The Cinematic Turn in Museums: Exploring Immersive Technologies for Engagement and Accessibility

Joseph S. Raju[1], Prof. Dr. Robinet Jacob[2], Mr. Vishnu Saju[3]
[1]*Research Scholar, School of Tourism Studies, Mahatma Gandhi University, Kottayam, Kerala, India*
[2]*Research Supervisor, School of Tourism Studies, Mahatma Gandhi University, Kottayam, Kerala, India*
[3]*Research Associate, Research Associate Major Research Project RUSA 2.0, School of Tourism Studies, Mahatma Gandhi University, Kottayam, Kerala, India*

***Abstract*—Museums are in a state of dramatic shift from static models of exhibitions across the globe. This trend reflects an emphasis on more active and participatory exhibitions that centralize the visitor experience, instead of traditional passive encyclopaedic shows with curatorial authority. Immersive experiences are aggressively designed to attract and engage audiences by replicating environments or providing near-flawless historical events—not to mention enabling complex subject matter through narratives in a highly interactive way. The rise of sophisticated immersive technologies, such as virtual reality, augmented reality, and mixed reality, marks a turning point in museum practice. These technologies enable museums to craft innovative exhibitions that broaden visitor reach, increase engagement, and expand accessibility beyond classical confines. By transcending physical and temporal boundaries, immersive technology creates multisensory cinematic experiences that merge narrative storytelling with interactive environments. This paper, based on multi-case studies, examines how leading museums employ filmic and immersive tools to enhance visitor engagement and foster deeper learning outcomes.**

***Index Terms*—Museum Environment, Virtual Reality, Cinematic Immersive Experience, Digital Storytelling, User Engagement and Accessibility.**

I. INTRODUCTION

A visitor enters a dimly lit gallery, and suddenly, they're transported to a 19th-century battlefield. The distant rumble of cannon fire, the movement of soldiers across the landscape, and a narrator's voice all pull the viewer into the scene. Though no tangible objects are handled, the feeling of presence is instantaneous and deeply affecting. This isn't a movie theatre, but a modern museum, which has made cinematic immersion a key interpretive strategy. These experiences illustrate the cinematic turn in museums, where storytelling, multisensory design, and immersive technologies come together, turning visitors from passive watchers into engaged participants. Historically, museums have been reflective spaces, whose primary role is to conserve and display artifacts, and the interpretation of the curator has a lot of power. Despite the importance of this model in preserving culture, it has been criticized to be promoting mostly passive forms of interaction, hence limiting emotional interactions and experiential learning (Popoli and Derda, 2021). As a result, museums around the world are redefining themselves not merely as objects collections, but as storytelling environments, where empathy, curiosity and bodily understanding can be aroused. This shift is a reflection of cinematic customs, where the meaning is created by its atmosphere, speed, point of view, and emotional cues, but not just by the presentation of facts (Faherty, 2019).

Museums have embraced immersive technologies like virtual reality (VR), 360 video (VR360), and mixed reality (MR) to create new experiences in response to an experiential shift for visitors. Empirical research has shown there are significant differences between how immersive modalities create presence and sustained engagement. In particular, VR and MR present much greater levels of “being there” than do panoramic VR360 experiences (Ariya et al., 2025), which indicates that other than the visual experience, embodied interaction and spatial integration are vital to meaningful experiences at museums. However, these studies have compared immersive technology performance by grouping it based upon modality, but

largely do not address how these immersive formats relate to the broader cinematic turn in museums, which re-defines how visitors encounter heritage through elements like narrative flow, affective immersion, and experiential spectator-ship.

The further development of the digital museum supports this cinematic logic. Digital technology is no longer used solely for documentation, archiving or conservation, but has become an important element of communication, enjoyment and experiential design (Pantile et al., 2016). Immersive installations, including AR-enhanced tours, VR simulations and large-scale 3D projection environments, are illustrative of how museums can create multi-sensory narratives that create fluidity between physical and mediated spaces. Immersive environments are specifically designed to captivate audiences by recreating historical events through interactive and compelling narratives. The main intent of these interactions is to foster a deeper comprehension of the subject and to establish a more personal connection between the exhibit and its viewers; that go beyond simple entertainment. This radical rethinking of the museum's central purpose marks a shift from a mostly didactic, object-cantered approach to a more immersive, visitor-cantered one. This change implies that museums increasingly view themselves as hubs for embodied learning and emotional connection in addition to being knowledge repositories (Lee, 2025). This research delves into the confluence of immersive technologies within museum settings by employing case study methodology to provide actionable insights for museum professionals to create an impactful experience for their audience

II. THEORETICAL FOUNDATION

The cinematic turn represents a major shift in contemporary visual culture, moving beyond traditional artistic media to position cinema as both a material medium and a conceptual framework. Artists increasingly blur the boundaries between film, sculpture, photography, and digital media through intermedia practices. Bovier (2020) argues that this dissolution of disciplinary boundaries defines contemporary art, while Mondloch (2007) describes the fusion of cinematic and sculptural concerns as a challenge to conventional art historical methods. Rather than treating cinema as an obsolete medium, contemporary artists reinterpret its materiality and history as creative resources.

This transformation is reflected in diverse artistic practices. Nardelli (2009) observes that artists such as Rodney Graham and Atom Egoyan incorporate film projectors, filmstrips, and obsolete cinematic materials into gallery installations, using cinema's history as a means of critically reflecting on the medium itself. Similarly, Green and Lowry (2009) demonstrate how photographers such as Gregory Crewdson adopt cinematic production methods, while Wójtowicz (2020) highlights how digital artists employ post-production, remixing, appropriation, and re-contextualisation to construct new multimedia narratives. These developments illustrate a shift from producing original images toward reworking existing visual archives within digital and institutional spaces.

