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Cooperating across borders in the Mediterranean

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REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA

iHERITAGE

Output 5.1
Commercialisation of new products and services

FINAL VERSION

(V1.0 - 06/02/2024)

iHERITAGE

ICT Mediterranean platform for UNESCO cultural heritage

Work Package 5: Capitalization and Commercialisation of new products and services

Output O5.1: Commercialisation of new products and services

Activity A5.1.1: Preliminary analyses, marketing research and pre-competitive analysis

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1. The Market Context: Cultural Tourism

For the enhancement of archaeological heritage and UNESCO sites, the target market is cultural tourism in a very positive growth phase.

Within an extremely positive global scenario (+58% over 2021), the Old Continent takes the stage, generating half of the total revenue thanks to the presence of museums, villages, and attractions with timeless appeal on the ground. In Europe, the biggest spike thanks to Germany and Italy, which focuses on enhancing the beauty of its heritage through targeted and effective activities such as festivals, awards, and educational initiatives.

The first confirmations on this come from the GlobeNewswire portal, according to which the cultural tourism asset will reach $12 billion in revenue by 2028 after approaching $5 billion in 2021.

Technavio proves to be on the same wavelength and states that the Old Continent holds the majority share of the asset because it will contribute to obtaining 50 percent of total revenue within the next five years. This "goal" is dictated by the fact that the European territory can boast the presence of countless cities, museums, villages, and attractions with timeless appeal.

https://www.globenewswire.com/news-release/2022/08/30/2506734/0/en/Cultural-Tourism-Market-Growth-Size-Shares-Revenue-Types-Applications-Key-Players-Top-Countries-Growing-Factors-Key-Dynamics.html

1.1 Virtual Archaeology Market

The virtual archaeology market is almost exclusively public. Private players are few and with poorly sustainable business models. There are many case histories in the museum field, and some attempts emerged in 2022 in the metaverse.

However, the dominant Metaverse genre until mid-2022 (social game, with avatars and 3d real-time) has gone into severe crisis and has shown a strong prematurity, failing to garner user favour even in free form. Therefore, the possibility of phygital metaverses is being explored, as emerging from the evolution of hardware technologies.

One of the most interesting and advanced projects has been developed by the Ministry of Culture: it is e-.archeo. In addition to being a webXR solution, it includes the description of scientific SOURCES and the research path underlying archaeological reconstructions. Of note is the case of the tourist metaverse of Procida, which won the Moebius award in Lugano.

The idea of XR in museums does not change from its very early roots: enhancing the visitor's experience. Throughout the years, research includes several different factors, either related to personalized content

(better applied to AR), differentiated environments (worlds) in which the user navigates, presentation of different objects, representation of the past and rebuilding ancient ruins.

2. The European Scenario

The 2011 Recommendation on the digitisation and online accessibility of cultural material and digital preservation provided an important policy instrument aimed at enhancing digitisation efforts among the Member States in a concerted way and has undoubtedly contributed to:

- raising the amount of openly accessible digitised cultural heritage content;
- stirring the development of national and thematic aggregators that coordinate and amplify relevant developments in their respective countries and domains.

As such, it should be seen as a major contribution to the leading position Europe has in the field of digital cultural heritage today. Indeed in some areas, resultant activity goes beyond what was originally foreseen, for example in the use of digital material in education.

Looking to the future we need to also acknowledge that some areas that the current Recommendation sought to address have not yet been adequately met.

For example, at this point, the European copyright landscape remains unharmonized. However, proper implementation of the Copyright in the Digital Single Market Directive should correct this situation, addressing remaining challenges and meeting the goals on the availability of public domain works. We are hopeful that countries will contribute to harmonisation throughout the Directive's transposition period ending June 2021.

A coherent sectoral approach to infrastructure and research that promotes and supports the twin pillars of the green and digital transition is necessary, and should include funding and support for:

- sustainable, cost-effective, green infrastructures on an EU and Member State level that are in line with the vision of the Net Generation Internet;
- use of advanced digitisation technologies in the sector, e.g., AI, semantic web, 3D and Mixed Reality;
- heritage institutions to improve their capability to manage, preserve and make accessible complex digital objects (games, webvideo, software);
- the adoption of translation tools for multimodal heritage objects (text, image, audiovisual) in all European languages that enable cross-lingual search and analysis, ensuring truly pan-European access to cultural heritage;
- research and legislation that support the creation of a more equitable and democratic future internet and explainable AI systems;

- investment in fundamental and applied research (through Horizon Europe) in digital technologies to create more engaging, personalised, connecting experiences, as set out in the Europeana Research Agenda.

Metaverse - THE EUROPEAN APPROACH

The iHeritage project, and related virtual and augmented technologies, are consistent with the European vision of the metaverse.

In her State of the Union 2022 letter of intent, President von der Leyen states: "We will continue looking at new digital opportunities and trends, such as the metaverse."

The EU's approach to the metaverse is based on:

- Standards
- Ethics and security
- Real-virtual hybrid
- Open and public space
- Non-monopolistic
- Pluralism
- Creativity and innovation

European Metaverse – STANDARD
“Private metaverses should develop based on interoperable standards and no single private player should hold the key to the public square or set its terms and conditions.” EU Commissioner Thierry Breton

The metaverse must:
- Be a public space
- Adopt web 3.0 standards
To be interoperable, private metaverses must align with standards

European Metaverse - ETHICAL, LEGAL AND SECURE
This new virtual environment must embed European values from the outset. People should feel as safe in the virtual worlds as they do in the real one.
EU Commissioner Thierry Breton

In the metaverse:
- The user must be protected and secure

- Purposes must be made clear and consistent with ethical values
- No fake news should be added to fake people in fake worlds

European Metaverse – PHYGITAL
"The next step will be a quantum leap from current virtual reality and other enabling technologies to a world that truly blends the real with the virtual." EU Commissioner Thierry Breton

Emerging technologies lead to Mixed Reality.
A Phygital integration between the virtual and physical worlds.
Access to the metaverse is optimized by special devices - VR Visors and AR Glasses.
But it must be Cross Device, also available from PCs and Smartphones.

Metaverse: PUBLIC AND OPEN SPACE
"These metaverses operate in real-time, augmented or virtual reality (…) are becoming something akin to what for the ancient Greeks was the "Agora": a public space, a new public "square" where the digital interactions already possible online have the potential to be amplified as never before." EU Commissioner Thierry Breton

Like the Internet from its origins, the metaverse is a public space
A virtual plaza where experiences and interactions take place.

Metaverse - NOT MONOPOLISTIC
"We will not witness a new Wild West or new private monopolies." EU Commissioner Thierry Breton.
There is a need not to repeat the mistake of letting private monopolies control the Metaverse.
As has happened instead in Web 2.0 (Social Media, Search Engines, App Stores, Operating Systems...)

Metaverse - MANY METAVERSES
In compliance with a standard, many metaverses will be developed.
"Not one but many metaverses are being developed, as a new generation of digital platforms offers possibilities for people to interact in completely innovative ways.
Not only for entertainment purposes, but also to work together, develop artistic creativity, do real-life simulations aimed at medical interventions, cultural preservation, environmental protection or disaster prevention and a lot more." EU Commissioner Thierry Breton

Metaverse - SKILLS AND SCHOOLS.
“Similarly to the European Bauhaus, we will launch a creative and interdisciplinary movement, aiming to develop standards, increase interoperability, maximising impact with the help of IT experts, regulatory experts citizens' organisations and youth.” EU Commissioner Thierry Breton

- The metaverse will enable new professions.
- Technological and creative skills will require training pathways.
- New metaverse academies are emerging.

2.1 The Italian cultural heritage digitization market: the Next Generation EU effect

Italy is the country that has benefited the most from Next Generation EU resources.

In particular, we highlight a number of calls for proposals that put substantial resources into the market, from 2023 to 2025, creating a large and widespread market even at the capillary level.

- Call for the digitization of cultural heritage: 200 million euros (Ministry of culture)
- Call for attractiveness of villages: 1 billion euros, of which about 200 million are invested in the digitization of cultural heritage (Ministry of culture)
- Call for Roma Caput Mundi: 500 million, of which about 60 million are for the digital enhancement of archaeological sites and museum (Ministry of tourism)

Other smaller calls distribute a total of hundreds of millions of euros the Italian market, for cultural heritage.

2.1.1 Case histories

<u>THE PROVISION OF TOURIST AND CULTURAL EXPERIENCES IN VIRTUAL REALITY</u>

Augmented and virtual reality tourism experience offerings are multiplying around the world.
In particular, analysing the commercial offerings of platforms such as Trip Advisor, we find the increasingly widespread diffusion of virtual tours of archaeological sites, oculus rooms, and immersive museum setups, all over the world, and especially in Europe and Italy.

Historium Brugge

https://www.historium.be/en

In the The Historium – Bruges' most visited attraction – you can see how lively Bruges was during the Golden Age in various ways. In the Historium Story you follow the love story of Jacob, Jan van Eyck's apprentice, as you wander through this spectacular attraction with film, backdrops and special effects. In the Historium Exhibition you will find additional information about Medieval Bruges or you can get started on the Family Trail. Go back to the year 1435 in the Historium Virtual Reality and sail virtually into the port of Bruges! You will see how the Waterhalle and Belfort tower were in the past and can fly from the Market Square to the former St. Donatian's Cathedral. NEW: you can now climb the Historium Tower for an impressive 360° view of the Market Square and the Belfry. The activities are available in 10 different languages. Open daily from 10h am – 6h pm.

