Virtual Platform for Museum: A Case Study with Oman Across Ages Museum

Rehab Salim AL Khatri, Maitha Hamood AL Hashami, S. M. Emdad Hossain

Department of Information Systems, CEMIS, University of Nizwa, Oman

Abstract: The Virtual Platform for Oman across Ages Museum (VPOAAM) is a project initiated in 2015 in Manah, Al Dakhiliyah Governorate, aiming to highlight the unique qualities of the Sultanate of Oman and its features, ancient history, and Renaissance. The project, designed in the shape of mountains, was initiated by His Majesty Sultan Haitham bin Tariq the Great. The project is situated on a 300,000 square meter land area with a building area of 66,591 square meters, designed in the shape of mountains. The late Sultan Qaboos bin Said laid the foundation stone for the project, which inspires architectural innovation and showcases the Sultanate of Oman's qualitative transition from its historical splendors to its bright present. Visitors can explore the museum's art and historical collection online, with interactive virtual tours allowing them to interact and learn about art pieces and exhibits. The museum also contains a wide range of multimedia, including images, videos, written texts, and audio information, allowing visitors to interact with antiques and artistic exhibits. These are a glance of the museum we taken as case study to develop the platform with the approval and kind support from the competent authority of the museum. After successful completion of the research project; the output will be the same museum in a virtual platform. This research conducted with a number of items among thousands of physical items in the museum. And the result shows a significant remark to continue and complete the virtual museum platform for the stated museum.

Keywords: innovation, showcase, historical splendors, visitors, museum, platform

I. Introduction

Museums are increasingly utilizing virtual reality (VR) technology to enhance their exhibits and engage visitors in new ways. The Virtual Reality Museum is a simulation of reality, allowing visitors to interact with the virtual environment using headsets to experience digital settings similar to the museum's exhibits. This allows visitors to interact with three-dimensional models of artifacts, display them, and participate in virtual trips or educational activities. The virtual reality museum also allows visitors to zoom in on details, handle objects, and learn more about exhibitions through audio or visual cues, making the experience more engaging and dynamic [1]. The virtual museum is considered safe and suitable for people with special needs, the elderly, and those with diseases such as vision and hearing. It also helps clarify and simplify abstract concepts that are difficult to perceive sensoryally. The museum presents scientific material in an interesting and exciting way, combining sound, image, movement, and color. Virtual reality museums have a significant role in the tourism sectors, as they attract users who are not accustomed to traditional museums.

II. Literature Review

Virtual reality provides a unique and immersive museum way to explore art and history, and it does enter a whole new world of culture and creativity. In addition to VR museums, there are also VR games, VR experiences, and even VR concerts. In the beginning, the writer on the page talks about some examples of famous museums in the world and their locations. The main site is. He also talked about the year these museums were established or when they were created4 and the museums were launched, and he also talked about what is inside these museums. Some photos and videos have been added to these museums [2]. On the second page, the writer spoke

About virtual reality in general and augmented reality, and adding some videos. Third: Talk about how to use virtual reality to attract more museum visitors and increase revenues [3]. Fourth, it talks about the best examples of virtual reality museum tours from around the world and how advanced technology has helped museums stay open during the Corona pandemic [4]. Fifth, the Virtual Reality Museum, Art Over Time [5], talked about some of the artists present in this museum and the works included in this museum. Sixth, it talks about new ways that visitors can discover them [6]. He talks about the virtual tour of the Freud Museum [7], and on this page there are some pictures from the Freud Museum. Eighth, he talked about the immersive virtual reality experience in museums (VREM) [8]. Ninth, he talks about location-based virtual reality experiences [9] for the museum. Tenth, Virtual Reality for Museums and how Ingeborg Toth [10] created the Virtual Reality Game for Museums Finnish National Museum with Vargo. Eleventh, in this article, the writer talked about applications of virtual reality technology for the purposes of museums and art galleries [11]. Twelve, the writer talked about the 5 most important cases of using the virtual condom in the museum and talked about the virtual world [12]. After that, the other writer in this article talked about museums and the ways in which museums can use augmented reality [13]. Fourteen, in this article, the writer talked about the virtual reality revolution in museums and the potential of virtual reality [14]. Fifteen, the writer talked about the Museum of Virtual Reality, virtual reality, and reimagining exhibitions, and talked about the Museum of Interactive Exhibitions and the advantages of museums [15]. Sixteen, the writer talked