The cinematic turn has significant theoretical implications for understanding visual culture. Bal (2021) conceptualises this transformation through "thinking in film," which identifies four interconnected dimensions of movement: literal movement within images, perceptual movement, affective movement, and political movement. Likewise, Brougher et al. (2008) describe "The Cinema Effect," arguing that cinematic language has become deeply embedded in contemporary culture, blurring distinctions between reality and fiction and demanding new approaches to image interpretation. Consequently, visual culture increasingly functions as an evolving process of layering, networking, and remediation rather than a collection of fixed visual objects (Wójtowicz, 2020).

The emergence of visual culture studies has further expanded this perspective by integrating insights from art history, film studies, phenomenology, technology studies, and cultural theory. Rather than maintaining traditional artistic hierarchies, moving images are understood as primary mechanisms through which cultural meaning is produced and communicated (Dikovitskaya, 2005). Bruno's (2006) concept of the spatial turn further demonstrates how cinema intersects with architecture, urban space, and bodily movement to create immersive forms of experiential engagement that extend beyond conventional film viewing.

Contemporary art increasingly relocates cinematic experience from the cinema screen into museums and galleries. Rascaroli (2020) argues that gallery

installations deconstruct film into its material components, producing hybrid forms that challenge conventional definitions of both cinema and visual art. Similarly, Kartseva et al. (2020) observe that video has evolved from an experimental countercultural practice into a dominant exhibition medium, widely employed in international events such as the Venice Biennale. Combined with post-production techniques and digital platforms (Wójtowicz, 2020), galleries, museums, and biennials have become primary sites for experiencing these hybrid cinematic works (Zuzulich, 2020).

Theoretical discussions also emphasise how cinematic practices redefine relationships between media, audiences, and exhibition spaces. Nardelli (2009) argues that contemporary cinematic practice encourages active engagement with the material processes of filmmaking, while De Rosa (2020) suggests that moving images transform galleries into personalised experiential environments requiring new theoretical perspectives. These developments replace passive contemplation with embodied, multisensory forms of perception based on the convergence of communication media (Kartseva et al., 2020).

Bal's concept of "thinking in film" provides an especially valuable framework for museum research. By examining literal, perceptual, affective, and political dimensions of movement, the framework explains how cinema reshapes understandings of both art and history (Bal et al., 2021; Lipiński et al., 2020). Her related concepts of heterochrony and timespace further demonstrate how museum installations construct interconnected temporal and spatial experiences that encourage visitor participation and agency. Through these "contact spaces," movement, narrative, and space combine to create immersive environments that support embodied learning and democratic engagement, making Bal's framework particularly relevant for analysing cinematic storytelling in contemporary museums (Bal et al., 2013; Bal et al., 2021).

III. LITERATURE REVIEW

Museum professionals increasingly view immersive technologies as transformative tools for experiencing, interpreting, and remembering cultural heritage. Since the mid-2000s, Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), and Extended Reality (XR) have evolved from experimental applications into essential tools for museum storytelling, education, and visitor engagement (Li et al., 2023). Despite rapid technological progress, research remains conceptually and methodologically limited. Most studies emphasise technological performance and interface design rather than the interpretive processes through which immersion generates meaning. Immersion is frequently treated as an outcome rather than a mechanism of historical understanding. Furthermore, empirical research largely relies on short-term experiments and satisfaction-based evaluations, providing limited evidence of long-term learning, memory retention, emotional engagement, or embodied experiences. Theoretical integration is also weak, with limited application of concepts such as presence, embodiment, empathy, and narrative transportation to explain how immersive storytelling shapes heritage interpretation.

Although immersive technologies are promoted as tools for creating living histories, several limitations persist. Existing research generally assumes that greater immersion leads to deeper learning (Roussou, 2002; Sylaiou et al., 2010; Bekele et al., 2018), while paying comparatively little attention to visitors' critical interpretation of historical narratives (Parry, 2007; Kidd, 2014). Studies commonly employ self-reported measures collected immediately after immersive experiences, offering limited insight into reflective learning and long-term meaning-making (Falk & Dierking, 2013; tom Dieck & Jung, 2017). Moreover, the literature prioritises sensory realism over narrative complexity, raising concerns regarding emotional manipulation, historical authenticity, and the oversimplification of contested histories (Smith, 2006; Champion, 2016). Accessibility, inclusivity, and sensory overload remain underexplored, particularly for visitors with cognitive or sensory sensitivities (Bautista, 2014; Giaccardi, 2012). Collectively, these studies suggest that immersive technologies are often examined as digital enhancements rather than interpretive media capable of reshaping historical understanding.

The transition from object-centred exhibitions to cinematic, story-driven museum experiences is increasingly evident. Shen et al. (2024) found that AR-based museum experiences enhance attention restoration and reduce stress by creating immersive fascination and psychological detachment, drawing on Attention Restoration Theory and Stress Reduction

Theory. However, their findings are constrained by a single astronomy museum, a predominantly young sample, and reliance on self-reported, cross-sectional data. Nevertheless, the study demonstrates how cinematic features such as multisensory interaction and immersive spectacle transform museums into emotionally engaging environments.

Similarly, Marasco (2020) examined cinematic Virtual Reality (cVR) as a medium for "history-living." Using filmic techniques including 360-degree framing, first-person perspectives, and narrative sequencing, cVR strengthens emotional engagement, empathy, and presence, enabling visitors to experience rather than simply observe heritage. However, the study relied on exploratory qualitative analysis of online comments, limiting empirical validity, while high implementation costs and the linear nature of cVR reduce scalability and visitor agency. Despite these limitations, the research highlights the importance of integrating narrative and embodied experience within cinematic museum interpretation.

Dağ, Çavuşoğlu and Durmaz (2023) further demonstrated that immersive AR positively influences visitor engagement, perceived authenticity, and place satisfaction, suggesting that technological immersion is most effective when aligned with meaningful cultural representation. Nevertheless, the study's reliance on questionnaire data from a single Turkish museum and handheld AR devices limits cross-cultural applicability, long-term understanding, and full sensory immersion. Although the findings confirm that immersive technologies enhance visitor satisfaction, cinematic narrative structures and accessibility remain insufficiently examined.