Caracalla IV Dimension

https://corporate.coopculture.it/it/articoli/case-history-caracalla-quarta-dimensione/

With the "Caracalla fourth dimension" project, the Baths of Caracalla have become the first Italian archaeological site to be fully usable in 3D.
Thanks to the use of virtual reality, we developed an immersive guide for the Baths of Caracalla, giving all visitors-regardless of each person's prior knowledge-the opportunity to observe the Baths with a never-before-seen gaze, reliving them as they were in 216 A.D., the year of their inauguration.

A NEW VISITOR EXPERIENCE
Compared to traditional fruition media, Caracalla IV Dimension guarantees greater emotional involvement of the visitor: with the use of immersive technology, the visiting experience becomes active and real.
Content suitable for everyone and accurate graphic reconstructions allow the overcoming of cognitive barriers and the possibility of reliving architectural spaces without efforts of imagination with proven beneficial effects on the memorization and learning process.
The immersive guide to the Baths of Caracalla is designed to be a versatile, user-friendly tool that can also be replicated in contexts other than the stand-alone visit.

Nero's Golden House VR experience

https://www.coopculture.it/en/products/domus-aurea-experience/

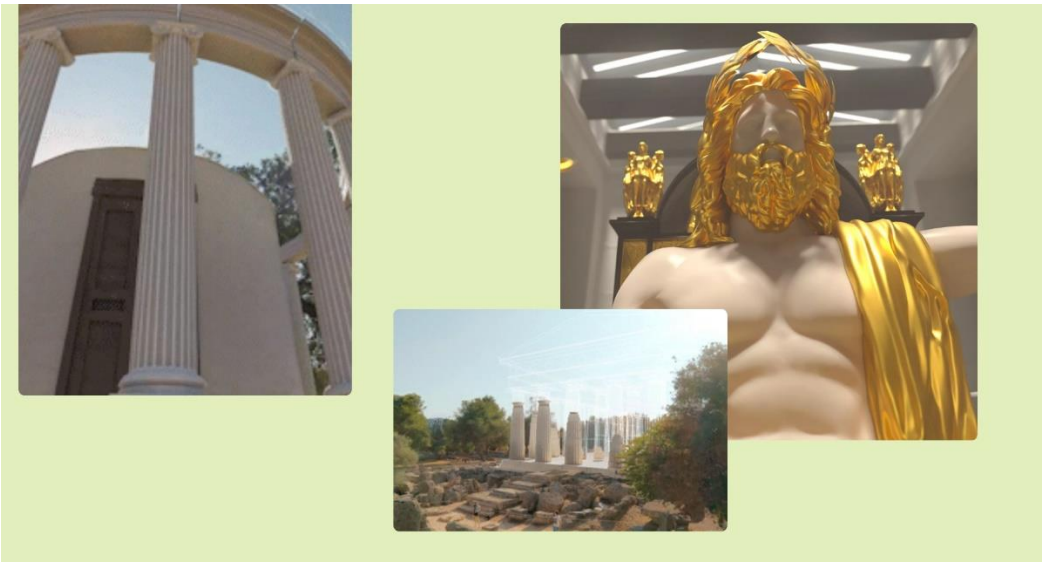
Thanks to new technology (VR OCULUS) and video narration it is possibile to visit Nero's Golden house's (the Domus Aurea) archeological restoration. These new technologies will be combined with the guided tour of the Domus Aurea's site. Nero's Golden House (Domus Aurea) tour provides visual insights into how Emperor Nero's golden palace looked 2,000 years ago. The final result is be a true time travel, a sort of cognitive and emotional short circuit, something really innovative in the new technologies applied to the cultural heritage.

Ancient Olympia

https://unlocked.microsoft.com/ancient-olympia-common-grounds/

Digitally preserving and restoring Ancient Olympia as it stood over 2000 years ago.

Ancient Olympia: Common Grounds, a collaboration between Microsoft and the Hellenic Ministry of Culture and Sports, is a ground-breaking project that brings the site of Olympia in Ancient Greece to life as it stood over 2,000 years ago. The experience, built using Microsoft AI, digitally preserves the heritage of Ancient Olympia for generations to come.



https://www.youtube.com/watch?v=rXnMW3T5nNY

e-Archeo

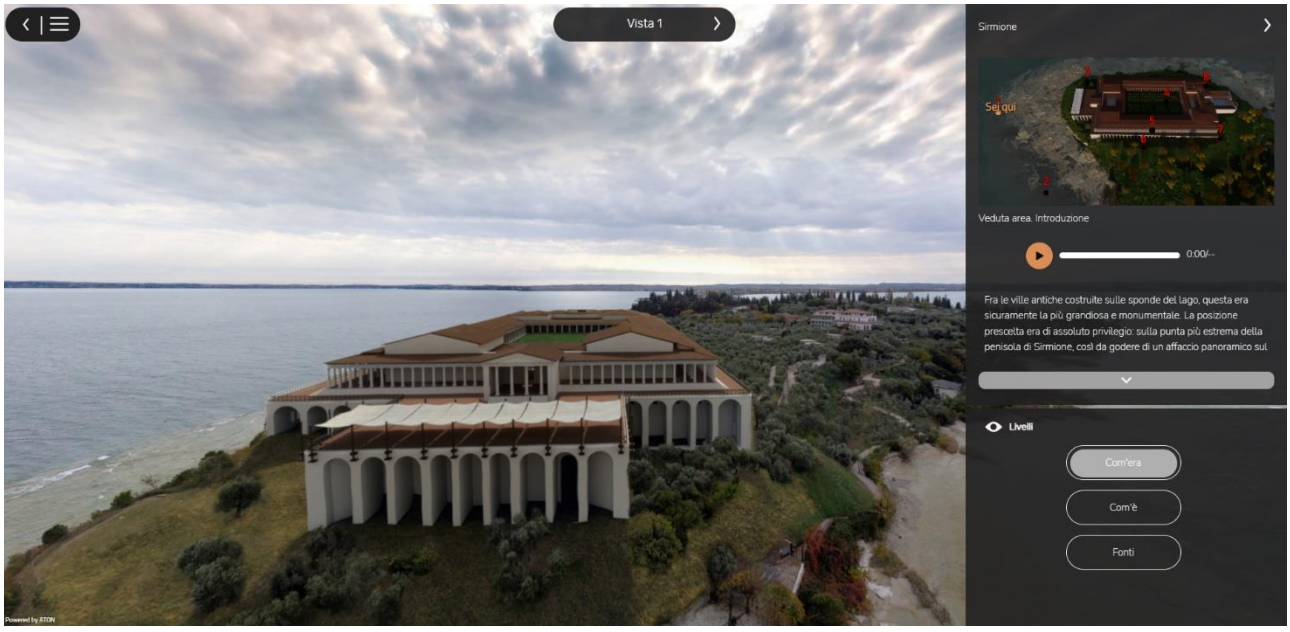
https://e-archeo.it/en/

e-Archeo drafted out from the desire of Ales SpA, after the Ministry of Culture (MiC) specific request, to offer a way of interpreting and experience some archaeological sites with a significant narrative potential. The common thread that guided e-Archeo's narrative choices was of illustrating the different types of settlements that developed on the italic territory, due to the presence of various populations and cultures.

Centres founded by the Etruscans, Greeks and Punic Phoenicians were chosen; the story and final destiny of each them was also presented by means of the best preserved monuments, in their current state and in their ancient reconstructive appearance, aimed at restoring the third dimension lost over the centuries.

For the narration, the places of public life (forums, basilicas, temples) and private life (urban dwellings and villas) were chosen, without neglecting the necropolis with tombs and grave goods, a mirror of the beliefs in the afterlife.

The studied chronological period covers more than ten centuries, during which the peninsula became a place of integration, where different traditions were recognised in a single culture.



Diocletian Dream

https://diocletiansdream.com/

Diocletians Dream is a dynamic VR 360 3D experience with an aim to tell Diocletian's story in a new and original way that opens a completely new perspective on the approach and presentation of cultural and historical heritage. Step back to 305 AD and experience Diocletian's Palace as it was more than 1700 years ago. This 15-minute VR experience brings the history of Split to life and is available in English, German, Italian, French, and Croatian language. It is located just outside the palace walls.