about how virtual reality works in museums and some virtual tours in the museum [16]. In this article, the writer talked about some examples of the use of virtual reality and talked about the difference between augmented reality and virtual reality [17]. Eighteen, the writer talked about the museum's location-based virtual reality experiences [18]. Another writer talked in this article about virtual reality in the museum [19]. Finally, the author talked in this article about whether virtual reality can capture an experience in a museum [20]. Museums and cultural institutions invite people to explore new cultures and topics through their carefully curated collections and distinguished exhibitions. The writer here explains the importance of museums around the world because through museums the culture and history of each country is spread. She talked about some museums and added many pictures of museums [21]. This article talks about the twenty best museums in the world and galleries in the world [22]. In this article, the writer talks about the most exciting art museums around the world and also classifies museums around the world [23]. The world's best museums are a place of knowledge, history and art. They are spaces where past and modern culture are preserved and shared, and are designed to deepen your understanding of a particular place or subject. Spending a few hours wandering around museums is a great way to gain new perspectives on everything [24]. People usually visit museums to get an insight into various aspects of art, culture, historical remains and a sufficient amount of information. This article talks about some of the most unusual museums in the world which provide interesting information and facts on different amazing topics [25]. This article includes amazing collections of historical artifacts and priceless treasures from the world of art, and will take you on a journey through time [26]. In this article, ""the writer talks about strange and wonderful museums, the strange side of a strange person's life. No matter how special the piece is, there is likely a museum dedicated to it somewhere in the world. Whether you want to learn more about spam, spies, dog collars, death, barbed wire or lawn mowers, there's an extraordinary gallery entirely dedicated to just that. Here's a guide to some of the most unusual groups on the planet"" [27].

We encountered some problems with articles written by authors, such as those where the authors did not specify the pros and cons of museums and what is so special about going to visit a museum. Also, some writers did not include some illustrative pictures in their articles, videos and explanations of the museum. Researchers also did not specify the contents of the museum. Or they did not put explanatory models for it in the museum. There is some difficulty in understanding the context because it contains a lot of words, and some articles also contain pictures and video clips, but there is no written description of it and vice versa. Similarly, there are many ways to get rid of this; such things i.e. problems or how to solve this problem professionally are missing. The proposed solution of this research is constructed by considering all those shortcomings highlighted in this literature review. In our proposed solution; the pros and cons of the platform / museum will be highlighted including a detailed explanation of the components and contents of the museum.

III. Methodology

As conventional method of development, the system development life cycle is applied for the development of the project. The System Development Life Cycle (SDLC) is a structured framework for efficient software development, guiding the entire process from inception to deployment and maintenance. It aids in project management, resource allocation, and identifies project goals, requirements, and scope. This methodical approach reduces risks, promotes teamwork, and increases project outcomes predictability [21].

It consists of several phases that guide the development process from start to finish. The main phases of the SDLC are as follows:
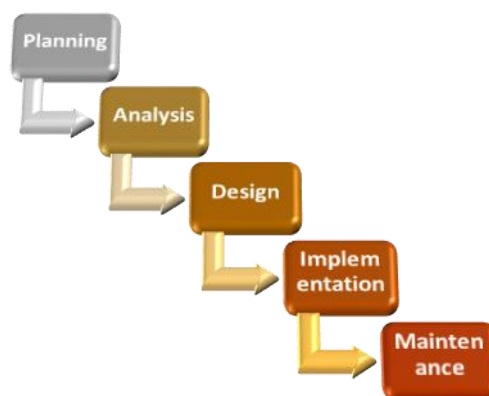

Figure 1.: System Development Life Cycle (SDLC)