Beyond immersive experiences, museum accessibility also involves spatial equity. Kim et al. (2023) used GIS and network analysis to evaluate whether residents could access cultural institutions within a 15-minute travel threshold. Their findings revealed substantial disparities between central and peripheral districts, reframing museum accessibility as an urban planning issue rather than solely an institutional concern. However, the study did not examine visitor experiences within museums, limiting its contribution to understanding engagement with cultural heritage.

Museums are increasingly integrating cinematic storytelling with eXtended Reality (XR) technologies to transform traditionally static exhibitions into immersive digital experiences. According to Okanovic et al. (2022), XR—including Virtual Reality (VR) and Augmented Reality (AR)—supports "hyper-storytelling" by combining narrative sequencing, multimedia design, and user-centred interaction. Their study found high levels of immersion (mean = 4.76) and edutainment (mean = 4.68), demonstrating that narrative quality is central to visitor engagement. By incorporating actors, 360-degree environments, and cinematic grammar, XR enhances presence and emotional involvement while web- and mobile-based AR extends museum experiences beyond physical spaces. However, the study is limited by project-specific implementations, short-term usability testing, reliance on self-reported measures, and insufficient consideration of users with disabilities or limited digital literacy.

Chen et al. (2023) proposes an immersive VR framework to improve museum accessibility for non-visual users. Their system combines Claude Monet's paintings with multisensory stimuli, including sound, haptic feedback, scent, temperature, and airflow, using Unity XR, MANUS haptic gloves, and the SENSIKS Sensory Reality Pod. The framework incorporates subjective, behavioural, and physiological measures to evaluate user experience. Despite its innovative design, the study remains conceptual, lacking empirical validation, while its dependence on costly technologies and controlled environments raises concerns regarding scalability and institutional adoption.

Comes et al. (2020) argue that digital technologies such as 3D modelling, virtual exhibitions, VR, AR, and online platforms enable museums to preserve heritage while expanding public access. These technologies promote inclusive participation for visitors facing physical, temporal, or mobility constraints and facilitate hybrid museum experiences that combine cinematic storytelling with interactive spatial exploration. Digital replicas also protect fragile artefacts while supporting layered multimedia interpretation. Nevertheless, the study is primarily conceptual, relying on case studies without empirical evidence or quantitative measures of visitor engagement and emotional responses.

Similarly, Liu (2024) examines immersive VR as a foundation for intelligent museum design. The study identifies immersion, interaction, and imagination as core characteristics for transforming conventional exhibitions into dynamic learning environments. By integrating active visual localisation, AR Toolkit, inertial positioning, and Kalman filtering, the proposed system achieved an average positioning error of 14.0690 mm, demonstrating high technical precision. While grounded in communication-education theory and user-centred design, the research focuses primarily on technological performance and provides limited discussion of visitor experience, narrative effectiveness, or emotional engagement.

The foundation of these technological developments lies in cinematic storytelling. Cinematic techniques—including lighting, colour, composition, sound, and narrative structure—shape viewers' cognitive and emotional experiences, creating immersive engagement (Nyiramukama Diana Kashaka & IX, 2025). Museums increasingly adapt these techniques to transform exhibitions from static displays into emotionally engaging narrative environments that encourage active visitor participation and lasting memories (Faherty, 2019; Asankomah, 2023). This shift reflects the concept of film spectatorship, where audiences actively construct meaning from cinematic cues, an approach museum increasingly seek to replicate (Lee, 2025b). Consequently, cinematic exhibition design represents more than aesthetic enhancement; it applies principles of cognitive psychology to direct attention, influence perception, strengthen memory, and enhance learning through carefully orchestrated visual, auditory, and narrative elements (Nyiramukama Diana Kashaka & IX, 2025).

IV. OBJECTIVES OF THE STUDY

1) To identify the cinematic characteristics embedded within the official narratives of selected contemporary heritage museums.
2) To analyse how narrative sequencing, spatial design, multimedia technologies, and participatory interpretation contribute to the construction of cinematic experience in heritage museum narratives.
3) To compare the cinematic characteristics across selected heritage museum narratives in order to develop a conceptual understanding of cinematic experience in contemporary heritage interpretation.

V. METHODOLOGY

This study adopts a qualitative multiple-case study design using directed thematic content analysis to examine how heritage museums construct cinematic experiences through immersive interpretation, digital technologies, spatial design, and narrative strategies. Grounded in an interpretivist paradigm, the study seeks to understand how museums communicate cultural heritage through designed visitor experiences rather than measuring visitor behaviour quantitatively. A purposive sampling strategy was used to select five internationally recognised heritage museums known for integrating immersive technologies and experience-oriented exhibition practices: the Gettysburg National Military Park Museum & Visitor Center (USA), Digital Dunhuang Museum (China), Museo Archeologico Virtuale (Italy), Acropolis Museum (Greece), and Grand Egyptian Museum (Egypt). These museums represent diverse cultural contexts while sharing a strong emphasis on digital innovation, immersive storytelling, and visitor engagement.

The study relies exclusively on secondary qualitative data obtained from official museum sources, including institutional websites, exhibition narratives, virtual tours, multimedia documentation, educational resources, and digital exhibition descriptions. Official documentation was selected to ensure the authenticity, consistency, and reliability of the data.

The analytical framework was adapted from Tzortzi (2016), who examined museum spatiality through website analysis. Building on this approach, spatial themes were replaced with eight theoretically derived cinematic themes informed by cinema studies, museum studies, immersive media, visual culture, and digital heritage: (1) Cinematic Turn as a Paradigm Shift, (2) Intermedia and Hybrid Artistic Practices, (3) Cinema Apparatus and Materiality, (4) Remix, Post-Production and Digital Culture, (5) Motion, Perception and Affect, (6) Visual Culture Transformation, (7) Spatial and Institutional Shift, and (8) New Audience Experience Models. These themes served as predefined coding categories throughout the analysis.