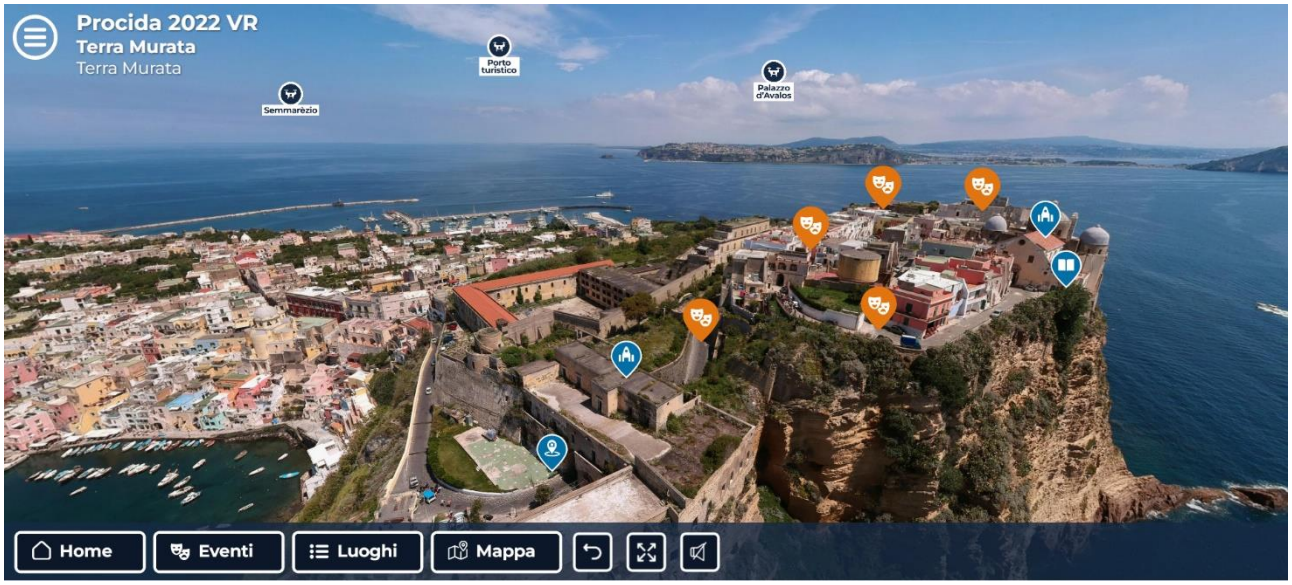
Procida 2022 – tourism metaverse

https://www.procida2022vr.com/

The Procida 2022 platform is an immersive portal, integrated into the Campania Culture Ecosystem. The immersive info point features make the environment not only a high-level virtual content, but also an environment, precisely a Metaverse, where users and operators of the promotion body can meet On Line, explore Procida together, interact on content, organize guided tours, and get to event booking.

The island is presented On Line thanks to aerial shots from drones: with "air view" navigation it is possible to fly over the locations, reproduced in high definition down to the smallest detail, and land at points of interest reproduced with 360-degree photos and videos.

The virtual voyage of discovery of Procida also develops over time. For example, it becomes possible to fly over the island of Vivara and observe it in the Mycenaean age, in the 16th century BC. It is thus discovered that the sea level was several meters lower, and the gulf was occupied by a beach where Mycenaean ships landed. The Time Machine also makes it possible to visit a village from that time.



M9, Italy's leading immersive museum

The M9 museum, dedicated to the history of the 20th century, features several advanced immersive installations

- the space-time elevator, which allows you to virtually soar over Mestre, the Lagoon and the Po Delta and observe them in their historical evolution, from reclamation to bombing.

- the introductory room, reminiscent of a control room, with large projections on the shock of the 20th century and the Po Valley megalopolis. Images from the projections are deepened with a virtual reality application with 360 video and 9 interactive tablets.

- Other installations, dedicated to the history of environmentalism, the fight against malaria, agricultural and land reclamation techniques, earthquakes and their devastating effects, the Italian landscape captured in historical footage of the 1000 miles and the Giro d'Italia, the urban development of 10 cities developed with a zenith projection.

2.2 The Spanish Cultural Heritage Digitization Market

The digitization market in Spain has been actively engaged in preserving and promoting the country's rich cultural heritage made up of diverse cultural tapestry, encompassing historical monuments, art collections, manuscripts, and more. Several institutions and organizations in Spain have been at the forefront of digitization initiatives. National libraries, museums, archives, and historical societies have collaborated to digitize and promote artifacts and cultural sites using 3D Scanning and Printing, Virtual and Augmented Reality, Digital Archives and Databases, Mobile Apps and Audio Guides, Big Data and Analytics, Artificial Intelligence, Blockchain for Authentication, Digital Storytelling.

For instance, the National Library of Spain has undertaken projects to digitize rare books and manuscripts, making them available online for researchers and the general public.

In addition to national institutions, regional entities and private organizations have also contributed to the digitization landscape. Collaborative projects between public and private sectors have been pivotal in advancing these efforts. The digitization market in Spain has witnessed the use of cutting-edge technologies such as high-resolution imaging, 3D scanning, and virtual reality to enhance the digital representation of cultural artifacts.

2.2.1 Case histories

Museo Nacional del Prado

One notable case history involves the digitization of the Prado Museum's collection in Madrid. The Prado, one of the most renowned art museums globally, embarked on a comprehensive digitization project to make its extensive collection of paintings, sculptures, and decorative arts accessible online. This initiative not only facilitates virtual tours and online exhibitions but also serves as a valuable educational resource.

Another example is the digitization project by the Regional Archive of Catalonia, which focuses on preserving and providing online access to historical documents from the region. This effort contributes to research, education, and public engagement by allowing users to explore Catalonia's historical records remotely.

Museo Arqueológico Nacional

The State Secretariat for Culture, together with the National Archaeological Museum have developed new digital facilities made possible thanks to a collaboration agreement with the company Samsung.

The collaboration between the two organisations aims to transform cultural experiences inside and outside the museum by using the latest technology.

These case histories underscore the importance of digitization in preserving and promoting Spain's cultural heritage. The ongoing commitment to such initiatives reflects the recognition of the digital realm as a powerful means to safeguard and share the nation's rich cultural legacy.

https://www.man.es/man/mandigital/visitavirtual.html

3. The Mediterranean Partner Countries

3.1 Current situation in Egypt

Egypt has played an important role in world affairs from the birth of civilization to the present. Egypt's legacy in law, politics, religion, philosophy, science, medicine, and engineering, not to mention the arts and literature, spans numerous centuries from prehistoric to current times, making it one of the first nation states and one of the first world civilizations. Egypt is a country rich in heritage resources because of this legacy, and some of this heritage still exists around us, whether tangible or intangible, moveable or immovable artifacts, the Egyptian cultural institutions need digital solutions and digital platforms to enhance their users' experiences by incorporating these solutions into exhibitions and installations, as well as by establishing remote experiences for people who cannot physically visit. These range from more typical applications to interactive gaming and even virtual reality and augmented reality applications.

One of the biggest problems facing Egyptian museums is the lack of the egyptian museums under one umbrella, as well as the lack of a law regulating the work of these institutions, which has led to the lack of a comprehensive digital strategy for those museums.

With the beginning of the existence of the Ministry of Communications and Information Technology in Egypt, the Center for Documentation for Cultural and Natural Heritage was established, after that it became one of Bibleotheca Alexandrina centers, the center was the primary reference for the use and innovation of digital technologies in the field of heritage. It produced many applications and created many systems that helped document and disseminate the Egyptian heritage as well as capacity building in museums and heritage, the Center has contributed significantly to raising awareness of Egyptian heritage and its importance by participating in many events inside and outside Egypt. This center continued to carry out its role in an increasing manner until 2014, and since then the center has become dependent on previously implemented projects, with the production of some relatively few projects, and the center has not currently provided what is expected of it to advance the digital heritage community in Egypt.

Among the experiences that contributed to building capacity in Egyptian society was what the French University in Egypt did in cooperation with the Sorbonne University to create a master’s program in heritage management in 2011, Helwan University also later established a master’s program in museum studies and a

cultural heritage preservation program in cooperation with the University of Brandenburg in Germany in addition it created a bachelor's program for museum studies, these programs contributed to increasing awareness of the use of modern technologies in documenting and disseminating heritage among the community of heritage workers. Cairo University and Ain Shams University created a program for archaeological and heritage information systems to prepare a generation of digital heritage specialists.

Among the entities that have worked significantly to build capabilities in the field of digital heritage are the UNESCO Regional Office in Cairo, the Information Technology Institute (ITI) at the Ministry of Communications and Information Technology, the Academy of Scientific Research, as well as a number of Egyptian institutions.

Those working in the digital heritage community have done well in the field of digital heritage. Three projects won the F@IMP Festival Award, which is held annually by the AVICOM Committee of the International Council of Museums. The Dinosaur Park project was also ranked among the top 10 educational applications using technology in museums from the International Council of Museums.

Unfortunately, the online presence of most Egyptian museums and archaeological and heritage sites is limited to some social media networks, without the presence of professional websites for most of these entities, and thus the lack of sufficient organized content on the Internet.

Egyptian heritage institutions should work to employ digital technologies within them in a rational manner that helps in the processes of documenting and disseminating heritage, which includes the following:

- Build professional trained cadres to develop virtual heritage applications

- Employing the most modern technologies such as artificial intelligence and metaverse platforms

- The existence of a law regulating the work of Egyptian museums

- Increase communication with international bodies and exchange experiences in the field of digital heritage

- Emphasizing the code of ethics developed by specialized international bodies such as ICOM

- Taking into account the sustainability of projects by developing plans for content management and maintenance of the developed systems

Many successful initiatives in the field of virtual heritage have been undertaken; some of these virtual heritage projects have the potential for viability in terms of content. By examining two projects created by the same organization, which is the Center for Documentation of Cultural and Natural Heritage (CULTNAT). Eternal Egypt (an online Virtual Museum) is the first project, and CULTURAMA (a portable Virtual Museum) is the second. We noticed a difference in their degrees of sustainability by interviewing the technical managers of both projects.

