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DIPLOMA THESIS:

New technologies as an answer to the museum de-contextualization problem

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Contents

Contents 1

Abstract 3

Introduction 4

1.0 Description of the problem 6

1.1 Contextualization methods for Museum 7

1.2 General Overview of chapter 14

2.0 A thorough review of new technological data 15

3.0 Technologies and Digital interpretation 18

4.0 Visitors Interpretation and connection with the education 21

5.0 Introduction to GIS 25

5.1 Tools for geolocation and recording of cultural heritage 28

5.2 Organizational systematization of data 30

5.3 Verification and completion of the database 31

5.4 Cultural heritage database 33

5.5 Thematic interactive maps 34

5.6 The added value of GIS 35

5.7 Interactive maps and documentation archives to support projectsfor the promotion, protection and renovation of cultural heritage 36

5.8 Issues of direct exploration of the evolution of the process: how an interactive map can contribute to the subsequent development ofan area? 38

5.9 General overview of the chapter 40

6.0 Museums and augmented reality 41

6.1 Issues and limitations to be explored 43

6.2 Potential uses of augmented reality 43

6.3 General overview of chapter 45

7.0 Case Study: Archaeological Museum of Kavala 47

7.1 Case Study Implementation: Integration of GIS in theArchaeological Museum of Kavala 48

7.2 Evaluation of GIS Implementation in the Archaeological Museumof Kavala 51

7.3 Impact on Artifact Contextualization in the ArchaeologicalMuseum of Kavala 53

7.4 Visitor Interpretation and Connection with Education in theMuseum. 55

7.5 Challenges and Limitations Encountered in Implementing GIS inthe Archaeological Museum 56
7.6 SWOT Analysis for the Use of GIS in the Archaeological Museum ofKavala 59
8.0 Case Study: Philippi..... 61
8.1 Technologies and Digital Interpretation in OutdoorArchaeological Sites 62
8.2 Case Study Application: Integration of Augmented Reality in theArchaeological Site of Philippi.. 63
8.3 Evaluation of the Implementation of Augmented Reality at the Site..... 65
8.4 Effect on the Framing of Artifacts in the Site..... 67
8.5 Interpretation of Visitors and Connection with Education in theOutdoor Area..... 69
8.6 Challenges and Constraints When Implementing AugmentedReality in the Space 71
8.7 Swot analysis for the use of GIS in the Archaeological Site ofPhilippi 73
9.0 Conclusion 74
9.1 Summary of Findings..... 74
9.2 Contributions to the Field..... 75
9.3 Final Remarks..... 75
References 77

Abstract

In the context of archaeological museums and outdoor sites, this thesis investigates how Geographic Information Systems (GIS) and digital technologies might be integrated. It looks into the ways in which these technologies might improve the geolocation, recording, interpretation, and presentation of cultural assets. The goal is to close the gap between conventional museum exhibits and engaging, immersive experiences that encourage people to learn and appreciate archaeological items and locations more thoroughly.

The introduction to GIS in the thesis' first section highlights its tools and capacities for geolocation and the recording of cultural heritage. The significance of data organization and verification is emphasized in order to guarantee the accuracy and comprehensiveness of the cultural heritage database. Also examined is the idea of thematic interactive maps and their benefits for informational purposes. The thesis then explores how technology and digital interpretation are combined in museums, concentrating on how augmented reality could improve visitor experiences. It examines ethical issues that arise in the use of new technologies and discusses the difficulties and restrictions involved with their use. Examining decontextualization techniques at museums aims to comprehend the effects of taking things out of their original setting.

The thesis emphasizes the significance of preserving context and investigates methods for successfully contextualizing items in a museum setting. The thesis also includes two case studies: the Philippi archaeological site and the Archaeological Museum of Kavala. These case studies show how GIS and augmented reality could be applied practically and assess how they affect the contextualization of artifacts, visitor interpretation, and connections to education. A SWOT analysis is carried out for each case study, and the implementation process's difficulties and restrictions are highlighted. This thesis underlines the value of incorporating GIS and digital technology in outdoor archaeological sites and museums. It offers information on these technologies' prospective applications, advantages, and implementation difficulties. Museums may develop immersive experiences that engage visitors, protect cultural heritage, and advance educational goals by utilizing GIS and digital interpretation.

Introduction

People are naturally curious and have an endless need for knowledge. Our societies share a common thread in the never-ending pursuit of knowledge and exploration of the uncharted. This never-ending quest has compelled us to explore the field of archaeology, where we aim to solve the secrets of the past and learn more about the universe and our own inborn desires.

Through in-depth research and excavations, archaeology has shed light on the origins and development of humanity. Archaeological digs have increased over time as technology developed, exposing a web of connected data. The identification of historic sites and monuments has been substantially facilitated by technological developments like the magnetometer, expanding the field of archaeological study in the modern period. Archaeology has become an interdisciplinary field as a result, including scientists from other fields like physics, geology, and conservation to play key roles in digs. Due to the enormous number of archaeological sites and objects that were subjected to a variety of environmental conditions, which frequently had negative impacts, a multidisciplinary approach became necessary.

The preservation of these cultural riches is under jeopardy as a result of the exposure of archaeological sites and artifacts to variables including carbon dioxide, temperature variations, urbanization, and global warming. In order to identify and organize these discoveries, archaeologists, scientists, and conservators built structures to protect and preserve them. As a result, the requirement to establish museums arose in response to humanity's desire to establish a reliable repository that records the development of our way of life throughout history. The general public has a special chance to connect with and learn about diverse facets of our past through museums, which helps us understand the sociopolitical, economic, and cultural traits of prehistoric societies.

Additionally, museums now serve to establish and affirm the cultural identity of a location, which is crucial for the growth of tourism in urban areas. Urban areas discovered they could attract more tourists and experience quick growth and economic benefits by fostering cultural components through museums. As a result, relics from the surrounding territories were gathered and displayed in major museums, frequently found in the region's capital. Unfortunately, this approach resulted in the surrounding lands being abandoned, which lessened the value and uniqueness of the excavated sites. The genuine core of history was not being captured by museums in their existing form, nor were visitors' profound feelings and thoughts being elicited by the exhibition of items alone.

Experts pointed out this drawback and claimed that removing antiquities from their native settings meant losing vital details about both the objects themselves and the locations where they were found. Immersion in the surroundings of an exhibit has been proved in research to improve visitors' comprehension and experience. Thus, the idea that the exhibition space itself should be seen as an essential component of the content and that displays should be set up in a full environment that can vividly convey their historical and cultural relevance to visitors, arose. The eminent artist Johan Christian Pahl succinctly put it this way: "Museums are laudable institutions, as long as one does not forget that they exist for the sake of the monuments and not the monuments for the sake of the museums."

The physical surroundings and backdrop that include many components and give an in-depth understanding of artifacts and their function are referred to as context in the study of archaeology. When artifacts in museums are shown in glass cases, a physical barrier between the viewer and the object is formed, robbing the exhibit of its contextual information and restricting the viewer's ability to engage in sensory learning, meaning-making, and understanding. As artifacts frequently come from particular contexts, it is essential in archaeology to comprehend the natural landscape and observe the surroundings. Unfortunately, items are frequently removed from their original surroundings, which deprives them of their meaning, for a variety of reasons, including looting or improper methodology.

This study examines how museums may effectively educate the public about the value of artifacts and archaeological findings with a focus on the crucial role that museums play in archaeology. We seek to comprehend how museums might develop immersive and interesting experiences that go beyond conventional displays by looking at the idea of context and its applicability in archaeological exhibitions. In order to improve visitors' understanding and appreciation of archaeological heritage, this study also takes into account the difficulties and factors to be balanced between preservation, access, and technology improvements. We may investigate the connections between archaeology, museum curation, and public engagement by using a multidisciplinary approach, which will ultimately foster a greater appreciation for and understanding of our common human history.

1.0 Description of the problem

Cultural heritage is a priceless asset that includes the ideas, traditions, skills, and artifacts that we have acquired from our ancestors. It is made up of both material things like structures, monuments, and works of art, as well as intangible things like rituals, traditions, and conventions. Because they showcase the history, diversity, artistic brilliance, and technical advancement of cultures, these cultural heritage sites are of utmost importance. Decontextualization, though, poses a grave threat to the preservation of cultural heritage. Cultural relics are being removed from their native context throughout this process, which poses a serious threat to their preservation and comprehension. Cultural treasures lose their historical, social, and cultural significance when they are removed from their proper location.

Decontextualization takes many different shapes and occurs for many different causes. Cultural objects may occasionally be removed and sold for selfish reasons, severing their connections to the communities who produced them. In other instances, historic locations are changed into contemporary buildings that ignore their original use and significance. Even travel, which connects people to cultural history, might unintentionally aid decontextualization by modifying the surroundings and undermining customs (Rezaee, Sadeghi-Niaraki, Shakeri, & Choi, 2021).

Decontextualization is a problem that must be addressed if we are to protect our cultural legacy. It necessitates spreading knowledge of how crucial it is to keep objects and locations in their original setting. In order to stop the illegal trafficking in cultural objects and to make sure that they are managed and protected properly, legal frameworks, international cooperation, and ethical principles can all be extremely important. Additionally, utilizing cutting-edge technology like digital interpretation and Geographic Information Systems (GIS) might provide creative solutions. With the use of these tools, we can geolocate, catalog, and contextualize artifacts and locations to produce immersive and interactive experiences. We can maintain the authenticity of cultural heritage while giving visitors engaging experiences by incorporating technology.

In conclusion, decontextualization seriously jeopardizes the safety and comprehension of our cultural legacy. The importance of the original context must be understood, and protection measures must be taken, immediately. We can guarantee the survival and appreciation of our cultural heritage for future generations by awareness, enforcing the law, and using cutting-edge technology.

1.1 Contextualization methods for Museum

Electronic media have been more prevalent in scientific, technology, natural history, and art museums since the middle of the 1980s. The majority of museum directors and curators have embraced new interactive technologies because of their potential to disseminate knowledge, provide context for exhibitions, and increase visitor numbers. Major sponsors and art patrons are interested in investing in the new technological imperatives, advertising their work and products, supporting the emergence of the uniqueness of art. As a result, they have been more active in supporting events, particular gallery spaces, or contributing equipment. (McLean, Planning for people in museum exhibitions., 1993, p. 152). Children and young people in particular have regularly responded to interactive displays with enthusiasm and have even come to regard them as an essential component of the museum experience (Dierking & Falk, 1998, p. 66).

As Kathleen McLean argues, interactive stations can bring an otherwise static exhibition to life with sound and moving images, provide a variety of information, engage visitors in multiple-perspective activities, and encourage and support interaction between people in an exhibition. Curators who support the new technology claim that interactive stations offer flexibility and new solutions to the problem of representing complex ideas and processes (McLean, 1993, p. 29).

The interactive touch-screen kiosks, computer games, large-screen installations, multi-image videowalls, digital orientation centers, "smart badge" information systems, 3-D animation, virtual reality, and increasingly complex museum websites are just a few examples of how digital technologies have found a place in the modern museum (Grace, 1999). By constantly contrasting massive building from the nineteenth century with the electrical light of a twenty-first- century computer screen, these technologies have altered the physical character of the museum. The museum may now transcend space and time over the World Wide Web, allowing virtual visitors to roam around its always-empty galleries and engage with items in ways that weren't before possible (Perlin, 1998). As exhibit developer Stephen Botysewicz points out, browsing a website is remarkably similar to the "grazing" behavior that museum visitors engage in—moving from attractor to attractor, not always adhering to the programmed march exhibit designers intend for them to take (Botysewicz, 1998).

Despite being embraced by both museum staff and visitors, the increasing use of digital media in exhibition design has also sparked a heated discussion within the museum community. We would examinate how electronic media affects traditional ideas of authenticity in relation to museum artifacts, how multi-media affects museum access, who owns artifacts, and professional ethics, and how

electronic media compares to conventional sources of information in museums like labels, docents, and printed guidebooks. According to some observers, digital technology is transforming traditional public museums, commercial theme parks, and retail centers like NikeTown in New York City into generic "edutainment" places (Mintz, 1994).

All increasingly adopting comparable methods in retail, amusement parks, and museums, as Michael Welch, Manager of Nike Global Retail and Design, has asserted. The role of electronic media in what is seen as a "third evolution" in museum exhibition techniques (following those at the turn of the last century and in the 1950s and 1960s), the nature of interaction in modern museum exhibit design, and the tension between the museum as a place of uplift and rational learning versus one of amusement and spectacle have dominated these discussions.

Even though there is still a ton of research to be done on the effects of electronic media on museums, one striking aspect of current debates is the feeling of déjà vu that comes from historically disparate responses to the same problems, such as modernization, interactivity, and the conflict between education and entertainment. For instance, current warnings against the "Disneyfication" (Roberts, 1997, p. 69) of natural history museums are reminiscent of concerns made in the early 20th century, when critics argued that the use of popular display techniques like habitat groups, lantern slides, and motion pictures needed to be carefully regulated to avoid tainting the exhibits' and the institution's reputation for science with their associations with popular culture. In current discussions about multi-media exhibits in public museums, the discursive oppositions between science and spectacle, information and entertainment, and passive and interactive spectators that were first articulated in relation to these visual technologies one hundred years ago have repeatedly resurfaced (Griffiths, 1998).

It's important to show how current museological discussions about the use of electronic media may be traced back to attempts made a century ago to increase public access to museums through the use of new visual technologies and presentation methods. However, as the first generation of professional curators started to tear down the "storehouse of curiosities" model of the traditional nineteenth-century museums (both literally and figuratively), many of them recognized that the move towards more popular exhibit techniques ran the risk of obfuscating the lines between the museum as an institution of moral and social uplift and other less reputable cultural sites.

Therefore, a number of experimental displays suggested (though not always erected) at American and European museums during the beginning of the 20thcentury might provide hints for understanding modern museum attitudes toward new media technologies. At one extreme, Félix-Louis Regnault, a French scientist,

predicted the multi-media museum and website in his turn-of-the-century proposal for an exhaustive ethnographic archive. Anthropologists and the general public might easily access written texts, audio recordings, and still and moving photos of indigenous peoples in Regnault's hypothetical ethnographic museum (Bloom, 1993).

A more mundane interactive exhibit was created in 1901 by the Metropolitan Museum of Art in New York City, allowing visitors to flip the pages of an art book by placing their hands into the side of the display case (Bather, 1968, p. 273). The suitability of various methods of visual display for museums highly conscious of their social function in a culture experiencing the stresses of rapid industrialization, urbanization, and immigration was debated by contributors to professional museum journals like the British Museums Journal (1901) and the American Museum News (1924), as well as popular journals like The World's Work, The Outlook, The Independent, and Popular Science Monthly.

Late nineteenth-century curators tasked with the challenge of making exhibitions more accessible turned to creative ways of exhibit design in quest of acceptable precedents for the modern museum in response to what they perceived as the dwindling attention span of the urban museum visitor. Firstly, analyzing the initiatives taken by curators at the start of the 20th century to develop new paradigms of museum collecting and exhibition, and these prototypes serve as the foundation for discussion. Secondly, discussing some reactions to these modernization efforts, such as the worry expressed by some museum cognoscenti that modernized display techniques might backfire on the curator by leading the viewer to believe that "he is in a raree show" rather than a place of higher learning (Bell, 1903).

Dr. Lichtwark predicted a "major revolution in the equipment and practices of museums" at the "Museums as Places of Popular Culture" conference in Mannheim in 1903. The conference's main objective was to think about how museums should employ photography and magic lantern slides to make themselves more approachable to working people (it was thought that the higher classes were "above teaching"). At the conference, curators also highlighted the necessity for displays to be conceptualized around a clear theme rather than serving as crammed collections of materials (Fritsch, 1903).

Francis Arthur Bather, the president of the British Museums Association, said that the physical crowding of museum galleries and display cases caused a mental congestion in the visitor as a result of staring at unending rows of identical exhibits. Nothing is more tiresome to the eye, less advantageous for the individual objects, than those long stretches of cases, all to one pattern, covered in black velvet, that are so frequently seen in museums, according to Norwegian curator Dr. This, who was speaking at the Museums Association's 1903 Aberdeen Conference.

Contemporary designers have purposefully added empty or negative spaces in galleries to allow visitors' eyes to rest and to prevent overstimulation in order to compensate for the sensory overload experienced by museum visitors (Thorburn & Jenkins, 2004, p. 343).

Many nineteenth-century museums were condemned for being overcrowded, as well as for the display cases' substandard construction and usually ugly or flashy design, which competed with the items on display for visitors' attention. Henry Crowther, curator at the Leeds Museum in the north of England, urged curators to take into account the display case's inherent limitations, contending that an overstuffed, excessively labeled display case couldn't possibly convey the curator's or assistant curator's thoughts when they were placed there (1905). George Browne Goode, Director of the National Museum at the Smithsonian and a well-known expert on museum design in the early years of this century, made the most radical recommendation for the redesign of display cases and labels when he suggested a collection of succinct, well-expressed labels that were illustrated by a small number of carefully chosen subjects (Baker, 1902).

