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EXPLORING THE USE OF DIGITAL MUSEUM TECHNOLOGY FOR URBAN CULTURAL TOURISM DEVELOPMENT IN JAKARTA

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Abstract *Museums play an important role in cultural preservation, public education, and the development of cultural tourism. However, museums in urban areas face challenges in maintaining public engagement amid the growing use of digital technology, particularly among younger generations. This study aims to explore the forms, patterns, and strategies of digital technology utilization in museums in Jakarta from the perspective of urban cultural tourism. An exploratory qualitative approach was employed through participatory observation and in-depth interviews with museum visitors and managers, supported by content analysis and thematic analysis of digital museum documentation. The study examined the Museum Bank Indonesia, Museum Wayang, and National Museum of Indonesia. The findings show that digital technology is utilized for education, cultural preservation, collection interpretation, visitor services, promotion, and the development of cultural experiences, with different orientations across the three museums. Museum Bank Indonesia emphasizes interactive and creative digital technologies, Museum Wayang focuses on immersive and interactive experiences, while the National Museum demonstrates more comprehensive technological integration, including virtualization and artificial intelligence. Overall, digital technology functions not merely as a modernization tool but also as an instrument for strengthening cultural experiences and supporting urban cultural tourism development.*

Keyword:

Digital museum technology, urban cultural tourism, development, DKI Jakarta

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1. Introduction

Museums play an important role in safeguarding cultural heritage, facilitating public education, and providing opportunities for cultural engagement. Their role becomes particularly relevant in large urban areas such as Jakarta, where cultural institutions are embedded within a wider tourism environment consisting of historical sites, heritage buildings, creative spaces, cultural events, and other urban attractions. In this context, museums are not only institutions for preserving and presenting collections but can also function as cultural resources within the

urban tourism system.

Urban cultural tourism refers to tourism activities in which the cultural assets of a city become part of the attraction and experience offered to visitors. These assets may include tangible heritage, museums, historical places, artistic activities, cultural practices, and other forms of cultural expression. Liu (2020) describes urban cultural tourism from a tourism-planning perspective as a form of tourism that transforms a city's cultural assets into tourist attractions. D'Auria (2009) further emphasizes the relationship between urban cultural tourism, cultural heritage, cultural capital, and experiential forms of tourism. Thus, urban cultural tourism differs from urban tourism in general because culture is not merely the setting in which tourism takes place but constitutes an important component of the attraction, interpretation, and experience.

Museum visits can therefore constitute part of urban cultural tourism when the visit involves engagement with the cultural, historical, artistic, or heritage resources of the city. However, not every museum visit should automatically be understood as urban cultural tourism. The distinction lies in the relationship between the museum, its cultural resources, the visitor experience, and the broader urban tourism context. Museums contribute to urban cultural tourism when their collections, exhibitions, interpretation, services, and activities become resources through which visitors encounter and understand the cultural identity of the city. Previous research has consequently identified museums and heritage sites as important components of cultural activities within urban tourism. Studies of museums and cultural spaces in Indonesia cities also indicate that cultural institutions can contribute to urban tourism by combining cultural interpretation, visitor experience, public engagement and tourism-oriented functions (Majdina et al., 2025; Hanorsian et al., 2024).

The contribution of museums to urban cultural tourism can also be understood in relation to tourism development. In this context, tourism development does not refer only to an increase in visitor numbers or the construction of tourism infrastructure. It also involves the development and diversification of tourism resources, improvement of accessibility and visitor services, enhancement of destination experiences, and integration of cultural resources into broader tourism activities. Museums can contribute to this process by transforming collections and cultural narratives into accessible and meaningful visitor experiences. Recent research on museum tourism destinations indicates that digital innovation can support destination attractiveness and the development of museum capabilities by connecting technological innovation with visitor demand, institutional resources, and tourism-oriented strategies (Xu et al., 2025). Thus, the development of urban cultural tourism can involve strengthening the capacity of museums to function simultaneously as sites of cultural preservation, education, interpretation, and visitor engagement.