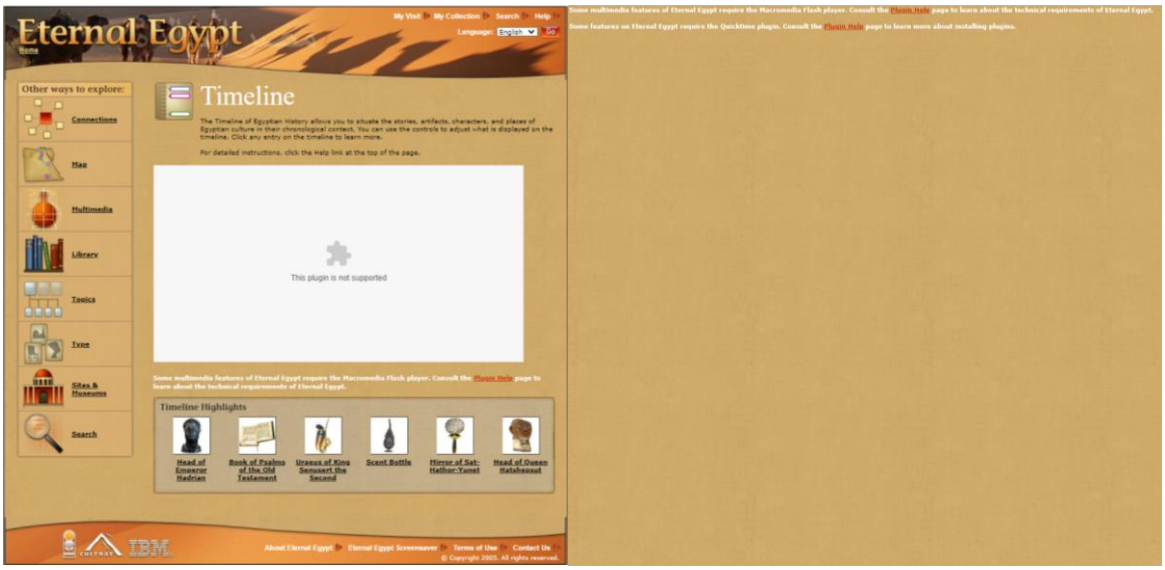
CULTNAT and IBM Corporation collaborated on Eternal Egypt on a large scale. The project's goal is to use a variety of information technologies to disseminate Egyptian heritage.

Eternal Egypt landing page

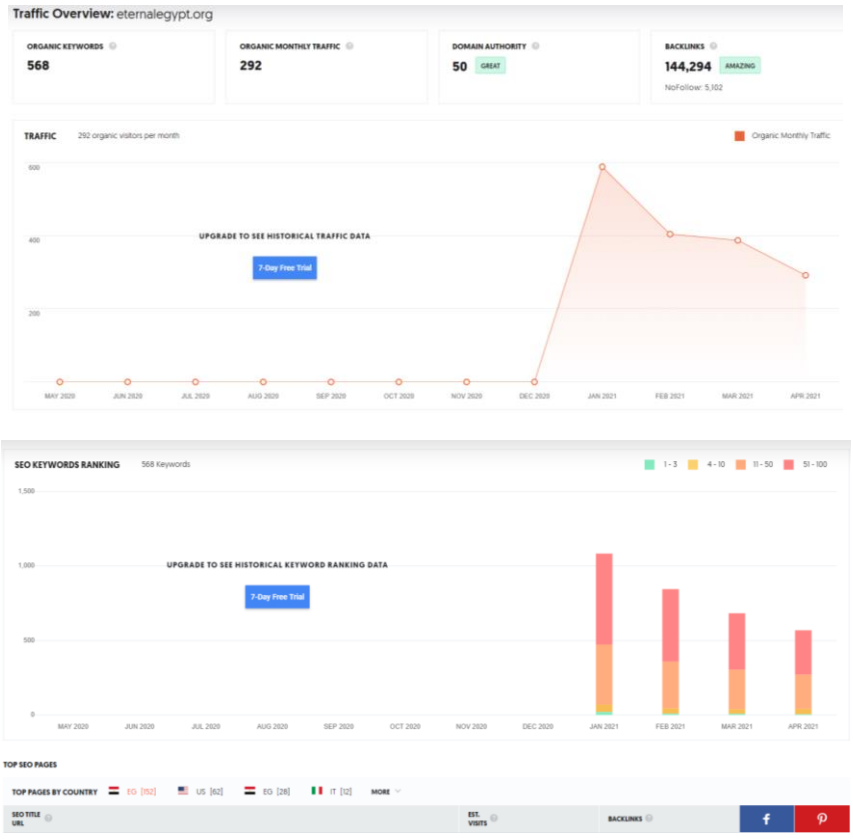
The website of Eternal Egypt began as a trilingual website (Arabic, English, and French), providing the most comprehensive repository of information and media concerning Egyptian cultural history accessible on the web at the time; later, two additional languages (Spanish and Italian) were added. The Eternal Egypt project's content has been illustrated utilizing a number of media formats. Examples include photographs, image sequences, panoramic views, reconstructions from three-dimensional models, and virtual environments. The website Eternal Egypt introduced the concept "Egypt Everywhere," which focuses on Egyptian history. Visitors can browse the website's content by type - artifacts, characters, and places - or by the multimedia that represents it. Visitors may learn more about the collections geographically by visiting the places and museums where they are housed. A dynamic media viewer makes it simple for viewers to interact with the website's hundreds of photographs and multimedia, allowing for the zooming in of high-resolution images, as well as the control of panoramic movies and virtual worlds. The material is dense, with detailed descriptions explaining the significance of the objects, monuments, and people. The basis of a repository of knowledge about Egypt's Pharaonic, Greco-Roman, Coptic, and Islamic periods would be made up of artifacts from seven museums and dozens of archaeological sites around Egypt.

Eternal Egypt home page

Eternal Egypt has a CMS, which is a web-based application developed on IBM WebSphere Application Server and DB2 on Linux operating system. One of the CMS's distinguishing characteristics is the usage of IBM's Text-to-Speech technology, which creates spoken audio versions of any textual content in the five languages. In 2004, the website Eternal Egypt was founded. It was intended to utilize ultra-sophisticated technology of the time, some of which were deployed for the first time. This, together with its valuable high-quality content, was a major factor in its success. The website has grown in popularity since its start, with a rising number of monthly visitors. After a while, the number of visitors decreased, some pages became unavailable, certain features (such as panoramic pictures, enlarging high-quality pictures, guided tours, and the timeline) ceased to function, and there is a lack of monitoring due to technical problems, so it is seriously out of date.



Eternal Egypt unavailable content

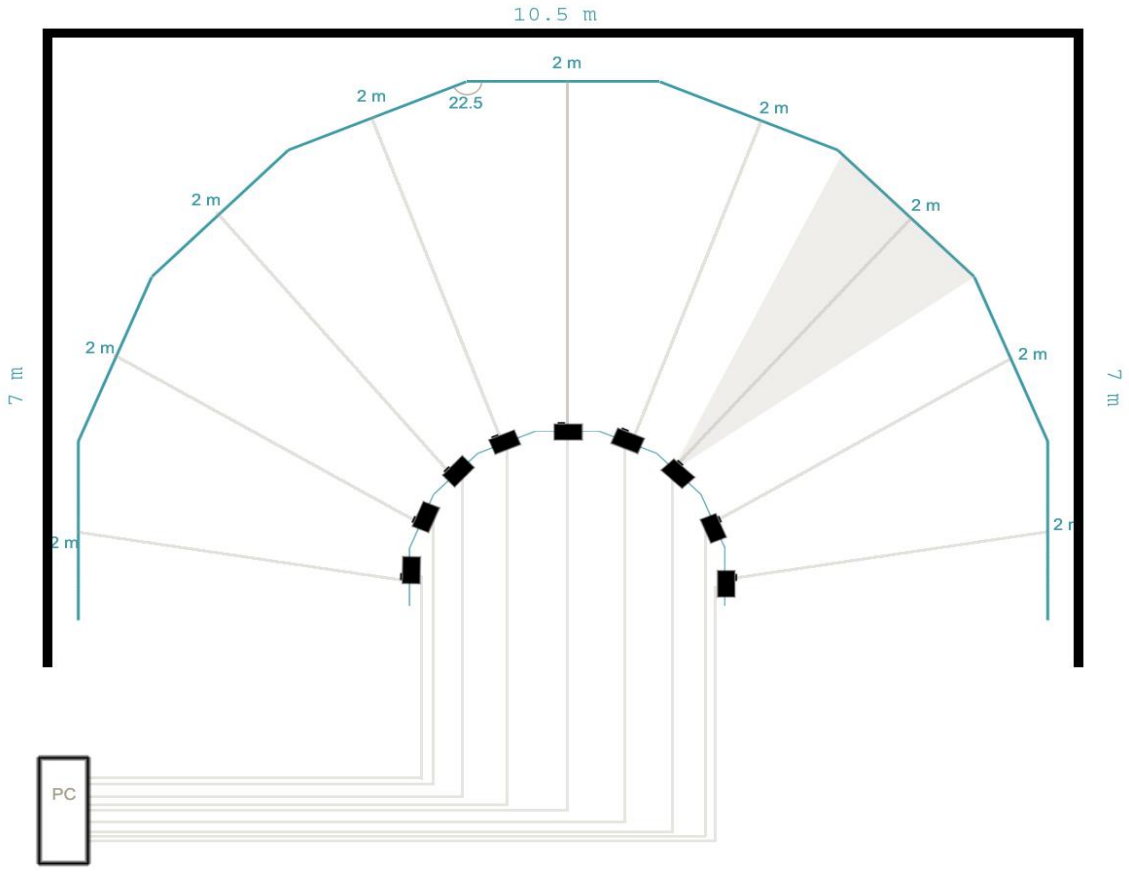


Eternalegypt.org Traffic Overview and SEO KEYWORDS RANKING from May 2020 to April 2021

CULTURAMA, the second example, is a large panoramic display system that surrounds the audience in 180 degrees. It has a half-circular form, but it may be customized to have other shapes. There is also a large computer display area with; this area is utilized to provide a wide range of information that could never be delivered using standard computer display.