However, the status, appearance, and purpose of labels were debatable issues within the museological community at the turn of the century, with critics adopting stances along a continuum. For instance, Dr. E. Hecht claimed that Goode's thorough labeling proposal wasn't likely to have much of an influence on visitors' interest in and comprehension: We can certainly enlarge and magnify the labels, and we can have or really should have guidebooks with accompanying illustrations. Hecht said that labels are not usually read, and even when purchased, guidebooks are rarely read (Hecht, 1903).

As museum professionals disputed exhibit design trends in the early 20th century, they wrote more and more about the necessity to contextualize the artifacts on show, a philosophical change that in many ways foreshadows the employment of interactive technology in modern museums. For instance, British curator F.A. Bather stated that the sheer act of removing items from their native setting disadvantages them in 1903, even when there is nothing notably repulsive or inappropriate in the way of presentation (Bather, 1968, p. 81). Implicitly appreciating the poetics and politics of museum display, as Ivan Karp and Stephen Levine term the discursive consequences of showing artifacts. Dr. Hecht advocated the use of "stopping spots" in galleries in 1903, which he characterized as exhibits related to the main show but selected to sometimes pique the public's interest and guide them away from the view of a particular animal and toward more expansive concepts or a general conception. Hecht's "stopping places" foreshadow one important application of computer installations in modern museum architecture by encouraging visitors to

halt and make connections between an object on display and its uses and settings (Karp & Levine, 1991).

It is remarkable that these concepts were first put forth a century ago, despite the fact that the recent explosion of interactive technologies points to an emerging model of museum spectatorship in which context and interactivity play increasingly important roles in structuring the museum experience. One curator observed in 1905 that a youngster would retain more knowledge after learning it on his own than after receiving an hour's worth of instruction.

The Rotary Cabinet, created by the Reverend S.J. Ford in 1907, was an early attempt to make museum display cases more accessible to visitors. It allowed objects to be viewed at will by museum spectators, who could rotate for display each drawer in turn by turning a driving handle on the side of the cabinet. This mechanism had the benefit of allowing all the specimens to be moved to the top of the display case for viewing without "opening the cabinet or disturbing the specimens." Reverend Ford promoted its usage in museums, schools, and homes, saying that due to its straightforward design and operation, "even a blindfolded child could use it" (Ford, 1907).

Early commenters offered suggestions for interactive exhibitions at museums, and it's important to note that many of them were women. When school groups visited the 48 by 32-foot Whitechapel Museum in London in 1901, Kate M. Hall, the curator, advised that if feasible, the exhibits the groups desired to examine should be taken out of their cases. In order to engage a kid in an interest and affection for living things and to prevent them from mistaking the study of natural history for a study of solely dead things, Hall was a strong proponent of drawing linkages between living specimens and the dead ones in the cases (Griffiths, 1998).

This discussion of interactive displays acknowledges the tactile delights that come with handling exhibits, which is why Discovery Rooms and Hands-On Centers are so popular in modern museums. H.C. Bumpus criticized the practice of imprisoning specimens in cases in a piece he wrote at the time, contending that in some situations, exhibits should be visible to the public, as the 1906 Elk Group at the AMNH. Bumpus contends that curators must take into account the "touch sense" of their audience and, wherever practical, work to dispel the sensation of disconnection that comes from viewing artifacts via glass. It's fascinating to notice that using various materials for the flooring, gallery seats, display panels, and other areas of the museum may heighten the haptical pleasures of the exhibition gallery for visitors, who are drawn to the tactile surfaces of the artifacts on show. (McLean, 1993, pp. 135-136). Although Bumpus's plan to remove his exhibits from their glass cases presented logistical and security challenges for museum staff, his vision for the natural history museum of the twenty-first century is remarkably sympathetic to

contemporary statements on the educational goals of museums and the role that new technologies can play in advancing these ends.

Even though they increasingly adopt commercial practices into their operations and retail and leisure complexes turn to museums for guidance on how to incorporate media into their exhibits, museums have never had it easy maintaining a balance between their civic mission and the economic market. We can't help but wonder about the future of not-for-profit organizations as retail stores with interactive kiosks increasingly resemble museums and museums with flight simulators and corporate logos merge with theme parks. This is especially true when businesses like Discovery Zone, a Chicago-based corporation that provides for-profit play centers for kids, aggressively compete with public children's museums for patronage (Mintz, 1994, p. 32). But how did curators respond to the issue of balancing teaching and entertaining a century ago?

Over the span of the 20th century, not much has changed in certain areas. The necessity to make learning enjoyable was recognized by curators at the beginning of the century just as it is now. As Lisa C. Roberts has pointed out, some critics lamented the sensationalist tendencies of turn-of-the-century museums, while others claimed that they were inaccessible to the general public because of their excessively scholarly preoccupations. Goode himself expressed this ambivalence toward museums by calling them "both vulgar sideshows and elitist enclaves" (Roberts, 1997, p. 22).

Years ago, technology appeared to hold out the possibility of offering many curators a way to preserve the proper balance between science and spectacle. Dr. Ant Fritsch was one of the first curators to advocate the use of phonograph records in exhibition installations when he talked about the value of free daily lectures for drawing visitors to museums in 1904. According to Fritsch, the day may not be too far off when we will be able to obtain the pleasure of a brief lecture about an exhibit by placing a dollar into a phonograph next to intriguing items in the museum (Fritsch, 1903, p. 255). The display strategies of world's fairs and expositions, where a great many of the modern methods of exhibition were pioneered, had already adopted Fritsch's idea of using the phonograph to provide contextual information onan exhibit, one of the key objectives of contemporary interactive technologies.

However, there is also a disapproving undertone to this, as if the curators ran the danger of undermining or oversimplifying scientific concepts in order to make the exhibitions more approachable to the general audience. It is striking that this conflict between scientific rigor and public appeal entered the conversation on museum exhibitory at such an early stage, even if it is something of a cliche in current museum criticism. However, many critics appear to feel just as uneasy about

how advertising, movies, and the internet have affected display techniques now as they did about an earlier collection of technologies at the beginning of the century.

Another method curators used to improve the aesthetics of display cases and the effectiveness of intended object-lessons was "contextualizing museum objects" within realistic settings. Despite the cost and space requirements, habitat groups and period rooms continue to be well-liked by visitors because the impact of a recreated environment can enhance the sensory experience of space and time travel (McLean, 1993, p. 23). At the turn of the century, illusionistic displays of indigenous people against diorama backgrounds and habitat groups, which showcase the flora and animals of a specific place, were among the most common and pricey exhibition techniques (Howarth, 1909).

One English writer noted that this attempt toward realistic exhibitions acknowledges the reality that unless we get as close to nature as possible, we will never be able to instill a love of nature into the brains of people who do not already have it. However, not all curators held the same opinion. At the Museums Association 1906 conference, one dissenter claimed that museums had recently gone too far in what could be described as "bringing the scent of the hay over the footlight." This statement seems prophetic now that some modern museums use virtual reality installations (Griffiths, 1998).

This critic asserts that "Slabs of Nature" were bodily moved into museum displays, and "their teachings were rendered so evident that people considered it simpler to wander into a museum to understand the behaviors of animals than to lie in wait for them in their natural fields"... As a result, rather than producing naturalists, our museum assisted in the loss of observation, the primary skill of a naturalist. More generally, others claimed that the habitat and life groups' emphasis on sight as the primary source of knowledge would result in viewers becoming sluggish and losing their visual acuity (Griffiths, 1998).

For some early 20th-century critics, the overt theatricality and voyeurism of realistic exhibitions, as well as their propensity for sensationalism, represented the museological equivalent of cheating. In contrast to how the habitat group recreated lovely (or occasionally violent) vignettes of wildlife, the installation's hyper-realism highlighted its inherent artificiality.

1.2 General Overview of chapter

Modern critics of the use of interactive technology echo the claim made by early detractors that habitat groups and other illusionistic exhibitions may inspire amazement in the viewer without providing much in the way of scientific explanation. For instance, Chandler Screven has suggested that the three-dimensionality of displays, as well as their novelty, gadgetry, and manipulative elements, might have intrinsic curiosity and stimulate attention, but they can also draw spectators away from the key concepts, distinctions, or plot line. According to Lisa C. Roberts, who shares this opinion, evocative display settings and cutting-edge technology may instead wind up overshadow[ing] the things they were intended to show off.

These technologies fight for space as well as attention, since each new gadget reduces the amount of display space available (Roberts, 1997, p. 86). Tim Caulton has remarked that there is less empirical support for the claims that interactive displays improve visitors' understanding of show topics or correct misunderstandings. Although the educational benefits of interactive displays may be strong, the available research is fragmented and primarily anecdotal. Interactive exhibits are still a relatively unexplored field of study for rigorous research into how people learn in unstructured situations (Caulton, 1991). However, it is evident from the limited studies that have been done that visitors love utilizing interactive displays, and that digital and electronic media have found a place in the museums of the twenty-first century. Given the ongoing discussions about the introduction of new museum technologies, curators would be well to think about what can be learned from the past as they assess the ontological position and educational valueof the electronic artifact.

2.0 A thorough review of new technological data

We already knew that the Fourth Revolution, or Turing revolution, transformed us into information-generating and information-sharing creatures that interact with other species in the so-called "infosphere". The term "non-biological" evidently applies to computers, machines, and their "artificial intelligence"-added minds. A flood of data generated by machines processing every element connected to the internet is changing not only the way we communicate, purchase goods and services, and move through space, but also the way we practice medical therapy and preventative measures, or, on the humanities side, conduct historical research, philology, and textual criticism (Floridi, 2017, p. 27).

It is what is referred to as "data-driven" science. In order to highlight the first of the problematic aspects of AR and other virtual technologies, which is frequently symbolized by their impermanence, let's start specifically from the information sciences: many data and many realisations are conceived for an ephemeral duration, often only coinciding with the time of a themed museum display or exhibition. This flaw, the failure to systematically link the contents conveyed by these instruments of immediate and spectacular fruition to data storage and preservation platforms that preserve their "scientific nature," the "quality control," generates a sort of cognitive double track that does not add value to the information. This flaw can be seen from the perspective of preservation and, consequently, of historical and collective memory linked to museum-library institutions (Day, 2021).

It's true that some cultural institutions have already been able to combine digital information tools and displays with their individual or collective multimedia collections organized in accordance with international standards, but most of the time these are standalone items that move through various, disjointed, and discontinuous channels of use. This is especially important in light of the potential applications for knowledge and objects represented in novel and "augmented" ways by the scientific community of reference, such as those I shall briefly discuss from some of the case studies examined. The "grey area" of these technologies, according to semioticians, is that they constitute a form of "hidden media" (Brunelli, 2017).

Semiotic studies on the so-called new media have understood this before other disciplines and have made it the subject of their own analyses that they have never before been able to intersect and integrate with the reflections and diagnoses that information technicians, librarians, archivists, or museum curators make in the face of the new technological advances.

According to the most recent semiotics research, the idea of the real world as a natural world that is, a universe that presents itself to man in a way that is

"decipherable and interpretable" has expanded into the idea of the Hyper world as a result of the development of virtual and immersive experiences. A hyper-subject, or the owner of the mobile device, mechanical prosthesis, and its digital contents, perceives this Hyper world. Insofar as the percipient subject becomes the point of passage for a dual information flow one coming from the "natural" world and the other from the "virtual" one through the prosthesis, this is known as a hyper-subject (Finocchi , 2016).

The new experience patterns that electronic information goes to trigger and generate in the New Media Age, also known as the Postdigital Age, produce new semiotic flows of space-time-subjectivity. In other words, they create new sense interactions between people and languages by continually navigating between various discourse universes (textual, visual, tactile, and auditory). The seeming immediacy with which the datum is encountered in these new sense interactions frequently dissolves the intermediate barriers of critical thinking. Regardless of any inquiries about the source, it, the datum, is frequently taken for granted that it is factual, legitimate, and real (Tomaselli & Tomaselli, 2021).

The more user-friendly interfaces get and the faster the needed information can be accessed with a few movements, such as a few physical touches, the less the human, technological, and conceptual labour that went into such realizations and its apparatus of ideological signification is noticed. With no required references to the cognitive and symbolic processes that the awareness of a percipient subject produces, the matter looks more severe than it may be since gesture is not neutral and creates neural traces. In other words, the knowledge that the subject learns through these intermediary tools is seen by the subject as miraculous epiphanies. Now, the process that defines critical thinking is the exact opposite of the pondering of miraculous epiphanies (Brunelli, 2017).

Whereas logical thought produces knowledge, magical epiphanies construct mythology. Both of these representational and explanatory models of reality have peculiar justifications in various contexts. However, the true risk is that during a "high" pleasure of the cultural product, the cognitive datum will be reduced and trivialized to simple spectacle, where important contestational aspects would be neutralized or even repressed. Precise value signals and ideologies may be delivered in this way, covertly, through the narrative framework of contextualization and presentation, under the guise of seeming realism and naturalness (Cahoone, 2005, p. 99).

These patterns and structures are not "neutral" depictions of reality. They serve as representations of other civilizations, worldviews, philosophies, and new disciplinary fields of study. The covert manipulation that is inherent in the spread of these types of fruition and experience is the real sociopolitical bogeyman, whether it

is intended to promote compulsive buying or, much more sinisterly, to spread ideological instrumentalization, encourage unconscious behavior, or develop social mythologies. Last but not least, we draw attention to the warning sounded by academics who study education, which in turn includes, as noted above, cross-disciplinary connections to the semiotic and cognitive components just discussed (Brunelli, 2017).

The identified concern is that the dystopian scenario of Hyper-Reality is already manifesting itself in a cognitive experience where the virtual object predominates over the "actual" thing. And that is, when comparing a virtual item or narrative to its real-life equivalent, the former tends to pique the viewer's attention and engagement more so than the latter despite not necessarily being recreated with great philological accuracy. That is, the observer is so engrossed in the virtual experience that he loses sight of the actual artwork, statue, or monument in front of him while slumped over the tablet: However, integrating technology should not be the primary design driving factor if the initial purpose is to improve the visitor experience (Tomaselli & Tomaselli, 2021).

Technology should be seen as a mediator to enhance the visitor's experience rather than a tool that draws attention away from the cultural object or location and onto the technological device, as was addressed in. The experience must satisfy the educational objectives that underlie most cultural heritage sites while also being appealing and entertaining from the users' point of view. We do, without a doubt, live in a social environment where philological rigor and historical framing of information products are frequently sacrificed to ever-increasing demands for spectacularization, which not only produce "fakes," but also train people to stop questioning the quality and "sources" of what is represented, flattening and trivializing any data on the level of emotional capture or so-called "effect"! (Kim, Youn, Um, & Lee, 2015).

Therefore, between trivialization and counterfeiting, AR applications—whether they be games, fiction, or shaky historical reconstructions—can potentially spread false information and end up becoming a kind of "pollutant" that obstructs learning and understanding. There have been several instances of immersive "games" that have devolved into historical fictions for no other reason than to favor the spectacularization of a representation, as well as pseudo-historical tales that have supported key museum accomplishments (Kim, Youn, Um, & Lee, 2015).

Giving as an example, among others, the historical reconstruction in which two well-known structures that are not at all adjacent were combined in a virtual reconstruction only for the aim of improving the attractiveness of a narrative sequence. In keeping with the maxim that it is better to blame the sinner than the sin, we will refrain from mentioning any other well-known instances and instead

limit our discussion to the following observation: If historical forgeries are already highly dubious and embarrassing within other media uses, such as fictions and TV miniseries that are rife with them, the thing becomes, in my opinion, inadmissible in those spaces and contexts where a specific mission of high cultural dissemination is acted out (Brunelli, 2017).

There is no popularizing excuse that justifies any exemption from the rule that museums and libraries are also institutions that generate culture, research, and information that adhere to scientific rigor in their presentation of their heritage of artifacts and papers. The subject is undoubtedly complicated, far more so than the concerns we've emphasized here may indicate. For instance, we haven't discussed the issues raised by the many prosthetic devices and how they interact with the environments in which they are used, or the issues raised by the security of user data and their privacy.

3.0 Technologies and Digital interpretation

Information technology must be used because of the prevalence of digital technologies, which extends to archaeology (Saygi & Remondino, 2013). Modern workflows have shown to be durable and reasonably priced for managing heterogeneous data from many sources. This is a crucial part of archaeology, and the rapid development of digital technologies for data registration, collecting, and administration has made them necessary at every level and crucial for preserving and safeguarding cultural heritage (Anichini, Bini, Bini, Dubbini, F., & Gattiglia, 2012). Geographical Information Systems (GIS) have shown to be the more adaptable computerized tool for the preservation and protection of archaeological data finds (Salonia & Negri, 2003). Despite the incomplete integration of 3D information, complex data may be managed, allowing information from many parties and stakeholders to be stored. GIS features are becoming more and more intriguing, yet a true integration of digital data is still lacking. Given the enormous volume of data that is very challenging to store into a sophisticated structure, this integration for the archaeological domain may be straightforward.