Data analysis was conducted in four stages. First, each museum was examined using an observation checklist documenting architectural design, spatial organisation, narrative structure, multimedia elements, digital technologies, visitor interaction, educational features, and accessibility. Second, museum narratives were repeatedly reviewed to identify meaningful units relating to storytelling, immersive technologies, exhibition design, and visitor experience, which were deductively coded using the eight cinematic themes. Third, each case was analysed through a standardised matrix comprising the cinematic theme, supporting evidence, thematic interpretation, and critical reflection to ensure consistency across cases.

Finally, a cross-case comparative analysis identified similarities and differences in narrative construction, spatial storytelling, digital mediation, emotional engagement, visual communication, and visitor participation, focusing on how cinematic principles transform heritage interpretation into immersive experiences. To strengthen trustworthiness, the study employed a theory-driven coding framework, analysed only official museum documentation, applied a standardised analytical procedure across all cases, and triangulated textual evidence with official photographs, exhibition images, architectural views, and digital interface screenshots. This combination of visual and textual analysis, together with cross-case comparison, enhanced the credibility, consistency, and transparency of the findings.

VI. ANALYSIS

A. Gettysburg National Military Park Museum & Visitor Center

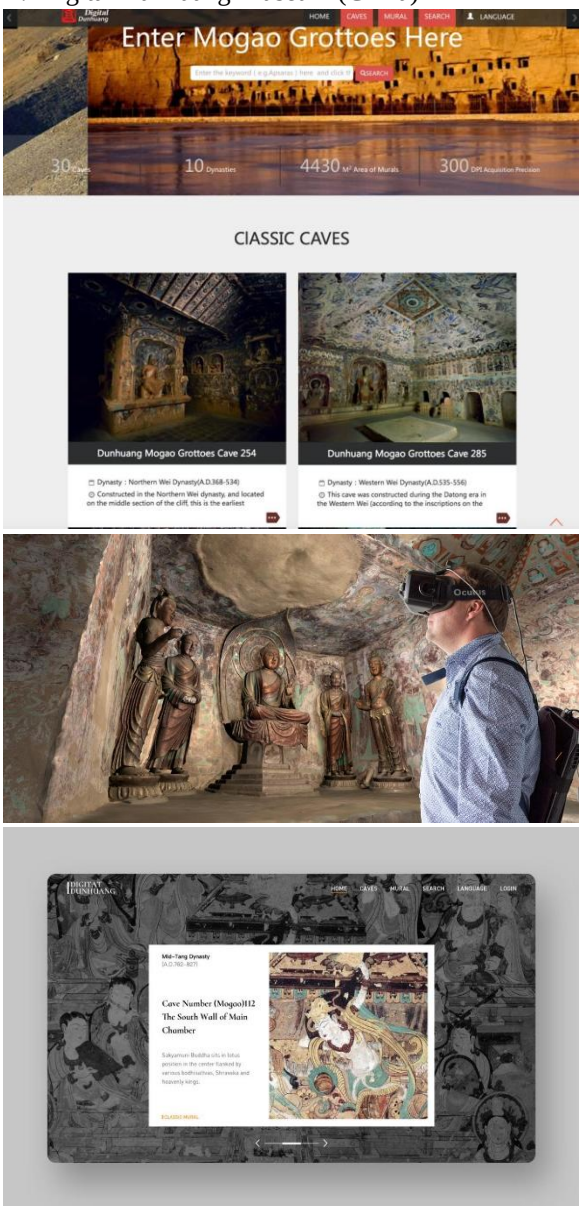
Gettysburg National Military Park Museum & Visitor Center illustrates how heritage interpretation can be organised as an experiential journey rather than a conventional museum visit. Instead of introducing visitors through chronological displays of Civil War artefacts, the narrative constructs a carefully sequenced experience beginning with *A New Birth of Freedom*, a twenty-two-minute orientation film narrated by Morgan Freeman. The film establishes the historical context before visitors proceed to the Gettysburg Cyclorama, the museum galleries, guided battlefield tours, and the *Ticket to the Past* virtual reality experience. Viewed collectively, these components create a narrative progression that closely resembles the structure of a cinematic production, moving from exposition and emotional development towards immersive engagement with the battlefield itself.

An important characteristic of the narrative is the deliberate combination of diverse interpretive media. Documentary film, panoramic painting, immersive virtual reality, authentic artefacts, ranger interpretation, and the historic battlefield function as interconnected layers of storytelling rather than independent attractions. The visitor therefore experiences Gettysburg through multiple sensory and spatial perspectives, creating an interpretive environment where visual representation and physical landscape reinforce one another.

Equally significant is the emphasis placed on movement throughout the visitor experience. The narrative extends beyond the museum building into the battlefield, national cemetery, and surrounding commemorative landscape. Learning consequently unfolds through physical movement across historically significant spaces, transforming visitors from passive spectators into participants within a larger historical narrative.

From the perspective of cinematic experience, the Gettysburg narrative relies less on technological spectacle than on narrative sequencing, emotional pacing, and immersive storytelling. Film, panoramic visualisation, authentic landscape, and digital reconstruction collectively produce an experience that encourages empathy and historical imagination rather than detached observation. The official narrative therefore demonstrates that cinematic experience emerges through the integration of narrative, space, and participation, allowing visitors to experience the Battle of Gettysburg as a lived historical event rather than a distant historical episode.

B. Digital Dunhuang Museum (China)



Unlike traditional museums where interpretation is centred on the physical presence of original artefacts, the Digital Dunhuang Museum constructs heritage almost entirely through digital mediation. Its official narrative presents the Mogao Grottoes as an immersive virtual environment where visitors explore murals, Buddhist sculptures, manuscripts, and cave architecture using high-resolution imaging, three-dimensional modelling, virtual reality, and artificial intelligence. Consequently, the visitor experience is organised not around gallery circulation but around digital exploration and visual immersion.