Displayed content includes historical timelines, panoramas of real scenes and locations, visual comparisons of particular aspects, and simple presentations of massive things. To take use of this huge display space, CULTNAT has also introduced a new multimedia production concept. It has also employed standard equipment such as workstations and video projectors, as well as flat projection screens, to build a semicircular screen. The usage of familiar equipment makes the CULTURAMA system possible.

One of the main advantages of CULTURAMA is the ability to exhibit content that could not previously be presented. For instance, depicting the pharaonic civilization's time line beginning in 3000 BC. Another idea would be to smoothly display 180-degree panoramic photographs of Egypt's iconic sites. All of this is accomplished with low-profile hardware, allowing CULTURAMA to be a low-cost and portable solution (Saleh, Cultnat, & Farouk, 2004).



CULTURAMA design

CULTURAMA is both an effective tool for exhibiting historical information and an educational technique. Because of its scale and usability, it may be used for history education, particularly for school students, who can interact with timelines and view real panoramic images of ancient monuments in an engaging and immersive manner with the help of their teachers. CULTURAMA is a patented invention in Egypt, having Patent #23651.

CULTURAMA features a variety of applications that show various aspects of Egyptian heritage; the majority of these applications are available in three languages: Arabic, English, and French. CULTNAT created the CUTURAMA completely to highlight the unique Egyptian heritage information held in CULTNAT's database. The main CULTURAMA presentation takes the audience from the Pharaonic civilization through modern Egypt, as well as through the Coptic and Islamic periods. The main show is available in eight different languages (CULTNAT, 2021).

Culturama hall

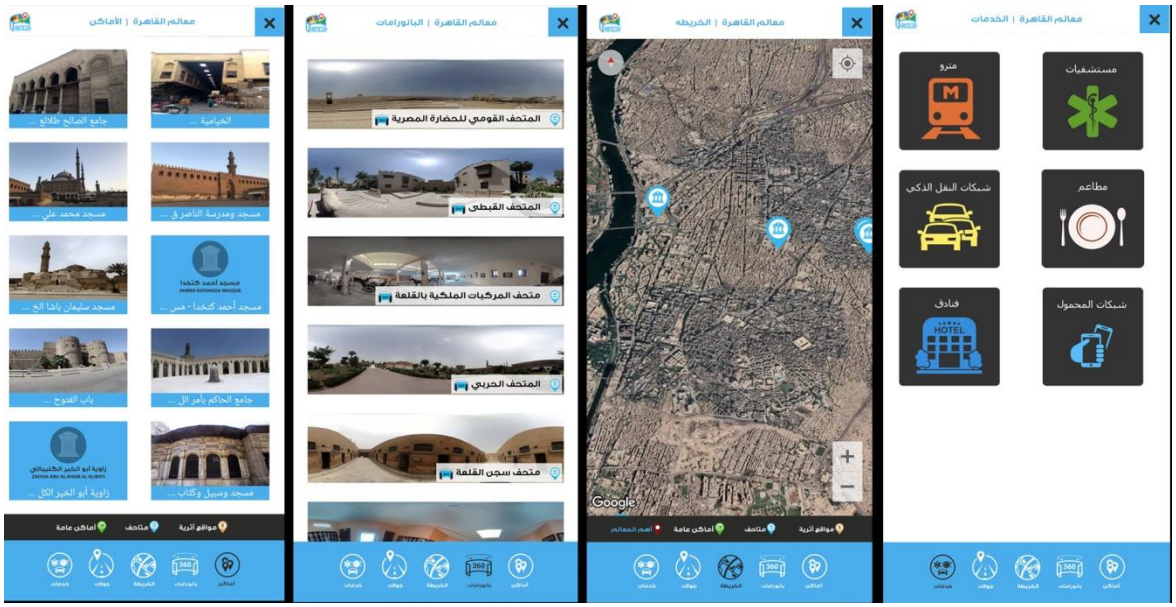
CULTURAMA has a total of 12 permanent installations. Ten halls are distributed around Egypt, as well as two halls in the Democratic Republic of the Congo (DRC) and the Egyptian Cultural Center in London. There is also a portable setup that has travelled to cities such as Tunis, Rome, Berlin, Kyoto, Frankfurt, and Paris. CULTURAMA model is considered as a sustainable Virtual Museum.

3.1.1 Case histories

Virtual Museum of Cairo

Historic Cairo is an open-air museum with a plethora of one-of-a-kind monuments and cultural assets. It was founded in the tenth century and gradually became the new centre of the Islamic world, reaching its peak in the fourteenth century. It is now on the UNESCO World Heritage List.

The "Virtual Museum of Cairo" mobile app was built to highlight Cairo's cultural attractions in an interactive way, with the purpose of promoting and raising awareness of the city's treasures. The VMC app provides virtual visits to Cairo's most famous tourist destinations via 360° panoramic tours. Furthermore, the app recommends various trips for the traveller to choose from based on his interests and availability. By selecting his or her favorite destinations, the user may plan his or her own visit itinerary. Furthermore, the map may be used to determine the optimal routes to take between different sites. The interactive map guides tourists to heritage sites, attractions, museums, and public spaces. The app also provides them with information on hotels, restaurants, hospitals, subway maps, public and private transportation alternatives, and internet and cell service providers.



Screen shoots form VMC app

The "Heritage Fragments" exhibition

In collaboration with the Center for Documentation of Cultural and Natural Heritage (CULTNAT, Bibliotheca Alexandrina), a holographic display produced to present two artifacts, that no longer exist due to a terrorist attack was made.

In January 2014, an explosion blasted through the Cairo Museum of Islamic Art, which houses one of the world's most important collections of Muslim art. The blast damaged 179 valuable artifacts. The bulk of them were restored by the museum's restoration specialists. Unfortunately, numerous glass lamps from Cairo mosques, as well as some valuable antiquities, were broken in the explosion and cannot be repaired physically.

The "Heritage Fragments" exhibition re-displayed some of the blast-damaged objects after they had been restored, as well as two important pieces that had been completely destroyed, utilizing a holographic display technology that showed 3D representations of the two artifacts. The first 3D model was for a Bahri Mamluk era glass rosewater sprinkler, and the second was for a Mamluk era glass bottle.

The holographic display in “Heritage Fragments” exhibition

Screen captured from the 3D software

The Virtual Museum of Tutankhamun

The concept of the Tutankhamun Virtual Museum is to give certain extended reality experiences that emphasize some aspects of Tutankhamun's stories and treasures in an appealing and educational manner, such as virtual visits, 360-degree video, mixed reality, augmented reality, and hologram.

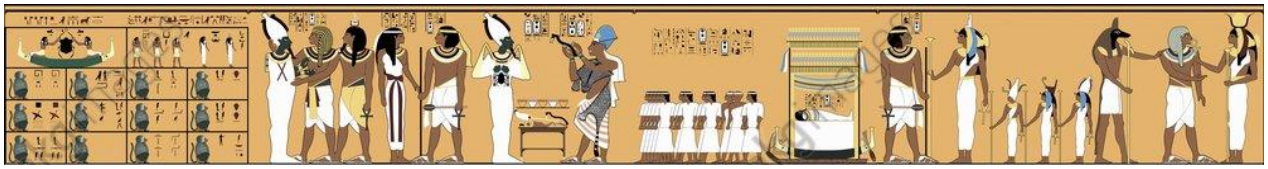
The first application is a virtual visit to the tomb with the ability of exploring its collection; it is an immersive walkthrough experience that digitally mimics a virtual environment of the tomb, allowing the user to see the tomb in its nearly original form, as the collection is no longer housed in the tomb.

The second application is a 360-degree documentary film that takes the user through the Valley of the Kings and the tomb, complete with voiceover about King Tut and the stories surrounding him.

The third application is a mixed reality app that displays some of the artifacts. The user may move around the marker using a headset or smart phone to explore the artifact from different angles. In addition, an augmented reality application was created to interpret the visuals on the wall in the king's burial chamber.