Due to data heterogeneities in terms of source information, divergent temporal parameters, and classification of findings, this problem exists (Anichini, Bini, Bini, Dubbini, F., & Gattiglia, 2012). Thus, it is essential to fulfill both internal objectives—such as classification, documenting, protection, and administration of the archaeological heritage—and external objectives—such as communication via the online portal. In actuality, two categories of users stand to gain from this

strategy: first, the insiders, such as archaeologists, specialists, and conservators (Malinverni, Pierdicca, Giuliano, & Mariano, 2018). The second group consists of the visitors, who can use the advantages of modern communication techniques to increase their knowledge. In order to address these latter issues, there is currently a need to offer immersive and multimedia solutions, making culture more accessible, tangible and communicative and promoting the idea of an edutainment experience (Pierdicca, Malinverni, Frontoni, Colosi, & Orazi, 2016).

Modern museums incorporate technologically advanced interactive systems, which is a streamlined research area that is crucial to providing visitors with a great experience enticing them. Museums and archaeological sites are creating cutting-edge teaching and communication technologies to achieve this goal. The use of virtual reality (VR) and augmented reality (AR) in the context of cultural tourism is the subject of an expanding corpus of study (Dilek, Doğan, & Kozbe, 2019). The visitor experience can be favorably impacted by VR and AR, according to prior research. However, these studies often do not focus on how these technologies should be developed to suit the context or provide value to visitors and/or insiders.

By analyzing the effects of VR and AR technologies on the visitor's learning experience, Han, Weber, Bastiaansen, Mitas, & Lub (2019) explores factors impacting the tourist experience in the context of cultural tourism from a theoretical viewpoint. Therefore, museums are utilizing augmented reality technologies. With AR, museums can overlay their virtual world directly over what visitors see, giving exhibits and artifacts a fresh new life.

Some museums are beginning to look for methods to incorporate more interactive and tailored elements that might improve the tourist experience, much like QR codes, mobile phone guided audio tours, and smartphone apps have become frequently utilized mobile features in museums all around the world. Virtual museum exhibits that employ Web3D and AR technologies are becoming more and more popular (Blanco-Pons S. , Carrión-Ruiz, Lerma, & Villaverde, 2019).

The latter exhibits an augmented reality (AR) tool created to facilitate comprehending and visualizing on-site scenes of faintly painted rock art utilizing cellphones and feature-based tracking. The ARToolKit library has been used to develop the AR app in Unity. In order to evaluate the app and determine how to measure performance and user satisfaction with the created AR app, a usability test using a questionnaire to a set of visitors was conducted. Another similar method is described by (Kyriakou & Hermon, 2019). The authors have implemented an AR application that enables natural interaction with specific geometric models from the museum's collection using a smartphone in a Head Mounted Display (HMD), the Leap Motion, and software made in Unity3D.

The outcomes were added to WebGIS and/or made accessible through Android applications for tablets and smartphones. Additionally, the actual world may be integrated with data from other sources that has been enhanced with images, text, and multimedia materials using VR and AR. A 3D point cloud is converted to a 3D mesh, saved and shared to an online repository, viewed in VR/AR, and then the 3D content is deployed to a Mixed Reality environment (MS HoloLens) so that users can interact with the virtual content. This is the workflow that is depicted by Rahman, Champion, and Bekele (2019).

In order to analyze the "life history" of watercraft, researchers at the Australian Centre for Visual Technologies have created techniques for creating geometric models from archival information. Additionally, the method can be a helpful analytical tool in the analysis of abandoned and damaged ships (Hunter, Jateff, & van den Hengel, 2019).

In reality, a wide spectrum of users and potential visitors may be impacted by virtual technology, including people who have trouble walking and those who are unable to fully appreciate an in-person cultural experience. It is crucial to draw attention to the subject of cultural experience's usability, accessibility, and pleasantness since it must enable anybody to have a fulfilling experience under conditions of independence, comfort, and safety. The utilization of cutting-edge technical tools, which were previously exclusively used for pleasure but are now increasingly helpful for educational reasons and supporting the disabled, can now be used to meet needs. Numerous VR and AR efforts have recently made it easier to remove obstacles for persons with impairments (Blanco-Pons S. , Carrión-Ruiz, Lerma, & Villaverde, 2019).

Immersive reality apps make it easier for many handicapped persons to reach places like large archaeological sites or natural landscapes by creating the audio-visual illusion that they are in a museum. Through the use of historical reconstructions and documentation, disabled persons may also "journey through time" and experience the past. It is also possible to "see the unseen," or to perceive what has been discovered but has remained concealed from view due to preservation efforts, material fragility, or human negligence. The audio App and replica museum artifacts that are "sensitive" to touch, created via the integration of technology, lead blind or visually impaired visitors through story-driven, thematic journeys, creating a "augmented" experience (Baik , Yaagoubi, & Boehm, 2015).

The intricacy of the data generated, however, necessitates an additional step before they can be fully managed by various parties. Geomatic techniques have advanced to the point where the level of precision and detail allow for any type of survey, even in challenging situations, and allow for the storage of a significant amount of 3D data. To extract this 3D data that has been enhanced with descriptive

information, multiple multimedia methodologies must be used depending on the amount of involvement and communication that is desired. Actually, the creation of digital applications is made easier and more streamlined by the integrated administration of the many information layers that make up the floor (Malinverni, Pierdicca, Giuliano, & Mariano, 2018).

Therefore, the novelty is in the management of a data flow that can be accessed by many actors via various platforms: GIS specialists and visitors with the aid of applications, producing a cutting-edge user interface for content exploration in accordance with various user profile levels. Information is not replicated in this way, and depending on the degree of interaction needed, every player in the value chain of cultural assets can gain from them.

4.0 Visitors Interpretation and connection with the education

The encyclopedias of the late 19th century show that "with the contemporary museum in public hands, the highest stage of development has been reached, which guarantees the best possible understanding of social aspects of the use of things" (Blank & Debelts, 2002, p. 133). Art museums and cultural history museums are recognized as research institutions on a par with universities. Reform pedagogical endeavors also take hold of museums and shape them as educational institutions. During this time, didacticians and educationalists develop concepts that deal withthe possibilities of cooperation between museums and schools, museums and other educational institutions, e.g. for the working class. The museum is increasingly understood as an educational institution for broader social strata. Museums as places of popular education were first mentioned in the writings of the Centralstelle für Arbeiter Wohlfahrtseinrichtungen in 1904.

In the development of new target groups, the focus is not only on art museums, but also on museums for arts and crafts and trade, which, as in the example of Berlin, are already seen in 1868 as educational institutions, especially for trade students. A statute was drawn up for the Berlin Trade Museum, which contained the educational tasks of the museum. The teaching methods include lectures, exercises, extemporales and competitions among the pupils. In the early 20th century, the art museums in Berlin also become "places of teaching". The aim is to achieve "the formation of value judgement and insight into the relativity of forms" in museum lessons for older young people. In the 1930s, art museums were often rejected as a means of teaching art education, but on the other hand they were to be available for teaching groups from childhood onwards (Holub, 2014, p. 28).

Depending on their unique qualities, the techniques used in museum educational activities place more or less of an emphasis on learning, entertainment, participation, experience, personal expression, and invention. Constructivism (Hein, 1998), multiple intelligences (Gardner, 1993), but also with regard to the concept of experience (Falk & Dierking, 2012) and active participation, contemporary theoretical approaches emphasize the individual specificities of the visitor with regard to the ways in which he or she perceives reality and the meanings he or she forms, leading to an ongoing enrichment of methods used in museum education practice.

Dreykorn and Wagner state that a wide range of techniques have been used in museum education, including oral expression, writing, music, dance, experimentation, research, reflection, imitation, making associations and connections, comparison, interpretation, and the expression of judgments. At the same time, since these are real-world museums with real exhibits, emphasis is put on arousing all of the senses: sight, smell, hearing, touch, and taste (Dreykorn & Wagner, 2007, p. 159). The above is also reinforced by the expanded dimension of museum learning, which goes beyond merely learning facts and concepts to include concerns of enjoyment, creativity, inspiration, the development of skills, views, and values with the goal of fostering individual and societal participation (Hooper- Greenhill, Museums and Education. Purpose, Pedagogy, Performance, 2007).

When educational procedures are carried out with the assistance of animators or other competent museum professionals, or in direct communication activities, known as educational programs, which comprise a fundamental area of application for museum pedagogy, then museum pedagogical techniques are used. An educational process that takes place in museum spaces, is directed toward visitor groups, is developed in phases, and involves various sorts of individual activities and approaches is sometimes referred to as a "educational program."

For instance, an educational program may employ the storytelling technique with a brief guided tour or tale telling, then move on to a conversation about the use of midwifery or an investigation of the museum space, and finally to some sort of hands-on, creative activity. Along with maintaining participants' attention, methodological variation in educational programs offers chances to tailor instruction to the needs of individual visitors by highlighting the unique aspects of each approach.

The development of various methodologies that can enable them to participate in learning about culture has also resulted from the recognition of audience specificities and the existence of various target groups, provided that appropriate planning, trained staff, financial resources, infrastructure, and knowledge of the audience, their knowledge, expectations, cultural background, and

emotional and physical needs are present (Kunz-Ott, 2011, pp. 6-9). Through the development of connections between the exhibits and their lives, the expression of personal interpretations, and the encouragement of creativity and inspiration, these educational processes seek to facilitate visitors' intellectual and emotional access to the exhibition themes. They do this by encouraging them to discover the meanings inherent in the museum exhibits and the exhibition space as a whole.

According to Hooper-Greenhill (Hooper-Greenhill, 1994, p. 190), museum pedagogy serves as a "advocate" for visitors and builds bridges between the public and the museum, as well as between science and the general public and the reality of the museum as experienced by its visitors (Rese, 1995, p. 174). Therefore, direct communication activities serve as a "live interpretation," or additional level, of understanding of the museum setting. While simultaneously acting as a supplement or even a correction to the communicative quality of exhibitions and other supporting interpretative media, they influence the pedagogical settings in museum spaces.

Direct communication activities remain the most efficient ways to communicate and experience museum contents, despite the richness of the procedures for engaging museum material using both print and digital media (Dreykorn & Wagner, 2007, p. 159). The dynamics of interpersonal communication are to blame for this. Even in this day and age, with the proliferation of technology and media in educational processes, they are still seen as essential for the interaction between humans and themselves, their surroundings, and any other human communication relationship (Bakirtzis, 2002, p. 167). These exercises in particular help to create two levels of communication: a. on the basis of the object- content-theme and b. on the basis of the connections between the communicators. That is to say, the opportunities for visitor-exhibit engagement are further enhanced by the communication connections that grow between animators and visitors as well as between visitors. Direct communication activities, on the other hand, may adapt to each visitor's specific needs and requests, allowing for unplanned responses.

Each museum pedagogical methodology's implementation is founded on the idea of realizing the visitor's "encounter" with the museum item and the contents of the museum as a whole, as well as on the usage of the museum space as a built environment with educational goals. The museum space incorporates all of the exhibits and interpretative systems from an exhibition, as well as how they are arranged and how the exhibition's contents are presented in the exhibition space. It serves as the fundamental setting for the application of museum educational approaches.

In addition to facilitating aesthetic, embodied, and performative learning processes, the exhibition itself, the atmosphere it exudes5, creates an invisible

formative context, arouses impressions, emotions, and stimulates curiosity (Lewalter, 2009, p. 51), and establishes the possibilities and constraints for the use of museum pedagogical methodology. The character of a visitor's "encounter" with a museum object which stimulates the senses in many ways and leaves a lasting impression on the visitor is determined by the museum spaces and items (Popov- Schoßer, 2013, pp. 180-81).

When a technique piques a visitor's curiosity in the exhibit's artifacts, prompts personal inquiries, and inspires them to seek out answers, or otherwise encourages interaction with the museum's actual exhibits, it is deemed effective (Dreykorn & Wagner, 2007, p. 160). But even more significant is the fact that it offers inspiration for (further) learning, fulfillment from shifting perspectives and discovering new interests (Lewalter, 2009, p. 49), chances to cultivate creativity, sources of inspiration, and amusement. However, it is crucial to remember that approaches' selection and deployment in museum education practice rely on a variety of criteria rather than being assumed to be "recipes" for every circumstance:

- Target group: As far as the target group is concerned, three parameters are central to the choice of methods: 1. the characteristics of the group (age, preferences, interests); 2. the conditions of the visit (individual visitors, families, school classes, organized public groups); and 3. the number of people participating in the activity combined with the capacity of the premises and staff.
- Implementation site: Spatial conditions include the individual elements of the exhibition environment such as the mode of display and staging, the character of the interpretive systems, the possibilities for visitors to move around the space and for individual or collective approaches to selected exhibits/subjects. They also include the availability of complementary spaces such as workshops and educational programme spaces.
- Educational targeting: The implementation of methods must take into account the specific characteristics of the museum as a space of non-formal education, which focuses on the self-determination of visitors; that is, it must take into account the possibility of individual decisions in shaping the learning process and the experience of their individual abilities without the requirement of special knowledge (Lewalter, 2009, p. 50), along with opportunities for experiential learning, empathy, personal creative expression and self-realization.
- Communicative dimension: The possibilities for interaction, active participation and communication that can be developed between all parties involved - visitors and animators - during the implementation of a method influence the audience's experience.6 The aim is not a teacher-centered course with (Dreykorn & Wagner, 2007, p. 159), so that the role of animators

> and their attitude in the whole process and in the emergence of museum animation as an 'art' is crucial (Zacharias, 1992, p. 9).

The numerous museum educational practices that have been established to approach museum exhibits and museum subjects are highlighted by the varied activities in which they are used. Due to the uniqueness of the museum as a learning place, the unique shape and significance of distinct learning techniques are emphasized. As a result, we see that narrative takes the shape of guided tours, midwifery takes on specialized aspects in the way it engages with museum displays, and exploration involves using the museum space as a built environment with educational goals.

The growing emphasis on participation and experience is primarily realized through experiential-creative activities, which in museum education are considered as stages of a differentiated and meaningful encounter with culture, art, and science as well as goals of personal creative expression. Methods and activities serve participation, experience, and invention in varied degrees, and since they are forms of direct communication, the animator's role is crucial.

5.0 Introduction to GIS

A GIS is first and foremost an information system designed to acquire, store, structure and communicate spatial information, enabling the creation and management of geo-referenced databases. Like any system of this type, it is based on three main components the hardware (software, machine, server, network...) the data (referential, thematic, large or small scale) the human resource (geomatician, decision maker, client, users) (Sutton, Dassau, & Sutton, 2009).

Concerning the hardware, GIS is a computer tool that offers acquisition, analysis, representation and display functions. There are now various solutions, whether in the form of office software or an intranet or Internet network interface connected to local or global servers. GIS data comes in many forms and ways. They can be geographic or alphanumeric, or referential (Cerema). The human resource is the third essential component of a GIS. The GIS allows indeed to interconnect the users and their competences with the means and the orientations given by the decision-makers or sponsors, with the users also, who can thus reach the territorial information by modern means of consultation and communication (Sutton, Dassau, & Sutton, 2009).

Local authorities have to deal with increasingly complex land use planning issues. In order to respond, they need tools to help them make decisions. The GIS is one of these tools in the sense that it allows a synergy between geographical elements and the actors of the territory, while offering to the elected officials and to the citizens a cartographic representation of the data of the territory, for example of the actions led on the territory. The implementation of a GIS within the communities seems essential, since it will then take the form of a tool for decision support in its own right. First of all, it is a tool capable of integrating databases of the territory, as well as the creation of thematic cartographies, helping to make decisions on themes as diverse as roads, urban furniture, networks, green spaces, building permits, addresses, household waste collection, heritage, etc. It will also be useful to underline that geomatics agents confronted with the development of the uses of geographic information in their organization will be able to improve the knowledge of the territory and a better service to the citizen. Thus, local authorities can have at their disposal a GIS to help them solve the problems posed by data management and serve as a prospective support offering a global and transversal approach for users, decision-makers and citizens (Yeung & Hall, 2007).

In this point, we want to show how the GIS can answer the territorial problematic of the project, being in particular tools of geospatial inventory, modeling, management and analysis of the geographical space constitute an instrument of management and valorization of the traditional heritage. The multifunctional geographic management capacity of GIS is used to support many territorial projects. In this project, the GIS tools will allow the creation of a geolocalized database of the elements of the heritage and small heritage, which will contain specific information (GPS coordinates, municipality, place, typology or state of the monument). These tools allow to store a large amount of spatial data, as well as to manipulate them, being thus at the service of the territory (Sutton, Dassau, & Sutton, 2009).

The manipulation of the database will allow the knowledge of the intermunicipal territory with the help of innovative digital technologies. These digital technologies can allow the implementation of a digital service accessible to users in the form of an interactive map. Thus, these new services will make possible the promotion of local heritage resources, guaranteeing the opening of public data. The GIS that has been set up within the community forms an essential part of the project, since it allows the identification of heritage elements on the territory, to geolocalize them and to combine all the information gathered in a single database potentially open to the general public (Yeung & Hall, 2007).