The narrative consistently emphasises reconstruction rather than documentation. Murals that are difficult to access physically are digitally restored, fragmented architectural spaces are virtually reassembled, and archaeological knowledge is translated into interactive environments that can be explored remotely. These processes resemble cinematic post-production, where historical material is edited, reconstructed, and contextualised to create coherent visual narratives.

The museum also combines multiple forms of media into a unified interpretive environment. Digital imagery, sound, lighting simulation, guided interaction, gesture recognition, and online accessibility work together to recreate the atmosphere of the caves while making their cultural significance accessible to global audiences. Rather than functioning as separate technological features, these media collectively construct a continuous narrative experience.

Nevertheless, the narrative also reveals an important tension. While digital technologies substantially increase accessibility and interpretation, the experience remains mediated through reconstructed representations rather than direct encounters with the archaeological site. Authenticity therefore shifts from the material object to the quality of digital interpretation.

Viewed through the lens of cinematic experience, the Digital Dunhuang Museum demonstrates how contemporary heritage communication increasingly relies on visual immersion, narrative reconstruction, and digital participation. The official narrative positions visitors as explorers of reconstructed cultural worlds, illustrating a significant transformation in the way heritage is interpreted and experienced.

C. Museo Archeologico Virtuale

The Museo Archeologico Virtuale represents one of the earliest museums to place digital reconstruction at the centre of archaeological interpretation. Rather than presenting archaeological collections through conventional display cases, the official narrative invites visitors to experience the lost cities of Herculaneum and Pompeii through immersive simulations, virtual reality, holography, multimedia installations, and interactive environments. The visitor journey therefore unfolds as an exploration of reconstructed ancient spaces rather than an observation of surviving archaeological remains.

A defining feature of the narrative is its emphasis on experiential reconstruction. Streets, houses, monuments, and daily life are digitally recreated, allowing visitors to imagine the ancient city before its destruction. These reconstructions extend beyond visual representation by incorporating sound, animation, and interactive participation, creating environments that encourage visitors to experience history rather than simply observe it.

The narrative also demonstrates how cinematic principles operate through spatial immersion. Visitors move through digitally reconstructed settings that unfold sequentially, producing a sense of continuity comparable to cinematic storytelling. Multimedia installations, projection mapping, and interactive technologies collectively transform archaeological evidence into coherent historical narratives, enabling fragmented remains to be understood within their original contexts.

At the same time, the museum raises broader questions concerning the relationship between reconstruction and authenticity. Digital environments inevitably involve interpretation and creative reconstruction, meaning that visitors engage with carefully curated representations rather than archaeological reality itself.

Overall, the official narrative demonstrates that cinematic experience is constructed through digital immersion, narrative sequencing, and participatory interaction. The museum illustrates how contemporary virtual archaeology employs cinematic techniques to recreate vanished historical landscapes while expanding the possibilities of heritage interpretation.

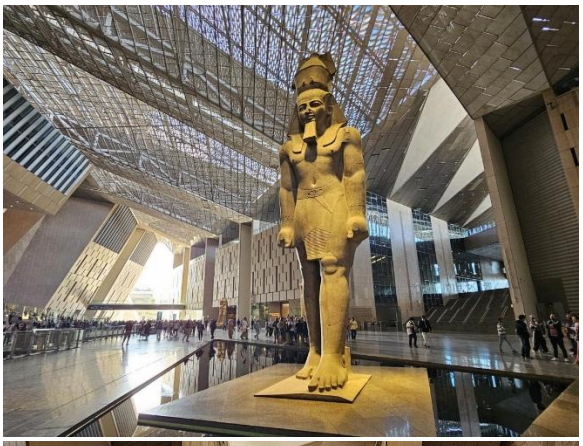
D. Acropolis Museum

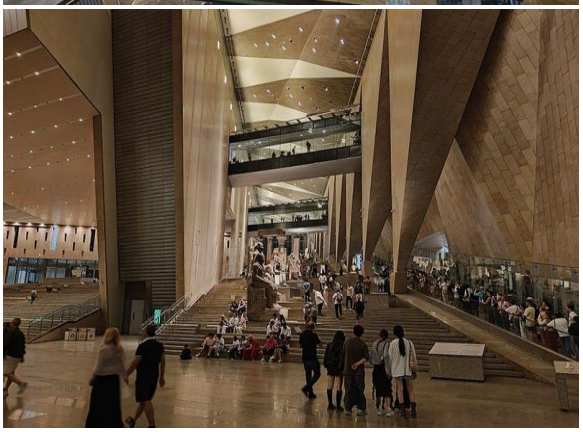
Although internationally recognised for its exceptional archaeological collections, the official narrative of the Acropolis Museum places equal emphasis on digital interpretation and visitor engagement. The museum is presented not simply as a repository of Classical antiquities but as a dynamic cultural environment where films, virtual reality, holographic projection, multimedia applications, interactive games, and educational programmes collectively enrich the visitor experience.

The narrative demonstrates a strong commitment to storytelling. Multimedia films reconstruct ancient religious rituals, archaeological excavations, temple architecture, and everyday life in Classical Athens, while interactive timelines and digital reunification projects reconnect dispersed sculptures into coherent historical narratives. Through these approaches, fragmented archaeological evidence is reorganised into interpretive stories that visitors can easily follow. Equally important is the museum's extensive use of diverse media. Digital archives, panoramic virtual tours, touchscreens, children's applications, holographic reconstructions, three-dimensional scanning, and immersive educational content function as complementary components of interpretation rather than technological additions. Visitors are encouraged to engage actively with archaeological knowledge through exploration, interaction, and personal discovery.