Screen shoot from the virtual reality app

360-degree Video

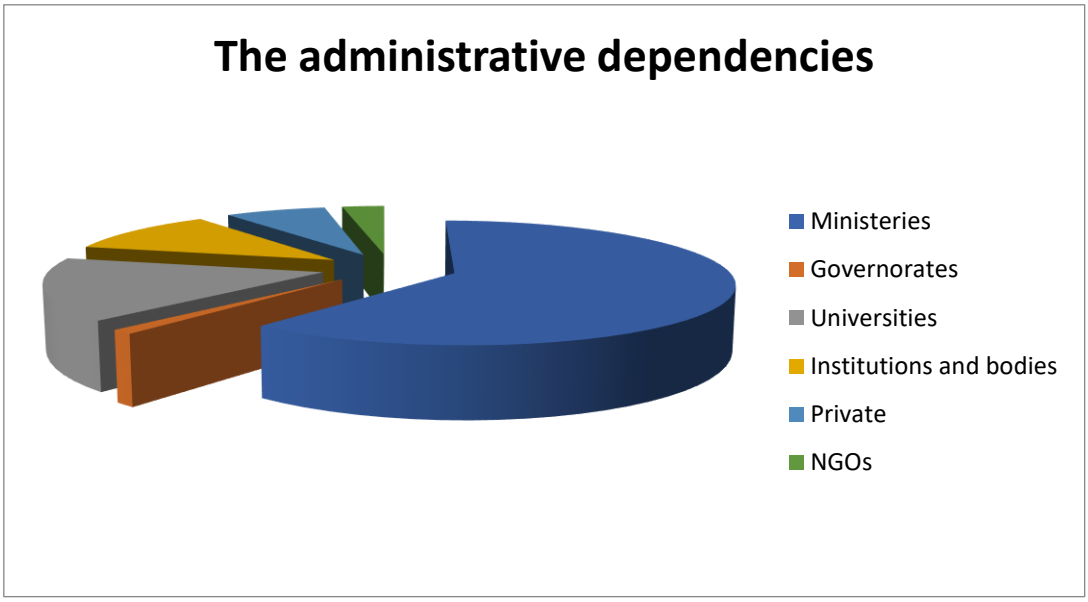


The tomb's burial chamber illustration

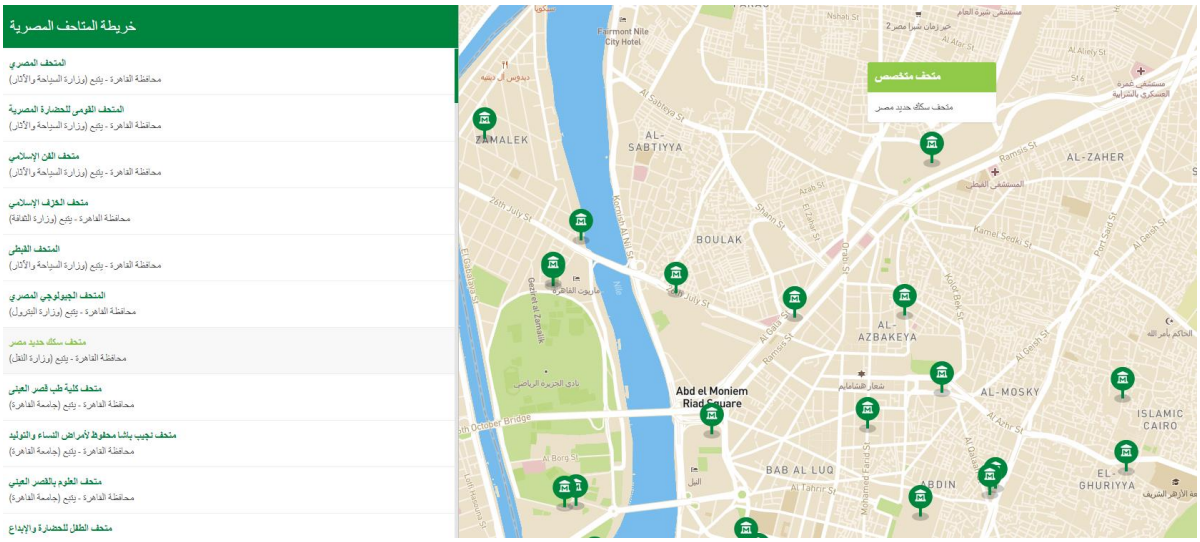
The interactive map of the Egyptian museums

The goal of this project is to create an interactive map for Egyptian museums, which required the creation of an Egyptian museums directory first. The important information necessary for each museum was determined by the name of the museum, administrative affiliations, governorate, and coordinates.

https://vm-egypt.com/map.html



Administrative dependencies of Egyptian museums



The interactive online map of the Egyptian Mueseums

<u>The Dinosaur Park Exhibition</u>

The Dinosaur Park exhibition, which ran from November 2019 to March 2020 at the Children Center for Civilization and Creativity, it is one of the exhibitions that used various technological means to introduce museum visitors to the world of dinosaurs and the historical and scientific information related to this world in an attractive and enjoyable way. It was visited by 7400 folks.

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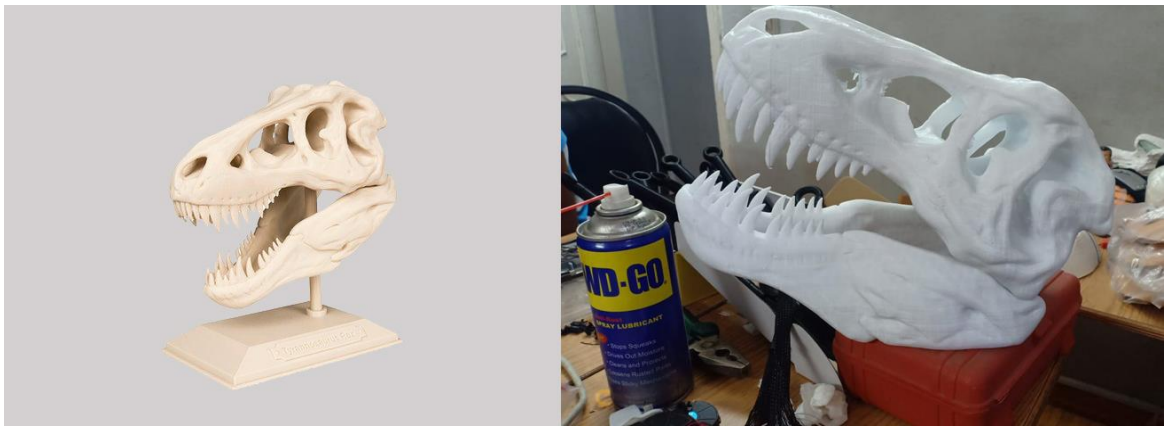
Holographic display of dinosaur embryo



1:1 scale 3D model of a T-Rex skull

The case of National Military Museum

A Virtual Museum dedicated to Egypt's military has been established within the National Military Museum.

The Egyptian military's CULTURAMA system, a holographic display system that illustrates the functionality and features of some select artifacts, a virtual tour application inside the museum, an augmented reality application for the battle of Qadesh, and visitors greeted by a virtual presenter are all part of the Virtual Museum.

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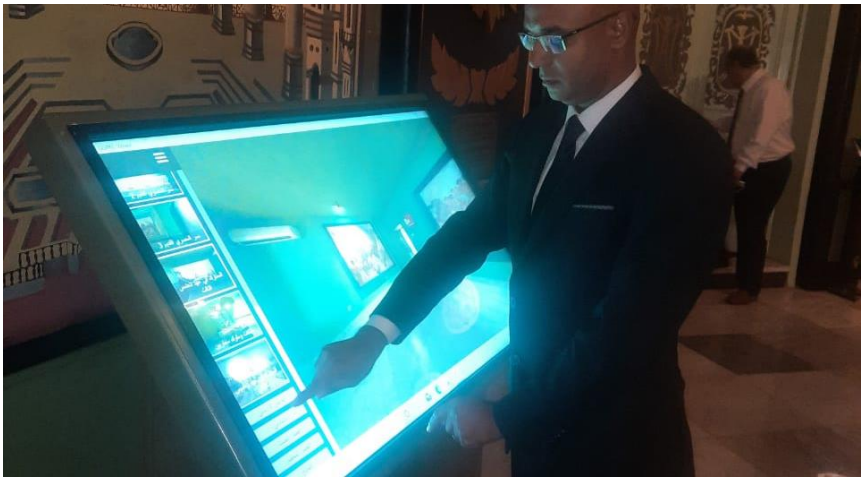
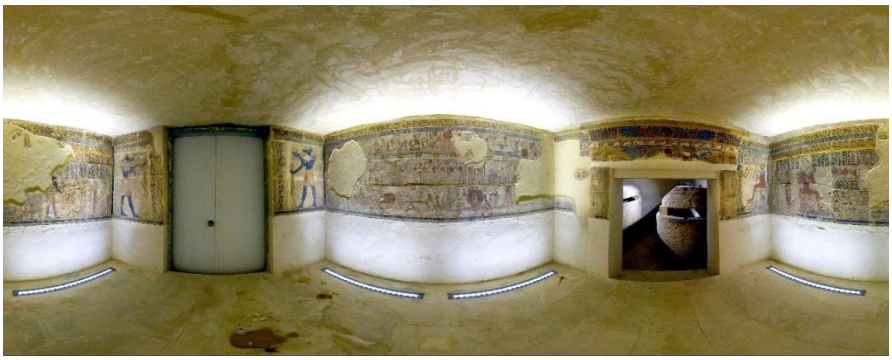