The needs in geospatialized and geolocalized information are important in the implementation of the development projects of the territory. The development,

deployment and implementation of GIS therefore responds to the needs of communities in relation to the collection of spatial information and its exploitation in various forms of territorial valorization. The projects of development and geographical valorization of the cultural heritage, call more and more for the use of integrated spatial approaches which are structured around geovisualization systems as for example, the creation of interactive maps, allowing interactivity between users and the heritage (Sutton, Dassau, & Sutton, 2009).

Territorial enhancement through GIS and geo-visualisation tools, such as Carto DB and the interactive map, is also a growing area of development that is largely driven by information and communication technologies (ICT). The development via telecommunication networks, such as the Internet and mobile networks of geovisualisation media, computers, tablet PCs, smartphones, etc., has increased the number of distribution media, but also the number of possible usesand applications. These will therefore make it possible for the general public to have digital access to the visualisation of heritage data (Sutton, Dassau, & Sutton, 2009).

5.1 Tools for geolocation and recording of cultural heritage

Any project based on GIS data from a field survey conducted expects a certain amount of data. These shapefiles (points, lines or polygons) are used as the basis for the development of the heritage database. Among the available geographic data types, it is worth noting the use of points for the spatial representation of heritage and small heritage elements. To make this clear, separate feature locations are defined for geographic phenomena that are too small to be represented by lines or surfaces that do not have an actual surface area such as dimensional points.

A range of georeferenced digital cartographic images such as IGN's SCAN 25 can be used directly to locate and position information, import and update business data, and format documents for display at scales of approximately 1:25,000. Typically these image databases respond to well-defined needs, contributing to the wider dissemination of geographic information (IGN). These files are primarily used as background maps during each project. In addition, they sometimes contain important information useful for the inventory as they report on certain heritage features (Gallego, 2016 , p. 12).

Therefore, in many cases the IGN's BD TOPO is used, which is a three-dimensional vector description (structured in objects) of the territory and its infrastructure elements, with metric accuracy, that can be used at scales ranging from 1:5,000 to 1:50,000. It covers in a coherent manner all geographical and administrative entities of the national territory. It allows visualisation, positioning and simulation for the analysis and operational management of the territory. (IGN) These files will also be used as a background map.

In addition, a tool such as the photo library allows a large part of the cultural heritage database to be completed. Initially, each information source consists of geolocated photographs (coordinates contained in the Exif data of the images). Some of these heritage photographs are extracted from this image database and integrated into the GIS. In a second step, the photographs taken during the field survey can be used. This database is created to illustrate and facilitate the processing of each project. Regarding the recording of the cultural heritage, it is necessary to make a link between the points of the shapefile and those photographs (which have not been geolocated). For this purpose it is necessary, for each element, to make the link between the photograph and the site. On the one hand, in the GIS, accurate geolocation but little information (only the type of element: cross, mill, etc.) and on the other hand inaccurate geolocation (the photos are sorted by community and village) but an element well identified through the visual (Houzet, 2013).

In order to enable such a survey, a number of internal and public documents should be available to the respective community about the local heritage. These documents are used to collect information about the monuments feeding the heritage database. They are usually found in various formats. Similarly, defining a working method around the corresponding digital tools, such as Geographic Information Systems, allows the processing and diagnosis of community heritage data to take place, thus helping to make the objectives achievable. Choosing the software to create the database is quite important as the use of a digital GIS software allows to create , edit and manage the heritage database. In addition, it is necessary to use a tool to exploit and visualize this data on the web. This will allow the general public to have access to online knowledge of cultural heritage (Gallego, 2016 , p. 19).

In order to carry out an inventory in an effective way, it is necessary to ask the question about the method to be applied and the tools to be used. In order to best address the challenges, it is suggested that a geographically localized database be created in some cases. Various GIS software (e.g. MapInfo, ArcGIS, QGIS) allow the creation of this type of geolocated database. There are several such free open- source programs that are customizable.

Among other things, these programs are able to read and write to the main standard cartographic formats (shp, kml, dxf, geotiff, gpx, etc.), thus ensuring data continuity. They offer the possibility of direct connection to all 'on-line' services via external data sources (WFS, WPS, odbc, etc.). They also allow connecting to a database such as PostgreSQL/PostGIS and thus easily realize data management and sharing to multiple users at the same time. They have a very large number of plug-ins. For example, for easy access to Open Street Map data or for quick viewing of cadastral data (Miller, 2018).

They also have a very large geoprocessing library for data. They have all digitization tools and allow importing data from field collections via GPS (Innemap). They are essentially a central working method tool, which allows in particular to manipulate and create spatial data allowing in this case, the geographical localization of heritage elements, but also to feed the database with attributes (community, location, name, monument status, photo, etc.). Among other things, they allow the visualization of the site data thanks to software extensions (plugins), such as for example the ID "identification" extension. This in turn enables the opening of "tooltips" containing the information from the attribute table as well as a photo for each site, identifying the heritage element on the map (Gallego, 2016 , p. 22).

The results of these processes are usually aggregated and accessible only on the local authority's internal server. In order to achieve the objective of opening up the data, it is necessary to consider the use of a corresponding software that allows

the database to be placed on the Internet. Such a database management system software is usually compatible with the corresponding software and allows the creation of web maps. It should be mentioned that in corresponding cases in the past the use of such software was considered particularly complicated and therefore their use was avoided because it was not possible to organize specific training for this software in a short period of time.

Nevertheless, the database was transferred to the corresponding software at a later stage in order to facilitate its use by many users. The e-services software allows the creation of interactive maps in a simple way. Such software makes it possible to meet the visualization needs of the geographically referenced web-based data of the inventoried heritage. In addition, it allows the database to be consulted by local stakeholders and even by the general public. From a functional point of view, these tools are simple to use and accessible.

5.2 Organizational systematization of data

The cultural heritage elements that are subsequently identified usually constitute a large amount of information, so it is advisable to create a data organization to ensure a readable knowledge of these elements. They are then grouped by themes in order to ensure a logical classification of the heritage. The classification takes account of a number of criteria, mainly relating to the historical function of the monument in question. This classification is carried out with a view to optimizing the representation of the elements of the conservation heritage, thus facilitating an understanding of the spatial distribution. It also contributes to the structuring of the map caption and the creation of sections in the corresponding documentation file (Petermann, 2015).

Similarly, the heritage elements that have been classified are then geographically positioned in a point by means of coordinates (latitude and longitude). Initially, the location allows these elements to be placed on a map, contributing to the creation of legible cartographic compositions on the ground. Moreover, the choice of points is justified because they are a key element incorporated in such software. Moreover, it is not a priority to know the exact contours of the features, what is of interest is their location. Each point has its characteristics marked on horizontal lines. Each attribute field is arranged in columns. An attribute table provides the basic information concerning each point. This information is sorted by the attribute fields and this information forms a dictionary of attributes of each point, incorporating attributes of the elements, for

example in relation to location, typology, photo, record or name of the element (Gallego, 2016 , p. 24).

In addition, in the attributes of each database, there is always a link to the legacy card (in PDF format) of each item. It is worth noting that to create these heritage sheets, it is necessary to transfer all the elements of the heritage attributes table, such as (photo, geographical coordinates, municipality, place, typology, etc.) to a heritage sheet. In a second step, such a card is completed by adding the historical description of each element, thanks to the advice of various sources (books, magazines, websites, etc.). Consequently, these heritage cards contain all the information on the geolocated database. Each such schema shows how the data in the attribute table is changed to create the legacy cards. It is important to note that the creation of identity cards allows the database to be enriched and expanded. These in turn are made available to the general public in various formats (Petermann, 2015).

No doubt when these heritage asset ID cards are put online in PDF format, they allow seamless access to both the community project manager and the general public, the users of the interactive map. Each friend of these allows the richness of the heritage assets to be highlighted and therefore brought together in a documentation archive. Such an archive consists of parts, with each part relating to a heritage theme. Such files are initially used as an internal working version, which allows all the information listed to be checked. Its preparation allows the identities of local heritage elements to be brought to the attention of communities. It is a base that is constantly fed with new data and completed. The more relevant information it contains, the more it is able to stimulate the creation of cultural projects (Petermann, 2015).

5.3 Verification and completion of the database

The identification of source persons is fundamental to organize meetings to complete the data on the various heritage elements identified. First, it should be clearly defined what is a "resource person"? A resource person is a person with a good knowledge of the area and, in this case, a good knowledge of heritage assets. In order to identify the resource persons, it is necessary to carry out a structured research work in order to identify who are the local partners of the community in question, namely mainly the institutional bodies (such as town halls), the tourist office, the members of the culture and recreation committee and the members of associations. The main interest in identifying resource persons is to check the database, fill in the heritage sheets and learn more about their vision for the area,

understand from their perspective which are the elements to be protected as a priority, which are the ones to be revised, which are more or less interesting, etc (Houzet, 2013).

The aim of the interviews is to gather verbal information from local stakeholders and to gather as much information as possible about the heritage assets. Prior to meetings with stakeholders, a questionnaire is recommended and, in most cases, drafted, which forms the main interview tape. Completion of this questionnaire facilitates the process. In parallel, interviews are scheduled with the partners of each community, via email or telephone calls. Preparation of the interviews is essential to make the most of the time spent by those involved. Thus, for each interview, maps are created identifying heritage assets in the area concerned, the interactive map is updated and statistical graphs are created in Excel (Gallego, 2016 , p. 26). Each of these tools provides a different view of the heritage surveyed and allows for better identification of errors or omissions. The partners' final corrections are then taken into account to make the relevant modifications to the heritage database, as well as to the heritage sheets in the documentation file. Thanks to the interviews, various forms of data exploitation can be envisaged. Among other things, the interest of the interviewees varies according to the typology of the heritage and the diversity of the heritage elements (Petermann, 2015).

5.4 Cultural heritage database

In this part the quantitative and spatial study of all the heritage sites included is carried out. The aim is to answer questions such as: Which are the most populated monuments in the territory? What is the distribution and density of cultural heritage sites in the territory? What is the geographical and/or cultural relationship between certain monuments in the territory? The analysis of heritage themes allows a better understanding of the distribution of heritage assets in the territory. Firstly, these themes are analyzed quantitatively in order to identify the most numerous cultural heritage elements. In addition, heritage maps are analyzed by theme in order to determine the spatial behavior of heritage assets in the territory. Within the five heritage themes, certain themes are numerically outnumbered. It should of course be noted that, although each list is important, it is probably not exhaustive and will need to be completed over time (Jackmond, et al., 2022).

In general, GIS allows using data visualization tools that enable us to improve the spatial analysis of all the cultural heritage sites registered in the territory. This represents the density of all cultural heritage, including all themes. This analysis allows for easy identification of the communities with the greatest heritage, or at least the identification of the areas with the greatest density of heritage assets. This type of map is very useful for decision making, especially when creating a heritage route or when selecting an area for an exhibition, for example. The highest densities of heritage assets are generally found in villages. Indeed, some elements are preferably located in residential areas. Other elements are more dispersed, etc (Dias & Koomen, August 2017).

As a first step, the GIS software (QGIS) allows the creation of a cultural heritage database, thanks to the heritage and small heritage inventory work carried out. Certainly, this database of cultural heritage and small heritage makes it possible to guide cultural policies. However, if a database is to be guaranteed over time, it must be continuously updated, in which the local stakeholders will have an inevitable role to continue to enrich it. In order to guarantee the development and dynamism of the database, it is necessary to create a visualization tool: the interactive heritage map. This will provide free access to cultural heritage data, allowing, for example, the exchange of data between the operators in the area and between them and the public (Combey, et al., 2021).

The implementation of a spatial database (BDD) created by a specialized software is an inevitable solution for the future. The development of BDDs is necessary to better control the data, to save time in processing and utilizing these data, and to ensure data security. This solution seems achievable with the use of a database management system software and of course an additional spatial neural

network software, which will be tightly interwoven with the needs (Jackmond, et al., 2022).

Such software aims at better control and utilization of data, with easy data management, better structural organization of data, simplification of data linkage and related analyses and data security: different levels of access (administrator, user, etc.) can be defined. It should not be overlooked that data visualization is necessary to make data more easily accessible by all departments. This is why software programs are preferred, usually free and open source, compatible with the GIS software in question (Gallego, 2016).

It should be noted that the creation of an interactive map through the GIS tool, based on the classification of the whole heritage in five thematic sections, contributes to making the cultural heritage database accessible to the general public, thanks to its ergonomics. This in turn allows for improved connectivity between the database, partners and the public. The interactive heritage map thus makes it possible to get to know the community heritage set in question, with a visualization of the heritage data in the Community of Communities. The information is presented in the form of a heritage sheet and can be downloaded electronically (in PDF format). In effect, the world map allows for the verification and integration of the heritage inventory with the territory partners, as well as the collection of new supplementary information to create the heritage sheets (Combey, et al., 2021).

If we take as an example in an interactive case map of a church, clicking on a point, we see a box with a photo and some information about the typology of the element, the name of the place, the municipality, the code, etc. This allows to know better the characteristics of the heritage element under consideration. There is also usually a link, which takes you directly to the heritage sheet. Among other things, users can directly download this information, which includes its geographical location and explanatory descriptions of the heritage element (Gallego, 2016).

5.5 Thematic interactive maps

Given the large number of items that can be extended, this map is difficult to read because the five heritage themes consist of a large number of typologies that are difficult to appreciate by an uninformed public. This could be an incentive to create an interactive map by theme. The thematic interactive maps for each of the five themes are created in order to make the data more readable. Their semantics are chosen to be more meaningful by using symbolic pictograms. These maps, more oriented towards the general public, are accessible from the website. The aim of

these maps is to bring to everyone's attention the elements that have been identified. Knowing the cultural heritage by theme will make it possible to understand the spatial behavior of cultural heritage in the Community territory (Roth, et al., 2020).

This will enable the general public to know and appreciate the cultural wealth of the territory. The problem of accessibility of these elements is often raised by decision-makers. Indeed, many of the items listed are on private property and may be difficult, impossible, prohibited or even dangerous to access on the ground.Therefore, it is important that the interactive map consultation does not encourage the public to go and see the items listed on their own. The interactive thematic map only represents a specific topic in order to be readable by the general public. For example, the religious heritage map is represented by several visible typologies(Zagrebin, Kotova, & Krylov, 2021).

Another way of promoting the local heritage of the area is to create a heritage and heritage documentation file. This file is an internal working version in order to verify all the information listed. Its preparation allows the identities of local heritage assets to be made known to communities. This initial database is constantly being revised and supplemented. The more information it contains that is relevant to the consultation of heritage assets, the more it will be able to encourage the creation of cultural projects. The way it works is as follows: Each municipality constitutes a documentation file, which are divided into five parts (one per topic). Each part begins with a map of the community with the details of the theme (Gallego, 2016).

5.6 The added value of GIS

First of all, the use of GIS had an added value, which allows to answer all the objectives set in any study, such as the geographical localization of the whole heritage and the potential of exploiting the heritage assets. It then becomes possible to gain knowledge of the heritage, create cultural policies and address new cross- cutting issues, such as the links between sustainable development, heritage protection and architectural quality. The opportunities for development are therefore numerous. The implementation of a GIS within a community allows for a cultural policy to be oriented towards exploiting the assets of heritage resources that are part of local identity (Sutton, Dassau, & Sutton, 2009).

GIS is created to allow for heritage to be highlighted in various forms. Firstly, interactive maps facilitate knowledge of the richness of local heritage, creating a

context in which citizens can react and organize themselves in a supportive and sustainable way, thanks to the intellectual and cultural knowledge of the local territory. Moreover, it allows for the prolonged management of the database over time, updating the heritage data. It is also possible to gather in a single place all the knowledge about the local heritage, by creating a database. This database in turn allows the project to continue, through geo-referencing the database and improving the technical processing of heritage data. This in turn triggers the creation of a dynamic and efficient interface between the database management software (Gallego, 2016).

5.7 Interactive maps and documentation archives to support projectsfor the promotion, protection and renovation of cultural heritage

The creation of interactive cultural heritage maps and the preparation of documentation files on the cultural heritage of each region are tools that allow the verification and completion of all the information recorded. The archive, as an internal working version, ensures the creation of cultural heritage files, which are used as elements of consultation with the community and then posted on the interactive map on the Internet. The archive also helps to make it easier to identify cultural heritage and minor cultural heritage assets in the community register, making it possible to classify, protect or enhance them, for example, or in heritage renovation and protection projects (Yakubailik, 2017).

The application of interactive maps is a digital tool for spatial consultation of community heritage assets and offers a service as a support for heritage enhancement. Thanks to it, the general public (local population and tourists) is able to identify the cultural heritage and small cultural heritage in the area, having the possibility to download heritage cards. Indeed, interactive maps and archives are supportive tools that allow to improve the knowledge of heritage, facilitating the possibilities of exploitation and heritage. As a consequence, they allow to recommend and guide their implementation. For example, the organization of thematic heritage tours and interactive thematic maps, or the organization of heritage days, demonstrate the potential of the documented information in the database and of new digital techniques, which guarantee the accessibility to the general public of registered heritage data. At the same time, the implementation of the recommendations will enable the territory's operators to be properly guided in the implementation of cultural or sporting projects, thanks to the contribution of theheritage database (Gallego, 2016).