Planning: In the planning phase of developing the Virtual Platform for Oman across Ages Museum (VPOAAM) within the System Development Life Cycle (SDLC), careful and comprehensive planning is essential to ensure the success of the project by identifying key processes and stakeholders, to meet the needs of visitors of all ages, and to provide an immersive educational experience. The planning will also allow for highlighting the platform's easy-to-use interface with interactive exhibitions, virtual

tours and multimedia content. The technologies used such as augmented reality, virtual reality and 3D modeling to bring the museum's interesting historical artifacts and information to life will also be demonstrated. We will work on designing the platform that will also include educational games and tests to enhance education and encourage active participation. The virtual platform can be accessed through multiple devices, including computers, smartphones and tablets, ensuring that people of all ages can explore Oman's rich history and culture from the comfort of their homes. In addition, there will be a dedicated section for children, offering age-appropriate content and activities to make the museum experience fun and accessible for young visitors. Next, we set clear, measurable goals aligned with key project objectives to improve efficiency, decision support and inventory management. Prioritize features based on their importance to achieving these goals and consider potential challenges that may arise during the development process. Establish a realistic timeline and budget, taking into account factors such as technology requirements, required skill sets, and potential risks. Key stakeholders will be involved throughout this phase to ensure that their views and expectations are taken into account. We will prepare a comprehensive project plan that defines tasks, milestones, and responsibilities for each team member. Also, consider implementing agile methodologies to allow flexibility and adaptability to changing requirements. We will also identify and allocate resources efficiently, and ensure that the development team has the skills and tools necessary to successfully implement the project [21].

Specifications for Hardware and Software:

Table 1: Software Specifications.

Item	Description
Front end	Notepad++, Spatial, Canva, YouTube, google forms
Back end	C++, HTML, CSS
Operating system	Windows 10

Table 2: Hardware Specifications.

Item	Description
Device 1	
Device Name	ZED_AIR_PLUS
Processes	Intel(R) Celeron(R) CPU N3350 @ 1.10GHz 1.10 GHz
Memory	600GB
System type	64-bit operating system and x64-based processor
Device 2	
Device Name	DESKTOP-Q2B740C
Processes	AMD Ryzen 7 3700U with Radeon Vega Mobile Gfx 2.30 GHz
Memory	8.00 GB
System type	64-bit operating system,x64-based processor

Data collection: Data collection is the process of measuring and collecting information about a specific topic, in order to answer research questions, or hypotheses, as well as in order to make accurate and clear decisions. We collected data to prepare a Virtual Platform for Oman across Ages Museum, through the following sources:

1- The questionnaire about the Virtual Platform for Oman across Ages Museum in general.

2- An photographer and image analyst from the case study-museum (Mr. Sami Al-Qawwal)

3- Relevant papers/journal as stated in the literature review.

Further, to design our project, we used the Spatial program, which helped us design this project. We added many images related to the museum, added the names of each image and information about it, and created and used the necessary database structure to maintain permanent information [23], such as the information contained within each image.

We have designed a web page through which the user or visitor can book and register their data. We will build a database management system to store and manage the museum's digital content, including photos, videos, descriptions, historical data and other relevant information.

IV. Results

Before discussing the result; let us display overall work-layout of the project. The figure (figure-1) below shows the overall work-structure of the project.
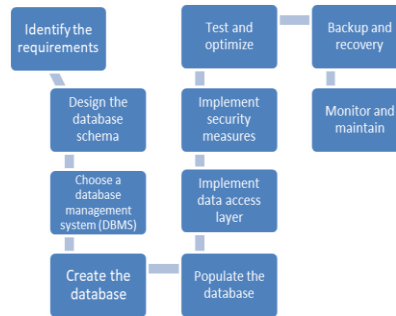

Figure 1: Work-structure of the project

This structure is clearly showing the project mechanism from the identification of the requirements to final output followed by the monitoring and maintenance. However, the museum aims to protect Oman's history and culture, informing generations about its illiteracy and providing information about its history and culture. The platform, designed using a program and languages, includes pictures with information about each one. The web page is designed to make it easy for users to enter the platform, ensuring a seamless experience for all visitors. Future development plans focus on making the platform more integrated and user-friendly.

Figure 2: Preliminary GUI

We designed this web page to make it easier for the user to enter the virtual museum, and all they have to do is enter the required credentials to enter to the virtual museum.