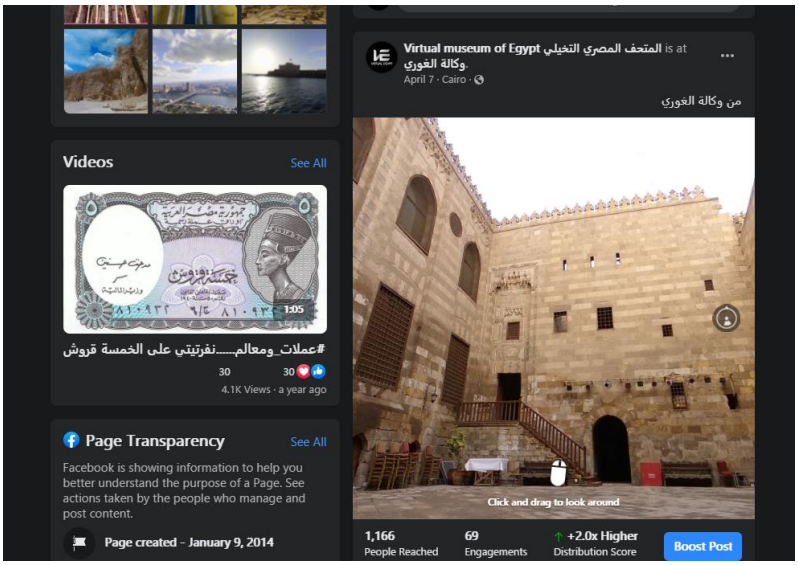
VR of Tutu's Tomb

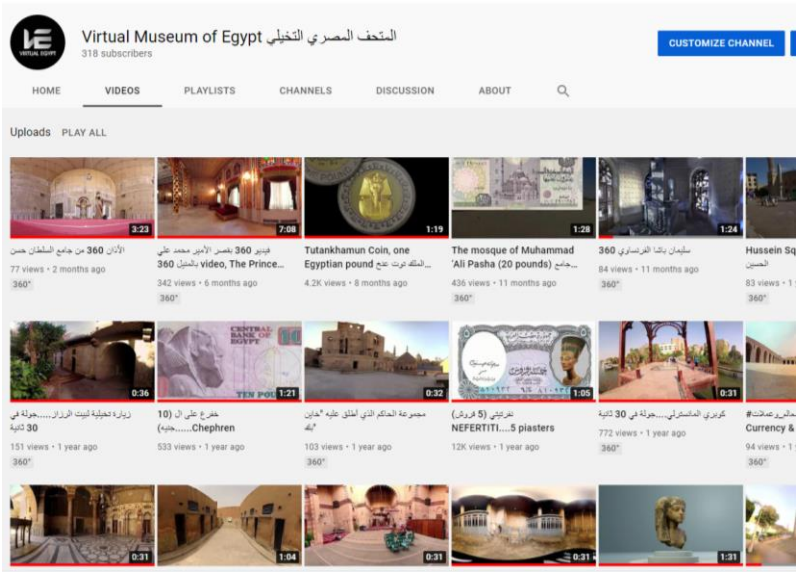
Tutu's and his wife T-Cherit Isis' tomb, discovered in Sohag, has been transported to Egypt's Capitals Museum, where it is part of the museum exhibition scenario. Given the tomb's tiny size and the impossibility of visitors to enter it for preservation reason, the idea of developing an interactive application utilizing virtual reality headset to allow visitors to see the details of the tomb from the inside was proposed. The tomb was shot from the inside with a 360-degree camera by RICOH THETA, the Unity game engine was utilized for programming, and the Oculus Go was used for display.



Social media channels

A Facebook page named "The Virtual Museum of Egypt" and a YouTube channel with the same name to exhibit various forms of media related to Egyptian heritage and civilization on social media platforms.





360 panoramic images, 360-degree videos, and 3D animations were produced as digital assets. Some panoramic photos were converted into 360-degree video, and voice over was utilized to produce "A Tour of 30 Seconds" series

Zafaran Museum

The museum is located in the main campus of Ain Shams University in Cairo, it is housed within the Zafaaran palace, one of Egypt's modern-era historic buildings.

The museum inaugurated in May 2023, It is an educational museum that mainly targets University students, researchers and scholars in the field of museums and heritage, It is also open to the public.

The museum offers an experience that reflects the richness of Egypt's great history and its ancient civilization by displaying 167 artifacts from various historical periods from ancient Egyptian times to modern times.

As a virtual museum, a digital heritage exhibition has been established within the museum, the concept of this virtual museum is to showcase topics from Egyptian heritage utilizing various technologies and systems, these systems function as a permanent infrastructure, allowing museum staff to update and edit content to change the theme of the exhibit.

3.2 The Jordanian cultural heritage digitization market

Recently, Jordan has witnessed significant developments in its cultural heritage digitization market, leveraging various funding initiatives and calls for proposals. The period from 2023 to 2025 will be a large investment, contributing to the growth of a dynamic and widespread market.

And in Jordan now the cultural heritage sites attract many companies to invest in the digital products for their promotion, and this trend will increase in the coming years in reference to the fact that such products in Jordan are still in the early stage, compared to EU countries.

3.2.1 Case histories

Jordan Immersive Experience using ICT

The Jordan Immersive Experience is a virtual reality program launched by the Jordan Tourism Board that allows users to explore many of Jordan's wonders, biblical locations, museums, and galleries online, including the Baptism Site of Jesus Christ. The program shows an extensive map of the Baptism Site that offers a start and end point. It also includes 16 pins of the many important spots in the area, including The Shrine of Jesus, The River of Jordan, and the Baptism Pool, as well as many new and ancient churches.

https://www.visitjordanfromhome.com/en

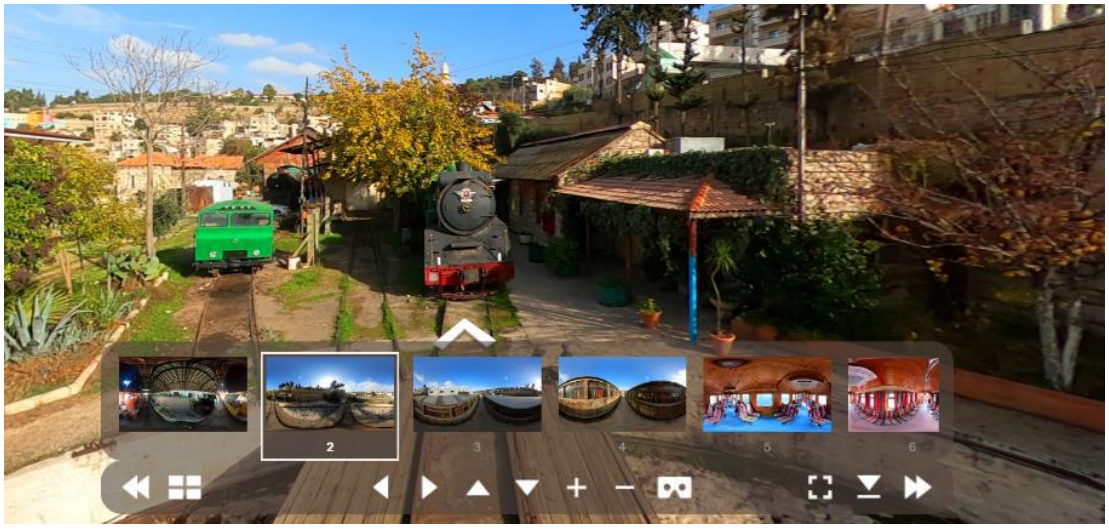
Baptism site and virtual reality

Home to several biblical cities including Sodom, Gomorrah, and Zoar, the archaeological discoveries between the Jordan River and Tal al-Kharrar have identified this area as Biblical "Bethany Beyond the Jordan." Designated as a UNESCO World Heritage site, the Baptism Site commission welcomes pilgrims from all around the world seeking spiritual connection to biblical times, a glimpse of history or a chance to be baptized where Jesus was so many years ago. If that's not enough biblical history for one area, the cave where Lot and his daughters took refuge after the destruction of Sodom and Gomorrah is located just outside an area called Safi (Biblical Zoar). Visitors have the chance to virtually experience such things in virtual reality, 3D and 360°.

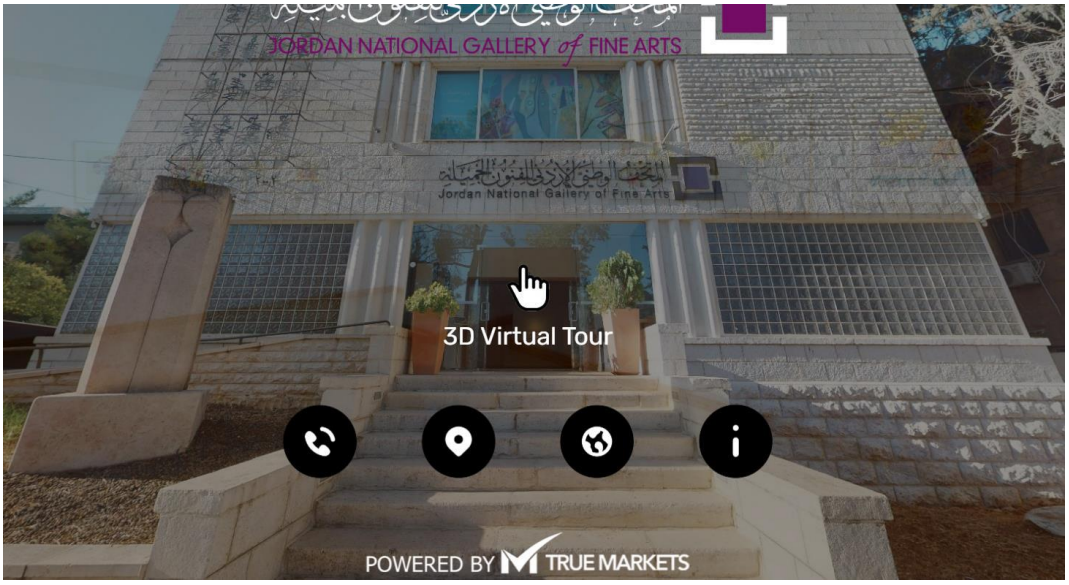
Jordan Hejaz Railway

View the great collection of working steam locomotives, formerly used for as part of a pilgrimage route connecting the Ottoman Empire to Saudi Arabia and an intrinsic part of the Great Arab Revolt in 1918. For

more of an in-depth look at the history of the station make sure to visit the onsite museum. Visitors to the virtual site enjoy 360° and 3D experiences.