These recommendations are concrete actions that can shed light on the territorial authority and, therefore, highlight solutions regarding local heritage. The elaboration of different recommendations responds to the challenges of each community, encouraging the organization of cultural and/or recreational activities, thus improving the knowledge of cultural and small heritage. The role and involvement of local stakeholders determine the success of the implementation of the recommendations. This requires promotion and dissemination actions to make heritage a place of encounter and exchange, a vehicle for economic, tourism and local development (Yakubailik, 2017).

Examples of the establishment of a thematic cultural heritage cluster have been achieved in many Central European countries thanks to the contribution of inventory and geolocation of cultural heritage elements through GIS, as well as the creation of cultural heritage sheets. This allows the community concerned to reflect on the implementation of a thematic heritage circuit. First of all, the reflection of this thematic circuit is generated by the wealth of information collected , in relation to the heritage elements of the route. It is known that there are elements of great historical and cultural importance that will allow the creation of an attractive and dynamic route (Gallego, 2016).

The creation of such thematic circuits and/or trails allows for the promotion of heritage. In order to enable similar projects to be developed, it was considered necessary to check whether the route is on private or public roads, in order to conclude an agreement with any private owners regarding the opening to the public of a hiking trail on private land. The trail is then entered into the Department's Hiking Trail Plan, which guarantees its durability over time. Finally, a "Rando Tarn" leaflet is usually published which presents the route and the various heritage features encountered along the route. The creation of such a trail requires the mobilization of local stakeholders, such as the community. It is advisable to coordinate communication initiatives within and outside the territory in order to guarantee the success of the trail. In many cases it is possible to organize guided tours along the route, either on foot or by electric bicycle. This is a relatively innovative idea that can make a trail accessible and educational for the general public. At the same time, in the context of its creation, events are proposed to raise awareness of the community's heritage through a cultural or recreational activity. Therefore, this trail contributes to the promotion of tourism in the community and the cultural development of the public (Ümit, 2017).

On a technical level, the interactive heritage map takes into account all the themes considered in the database, i.e. religious, folk, historical, archaeological or industrial heritage. The map has first of all an internal function intended for heritage "experts", whose aim is to complete the inventory of the heritage of the area so that

the community can know it. It should be noted that this recommendation does not require significant resources and can be implemented in a short time. In addition, the interactive thematic local heritage maps highlight, for each of the five themes, the heritage assets that have been identified. These maps are posted online for the general public (local population and tourists), with the aim of drawing the public's attention to the heritage elements in a particular theme (Gallego, 2016).

In the cultural projects of the future, there should be a link between cultural, natural and intangible heritage, so that all heritage resources can be exploited. This link between heritage resources is also addressed to the general public (local population and tourists). The objectives are to promote quality architecture and buildings and to promote the little-known heritage. Also, the installation of information signs in the area. For example, the possible placement of signs around the heritage thematic circuit. The installation of information signs is also aimed at the general public (local population and tourists) (Yakubailik, 2017).

The main objective is to highlight the remarkable unprotected rural heritage visible from the public road. Equally important, the creation of a municipal heritage brochure highlighting the rich heritage of each area. The creation of the brochure is also aimed at the general public (local population and tourists). The main objective is to create an information tool for the local population and a tool to promote tourism.

It should not be forgotten that the creation of a PosGIS database allows for improved database management. PostGis contributes to the creation of a web-based management interface between the GIS heritage database and the interactive map. Each actor in the region will be able to use the data contained in the database for project needs. The aim is to create a web interface to connect the GIS database with the interactive map (Gallego, 2016).

5.8 Issues of direct exploration of the evolution of the process: how an interactive map can contribute to the subsequent development of an area?

When launching the interactive map, it is important to carry out a communication campaign to launch the interactive map by various means: a news item on the municipal website, an article in the next inter-municipal newsletter, articles in the press, etc. While the dissemination of the interactive map is very important. In particular, links to the interactive maps should be emailed directly to resource persons, to potentially interested partners and through the internal information email to each of the local authority agents. In this way, they will have direct access to

the interactive map, enabling collaboration between local agents and the ability to populate the database with missing data (Houzet, 2013).

Equally important is the provision of the means to continue to populate the database, as enriching the database is an urgent priority. For example, the description of heritage elements and presentation texts must be thoroughly edited. While it seems appropriate to produce a literature survey to complete the data sources and then a synthesis to write a presentation text for each heritage element. At the same time, the implementation of the database manager should be continued in close collaboration with the relevant body that will create the appropriate interface data. This interface will allow the coordination of the heritage GIS database and the interactive map, saving time in updating the interactive map. Not to be neglected, motivating citizen participation by organizing workshops of cultural associations in order to facilitate exchanges between citizens and partners in the region (Dilek, Doğan, & Kozbe, 2019).

In order to achieve this, it would be necessary to organize events aimed at the general public, allowing the exchange of views and information on local heritage. This will make it possible to feed the database on cultural heritage and to guide heritage-related projects. Among other things, it should first be determined whether the monuments belong to the private or public sector. It will be necessary if the objective is to define recreational activities on the territory of the community. Also, the review of access to the monuments in the territory. It is important to prepare reports that will determine the status of access to heritage elements and incorporate them into the heritage database (Ümit, 2017). This assessment will determine the number of visitors and the monuments that can be visited. At the same time, the coordination of the stakeholders in the region is important to facilitate the knowledge of the monuments in the region. There should be constant communication between the partners in the region and the managers of the monuments in order to stimulate and diversify the guided tours during the heritage days. In this way, it would also be easy to create thematic tours.

The GIS will allow the tracing of hiking trails and the linking of hiking trails to the heritage and small heritage sites in the area. To this end, it would be possible to mobilize partners from the area, in particular the tourist office, who could organize activities linked to the promotion of tourism. In conclusion, this proposal, many socio-economic activities have had and still have a bond that must be maintained. In order to ensure the memory of these activities, photographic exhibitions of the monuments could be created thanks to the already existing large photographic database (Gallego, 2016).

5.9 General overview of the chapter

It is generally accepted that, GIS are digital tools that allow the state to obtain spatial information about the organization of community and small-scale heritage. Thanks to GIS, the state has been able to manage a huge database of heritage in order to achieve the objectives set in the territorial plan and its variants. The corresponding methodology allows the construction and feeding of a GIS database with important information on geolocation and other complementary information on heritage elements, such as the integration of photographs or heritage maps into the database.

This is a real methodological challenge. In addition, the organization of heritage assets by themes is essential to provide a simple and clear representation of the different types of heritage assets found in a given area. Each case of direct application is an example of how new digital GIS technologies can be used to make the most of the territories. Thanks to the technical GIS software (QGIS), it is possible to feed a geo-located database, which puts the community website online through interactive maps from the corresponding software. Knowledge of cultural and small heritage will be greatly improved, also allowing public access to heritage data. The results potentially resulting from the creation of the heritage database raise questions around forms of heritage promotion, such as the creation of a thematic heritage tour.

On the other hand, it should be borne in mind that exploitation projects are only possible if the heritage database is completed and continues to be updated and if the proposed recommendations are followed. Today, every single structured GIS network has resulted from the development of this heritage database. This allows numerous heritage related projects to be implemented where the local authority still has the levers of action that allow and will allow cultural policies to accompany. At the same time, the digital GIS put in place allows the new development resources of the area (heritage) to be highlighted. It also makes it possible to achieve the objectives of the project, such as the collection of information, inventory and geographical identification of the community's heritage, ensuring the accessibility of the data to the general public, and anticipating forms of highlighting the heritage elements, allowing a "territory-heritage" approach. Finally, each such project highlights the use of GIS as a geo-information system for territorial integration and decision support, integrating and standardizing the different actors.

6.0 Museums and augmented reality

Let's first attempt to comprehend the true meaning of augmented reality. What we should properly refer to as "augmented reality" (AR) technologies are a collection of digital programs that overlay digital audio, visual, and haptic signals on the perception of the real world by a user equipped with a suitable device, typically a tablet or smartphone, or wearable and offered on demand to supplement what we see. These are the so-called wearable gadgets, which also include smart glasses like Google Glass and viewers for augmented reality. In each of these situations, the subject and object are connected through the use of "prostheses" to enhance the subject's perceptual and sensory experience (Floridi, 2017, p. 5).

Operationally, the operations that enable this enhanced "vision" mostly involve framing any item with a tablet or smartphone and presenting any type of supplementary information on the display: text, photographs, videos from real life or in animation, conventional or 3D. In fact, the overlay principle is one of the fundamental tenets of augmented reality. When a device frames an object, the application detects it and activates a second layer of data and communication that perfectly overlays and integrates with reality, increasing the amount of specific information about that object (Caudell & Mizell, 1992).

It is always a question of superimposing various layers and levels of perception and information on one perceptual level, even in the case of "wearable" gadgets enabling immersive experiences. Because of this quality, which we could almost call a magical epiphany, augmented reality initially found use in games and entertainment. However, infotainment, a hybrid form, quickly emerged, shifting the technological and practical emphasis to forms that meet both informational and recreational needs. In this form, the application frontiers of these technologies have expanded to virtually infinity, including everything from digital marketing to car accessories, intelligent tourism to the museum experience (Floridi, 2017, p. 99).

The integration of these instruments into the cultural-informative sector as well as the digital administration and depiction of artistic, museum, and documentary assets have also occurred during this time. In truth, the digital revolution has had a significant impact on how knowledge is being transformed, including in the humanities, which are currently seeing advances that would be unfathomable in the "computer sciences." They themselves have evolved into "data sciences." Since the new web-devices have made "augmented" information accessible on a single media and from any place through geolocalization (GPS) and the many types of augmented and immersive displays already discussed, this augmentation also applies to the field of cultural heritage. In this light, we may now view augmented reality (AR) as one of the concepts and technologies putting into

practice the research interests and theoretical hypotheses, as well as the prototype designs, of that brand-new area of study known as the digital humanities (Drucker, Kim, Salehian, & Bushong, 2014, pp. 9-11).

In actuality, augmented reality (AR) is a type of visual content management 2.0 that may especially allow galleries, museums, and libraries to add new layers of knowledge and information to their locations, objects, and collections in real time and at a high rate of interaction.

From the very first experiments, it was evident that the key players in what is fast evolving into a true revolution in comparison to the conventional approach, including museum curators, knowledge organizers, and companies in the field, immediately understood the techno-magical aspect of these virtual representations and the power of the surprise factor they unleashed, to intercept the needs of heterogeneous users and to attract new audiences and new attention to events and cultural expression. In fact, art, museum, and library organizations may employ augmented reality to convey important information for comprehending the artifacts and papers kept in their collections to audiences of the widest variety of sorts, backgrounds, and educational levels. These details can be predetermined and displayed as pop-up indications next to the items that need more exploration, or they can be obtained from multimedia material (e.g. audio-video, animations) (Coates, 2022).

In this sense, these technologies are a part of the Internet of Things discourse and, specifically, the concept of smart cities. In smart cities, entities and institutions can interact and dialogue with citizens through a variety of objects that can talk and offer a variety of services, such as event information and ticketing, sharing digital objects on social media, and the creation of arcs. As a result, it is now possible, for instance, to visit locations of historical, archaeological, and cultural interest by contextualizing the visit through an educational frame of reference, such as a historical palace or a group of historically or conceptually related buildings, using a smartphone, tablet, or digital signage solution, or by engaging in an immersive experience that turns static exhibits into virtual panoramas or narratives with strong emotional resonance (Soydanbay, 2017).

These new types of user experiences, which are the result of concurrent cognitive science research on how information in multimedia format is perceived, make huge amounts of new data, both local and delocalized at the same time, available and turn museums and libraries, as well as other locations of artistic and cultural interest, into multidimensional realities. The employment of virtual expedients that convert locations of information into routes, or rather, into hypertextual "navigations," or "narratives," drastically alters the places where

experiencing and obtaining knowledge, and afterwards engaging with and re-interpreting the world, take place (Tirocchi & Taddeo, 2013).

It is no accident that museum curators and art exhibitors are reshaping the modeling and organization of collections within their cultural institutions by taking cues from theatrical staging or storytelling techniques and arranging their presentation through various virtual simulations to frame exhibits, objects, collections, and documents within narrative and emotional contexts that undoubtedly enrich the user's experience with added value. This ideal situation, however, is disrupted as a number of significant dystopian components enter the picture and turn the idyllic state into a distorting alienation from reality.

6.1 Issues and limitations to be explored

The problematization includes the laws and paradigms that model and organize historical memory and preservation sites, as well as formative and educational features related to knowledge, culture, and their social effects, as well as neuro-cognitive and cognitive components. Therefore, in my opinion, the field of studymust be multidisciplinary and raises issues in both neurosciences and educational sciences, physics and computer science, communication disciplines and archival and cultural heritage preservation, and opens the door to redefining professional roles and figures (Floridi, 2017, p. 251).

The majority of users, and frequently also those in charge of the custody and protection of cultural assets and information, frequently entirely ignore a number of these problematic nodes inherent to the indiscriminate use of AR technology. The quality of the data and information communicated; the transience of the same in the digital realm or infosphere, once removed from ephemeral usage (for example, a temporary display); and cognitive, as well as ethical-political ramifications of various sorts of interaction-fruition (Brunelli, 2017).

6.2 Potential uses of augmented reality

It is well known that a few years ago, the Integrated Research Team (IRT) conducted research. By combining and integrating multi-spectral imaging techniques, digital radiography, 3D X-ray computed tomography, and digital motion graphics imaging, the team provided new depth of scientific knowledge on the properties of specific

objects and documents that could not otherwise be found with other research tools, and made them visualisable and exploitable in very new ways (Brinkman, 2013).

It is challenging to delve into the technical aspects of these research and 3D visualization tools because they are partially patented, but it is definitely possible to discuss how this type of simulation, if transmitted by AR applications, can really enhance the perception of a "inexperienced" audience and the research of scholars with highly cognitive data and information because it is otherwise "invisible." In the context of cultural heritage, multispectral imaging methods—which rely on taking pictures in several spectral bands—have a wide range of uses. Multispectral imaging techniques have only lately been used to examine old manuscripts and parchments whose readability has been significantly damaged by the passage of time (Brunelli, 2017).

One example is a palimpsest codex that was extensively damaged in a fire and destroyed together with a sizable portion of the manuscript collection at the National University Library of Turin. The lettering that had been miraculously preserved beneath the burned mattress has magically reappeared, totally legible, thanks to the multispectral camera. the ability to see inside of things, artifacts, and works of art that are normally beyond of reach for the human sight (Williams, 2021).

The 3D animation "unwrapped" an Egyptian cat mummy that was on display at the Museo Civico Archeologico in Bologna, exposing the arrangement of the animal's bones within, including the uniqueness of the broken neck. The findings supported the researchers' theory that this was a common practice and suggested that animals buried with the dead were likely sacrificed in this fashion in order for them to join their owner in the hereafter (Brunelli, 2017) .

A bronze statue of a young Cupid kept at the Getty Museum is the subject of the case study that is being given since it required a 3D CT scan of the complete statue, the first of its kind to be done on an item of this kind. The results were incredible not only because of the skillful 3D rotational images that show the statue's entire external and internal structure, but also because, to the trained eyes of the experts, the CT scans returned an impressive amount of information even after an examination that only lasted a few minutes (Casali, Bettuzzi, Brancaccio , & Morigi, 2010).

In a relatively short period of time, traces showing the casting process, the wax-making process, fault corrections, structural issues, thickness variances, and a great deal more information were found. This also covers the examination of the 13th-century Japanese wooden figure Kongo Rikishi that was repaired in 2008 at the Turin facility known as "La Venaria Reale." The intricate process used to build the hinoki cypress wood blocks that make up the artwork, known as yosegi-zukuri, was

made clear by the CT scan. Later, restoration work also made use of this scan. Through animations of the wood being cut, three-dimensional imagery allowed for the visualization of the wood layers. a meticulous rebuilding of a damaged cultural object using philology (Morigi, Casali, Bettuzzi, & Brancaccio, 2010).

A 3D CT scan of Vincenzo Coronelli's "Globo Celeste" in the Biblioteca Manfrediana in Faenza is the most recent instance. Before World War II, the "celestial" and "terrestrial" globes by Coronelli were stored at the historic library in Faenza. The "terrestrial" sphere was obliterated by bombing during World War II. The conservator was able to recreate an exact replica of the sphere's original structure, which has since been donated to the Municipal Library of Faenza, using the original prints from the period and the findings of the twin celestial sphere's CT scan (Brunelli, 2017).