Figure 3: Post-GUI with some instructions for visitors

The page contains some general information about the real museum to better introduce visitors to it.
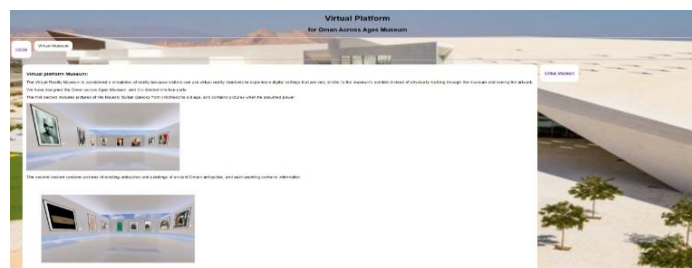

Figure 4: Inner view by item-directory

The second page includes some information about the virtual museum and how it works, as well as a link to enter the museum.
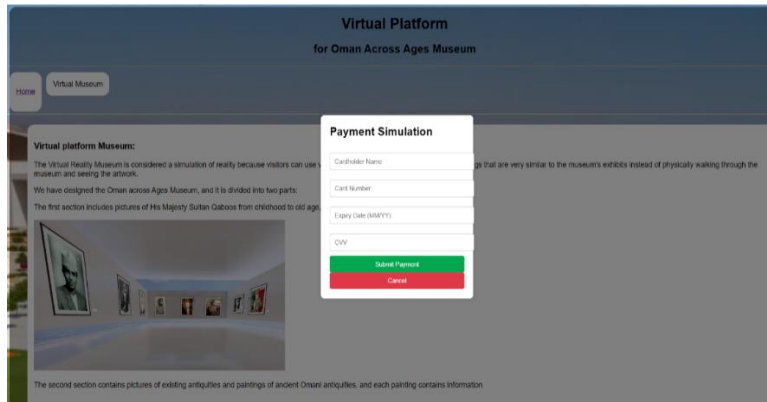

Figure 5: Payment page
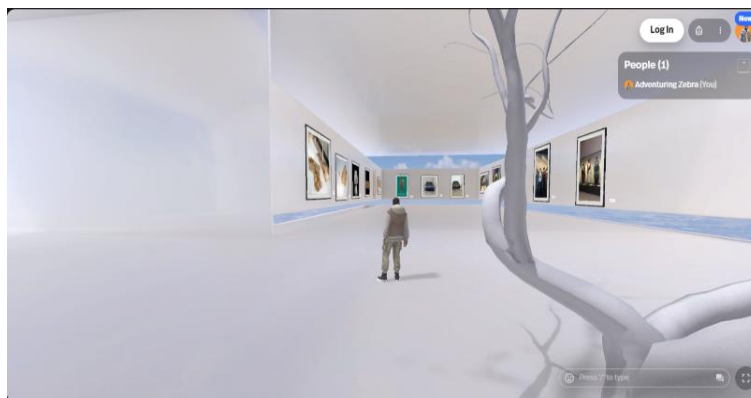

Figure 6: Some sample content of the museum

Figure 6: a virtual tour to museum

The virtual tour feature is one key feature of our research project which is successfully working for the visitor; that is in fact showing the progressive-potential of the project. Furthermore, on the integration of the project; the process of integrating virtual environments or platforms into existing workflows or systems is known as virtual platform integration. This connection allows users to access and interact with virtual platforms easily and allows users to log in once and access multiple virtual platforms. Without the need for separate credentials, we have customized the navigation interface to match the look and feel of the existing system and the ease of use of the site, where the user must log in by registering his data on the web page with ease. We have also provided some information about the actual or real museum and some pictures of the museum. The second web page includes information about the virtual platform and its purpose, as well as a video of the museum. To enter the museum, you need to pay first, then click on the link to enter, enjoy and view the exhibits.

V. Conclusion

At the end of this project, we hope that our project has covered all aspects of the research that we wanted to address through this research. This research talks about the virtual reality platform of the Oman across age Museum through the ages in order to spread the culture and history of Oman around the world. We used the Spatial program to design this platform, by which the user can

easily enter to know and learn about the museum and its components, history and culture of Oman. We considered a virtual tour with a number of images will be an initial remark to say successful completion of this research which is in our hand and explained in the result section.