This perspective is increasingly important as museums undergo digital transformation. The adoption of digital technologies, including interactive media, immersive technologies, virtual tours, digital archives, QR-based information, audio-visual media, and artificial intelligence, has expanded the ways museums preserve, interpret, communicate, and present cultural heritage. Digital transformation is not limited to converting physical collections into digital formats; it can also change how museums design exhibitions, provide access to information, facilitate interaction, and construct visitor experiences. Recent research shows that digital technologies can support exhibition design, accessibility, education, visitor engagement, and museum management, although their implementation remains dependent on technological, organizational, and contextual conditions.

The relationship between digital technology and museum visitor experience has also

become an important area of research. Lu et al. (2023), for example, demonstrate that research on technology and museum visitor experiences has developed from an emphasis on basic interaction and learning toward issues such as visitor behaviour, satisfaction, enjoyment, and virtual presence. This development indicates that digital technology should be examined not only in terms of the technologies themselves but also in relation to how they are integrated into museum environments and experienced by visitors.

Previous studies have examined the relationship between technological implementation and museum experiences in Indonesia and other contexts, including digital developments in Bandung museums, virtual museum applications, immersive technologies, and digital experiences at the National Museum of Indonesia (Nisa et al., 2023; d'Alessio, 2023; Widarsyah et al., 2024). Other studies have examined the use of digital technologies for museum promotion, visitor engagement, and cultural tourism development (Demolingo & Remilenita, 2023; Veronica, 2025). More recent research has also examined the relationship between museum digitalization and heritage tourism in Jakarta, including the role of digital attraction in visitors' motivation to visit the National Museum (Kubayan et al., 2026). These studies demonstrate the increasing relevance of digital technology in museum practices and tourism. However, much of the existing research remains focused on particular technologies, individual museums, or specific aspects of visitor experience.

A comparative examination is therefore necessary to understand how museums with different collections, institutional characteristics, and cultural orientations use digital technology for different purposes. Digital technology adoption is not determined solely by the availability or sophistication of technological tools. It is also shaped by institutional capacity, cultural objectives, collection characteristics, visitor needs, infrastructure, and the intended experience of the museum. A comparative perspective can consequently reveal differences in how technology is positioned within cultural preservation, museum management, visitor experience, and urban cultural tourism.

This study addresses this gap by examining three museums in Jakarta: Museum Bank Indonesia, Museum Wayang, and the National Museum of Indonesia. The three museums provide different institutional and cultural contexts for examining the use of digital technology. The study investigates how digital technologies are applied, what functions they perform, how they are integrated into museum practices, and how they contribute to visitor cultural experiences and urban cultural tourism in Jakarta.

The novelty of this study lies in positioning digital museum technology not merely as a technical innovation but as an institutional strategy and social practice. This perspective connects technological implementation with institutional functions, cultural interpretation, visitor behaviour, and the broader context of urban cultural tourism Rather than assessing digital maturity solely through the number or sophistication of technologies adopted, the study examines how technologies are integrated with cultural content, museum management, visitor needs, and the development of urban cultural tourism.

Accordingly, this study aims to explore the forms, patterns, and strategies of digital technology utilization in Museum Bank Indonesia, Museum Wayang, and the National Museum of Indonesia, and to analyze their implications for cultural preservation, museum management, visitor experiences, and the development of urban cultural tourism in Jakarta.

2. Method

This study employed an exploratory qualitative approach with a cultural tourism perspective to examine the utilization of digital technology in museums in Jakarta. The research

was designed as a comparative qualitative study focusing on the role of digital technology in cultural preservation, museum management, visitor experience, and the development of urban cultural tourism. A qualitative approach was considered appropriate because the study sought to understand how digital technologies re used, interpreted, and experienced within different museum contexts rather than to measure their effectiveness through numerical indicators (Creswell, 2014; Denzin & Lincoln, 2018).