6.3 General overview of chapter

As a result of its inherent nature as an interdisciplinary discipline, digital humanities applied to cultural heritage is still in the process of being established. It is also currently looking for a sufficiently definable epistemological framework and law. Interdisciplinarity is actually essential to the survival and success of the Digital Humanities field and is not only a conceivable variation. But for a few reasons in particular, it felt relevant to include a discussion of new augmented reality technologies used to preserve cultural heritage in the context of the continuing discussion regarding the true influence of these new disciplines on the "creation of new forms of knowledge."

One of them is that interdisciplinary teams will be necessary in order for digital tools to truly succeed in improving knowledge of cultural and documentary heritage. In these teams, curators can play a crucial mediating role if they act with scientific and historical methodology, have sufficient knowledge and awareness of the limits and risks of the technologies, as well as of their enormous opportunities. All stakeholders, including users, should develop suitable tools for in-depth analysis and interpretation that take into account both physical and artificial realities in order to determine when and to whom they are truly needed, as Floridi suggests from the philosophical-theoretical side, if we want the use of technologies for virtualizing reality to truly provide services to the information society.

The purpose of this paper is to precisely define some theoretical axioms as a precondition for a potential epistemological correlation of DH, in which, among the possible fundamental aspects, the function of providing human sciences with cognitive and informational tools and services that would not be possible without

the use of digital technology is mentioned. Although a long-term preservation effort is not always a digital humanities project, I have had significant responsibilities in six of them. The key idea here is that rather than focusing on broad problems about how to preserve digital objects in general, we should concentrate on what is special about the content of digital humanities, i.e., how we might preserve the knowledge that humanists accumulate through time. The working theory behind each of the instances was to employ augmented reality (AR) to creatively make knowledge available to a regular but specialized audience who could only experience the "actual" thing.

7.0 Case Study: Archaeological Museum of Kavala

Undoubtedly, the Archaeological Museum of Kavala is a remarkable organization that deals with the preservation and promotion of the rich cultural heritage of the region. Geographic Information Systems (GIS) are not currently used in the operations of the museum, despite their importance. The aim of this analysis is to examine the current situation and highlight the implications of this absence.

For the management, analysis, and visualization of spatial data, GIS technology offers a potent tool. It makes it possible to combine different layers of data, such the locations of artifacts, dig locations, old maps, and geographical features, into a comprehensive digital platform. Multiple advantages can be attained by integrating GIS into the museum's activities.

The capacity of GIS to better contextualize objects inside their original archaeological environments is one of its main advantages. It is possible to graphically display and evaluate the geographical relationships between artifacts, excavation sites, other artifacts, and the environment by georeferencing them within a GIS framework. Researchers, academics, and visitors can better appreciate the broader historical and cultural value of artifacts because to this spatial awareness, which gives interpretation of those artifacts depth.

Additionally, GIS makes it easier to manage and organize data. There is probably a lot of information about items in the Archaeological Museum of Kavala, including descriptions, provenance, acquisition stories, and related paperwork. This information can be efficiently cataloged, looked up, and retrieved by incorporating it into a GIS database. The curatorial and research procedures are streamlined as a result, making it easier to find pertinent data quickly and fostering a greater understanding of the collection as a whole.

The museum's ability to conduct data analysis and research is further constrained by the lack of GIS. Advanced spatial analytic capabilities offered by GIS technologies allow researchers to look for patterns, trends, and correlations in the data. For instance, by putting distribution maps of artifacts over geological or historical maps, researchers can learn more about early trade routes, habitation patterns, or cultural exchanges. This kind of study aids in developing fresh research hypotheses and advances our grasp of the archaeological setting.

The visualization and display of data is another crucial area where GIS can significantly help the museum. GIS systems provide compelling and dynamic ways to share information with visitors. Visitors can engage in a dynamic and interactive exploration of the museum's collection through thematic maps, virtual tours, or

augmented reality applications. In addition to increasing visitor interaction, this interactive experience encourages a better appreciation and understanding of the cultural legacy on display.

Additionally, the absence of GIS in the Kavala Archaeological Museum may make it more difficult to work together and share data on research projects with other organizations. Globally, GIS has established itself as a standard tool for heritage management and archaeological study. Its absence can make it more difficult for the museum to collaborate on projects or share data with collaborators who utilize GIS as a core part of their operations. This isolation can limit prospects for cross-disciplinary collaboration, inhibit information transfer, and slow down research development.

The Archaeological Museum of Kavala must create a strategy plan for its execution in order to address the situation as it is and take advantage of GIS's advantages. This strategy should include hiring the required employees, acquiring the required hardware and software infrastructure, and establishing data management processes. Working with GIS and heritage management professionals can be a great way to get advice and support for this process.

In conclusion, the Archaeological Museum of Kavala is missing out on a chance to improve the contextualization, organization, analysis, and visualization of its cultural heritage collection by not integrating GIS. The museum can fully utilize its data, enhance its research capacity, provide visitors with engaging experiences, and promote cooperation with other institutions by utilizing GIS technology. A crucial step in safeguarding and promoting the region's rich cultural heritage for present and future generations is the strategic integration of GIS into the museum's activities.

7.1 Case Study Implementation: Integration of GIS in the Archaeological Museum of Kavala

The Archaeological Museum of Kavala has a tremendous opportunity to improve the management, analysis, and display of its cultural heritage collection through the incorporation of Geographic Information Systems (GIS) into its operations. This case study attempts to lay out a thorough strategy for the application of GIS, highlighting its advantages and detailing the essential steps for a seamless integration into the workflow of the museum.

Conducting a detailed needs analysis is the first step in integrating GIS in the Archaeological Museum of Kavala. Engaging museum employees, researchers, and

other stakeholders in this assessment will help to pinpoint the precise needs and objectives for putting GIS into practice. Data management, research goals, visitor engagement, and institutional collaboration should all be covered.

A thorough implementation plan should be created based on the needs assessment. This strategy should specify the timetable, finances, and materials needed for the effective integration of GIS. To gauge the success and impact of the implementation, it should also set forth specific objectives and performance indicators.

The next step is to make sure the hardware and software infrastructure required for GIS installation is readily available. Purchasing computers with adequate processing, storage, and graphics capability may fall under this category. Obtaining and setting up GIS software, such as Esri ArcGIS or QGIS, on the selected computersis also necessary.

The museum could also think about integrating portable electronics with GIS software, such as tablets or cellphones. This makes it possible to acquire data in the field and improves the museum's capacity to record information in real time during archaeological surveys or excavations.

Data accessibility and quality play a critical role in the adoption of GIS. The digitalization of current item records, excavation reports, and historical maps should be given top priority by the museum. Documents and artifacts can be scanned or photographed and converted into digital formats to accomplish this.

After being converted to digital form, the data must be properly arranged and integrated into the GIS database. Creating metadata, giving artifacts distinctive IDs, and connecting those artifacts to their location and context are all required for this. The correctness and consistency of the data integration process can be ensured by working with professionals in data management and cataloging.

The museum staff should receive training in GIS concepts, data management, and analysis methods in order to use GIS efficiently. Working with GIS experts or organizations that specialize in heritage management, training programs, workshops, or seminars might be created. By empowering the personnel to administer and use GIS tools on their own, this initiative to build capacity ensures the implementation's long-term viability. Once the infrastructure and data are in place, the museum can explore a range of GIS applications to enhance various aspects of its operations:

- Artifact Visualization: GIS can be used to create interactive maps and virtual tours that allow visitors to explore the geographic context of artifacts. This provides a more immersive and engaging experience, enhancing visitor understanding and appreciation of the cultural heritage collection.

- Research and Analysis: GIS enables spatial analysis, allowing researchers to study patterns, relationships, and trends within the archaeological data. By overlaying different layers of information, such as artifact distributions, excavation sites, and environmental factors, researchers can gain valuable insights into past human activities and landscapes.
- Conservation and Site Management: GIS can support the conservation and management of archaeological sites by tracking changes, monitoring environmental factors, and facilitating site documentation. This information can inform preservation efforts and contribute to the long-term sustainabilityof the sites.
- Collaboration and Data Sharing: GIS integration opens opportunities for collaboration with other institutions and research projects. The museum can share its GIS data and collaborate on joint research initiatives, fostering knowledge exchange and advancing archaeological investigations.

The effectiveness and impact of GIS integration in the Kavala Archaeological Museum must be evaluated on a regular basis. During the planning stage, key performance indicators should be created to evaluate the achievement of goals and pinpoint opportunities for development. To understand how staff, researchers, and visitors use the GIS apps and identify any problems or suggestions for improvement, feedback from staff, researchers, and visitors should be actively solicited. This feedback ought to guide iterative upgrades and changes to guarantee that GIS keeps up with the changing requirements of the museum and its stakeholders.

The Archaeological Museum of Kavala can reap a variety of advantages from better data management and analysis to increased visitor interaction and collaborative opportunities. The museum may effectively employ GIS technology to realize the full potential of its cultural heritage collection by adhering to a methodical implementation plan those entails needs assessment, infrastructure setup, data integration, staff training, and application development. A deeper comprehension of the archaeological context, research advancements, and the promotion of the preservation and transmission of Kavala's rich cultural legacy willall be aided by the effective integration of GIS.

7.2 Evaluation of GIS Implementation in the Archaeological Museumof Kavala

The management, research, and display of the museum's cultural heritage collection might be greatly improved with the use of Geographic Information Systems (GIS) at the Archaeological Museum of Kavala. By assessing the GIS implementation's contributions to data management, research capabilities, visitor engagement, and collaboration with other institutions, this study tries to gauge the success and impactof the GIS implementation.

1. Data Management: Improving data management within the museum was one of the main goals of the GIS installation. The evaluation should take into account the following factors:
    - Data Organization: GIS makes it possible to combine and arrange various information, including records of artifacts, reports from excavations, and historical maps, into a single database. The evaluation should determine whether the GIS deployment has aidedin effective data retrieval and organization procedures.
    - Data accuracy and completeness: GIS offers tools for quality assurance and data validation. In the evaluation, errors, inconsistencies, and missing data should all be taken into account as it assesses the accuracy and completeness of the data entered into the GIS database.
    - Data-Accessibility: The evaluation should assess how simple it is for museum employees, researchers, and other stakeholders to obtain data. It should take into account whether the GIS deployment has increased the data's availability and accessibility for analysis and research.

2. Research Capabilities: Due to GIS's sophisticated spatial analytic tools, it is possible to analyze patterns, connections, and trends in the archaeological data. The following factors must to be taken into account:
    - Research Output: Evaluate how GIS has affected the volume and caliber of research output produced by the museum. Analyze the degree to which GIS has promoted fresh ideas, discoveries, and advances in archaeological knowledge.
    - Collaboration and multidisciplinary Research: Assess the degree to which GIS adoption has facilitated multidisciplinary research initiatives and

collaboration with other institutions. Analyze the new prospects for data sharing, collaborative research, and interdisciplinary cooperation.

- Research Efficiency: Evaluate the extent to which GIS has boosted research operations' effectiveness and efficiency. Take into account the time saved on data processing, visualization, and the capacity to do previously impractical spatial studies.

3. Engagement of Visitors: The use of GIS has the potential to improve the interaction of visitors with the cultural heritage collection. The evaluation should take into account the following factors:
    - engaging-Experiences: Evaluate how well GIS applications serve to give visitors engaging and immersive experiences. Analyze how much GIS has improved visitors' knowledge of the museum's objects and archaeological sites as well as their admiration for them.
    - Contextualization: Evaluate how well GIS has helped place items in their original archaeological contexts. Analyze how GIS has affected visitors' understanding of the wider historical and cultural relevance of the on display artifacts.
    - User input: Ask site visitors for input on their interactions with GIS applications. Think about how visitors feel about the interactive and geographic features included in GIS, how well they comprehend them, and how they perceive them overall.
4. Collaborating with Other Institutions: The deployment of GIS creates possibilities for working on research projects and collaborating with other institutions. The following factors must to be taken into account:
    - Assess how successfully the museum has shared GIS data with other organizations and research initiatives in area. Analyze how GIS has affected cooperative research projects, knowledge sharing, and data interchange.
    - Collaborative Projects: Count and evaluate the extent to which GIS implementation has resulted in the initiation or participation of collaborative projects. Analyze how GIS has helped to advance archaeological research and create collaboration.
    - Networking and Partnerships: Consider how much GIS has made it easier to connect with organizations, academics, and researchers working in the fields of cultural heritage and archaeology.

The Archaeological Museum of Kavala's GIS implementation should be thoroughly evaluated in order to determine how it affects data management, research capacities, visitor engagement, and institutional collaboration. The evaluation offers useful insights into the performance of the implementation and recommends areas for development by taking into account the effectiveness and

contributions of GIS in these areas. The evaluation's results can guide future plans for maximizing the museum's use of GIS and improving its capacity to safeguard, explore, and showcase Kavala's rich cultural heritage.

7.3 Impact on Artifact Contextualization in the ArchaeologicalMuseum of Kavala

The contextualization of items within their original archaeological surroundings may be considerably impacted by the incorporation of Geographic Information Systems (GIS) in the Archaeological Museum of Kavala. In this assessment, the usefulness of GIS will be evaluated along with its implications for the curatorial practices, research, and visitor experiences at the museum.

Artifacts can be spatially visualized and interpreted in relation to their archaeological context thanks to GIS technology. Artifacts can be georeferenced and added to a GIS framework to visualize and evaluate their spatial linkages with excavation sites, other artifacts, and the environment. Researchers, academics, and visitors can better appreciate the artifacts' broader historical and cultural valuebecause to this spatial awareness, which adds depth to the interpretation of the objects.

The evaluation should rate how well GIS facilitates spatial visualization of artifact contextualization. Consider about the GIS system's ability to display multiple layers of information (like excavation site plans, historical maps, or landscape features), the clarity and accuracy of artifact locations, and the degree to which these visual representations help us comprehend the artifact's original context.

Using GIS, it is possible to map the connections between archaeological sites, objects, and other contextual components. GIS enables the production of interactive maps that show these links by digitally connecting artifacts to their related metadata, such as provenance, chronology, or archaeological features. The evaluation should take into account how GIS affects mapping item relationships and how much technology improves the museum's capacity to show how interrelated and interdependent artifacts are within a larger archaeological context.

It is important to analyze how well GIS capture and display the connections between objects, such as trade networks, cultural exchanges or spatial patterns. Andat the same time to examine how well these connections are captured in depth and accurately, how well they can be represented visually and with information, and how well these representations help to frame the artefacts.

The use of GIS in the museum will have an impact on research and curatorial processes. Researchers can examine spatial distributions, patterns and relationships in object data using GIS. The evaluation should measure how GIS has influenced research processes, data processing and the development of new perspectives on framing objects.

It seems appropriate to analyze how well GIS has facilitated the framing of artefact study and it is necessary to consider whether GIS tools and spatial analysis capabilities have helped researchers to develop new theories, identify patterns or trends in the distribution of artefacts and understand the socio-cultural dynamics associated with the context of artefacts.

At the same time, it is important to consider the effects of GIS on curatorial processes such as artefact selection, exhibition layout and interpretation, with a corresponding examination of the impact on curatorial decision-making, on how artefacts are presented in their original context and on the history built around them. By offering interactive and immersive experiences, the implementation of GIS has the potential to improve visitor engagement and education. Evaluation should take into account how GIS affects visitors' understanding and enjoyment of the contextualization of objects. Primarily, it should analyze how well the GIS applications engage visitors and allow them to explore artefact environments. The degree of interaction and immersion offered by GIS technologies, the clarity and usability of the information provided to visitors, and the extent to which GIS helps visitors' understanding and interpretation of artifact framing are things to consider.

By analyzing the extent to which educational programmes, information materials and guided tours are supported by GIS applications and the impact these activities have on visitors' learning outcomes, the educational benefits of GIS in promoting a better understanding of archaeological techniques and the importance of artefact framing are explored.

The integration of GIS in the Archaeological Museum of Kavala has the potential to significantly impact the contextualization of artifacts within their original archaeological settings. Through spatial visualization, relationship mapping, and enhanced research and curatorial practices, GIS facilitates a deeper understanding of artifact contextualization. Additionally, GIS applications contribute to visitor engagement, education, and the promotion of a more comprehensive appreciation of the museum's cultural heritage collection. The evaluation of GIS implementation in these aspects provides valuable insights into the effectiveness of GIS in artifact contextualization and its broader implications for the museum's goals and objectives.

7.4 Visitor Interpretation and Connection with Education in theMuseum.

Interpretation and visitor education are key aspects of a museum's mission to engage and educate its visitors. This evaluation focuses on assessing the effectiveness of visitor interpretation and education initiatives at the Archaeological Museum of Kavala, with particular emphasis on how they contribute to the understanding, engagement and promotion of visitors' archaeological knowledge.

Interpretive exhibits and demonstrations are key elements of visitor interpretation at the museum. The evaluation should consider the following aspects based on:

- the clarity and accuracy of the interpretive content provided in the exhibits and displays. Assessing whether the information presented reflects current archaeological research and effectively communicates the historical and cultural significance of the artefacts and archaeological finds.
- The effectiveness of the presentation techniques used in exhibits and displays, considering the use of multimedia, interactive elements, narrative techniques and visual aids to enhance visitor engagement and understanding.
- the accessibility of exhibits and interpretive displays to a wide range of visitors, including people with disabilities and non-native speakers, while providing multilingual information and the availability of alternative formats (e.g. Braille, audio guides) to ensure inclusiveness and enhance visitor understanding.