Rather than replacing the original artefacts, these digital interventions strengthen their interpretation by revealing historical contexts that are otherwise invisible. At the same time, they broaden accessibility by extending the museum beyond its physical galleries through online platforms and virtual experiences.
From the perspective of cinematic experience, the official narrative illustrates how heritage communication increasingly relies on sequential storytelling, visual reconstruction, and participatory interpretation. The Acropolis Museum therefore demonstrates that cinematic experience can emerge through the integration of original collections with carefully designed digital narratives that deepen historical understanding without diminishing material authenticity.

E. Grand Egyptian Museum (Egypt)





The Grand Egyptian Museum presents perhaps the clearest example of cinematic heritage interpretation among the selected case studies. Its official narrative describes the museum as a carefully choreographed journey beginning with the Hanging Obelisk, progressing through the Grand Hall and Grand Staircase, continuing into the permanent galleries, culminating in the Tutankhamun exhibition, and concluding within landscaped terraces overlooking the Giza Pyramids. Rather than functioning as independent exhibition spaces, these locations collectively form a continuous narrative that resembles the structure of a cinematic production.

Architecture plays a central interpretive role throughout the narrative. Monumental spaces, carefully framed views towards the pyramids, gradual changes in lighting, and controlled visitor movement establish a rhythm that guides emotional engagement from anticipation to reflection. Spatial design therefore becomes an active storytelling medium rather than merely a container for archaeological collections.

Digital technologies reinforce this narrative rather than dominate it. Augmented reality, multimedia projections, immersive soundscapes, and interactive displays reconstruct historical contexts while maintaining the prominence of original artefacts. The Tutankhamun Galleries exemplify this approach by organising more than five thousand objects into a coherent story of kingship, death, and the afterlife, illustrating how curatorial sequencing generates meaning comparable to cinematic montage.

Unlike museums that rely primarily on technology for immersion, the Grand Egyptian Museum combines architecture, landscape, artefacts, and digital interpretation into a unified experiential environment. The visitor's emotional journey is shaped equally by monumental space, visual spectacle, historical narrative, and physical movement through the museum.

Viewed through the perspective of cinematic experience, the official narrative demonstrates how architecture, storytelling, and digital mediation converge to transform archaeological interpretation into an immersive cultural journey. Rather than presenting Egyptian civilisation as a sequence of isolated artefacts, the museum invites visitors to experience history as an unfolding narrative in which they become active participants.

VII. DISCUSSION

The museum sector is undergoing a profound transformation propelled by the integration of advanced AI-enabled systems and smart technologies, extending well beyond conventional digital interfaces. Artificial Intelligence (AI) is set to redefine visitor experiences through highly personalized interactions tailored to individual preferences, demographic profiles, or visit duration. By analyzing visitor behavior in real-time, AI systems can deliver bespoke recommendations for exhibits, educational programs, or ancillary services such as café visits, while dynamically optimizing navigation routes to mitigate congestion or suggest rest periods when fatigue is detected. This personalization, mirrored in virtual reality (VR) platforms that enable customizable exploration pathways, significantly enhances visitor engagement and satisfaction. Additionally, AI-driven solutions bolster operational efficiency by streamlining crowd management, optimizing environmental controls, and anticipating maintenance needs, ensuring seamless museum operations. The

concept of "seamless" or "invisible" technology is emerging as a cornerstone of museum innovation, emphasizing unobtrusive systems that anticipate and fulfil visitor needs. For example, smart glasses equipped with augmented reality (AR) capabilities can overlay contextual information, 3D reconstructions, or hidden artifact details directly onto physical exhibits, eliminating reliance on traditional signage or standalone devices. Similarly, wearable technologies can provide subtle haptic feedback to guide visitors through ticketing and navigation processes, fostering a frictionless and immersive experience. Such advancements aim to integrate technology so seamlessly that it becomes an invisible enhancer of the museum narrative. Extended Reality (XR), encompassing virtual reality (VR), augmented reality (AR), and Digital Twins, is increasingly embedded within museum exhibitions, unlocking unparalleled opportunities for immersive and interactive environments. Metaverse museums leverage XR to transcend physical, temporal, and resource constraints, enabling visitors to engage with digitally recreated historical sites or imagined spaces. This fusion of physical artifacts with digital storytelling creates novel interpretive frameworks that complement traditional curatorial practices. By blending tangible and virtual elements, museums can deliver enriched narratives that resonate with diverse audiences. Beyond enhancing engagement, technology advances sustainability and accessibility. Digital exhibits reduce dependency on physical artifacts, thereby lowering the environmental impact of collections management. Furthermore, adaptive technologies, such as VR tours designed for mobility-impaired visitors or AR captions for those with hearing impairments, foster greater inclusivity, ensuring museums serve as equitable cultural spaces for all.

VIII. CONCLUSION

The museums in this analysis— the Gettysburg National Military Park Museum & Visitor Center (USA), Digital Dunhuang Museum (China), Museo Archeologico Virtuale (Italy), Acropolis Museum (Greece), and Grand Egyptian Museum (Egypt). — momentously represent a fundamental transformation in understanding heritage and cultural connections; as cinematic experiences allow for the hybridization of historical authenticity and technological advancement. To fully harness the transformative potential of digital storytelling and immersive experiences, museums must adopt a strategic, forward-looking framework grounded in academic rigor and ethical responsibility. A shift from short-term project funding to sustained investment in the preservation and maintenance of digital assets is essential. Recognizing threats such as data degradation and link obsolescence, institutions should allocate resources for ongoing data migration, robust IT infrastructure, and proactive monitoring. Framing digital sustainability as integral to the mission of knowledge preservation ensures the longevity and relevance of digital collections for future scholarship and public engagement. Moving beyond traditional curatorial models, museums should engage audiences as co-creators in developing digital narratives, fostering a shared sense of ownership that deepens connections with communities. Systematically collecting visitor feedback on experiences and aspirations enables the design of content that is both engaging and culturally resonant, aligning with contemporary expectations of interactivity. To mitigate the fragility of digital records and escalating cyber risks, investment in resilient, adaptive systems is critical, incorporating robust cybersecurity protocols, comprehensive risk management strategies, and regular staff training in digital best practices. Adequate budgetary allocations for IT personnel and hardware modernization are essential to avoid reliance on obsolete or vulnerable platforms. Technology must serve to enhance the intellectual and emotional depth of museum content, rather than overshadowing it. Adopting strong narrative frameworks—rooted in compelling characters, purposeful perspectives, and meaningful conflicts—ensures that digital experiences transcend superficial novelty and foster profound connections with subject matter. Museums should embed inclusivity as a core tenet of digital content creation, adopting an ethos of accessibility as cultural stewardship. Collaborating with diverse communities and disability advocacy groups from the outset – participatory design - ensures that digital experiences are designed, tested, and responsive to varied needs, incorporating multi-sensory and customizable features such as alternative text, captions, tactile resources, and adjustable interfaces. The complexity of pioneering digital and immersive experiences demands collaboration across disciplines, including media arts, experience design, academic research, technology,

