between the real environment and what appears on the screen. The state of the space, shown by the floor, walls, ceiling, turns into an unfinished construction. The blue walls turned into unfinished stone. At the same time, some supporting properties such as lights and windows remain in place. The display on the screen is made in grayscale or sepia, making the impression of the past. In addition, there are additional on-screen actors, namely construction workers, who look natural and move on the screen. The visitor caught on camera can act as a foreman in the story scenario displayed on the screen. In addition, visitors can also walk around the area of this room and also use existing properties.

Some exhibition spaces generally only offer visitors a passive experience by conveying information through images, text, and display objects. On the other hand, the delivery of information in the historical space with AR technology is designed to be more interactive and provide an exciting experience for visitors. In this space, visitors can take on roles as an audience and as 'players' (actors). AR can engage visitors to experience the exhibition more deeply, enjoying silent visuals and interacting with visitors. The AR facility in this museum brings and brings closer visuals depicting the past to visitors, with visuals that are made as if visitors who use this facility are in the past. The AR presentation in the Gedung Sate Museum exhibition room is quite engaging and interactive, but it would be better if this technology could provide important information about history.

4. Conclusion

Augmented Reality is a technology that can bring us closer to history. AR combines the visuals of a natural environment with virtual objects that visitors can enjoy on a limited basis, such as fossils or artifacts that are damaged and no longer intact or objects that we cannot touch. AR has many benefits. It is used as a cinematic presentation and as a medium for delivering complete information in its development. Gedung Sate Museum is one of the cultural history museums that has used AR technology in one of its showrooms. With AR technology, visitors can enjoy the visualization of past conditions in the present.

Acknowledgment

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