The research was conducted at three museums in Jakarta, namely Museum Bank Indonesia, Museum Wayang, and the National Museum of Indonesia. These museums were selected purposely to provide a comparative perspective based on their different cultural collections and institutional characteristics. The research involved museum managers and visitors as primary informants, selected based on their relevance to the research objectives. Data were collected through observation, in-depth interviews, and digital documentation. Observations focused on the use of digital technology, including digital content, museum websites, social media, digital archives, and other digital facilities. Interviews explored institutional considerations and visitor experiences, while digital documentation was used to examine the forms and functions of technologies applied by the museum.

The data were analyzed using content analysis and thematic analysis. The analysis involved organizing field notes, interview results, observational findings and digital documentation, followed by coding, categorization, and identification of emerging themes. Content analysis was used to identify recurring patterns in technology use and its functions, while thematic analysis was used to group related codes into broader themes concerning education, cultural preservation, museum management, visitor experience, and cultural tourism (Krippendorff, 2013; Neuendorf, 2017; Braun & Clarke, 2006). The resulting themes were compared across the three museums and interpreted in relation to cultural content, institutional practices, visitor experiences, and urban cultural tourism.

3. Result and Discussion

3.1 Current State of Digital Technology in the Three Museum

The comparative exploration shows that the Museum Bank Indonesia, Museum Wayang, and National Museum have adopted digital technologies in different forms and with different institutional orientations. Although all three museums use digital technology to support education, cultural preservation, and cultural tourism, the types of technology and their modes of application reflect differences in museum collections, visitor needs, institutional priorities, and service development. Table 1 summarizes the main forms of digital technology, their functions, development strategies, implementations barriers, and evalution practies identifiels across the three museum.

Table 1. Comparative Exploratory Analysis of Strategies and the Development of Digital Technology Use in Museums

Category	Museum Bank Indonesia	Museum Wayang	National Museum
Types of Digital Technology	○ Kids Corner ○ Photobooth ○ Magic Wall ○ AR and QR Code ○ Personality Quiz	○ Photo AI Feature ○ Self-guided tour ○ Touchscreen Map ○ Gamelan Interactive	○ Website ticket online ○ QR Code ○ Virtual tour ○ 3 Dimensional

	Digital/Physical Stamp	○ Smart module ○ Smart wayang explain ○ Barcode QR ○ Technologyimersif 360°	○ Audio guide ○ Smart guide
Functions of Technology Implementation	○ Education ○ Preservation Culture ○ Tourism Culture	○ Education ○ Preservation Culture ○ Tourism Culture	○ Education ○ Preservation Culture ○ Tourism Culture
Development Strategies	○ Networking and benchmarking with the National Museum of Singapore ○ Interactive technology ○ Interactive displays ○ Creative digital media	○ Digital promotion through social media ○ Alignment with intergenerational technology needs ○ Risk mitigation and visitor regulations through CCTV ○ Collaboration with external parties and experts	○ Improvement of integrated ticketing systems and public services ○ Innovation in interactive educational facilities and development of Smart Guide for educational purposes ○ Renewal of digital services following revitalization
Barriers	○ Development and arrangement of digital devices are constrained by cultural heritage conservation regulations ○ Some devices are technologically outdated and incompatible with new system updates	○ Intensive use of interactive facilities accelerates device wear and tear ○ Accessibility of electronic devices increases the risk of damage ○ Social-media-driven visitation trends	○ Visitor behavior and reluctance to use digital facilities ○ Hardware vulnerability and environmental control ○ Integration of hybrid information systems and Wi-Fi accessibility ○ Room temperature management and routine maintenance schedules
Evaluation	The Visitor Experience Index survey is conducted twice a year by the museum	Periodic evaluation and digital trend mapping accelerate the resolution of	Museum management efficiently filters visitor feedback

	management	technical problems while maintaining the museum's adaptability	according to available resources and prepares contingency plans based on periodic evaluations.