and AI development. Such partnerships drive innovation, pushing the boundaries of museum storytelling to create experiences that are both intellectually rigorous and emotionally compelling. The integration of digital storytelling and immersive technologies marks a paradigm shift in the museum sector, transforming institutions into dynamic, inclusive, and interactive spaces that resonate with modern audiences.

By leveraging VR, AR, projection mapping, and AI, museums can achieve unprecedented levels of personalization, immersion, and engagement, fostering deeper emotional and intellectual connections with visitors. This digital transformation presents significant challenges, including data degradation, cybersecurity vulnerabilities, and the long-term costs of digital preservation. Ethical considerations, such as balancing education with entertainment, ensuring authenticity in digital representations, and upholding principles of consent in participatory initiatives, are equally critical.

True accessibility requires a proactive, community-driven approach to design, ensuring that technological innovations dismantle, rather than erect, barriers to participation. The future of museums hinges on their ability to integrate advanced technologies with compelling narratives and a nuanced understanding of visitor needs. By prioritizing digital sustainability, participatory design, resilient infrastructure, narrative depth, universal accessibility, and interdisciplinary collaboration, museums can solidify their role as vital cultural and educational institutions, ensuring their enduring relevance in an increasingly digital era.

REFERENCES

[1] T. Asankomah, "The art of storytelling in film: An exploration of the styles of storytelling," *GhMovieFreak*, Jan. 13, 2023. [Online]. Available: https://ghmoviefreak.com/feature-article-the-art-of-storytelling-in-film-an-exploration-of-the-styles-of-storytelling/

[2] M. B. Ashok and J. Thomas, "Harnessing digital technologies to enrich tourist experiences at cultural heritage sites," in Advances in Hospitality, Tourism, and the services Industry. Hershey, PA, USA: IGI Global, 2024, pp. 153–168, doi: 10.4018/979-8-3693-9636-0.ch007.

[3] A. Brown, "Digital art and authenticity: Debating the role of technology in museum exhibitions," J. Art History, vol. 45, no. 2, pp. 112–125, 2024.

[4] E. Carollo, "ARTECHOUSE founder Sandro Kereselidze on establishing a canon for digital art," Observer, Nov. 26, 2024. [Online]. Available: https://observer.com/2024/11/interview-artechouse-founder-sandro-kereselidze-digital-art-canon/

[5] K. Dağ, S. Çavuşoğlu, and Y. Durmaz, "The effect of immersive experience, user engagement and perceived authenticity on place satisfaction in the context of augmented reality," Library Hi Tech, vol. 42, no. 4, 2023, doi: 10.1108/LHT-10-2022-0498.

[6] DotCom Magazine, "Seismique Houston: The pinnacle of immersive art and entertainment," 2023. [Online]. Available: https://dotcommagazine.com/

[7] Electrosonic Inc., "Museum of the Moving Image," 2020. [Online]. Available: https://www.electrosonic.com/projects/museum-of-the-moving-image

[8] A. Faherty, "Why do stories matter to museums and how can museums become better storytellers?" MuseumNext, Jul. 7, 2019. [Online]. Available: https://www.museumnext.com/article/why-do-stories-matter-to-museums-and-how-can-museums-become-better-storytellers/

[9] Gettysburg Foundation, "Film, cyclorama and museum," 2025. [Online]. Available: https://www.gettysburgfoundation.org/exhibits-tours-events/exhibits-tours-events/film-cyclorama-museum

[10] National Park Service, "Cyclorama painting—Gettysburg National Military Park." [Online]. Available: https://www.nps.gov/gett/learn/historyculture/cyclorama.htm

[11] Guardian Staff Reporter, "Paris's first digital art museum: All lit up at Atelier des Lumières," The Guardian, Jul. 26, 2018. [Online]. Available: https://www.theguardian.com/travel/2018/jul/26/atelier-des-lumiere-paris-digital-art-museum-klimt

[12] C. Hardy, "A new immersive exhibition: Twilight Zone: Hidden Wonders of the Ocean," pp. 1–5, 2024.

[13] A. N. Hijazi and A. H. A. Baharin, "The effectiveness of digital technologies used for the visitor's experience in digital museums: A systematic literature review from the last two decades," Int. J. Interact. Mobile Technol., vol. 16, no. 16, pp. 142–159, 2022, doi: 10.3991/ijim.v16i16.31811.

[14] Houstonia Magazine, "The expert's guide to visiting Seismique in Houston," Sep. 2022. [Online]. Available: https://www.houstoniamag.com/arts-and-culture/2022/09/seismique-houston-hours-tickets-prices-info

[15] ARTECHOUSE, "ARTECHOUSE Washington DC," 2021. [Online]. Available: https://www.artechouse.com/location/dc/

[16] L. Jones, "AI as a curatorial tool: The 'Hello Vincent' experiment at Musée d'Orsay," Digit. Humanit. Q., vol. 17, no. 3, pp. 89–104, 2023.