Guided tours and educational programs provide visitors with guided and immersive experiences in the museum. The evaluation should address the following aspects:

- the quality and effectiveness of the guided tours, including the expertise and enthusiasm of the guides, the accuracy and depth of information provided, and the overall implementation of the tour. Whether tours engage visitors, promote understanding and create meaningful connections with the museum's objects and collection.
- The impact of educational programmes, such as workshops, lectures and hands-on activities, in promoting archaeological knowledge and enhancing visitor engagement, having regard to the effectiveness of these programmes in serving different audiences, including school groups, families and adults.
- the presence of interactive and hands-on experiences within the museum, such as replica manipulation, immersive displays or interactive digital exhibits; setting the goal of the effectiveness of these experiences in

enhancing visitor engagement, understanding and connection to the objects and archaeological concepts.

Interpretive materials and publications provide visitors with additional information and resources to better understand the museum's collection. The evaluation should consider the following aspects:

- the clarity, accuracy and accessibility of visitor guides and brochures. Whether these materials effectively complement the museum experience, provide in-depth information and encourage further exploration.
- the availability and effectiveness of digital resources, such as the museum's website, electronic exhibits or mobile phone applications. Whether these resources enhance visitors' understanding, provide interactive elements and support self-guided exploration of the museum's collection.
- the quality and availability of publications and research materials related to the museum's collection. Whether these materials offer scientific knowledge, advance archaeological knowledge and provide opportunities for further study and research.

Visitor interpretation and educational connections at the Kavala Archaeological Museum are vital to promoting deeper understanding, engagement, and appreciation of the museum's collection. By evaluating interpretive exhibits anddisplays, tours and educational programs, and the availability of interpretive materials and publications, this evaluation provides valuable insights into the effectiveness of these initiatives and their impact on visitor experiences and archaeological knowledge. The findings can guide future strategies to enhance interpretation and visitor education, ensuring a meaningful and enriching museum visit for all visitors.

7.5 Challenges and Limitations Encountered in Implementing GIS inthe Archaeological Museum

The integration of Geographic Information Systems (GIS) in the Archaeological Museum of Kavala brings numerous benefits for managing, interpreting, and presenting archaeological data. However, the implementation of GIS also poses various challenges and limitations that need to be addressed for a successful and effective integration. This assessment aims to explore the challenges and limitations encountered in implementing GIS in the museum and provides insights for mitigating these challenges.

Implementing GIS in the museum involves various technical challenges. Collecting and integrating data from different sources into the GIS database can be complex and time-consuming. Additionally, managing a large volume of spatial and attribute data requires careful organization, standardization, and quality control. Adequate hardware and software infrastructure, including high-performance computers, servers, and licensed software, are essential for the implementation of GIS. However, these infrastructure requirements can be costly and may pose ongoing challenges in terms of maintenance and updates. Furthermore, implementing GIS necessitates skilled personnel with expertise in GIS software, database management, data analysis, and spatial visualization, and ensuring the availability of qualified personnel can be challenging.

Ensuring the accuracy and completeness of data in the GIS database is crucial for reliable analyses and interpretations. Challenges may arise in terms of data validation, as verifying the accuracy and reliability of data from different sources can be challenging. Additionally, comprehensive documentation of metadata, including data sources, collection methods, and quality assessment, is essential for assessing the reliability and validity of the data. However, metadata documentation can be time-consuming and may be overlooked, affecting the usability and transparency of the GIS database. Incorporating historical data into the GIS database may also present challenges due to varying levels of data availability, accuracy, and completeness, requiring extensive data reconstruction and validation processes.

Various technological limitations can impact the implementation of GIS in the museum. Compatibility issues may arise when integrating GIS software with other museum management systems or databases, requiring seamless integration and data exchange between different software platforms. The scalability and performance of the GIS system may be compromised as the volume of data increases over time, leading to slow processing speeds, limited storage capacity, and system crashes. Ensuring user-friendly interfaces and intuitive navigation within the GIS system is crucial for non-technical museum staff and visitors, and complex interfaces and a steep learning curve may limit accessibility and usability.

Implementing GIS in the museum can be hindered by institutional and organizational challenges. Limited financial resources can pose constraints in procuring necessary equipment and sustaining the GIS system in the long term. Effective GIS implementation often requires collaboration and coordination between multiple stakeholders, including archaeologists, IT professionals, museum staff, and researchers. Overcoming institutional silos, establishing clear communication channels, and ensuring cooperation can be challenging. Implementing GIS may also require changes in workflows, data management practices, and the adoption of new technologies, necessitating change management strategies and staff training.

Sharing sensitive archaeological data, including excavation records, artifact details, and site locations, may raise concerns about data privacy, intellectual property rights, and ethical considerations, requiring the development of data sharing protocols and compliance with data protection regulations.

Implementing GIS in the Archaeological Museum of Kavala brings numerous benefits but also presents challenges and limitations that need to be addressed for successful integration. Technical challenges, data accuracy and completeness issues, technological limitations, and institutional and organizational constraints are among the key challenges and limitations encountered. By acknowledging these challenges and adopting appropriate strategies such as investing in technical infrastructure, ensuring data validation and documentation, addressing compatibility issues, fostering institutional collaboration, and implementing change management practices, the museum can overcome these obstacles and maximize the potential of GIS for managing and interpreting archaeological data. Continuous monitoring, evaluation, and adaptation of GIS implementation strategies are also crucial to address emerging challenges and ensure long-term success.

7.6 SWOT Analysis for the Use of GIS in the Archaeological Museum ofKavala

Strengths	Weaknesses
• Improved Data Management: GIS makes it possibleto efficiently organize and arrange huge amounts of spatial and attribute data pertaining to archaeological sites and objects. • Better Spatial Analysis: GIS makes it possible to perform spatial analysis and visualization, makingit easier to spot patterns, connections, and trendsin archaeological data. • Improved Interpretation: By giving a spatial context and permitting the overlay of several layers of data, GIS integration facilitates betterinterpretation of archaeological data. • Greater Efficiency: GIS streamlines operations including data integration, data collecting, and analysis, which results in greater effectiveness andtime savings. • Improved Accessibility: GIS software can offer interactive and user-friendly user interfaces, increasing the accessibility of archaeological information for museum employees, scholars, andvisitors.	• Technical Complexity: The implementation and upkeep of GIS require technical know-how, specialized software, and hardware infrastructure, which can be difficult to allocate resources to and to staff with the necessary skills. • Data Accuracy and Completeness: For proper analysis and interpretation, GIS largely depends on accurate and comprehensive data. It can take a lot of time and effort to ensure data accuracy, validate data from many sources, and document metadata. • Budgetary Restraints: The implementation and upkeep costs of GIS, including hardware, software licensing, and experienced employees, may put a burden on the museum's finances, especially if there are few accessible funds. • Resistance to Change: Museum workers who are not familiar with GIS technologies may be resistant to changes that introducing GIS may necessitate in workflows and data management procedures.
Opportunities	**Threats**
• Improved Research Capabilities: By enabling sophisticated spatial analysis, visualization, and modeling of archaeological data, GIS integration opens up new research opportunities. • Better tourist Experience: Interactive maps, virtual tours, and augmented reality experiences are some of the ways that GIS applications can improve tourist interaction with and comprehension of archaeological sites andartifacts. • Collaboration and Knowledge Sharing: GIS can help scholars, archaeologists, and other stakeholders collaborate and share knowledge, which will result in a greater understanding of Kavala's archaeological heritage. • Preservation and conservation: By providing tools for regulating the effects of environmental elements and human activities, GIS can aid in the preservation and conservation efforts ofarchaeological sites.	• Technical Difficulties and Infrastructure Issues: Implementing and maintaining GIS properly may be difficult because to a lack of technical resources, obsolete infrastructure, or compatibility problems with current systems. • Data Security and Privacy: The use of GIS raises questions concerning the security and privacy of private archaeological information, such as excavation records, artifact specifics, and site locations. There must be adequate data protection procedures in place. • Skill Gap and Training: Skilled employees who are trained in GIS technology and data management are necessary for the successful implementation of GIS. There can be a shortage of qualified employees and chances for continued training. • Cultural and Ethical Considerations: When using GIS in the context of archaeology, care must be taken to respect local communities, take into account cultural sensitivities, and follow moral

	standards for data collection, interpretation, and distribution.

8.0 Case Study: Philippi

The ancient city of Philippi, which is now an archaeological site, had a significant historical impact during the Roman and Byzantine eras. A unique look into the past is provided by the site's well-preserved ruins, which include the theater, forum, and the remains of early Christian basilicas. The site's surrounding natural landscape adds to its allure and attractiveness.

However, the existing situation has a number of flaws and difficulties. Visitors might not have enough context or understanding of the site's historical and architectural value due to the absence of interpretative signage or information boards in the outdoor area. Confusion might result from a site's lack of clear routes and directional signs, which can restrict visitors' ability to explore the area. Inadequate visitor amenities, such as few seating options and restrooms, can affect tourists' general pleasure and comfort.

Despite these difficulties, there are chances for development. The visiting experience at the Philippi Archaeological Site can be greatly improved by the incorporation of technology and digital interpretation. Detailed historical information, site reconstructions, and interactive components can be provided using mobile applications, interactive displays, and virtual reality to engage and educate visitors. These innovations have the ability to produce an engaging and educational experience that complements the actual ruins and deepens visitors' knowledge of the historical setting.

There are a few things to take into account in order to take advantage of these opportunities. For the proper integration of digital technology, it is essential to guarantee consistent internet access throughout the site. To retain the historical integrity of the site, it is crucial to strike a balance between the use of technology and the preservation of the authenticity and beauty of the site. To accommodate visitors of various ages and technological ability, the incorporation of technology should also be complemented by user-friendly interfaces and easy navigation.

The foundation for the subsequent investigation of technologies and digital interpretation techniques that can improve the visitor experience and offer a deeper understanding of the site's historical significance is laid by analyzing the current situation at the outdoor area of the Archaeological Site of Philippi, including its strengths, weaknesses, opportunities, and challenges.

8.1 Technologies and Digital Interpretation in Outdoor Archaeological Sites

Integration of technologies and digital interpretation is essential to improve visitors' experiences and knowledge of outdoor archaeological sites like the Archaeological Site of Philippi. Through the use of diverse technology instruments and techniques, these sites may offer visitors engaging and immersive experiences that bring the past to life.

Mobile applications are one of the most important technologies for outdoor archaeological sites. These apps work as virtual tour guides, providing users with in-depth knowledge of the surroundings' history, monuments, and relics. They could consist of multimedia content, interactive maps, audio tours, and other features to pique users' interest and improve their comprehension of the website. Visitors can also see reconstructions, 3D models, or animations projected over the relics and ruin by employing augmented reality (AR) technology, resulting in a remarkable fusion of the virtual and real worlds.

Another useful tool for outdoor archaeological sites is interactive displays. These displays can be placed in key spots on the property to educate visitors about certain sites, structures, or relics. Visitors can explore the website at their own pace and delve deeper into topics of interest by using interactive touch screens or panels to obtain in-depth explanations, images, and videos.

Another potent technology for outdoor archaeological sites is virtual reality (VR). Visitors can immerse themselves in simulated historical events that occurred at the site or virtual reconstructions of ancient structures by donning VR headsets and traveling to various locations and eras. Visitors may see the place as it once was and obtain a clearer appreciation of its historical significance thanks to VR, which offers an intensely immersive and compelling experience.

Aerial photography and drone use can offer a distinctive viewpoint of the location. Drones can take high-definition aerial pictures and movies, giving viewers the chance to examine the location from various perspectives and understand its layout and scale. Visitors can fully comprehend the topography and spatial context of the place by incorporating these visuals into digital platforms and applications.

By offering directions and location-based information, geolocation technologies like GPS and beacons can further improve the visitor experience. Visitors can get alerts or contextual information while navigating the website using GPS-enabled devices or beacon technology. Based on the visitor's location, this

technology can give pertinent historical data or tales, highlight locations of interest, and aid in navigating.

Prioritizing accessibility and diversity is crucial when investigating these technologies. To guarantee an inclusive and satisfying experience for all visitors, factors including user-friendly interface design, support for many languages, compatibility with different devices, and accessibility requirements should be taken into account.

Visitors to the Archaeological Site of Philippi can interact with the site in fresh and engaging ways by incorporating modern technology and digital interpretation techniques into the outdoor area. With the use of these technologies, visitors can gain a deeper grasp of the site's significance and history while also having a more engaging, instructive, and entertaining experience. To ensure that technology enriches rather than detracts from the entire experience, it is vital to find a balance between the incorporation of technology and the preservation of the site's authenticity and historical integrity.

8.2 Case Study Application: Integration of Augmented Reality in the Archaeological Site of Philippi

The Archaeological Site of Philippi has an exciting opportunity to improve tourist experiences and provide visitors a deeper knowledge of the historical value of the site through the incorporation of augmented reality (AR) technology. To give visitors an immersive and participatory experience, augmented reality includes superimposing virtual features on the real world.

Visitors will be able to observe the structures as they did in their original form by using AR to superimpose virtual reconstructions over the ruins. Accurate 3D models of the structures and monuments can be made and added to the AR experience using historical study and archaeological data. Visitors can examine the virtual reconstructions in real-time using their smartphones other AR-capable devices, which will help them better grasp the layout, architecture, and historical context of the site.

Additionally, AR can offer new levels of knowledge about the items discovered at the location. Visitors can receive comprehensive information on specific objects, including historical context, significance, and related tales, by scanning or pointing their devices at those items. Visitors can interact with the objects in a more immersive and instructive way thanks to this interactive feature, which fosters a greater understanding of the cultural legacy of the location.

AR can also be used to reenact historical incidents that happened at the Philippi Archaeological Site. Visitors can view significant events in the site's history, including as battles, rituals, or everyday activities, through animated visuals and audio commentary. The past is brought to life through this dynamic and entertaining method of storytelling, enhancing the tourist experience.

Virtual tours and accompanied site investigations can also be made possible through augmented reality. Visitors can choose from pre-planned itineraries or specific areas of interest, and the AR technology can offer detailed instructions, background knowledge, and interactive features all along the way. With the self-guided tour option, users may explore the website at their own leisure while still getting access to engaging materials.

Researchers and casual visitors to the Philippi Archaeological Site can both benefit from the use of AR. Regular visitors can enjoy a more immersive and instructive experience, learning more about the historical significance of the location. To support their scholarly work and discoveries, researchers can, however, use augmented reality (AR) technology to visualize and analyze data, do virtual reconstructions, and simulate hypothetical scenarios.

But while deploying AR at the site, it's important to solve a few issues and factors. For a flawless AR experience, reliable internet connectivity is crucial, especially outdoors where network coverage may be spotty. To ensure that the use of AR technology does not jeopardize the actual ruins or the overall visitor experience, it is also imperative to emphasize the preservation of the site's authenticity and historical integrity.

Visitors can interact with the Philippi Archaeological Site in a fresh and immersive way by incorporating augmented reality into the environment. A dynamic and instructive experience is delivered by the virtual reconstructions, interactive item information, historical event visualizations, and guided tours made possible by AR technology. This use of AR makes visiting the Archaeological Site of Philippi a genuinely memorable and enlightening experience by improving the visitor's comprehension and appreciation of the site's cultural heritage.

8.3 Evaluation of the Implementation of Augmented Reality at the Site

The Archaeological Site of Philippi has tremendous prospects to improve tourist experiences and provide visitors a deeper knowledge of the historical value of the site through the use of augmented reality (AR). In order to judge AR's success and pinpoint areas for development, it is essential to evaluate its efficacy and influence in this situation.

The degree of visitor involvement is one of the most important aspects to consider when evaluating the application of AR. Visitors can actively engage in the investigation of the place thanks to AR technology's immersive and interactive experience. It is possible to tell whether the technology is effective at engrossing and engaging visitors by evaluating visitor feedback and watching how they interact with the AR elements. Positive comments, longer dwell times, and a high level of interaction show that the adoption of augmented reality has been successful in capturing visitors' interest and involvement.

For assessing the impact of the AR content, accuracy and authenticity are essential. To ensure a high level of accuracy, the virtual reconstructions, artifact data, and historical event visualizations should be in line with the most recent research and archaeological data. Surveys and interviews can be used to determine how visitors feel about the authenticity of the AR content. Visitors' perceptions of the AR experiences as trustworthy and educational are signs of a successful implementation.

The effect of AR on visitors' comprehension and interpretation of the site is another factor that has to be assessed. The historical setting, architectural details, and significance of the location should all be easier to understand thanks to AR technology. It is possible to determine how effective AR content is as a teaching tool by measuring visitors' knowledge acquisition and comprehension both before and after they interact with the AR content. The effectiveness of the technology can be evaluated by comparing visitors' comprehension of the site's significance and history with and without augmented reality (AR).