The Jordan National Gallery of Fine Arts also offers a 3D virtual visit to the Gallery.



3.3 The Lebanese Market Context: Cultural Tourism in Lebanon

Lebanon boasts rich cultural and historic sites, making cultural tourism a significant market segment. Visitors are drawn to its archaeological sites, heritage events, and traditional festivities. Lebanon's diverse cultural heritage, including Roman ruins, Phoenician artifacts, Byzantine churches, and Islamic architecture, offers a unique experience for tourists.

The virtual archaeology market is rapidly developing in Lebanon, driven by technological advancements that enable virtual site visits and augmented reality experiences. With the proliferation of smartphones and accessible internet connectivity, tourists and locals alike can now explore archaeological sites virtually. For instance, the Baalbek Roman Temples and Byblos Citadel have been digitally recreated, allowing users to virtually walk through these historical marvels.

Recent data indicates that there has been a significant increase in the use of virtual archaeology applications and platforms, especially during the COVID-19 pandemic when physical travel was restricted. Local companies and organizations have been actively investing in virtual archaeology projects to cater to the growing demand for immersive experiences.

3.3.1 The Lebanese Copyright Landscape: Accessibility to AR VR Products and IPR Regulations Applicable

Lebanon's copyright regulations are undergoing a transition to adapt to the digital age. There is a strong interest in regulating AR and VR products to ensure creators' intellectual property rights are protected, and consumers have clear accessibility. In Lebanon, the registration of patents and intellectual property rights (IPR) is administered by the Lebanese Intellectual Property Office (LIPO), which is a part of the Ministry of Economy and Trade.

The Lebanese copyright landscape is evolving to accommodate the digital age, ensuring protection for creators of augmented reality (AR) and virtual reality (VR) content. Key points include:

Copyright Regulations: Lebanon's existing copyright laws protect digital works, encompassing 3D models, virtual environments, and multimedia elements used in AR and VR products.

Licensing Framework: Lebanon is developing licensing frameworks to balance creator rights and public accessibility, standardizing terms for content distribution.

Enforcement Measures: Legal actions are taken against copyright infringements in AR and VR content, including fines and injunctions to cease unauthorized usage.

International Agreements: Lebanon adheres to international agreements to harmonize copyright standards and address cross-border issues.

Overall, Lebanon aims to foster a thriving AR and VR ecosystem by safeguarding intellectual property rights and facilitating public access to innovative content.

3.3.1.1 Metaverse: the Lebanese Approach

Lebanon is in the early stages of embracing the metaverse concept, following global trends. Awareness and integration are increasing, particularly among tech-savvy millennials and Gen Z. Local startups and developers are exploring opportunities within the metaverse, with some focusing on creating virtual spaces dedicated to Lebanese culture and heritage. The government has also shown interest in fostering the growth of metaverse-related industries. While there might be individual initiatives or projects hinting at the potential of this technology, comprehensive documentation and widespread adoption are yet to be seen.

3.3.2 The Lebanese Cultural Heritage Digitization Market: Calls for Proposals and Funded Projects in Cultural Heritage

There is a notable surge in efforts to digitize Lebanon's cultural heritage, with numerous calls for proposals targeting both local and international stakeholders. Various government agencies, NGOs, and private organizations are actively funding projects aimed at preserving and showcasing Lebanon's rich heritage in digital formats.

Case Histories

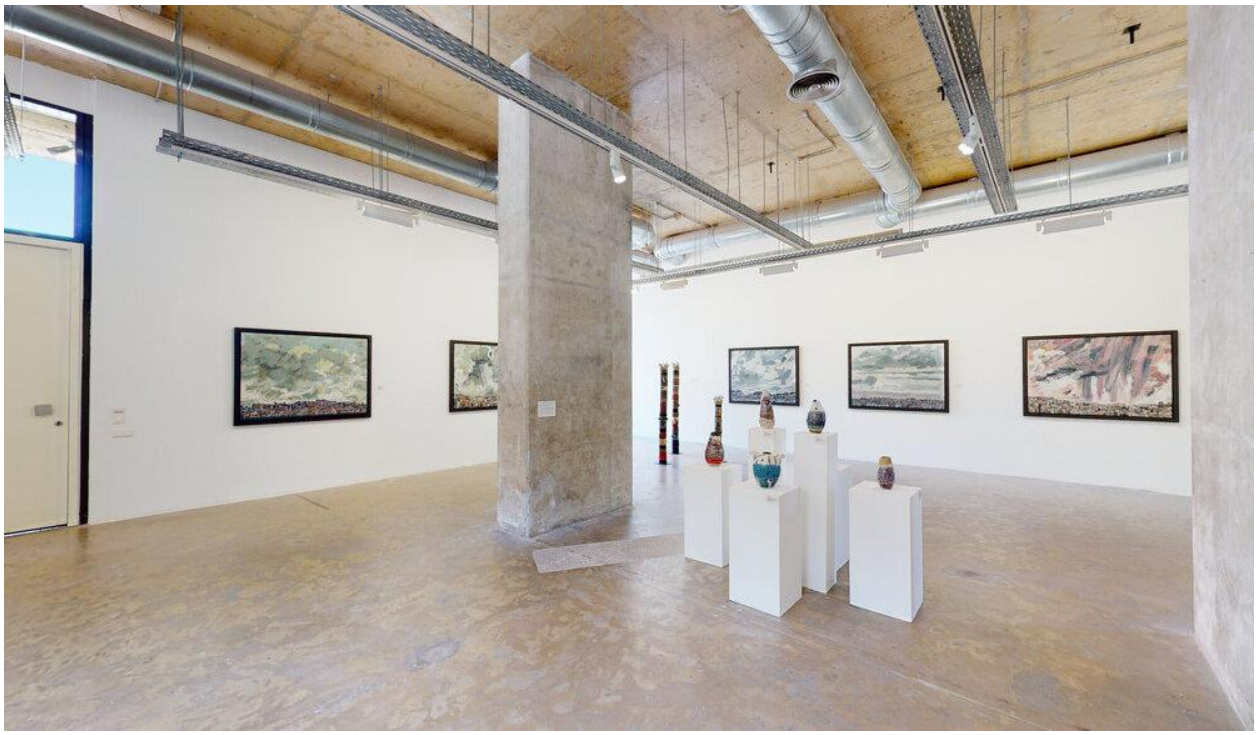
Successful projects in Lebanon's cultural heritage digitization efforts include the comprehensive digitization of Beirut's Roman Baths, which has allowed for detailed virtual reconstructions and educational experiences. Additionally, the virtual reconstruction of the ancient city of Sidon has garnered international attention and praise, contributing to the global promotion of Lebanon's historical sites.

The Provision of Tourist and Cultural Experiences in Virtual Reality

Lebanon has witnessed a surge in virtual tourism experiences, offering immersive VR explorations of heritage sites, museums, and cultural events. These VR experiences aim to enhance accessibility to Lebanon's cultural treasures, attracting a wider audience, including those who are physically unable to visit these sites. Data shows a growing interest in virtual tourism, with increasing downloads and positive user feedback, indicating its potential as a lucrative market segment in Lebanon's tourism industry. Below are some **AR VR and 3D cultural heritage immersive experiences in sites and musumes and touristic sites in Lebanon**:

-VT Leb - Virtual Tours of Lebanon's Site
This website offers immersive virtual tours of various iconic sites in Lebanon, allowing users to explore the country's rich history and culture from the comfort of their homes.
Virtual Tours

Recent Work – VT Leb



-Explore Baalbek with Baalbek Reborn App

A digital platform that provides an augmented reality experience of Baalbek, one of Lebanon's most historic sites. The app brings ancient ruins to life, offering a unique and interactive way to learn about the past.

-Baalback Reborn Project

https://lebanonuntravelled.com/explore-baalbek-with-baalbek-reborn-app/

-Matterport 3D Showcase
Matterport provides 3D virtual tours of various spaces. The links provided offer viewers a detailed and interactive exploration experience.

-National Museum of Beirut
https://matterport.com/discover/space/Fn4vQYVA4wd

-Art Exhibitions
https://my.matterport.com/show/?m=cj5XbjWZVdp
https://mpembed.com/show/?m=gQv8sRB5XV1&mpu=2341
https://my.matterport.com/show/?m=eLuXm6cjF68

-VT XYZ-LB
A virtual tour platform showcasing various locations.

-Construction site 3d in rmeil-beirut
https://vt.xyz-lb.com/show/?m=p1emhdgWtvv&mpu=876

-OVR Popups

This website might be related to virtual reality offering pop-up events or showcases in the virtual space.

-Lebanon's First Virtual Christmas Market

https://ovrpopups.com/