[17] S. Lee, "Digital Museum experiences," Number Analytics, Aug. 5, 2025. [Online]. Available: https://www.numberanalytics.com/blog/digital-museum-experiences

[18] S. Lee, "The cinematic experience," Number Analytics, Aug. 6, 2025. [Online]. Available: https://www.numberanalytics.com/blog/ultimate-guide-film-spectatorship

[19] J. Li, W. Wider, Y. Ochiai, and M. A. Fauzi, "A bibliometric analysis of immersive technology in museum exhibitions: Exploring user experience," Front. Virtual Reality, vol. 4, Art. no. 1240562, 2023, doi: 10.3389/frvir.2023.1240562.

[20] S. Man and Z. Gao, [Article title to be verified], J. Electron. Imag., vol. 32, no. 1, Art. no. 011208, 2023, doi: 10.1117/1.JEI.32.1.011208.

[21] A. Marasco, "Beyond virtual cultural tourism: History-living experiences with cinematic virtual reality," Tourism Heritage J., vol. 2, pp. 1–16, 2020, doi: 10.1344/thj.2020.2.1.

[22] A. Matheus, D. M. Do, O. F. M. Bessa, E. A. Ramos, and C. Rennó-Costa, "MedusoZoa—An immersive and interactive virtual reality installation in a museum," in Proc. 21st Brazilian Symp. Computer Games Digital Entertainment (SBGames), 2022, pp. 39–46, doi: 10.1145/3604479.3604507.

[23] N. D. Kashaka and U. IX, "Cinematic techniques: Shaping viewer perception and emotion," Res. Invent. J. Current Issues Arts Manage., vol. 4, no. 2, pp. 24–27, 2025, doi: 10.59298/RIJCIAM/2025/422833.

[24] V. Okanovic, I. Ivkovic-Kihic, D. Boskovic, B. Mijatovic, I. Prazina, E. Skaljo, and S. Rizvic, "Interaction in eXtended reality applications for cultural heritage," Appl. Sci., vol. 12, no. 3, Art. no. 1241, 2022, doi: 10.3390/app12031241.

[25] Atelier des Lumières, "Immersive digital art," 2024. [Online]. Available: https://www.atelier-lumieres.com/en/immersive-digital-art

[26] Z. Popoli and I. Derda, "Developing experiences: Creative process behind the design and production of immersive exhibitions," Museum Manage. Curatorship, vol. 36, no. 4, pp. 1–19, 2021, doi: 10.1080/09647775.2021.1909491.

[27] S. A. Ress and F. Cafaro, "'I want to experience the past': Lessons from a visitor survey on how immersive technologies can support historic interpretation," Information, vol. 12, no. 1, Art. no. 15, 2021, doi: 10.3390/info12010015.

[28] P. Restivo, "'Ticket to the Past': An unforgettable journey at the Gettysburg Lincoln Railroad Station," Gettysburg Connection, Sep. 18, 2024. [Online]. Available: https://gettysburgconnection.org/ticket-to-the-past-an-unforgettable-journey-at-the-gettysburg-lincoln-railroad-station/

[29] S. Alatrash, A. Arnab, and K. Antlej, "Communicating engineering heritage through immersive technology: A VR framework for enhancing users' interpretation process in virtual immersive environments," Comput. Educ. X Reality, vol. 3, Art. no. 100040, 2023, doi: 10.1016/j.cexr.2023.100040.

[30] Visit Houston, "Seismique," Aug. 14, 2025. [Online]. Available: https://www.visithoustontexas.com/listings/seismique/32291/

[31] Seismique, "Seismique Houston's art experience of tomorrow is here!" [Online]. Available: https://seismique.com/

[32] R. Smith, "Immersive technologies in the 'Van Gogh's Palette' VR experience," Art Technol. Rev., vol. 29, no. 4, pp. 56–67, 2023.

[33] A. Whitmyer, An Analysis of Immersive Art Experiences, Bachelor's thesis, School of the Art

Institute of Chicago, Chicago, IL, USA, 2021. [Online]. Available: https://digitalcommons.sia.edu/stu_theses/99/

[34] M. Yin, "Dwells in museum: The restorative potential of augmented reality," Telematics Informat. Rep., Art. no. 100136, 2024, doi: 10.1016/j.teler.2024.100136.

[35] B. Yuksel Inal, Human Experience in the Immersive Experience Economy, Ph.D. dissertation, City Univ. of New York, New York, NY, USA, 2024.

[36] Z. Abdulhusain, F. Qaed, and H. Aljawder, "Digital storytelling in museums to revive Islamic heritage in the digital museum: A design proposal," WIT Trans. Built Environ., 2022, doi: 10.2495/IHA220041.

[37] S. S. Bautista, Museums in the Digital Age. Lanham, MD, USA: AltaMira Press, 2014.

[38] M. K. Bekele et al., "A survey of augmented, virtual, and mixed reality for cultural heritage," J. Comput. Cult. Heritage, vol. 11, no. 2, 2018.

[39] E. Champion, Critical Gaming: Interactive History and Virtual Heritage. London, U.K.: Routledge, 2016.

[40] J. H. Falk and L. D. Dierking, The Museum Experience Revisited. Walnut Creek, CA, USA: Left Coast Press, 2013.

[41] E. Giaccardi, Heritage and social media: Understanding Heritage in a Participatory Culture. London, U.K.: Routledge, 2012.

[42] M. C. Green and T. C. Brock, "The role of transportation in the persuasiveness of public narratives," J. Pers. Soc. Psychol., vol. 79, no. 5, pp. 701–721, 2000, doi: 10.1037/0022-3514.79.5.701.

[43] J. Kidd, Museums in the New Mediascape: Transmedia, Participation, Ethics. Farnham, U.K.: Ashgate Publishing, 2014.

[44] M. Lombard and T. Ditton, "At the heart of it all: The concept of presence," J. Comput.-Mediat. Commun., vol. 3, no. 2, 1997, doi: 10.1111/j.1083-6101. 1997.tb00072. x.