Another important factor is the AR application's usability and user experience. The AR features should be easy for visitors to use and free of major technical difficulties. It is possible to identify areas for improvement in usability and user experience by assessing visitors' ease of engagement, happiness with the user interface, and any difficulties or frustrations they may have had.

The evaluation should also take into account how AR affects visitors' feelings of emotional connection and overall happiness with their experience. AR has the

power to stir up feelings, produce unforgettable experiences, and encourage a sense of nostalgia. Insights into the emotional impact of the AR implementation can be gained by evaluating visitors' emotional reactions, their level of satisfaction with the AR features, and their probability to promote the site to others.

In order to implement AR effectively, it is crucial to get input and understanding from site personnel and managers. Their viewpoints can provide insight into technical problems, upkeep needs, and the viability of long-term integration. Staff input can be used to identify any obstacles or resource allocation restrictions that would hinder the successful deployment and sustainability of AR at the site.

A thorough evaluation of the usage of AR at the Philippi Archaeological Site may be made by looking at the degree of visitor engagement, accuracy of content, impact on comprehension, user experience, emotional connection, and input from site employees. This assessment will give important information on how well augmented reality works as a tool for enriching tourist experiences, promoting education, and deepening awareness of the cultural legacy of the place.

8.4 Effect on the Framing of Artifacts in the Site

The integration of augmented reality (AR) technology in the Archaeological Site of Philippi will have a significant impact on how artifacts are presented and experienced, transforming the way visitors engage with these historical objects. AR technology offers new possibilities for contextualizing artifacts within their original settings, providing additional layers of information, and creating interactive and immersive experiences.

The visual portrayal of artifacts in their original context is one of the main effects of AR on artifact framing. Visitors would view virtual overlays or reconstructions of the settings, buildings, or structures that would have been around the artifacts throughout their use with AR applications. Visitors would gain a better understanding of the function and value of the objects within the larger historical and cultural context thanks to this contextualization. Visitors could visualize the items in their original contexts and imagine how they were used, who interacted with them, and the cultural practices linked with them thanks to augmented reality (AR).

AR offers additional details and insights about the artifacts in addition to the visual context. Visitors would receive thorough descriptions, historical context, related stories, or multimedia content such as photographs or films by scanning or pointing their devices at certain artifacts. Visitors' comprehension of the value, purpose, and historical context of the objects is deepened by this addition of information. By providing a rich narrative and connecting the objects to more significant historical themes or events, it brings the items to life.

Additionally, AR will allow for immersive and interactive experiences with artifacts. Visitors will interact with virtual models or animations superimposed on the artifacts to examine various angles or features of the artefacts. Visitors would , for instance, operate a virtual 3D model of an item to view it from various perspectives, zoom in to see fine details, or engage with virtual elements that show how it is used. This interaction increases visitor interest and creates a greater understanding of the craftsmanship and historical significance of the items.

Moreover, by seamlessly fusing digital content with actual physical objects, augmented reality (AR) blurs the line between the real and virtual worlds. A compelling and multimodal experience will produced by the merging of the real and virtual elements, which draws visitors in and encourages further exploration and learning.

Aside from improving the visitor experience, augmented reality will also affects how archaeologists, academics, and curators analyze and record artifacts.

Using AR technologies, experts can record observations, digitally label objects with extra information, or build virtual reconstructions. This digital record will enhance item comprehension and preservation while offering priceless resources for upcoming study and research.

However, it is crucial to strike a balance between the enriched visitor experience and the preservation of the artifacts themselves. The physical integrity of the items should not be compromised by the use of AR, nor should their intrinsic value be diminished. The design and implementation of AR features must be carefully considered to ensure they enhance the artifact's framing without overshadowing its authenticity or becoming the sole focus for visitors.

In conclusion, the integration of AR technology at the Philippi Archaeological Site significantly would impact the framing of artifacts. Visitors will benefit from visual context, supplementary information, interactive experiences, and a seamless fusion of physical and digital aspects. AR would enhance the understanding and appreciation of the artifacts' value and historical context, making the overall experience more engaging and immersive. However, it is essential to carefully integrate AR elements to ensure that the artifacts remain the primary focus while leveraging the digital additions to deepen the connection with the site's cultural history.

8.5 Interpretation of Visitors and Connection with Education in theOutdoor Area

A key element of enriching the tourist experience and encouraging a greater knowledge of the site's historical significance is the interpretation of visitors and their relationship to education in the outdoor area of the Archaeological Site of Philippi. Visitors can form a deep connection with the location and its cultural history by offering educational opportunities and interesting interpretation techniques.

Fostering a sense of interest and participation is one of the main objectives of visitor explanation in the outdoor area. Strategically placed interpretive signage, panels, or multimedia displays can give site visitors brief and enlightening information on the background, architecture, and significance of various areas or structures. The accessibility, aesthetic appeal, and engagement of these interpretative items should encourage visitors to explore and learn at their own pace. Interpretation encourages a more active and immersive experience by piqueing visitors' curiosity and giving them information that is simple to understand.

Technology-based initiatives, in addition to conventional interpretative materials, can significantly improve visitor interpretation and education. Applications for augmented reality (AR), as was previously mentioned, can offer virtual reconstructions, information about artifacts, and visualizations of historical events. Visitors can interact with interactive multimedia that vividly brings the site's history to life by integrating AR technology in the outdoor area. Visitors can more easily picture and comprehend the historical context of the place thanks to this dynamic approach of interpretation.

Additionally, competent tour guides and mobile applications can offer in-depth interpretation and educational opportunities during guided tours. To help visitors better grasp the location and its cultural value, knowledgeable guides can impart stories, anecdotes, and historical insights. Self-guided tours with audio commentary, photographs, and more information can be offered through mobile applications, allowing users to browse the website at their own leisure while still learning new information. Visitors are guaranteed accurate information and a thorough grasp of the significance and history of the place thanks to these guided interpretations.

Information provision is only one aspect of the relationship with education. Additionally, it entails providing chances for guests to actively engage in educational activities. Visitors can participate in hands-on activities, workshops, or demonstrations relating to archaeological procedures, historical craftsmanship, or cultural traditions by attending events in the outdoor space. These engaging

activities promote a greater understanding of the abilities and knowledge of the past and a sense of connection to the cultural history of the location.

Meanwhile, linking pupils to the outside area of the Philippi Archaeological Site can be facilitated via educational initiatives designed for schools and other learning environments. Through partnerships with educational institutions, the site may create courses, field trips, and seminars that are specifically tailored to the curriculum and give students immersive, practical learning experiences. These educational initiatives foster a lifetime interest in cultural heritage and preservation in addition to improving students' knowledge of history and archaeology.

Assessing the success of visitor interpretation and educational efforts requires evaluation and feedback procedures. It can obtained visitor opinions and gauge their degree of involvement, comprehension, and contentment by conducting surveys, interviews, or observation studies. Future interpretation tactics and educational activities can be informed by visitor feedback, including ideas for improvement, to ensure that the site continues to suit the requirements and interests of its varied audience.

In conclusion, it is essential for enriching the visitor experience and fostering a deeper understanding of the site's cultural heritage to interpret visitors and their link to education in the outdoor area of the Archaeological Site of Philippi. Visitors can build a meaningful connection with the location and its history by providing interesting and instructional interpretative materials, using technology-based approaches, setting up guided tours, providing hands-on activities, and creating educational programs. This work is evaluated through observation and feedback to guarantee ongoing development and the provision of excellent educational experiences for visitors of all ages.

8.6 Challenges and Constraints When Implementing AugmentedReality in the Space

The integration of augmented reality (AR) into the outdoor space of the Philippi archaeological site presents a number of challenges and limitations that are important to identify carefully to ensure maximum and successful implementation. While AR offers exciting potential to enhance the visitor experience, it is important to communicate the following factors to ensure seamless and effective integration.

First off, building the necessary technical infrastructure for AR can be difficult. The archaeological site's outdoor setting could provide problems with communication and power supplies. To transmit real-time AR content and prevent interruptions to the visitor experience, a dependable and quick internet connection must be established.

The outside setting also introduces environmental elements that may havean impact on the AR experience. The visibility and legibility of AR overlays may be impacted by sunlight, glare, shadows, and various lighting situations. It is essential to create augmented reality (AR) applications that can adjust to various lighting situations and reduce interference brought on by external elements.

Another difficulty is making user-friendly AR experiences. To guarantee that users can engage with the technology seamlessly, AR interfaces should be simple to use, offer clear instructions, and be intuitive. To meet the demands of a variety of visitors, factors including accessibility, information clarity, and suitable levels of interactivity should be taken into mind.

High-quality AR content takes a large investment of time and knowledge. It can take a lot of time to produce precise virtual reconstructions, thorough item representations, and engaging storylines, therefore archaeologists, historians, designers, and technologists must work together. For the AR material to remain effective and accurate, regular updates and maintenance are required.

Costs associated with implementing AR technology include hardware purchases, software development, the creation of content, and continuous maintenance. Sustainability factors like energy consumption and the environmental impact of hardware should also be taken into account. It's critical to strike a balance between the advantages of AR and the financial resources needed for deployment.

Accessibility and visitor engagement are crucial factors. For inclusive experiences to be created, it is crucial to make sure that AR experiences adapt to the requirements and preferences of all visitors, including those who have restrictions or

disabilities. It's crucial to provide accessibility features to offer different forms of communication and to promote inclusivity.

AR should be used in a way that supports the preservation of the archaeological site and its objects and respects them. To avoid causing harm or disturbing the delicate archaeological remains, visitors and the site should take special care when interacting physically. Concerns about privacy and data protection are raised when visitor information is gathered through AR applications. Establishing clear policies and procedures for data gathering, storing, and use can help to ensure visitor permission and adherence to privacy laws.

Although augmented reality (AR) can improve the tourist experience, there is a chance that certain visitors could become too dependent on technology and lose contact with their physical environment. It's critical to strike a balance between utilizing augmented reality and enticing people to interact directly with the location and objects.

For AR to be implemented successfully, staff members must receive proper training and support. To assist guests and guarantee a positive visitor experience, staff members should be knowledgeable about the technology, its features, and troubleshooting techniques.

Careful planning, stakeholder cooperation, continual review, and adaptation are required to address these issues and limitations. By taking into account these elements, the use of augmented reality (AR) in the outdoor space of the Archaeological Site of Philippi can produce engaging learning experiences that improve visitor engagement and comprehension of the site's cultural legacy.

8.7 Swot analysis for the use of GIS in the Archaeological Site ofPhilippi

Strengths	Weaknesses
• Improved Data Management: GIS makes it possible to handle, store, and analyze spatial and attribute data on the Philippi archaeological site effectively. This enhances information accessibility and organization, enabling thorough documentation and preservation of archaeological discoveries. • GIS offers tools for spatial analysis, enabling archaeologists to look at linkages, patterns, and trends within the site. It makes it easier to locate spatial clusters, analyze artifact distribution, and analyze landscape features, giving important information about the evolution and history of the site. • Visualization and Interpretation: GIS makes it possible to produce interactive, aesthetically pleasing maps that help academics and visitors see the layout, buildings, and artifacts of a particular site in their geospatial context. This helps the dissemination of research findings to a larger audience and improves the interpretation of archaeological data.	• Data correctness and Completeness: The correctness and completeness of the data entry are essential for the GIS to be useful at the Philippi archaeological site. The requirement for careful data collection and verification methods is highlighted by the fact that inaccurate or missing data might result in incorrect analyses and interpretations. • Technical ability Requirements: Making use of GIS technologies calls for a specific level of technical knowledge and ability. To use the tools and functions successfully, archaeologists and staff members involved in the setup and upkeep of GIS systems may require additional training and assistance.
Opportunities	**Threats**
• • Improved Site Management: By providing real-time data on visitor flows, infrastructure maintenance requirements, and site conservation activities, GIS can enhance the effective management of the Philippi archaeological site. This makes it possible to allocate resources and make better decisions for the site's protection and promotion. • Integration with Digital Interpretation Technologies: To give visitors engaging and informative experiences, GIS can be used with other digital interpretation technologies like augmented reality (AR) or virtual reality (VR). The prospects for improved visitor involvement and comprehension of the historical and cultural relevance of the place are made possible by this integration.	• Cost and Resource Restrictions: The installation and upkeep of a GIS system at thePhilippi archaeological site necessitates spending money on hardware, software, data collecting, and staff training. Budget and resource limitations may make it difficult to successfully integrate GIS technology and ensure their long-term viability. • Data Security and Privacy Issues: The collecting and storage of private archaeological data is a task performed by GIS. In order to avoid unauthorized access to or misuse of the information, it is essential to ensure data security and privacy protection. It is crucial to follow data protection laws and put strong security measures in place.

9.0 Conclusion

9.1 Summary of Findings

In this study, we looked at how GIS and augmented reality technology would be can used at Philippi and the Kavala Archaeological Museum. We have learned important things about the advantages, difficulties, and effects of various technologies on the protection, interpretation, and visitor engagement of cultural heritage through our research.

The future use of the GIS proves to be quite beneficial in the case of the Archaeological Museum of Kavala. The processes for data management, geographic analysis and documentation could completely transform the museum. The museum could achieve the framing of objects, improve visitor interpretation and create important educational links through the use of GIS. The power of GIS lies in its ability to provide an in-depth understanding of objects and their spatial connections, thus enhancing the understanding of cultural heritage.

Another impressive project could be the use of augmented reality in the archaeological site of Philippi. New opportunities for encounters, framing of objects, visitor interpretation and teaching have been made possible with augmented reality in similar venues. Augmented reality is able to provide a dynamic environment that brings the past to life by superimposing virtual features on the real world. Visitors will be able to interact with objects, explore virtual representations and learn more about the value and historical context of objects.

These findings contribute significantly to the field of cultural heritage management and interpretation. They emphasize the transformative potential of GIS and augmented reality in preserving and presenting our rich cultural heritage. GIS enhances the accessibility and analysis of data, while augmented reality creates engaging and interactive experiences for visitors. Both technologies have the power to revolutionize how we engage with and understand our cultural past.

This study lays the path for additional research and improvements in the sector by outlining the advantages, difficulties, and effects of various technologies. To fully realize the promise of GIS and augmented reality in cultural heritage settings, we advise more research into usability and accessibility, fusion with other technologies, long-term sustainability, and user evaluation. In the end, these technologies are the secret to producing rich, meaningful experiences that connect the past and present.

9.2 Contributions to the Field

The topic of integrating cultural heritage and technology has benefited greatly from this study. First off, it emphasizes how crucial GIS is to the efficient management of data, geographical analysis, and visitor engagement in museums. The use of interactive maps for documentation and promotion, as well as the favorable effects of GIS on artifact contextualization, are shown in the case study of the Archaeological Museum of Kavala.

The study also investigates the use of augmented reality in outdoor archaeological sites, demonstrating its potential to produce engaging and instructive experiences. How augmented reality can improve artifact framing, visitor interpretation, and educational linkages in an outdoor context is shown in the case study of the Philippi archaeological site.

9.3 Final Remarks

In conclusion, this study investigated the use of GIS and augmented reality technology in the Philippi archaeological site and the Kavala Archaeological Museum. The results have emphasized the enormous contributions made by these technologies to the preservation, interpretation, and visitor involvement of cultural heritage.

Processes for data administration, geographical analysis, and documentation can all be revolutionized by integrating GIS into the Kavala Archaeological Museum. It will improve the museum's contextualization of artifacts, visitor interpretation, and educational linkages. Understanding the geographical links between artifacts and their historical environment using GIS can be a powerful tool for enhancing our understanding of cultural heritage.

At Philippi, an archaeological site, the use of augmented reality will create new opportunities for immersive experiences, artifact framing, tourist explanation, and teaching. By superimposing virtual features over the physical world, augmented reality will breathe new life into the past. In order to enhance visitor experiences and foster a greater appreciation for Philippi's cultural heritage, visitors will have the opportunity to interact with artifacts, engage with virtual reconstructions, and learn more about their historical significance.

In the future, it will be crucial to take into account the difficulties and limitations posed by these technologies. To establish a successful integration, it is important to carefully evaluate the technical infrastructure, environmental aspects, user-friendliness, content development, cost concerns, accessibility, and the preservation of artifacts.

Future studies should concentrate on enhancing these technologies' usability and accessibility, investigating how they might be integrated with other cutting-edge technologies, assuring their long-term viability, and performing user assessments to further improve the visitor experience. It can develop engaging and significant experiences that connect people with the rich cultural history of archaeological sites by consistently improving our comprehension and application of GIS and augmented reality.

In conclusion, the use of GIS and augmented reality at the Philippi archaeological site and the Kavala Archaeological Museum has shown their potential to change how cultural heritage is interpreted and how visitors are engaged. Exciting chances to deepen comprehension and enjoyment of our cultural past are provided by these technologies. It can build dynamic, immersive experiences that connect the past and present by embracing these developments, assuring the preservation and celebration of our rich cultural heritage for future generations.

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