However, the maintenance phase of the virtual platform of the Virtual Platform for Oman across Ages Museum is crucial to ensuring smooth operation and optimal user experience. We perform regular updates and bug fixes to address any technical issues and improve platform performance. In addition, we regularly review and update the content on the platform to provide visitors with accurate and up-to-date information about the history and culture of Oman. Also, between periods, we strive to obtain user feedback and incorporate it into the maintenance process to address any usability issues and enhance the overall user experience. We will also try to respond to all user feedback to develop our website. Implement some platform security measures on a regular basis to protect against potential cyber threats and ensure the safety of user data [22]. Maintenance and keeping the platform running is achieved by implementing redundant systems and backup mechanisms. In case of any hardware or software failure, the platform automatically switches to a backup system Regular maintenance and monitoring activities will be carried out to identify and address any potential issues before they become worse. Through routine system scans, software updates, and data backups.

References

1. Maria Shehade and Theopisti Stylianou-Lambert. "Exploring the Experiences of Museum Professionals," Published 11. June 2020
2. Jim Richardson. "Museum Next." Virtual Reality is a big trend in museums, but what examples of museums using VR," Published June 05 2023
3. Jerry vanick "SMITHGROUP" "how museums utilize virtual reality to attract more vinues and increase revenue, Published: February 8 2023
4. ARPost" ARPost" "The Best Examples of VR Museum Tours From Across the World," Published: Jan 12 2022
5. Charlotte Coastes, "Blooloop." "Museum VR creates new ways for visitors to explore", Published: 13 August 2020
6. Thirty Digital, "FREID Museum London." "Virtual Tour Enjoy a virtual tour of the Fread Museum London", Published: Jan 2018.
7. Volume," Sciencedirect" "Experiencing immersive virtual reality in museums," Published: Volume 57, Issue 5, July 2020, 103229.
8. Gehan Selim, Monther Jamhawi, Mohamed Gamal Abdelmonem, Shouib Ma bdeh and Andrew Holland, "sustainability, The Virtual Living Museum: Integrating the Multi-Layered Histories and Cultural Practices of Gadara's Archaeology in Umm Qais, Jordan Sustainability 2022, 14
9. Project Ingeborg team, "virtual reality, Virtual reality for museums: How we made the Ingeborg Tott VR game for The National Museum of Finland with Varjo Published: September. 29 2022
10. Serhii Kholin. "VR APPLICATIONS ""How Virtual Reality (VR) Takes Museum Experiences to a New Level," Published Sep. 29,2023
11. Mario Ramić. "LinkedIn" "Top 5 Use Cases for AR and VR for Museums," Published Apr. 19,2023
12. Livdeo. "Museums and Augmented Reality: An Exciting New Frontier," Published Aug 7 2022
13. Geraldine Kendall Adams. "MUSEUMS ASSOCIATION" "Through the looking glass: the VR revolution in museums is here," Published 21 May 2021
14. Veronika. "YORD"" Exhibitions Reimagined | The VR / AR Museum Effect," Published January 19, 2022
15. 4Experience Crew. "4Experience" "More Than an Exhibition – Top Benefits of VR & AR in Museums," Published Sep 22, 2022
16. STORIES AR. "Stories AR" "Examples of using augmented and virtual reality for museums and art galleries," Published 20.04.2023
17. ASFN. "VR Museum" "Virtual Reality Museum," Published May 24, 2023
18. Maria Shehade. "Applied sciences" "Virtual Reality in Museums: Exploring the Experiences of Museum Professionals," Published 2020, 10
19. Eva Masen. "LYNX YACHTS" "Can Virtual Reality Capture The Experience Of Being In A Museum?" Published Oct 16, 2019
20. Intellectsoft, "Essentials: System development life cycle [guide]," Intellectsoft Blog, Oct. 21, 2019.
21. Gillis, "What is Systems Development Life Cycle? – Definition from WhatIs.com," SearchSoftwareQuality, Jun. 2019.
22. Tutorialspoint, "System Analysis and Design System Development Life Cycle," www.tutorialspoint.com, 2019.