The comparative exploration shows that the Museum Bank Indonesia, Museum Wayang, and National Museum have adopted digital technologies through diverse strategies. In terms of technology types, Museum Bank Indonesia emphasizes interactive and creative digital technologies, such as the Kids Corner, Magic Wall, augmented reality (AR), QR codes, and Personality Quiz. Museum Wayang focuses more on interactive and immersive technologies, including AI Photo, touchscreen maps, interactive gamelan, smart modules, and 360° immersive technology (Li et al., 2024; Shangguan et al., 2024; Lu et al., 2023). Meanwhile, the National Museum utilizes digital technologies to support visitor services and information delivery through online ticketing websites, QR codes, virtual tours, 3D technology, audio guides, and smart guides.

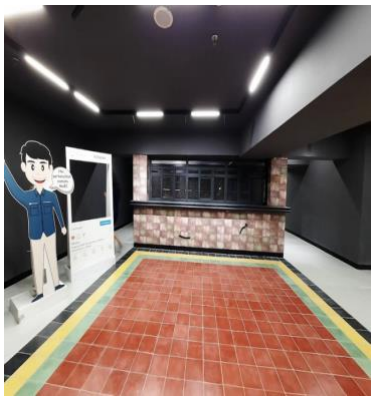
In terms of their functions, the three museums share a similar approach, as digital technologies are used to support education, cultural preservation, and cultural tourism (Arumsari et al., 2023; Kartika & Fajri, 2020; Veronica, 2025). However, differences can be observed in their development strategies. Museum Bank Indonesia develops its digital technologies through networking, interactive displays, and creative digital media. Museum Wayang emphasizes digital promotion, intergenerational technology adaptation, risk management, and collaboration with external partners and experts. Regarding challenges, each museum faces different issues, ranging from limitations in device development due to regulations concerning the conversion of cultural heritage buildings, equipment wear caused by intensive use, and the risk of facility damage, to hardware limitations, Wi-Fi accessibility, visitor behavior, and spatial environment management. In terms of evaluation, all three museums have implemented regular evaluation mechanisms using different approaches, including the Visitor Experience Index, digital trend mapping and technical evaluation, as well as the screening of visitor feedback and the preparation of contingency plans (Wiatuti et al., 2020; Malik et al., 2023). These differences suggest that the current state of digital technology in museum cannot be assessed only from how those technologies are integrated into existing museum environments and services.

Overall, the three museum demonstrate different patterns of digital technology adoption while maintaining common museum functions related to education, cultural preservation, and cultural tourism. The comparison provides the basis for examining the next dimensions of digital transformation, particularly hoe these technologies contribute to cultural preservation and interpretation and how they are incorporated into museum management practices

3.2 Digital Technology for Cultural Preservation and Interpretation

Digital technology in the three museums support cultural preservation by providing additional ways to document, interpret, and communicate cultural heritage. Rather than replacing physical collections, digital media complement them by providing interactive, audio-visual, immersive, and virtual forms of interpretation.

Table 2. Content Analysis Digital Technology at the Bank Indonesia Museum

Aspect	Category	Field Data Findings
Utilization of Digital Technology	Types of Technology (Photo and Description Content Analysis)	Kids Corner: Interactive educational media that provides easily accessible learning materials. 
	Photobooth	A promotional medium that also provides visitors with a digital record of their museum experience through photographs. 
	Magic Wall	Presents historical and cultural information through visual and interactive media.

		
	AR and QR Code	Code-based access to museum materials related to artifacts and historical objects, which can be accessed through visitors' mobile devices. 
	Personality Quiz	An interactive learning medium that presents questions relevant to specific topics or educational materials, with the final results displaying an IngLakon character.

		
	Digital/Physical Stamp	A digital or physical marker obtained by visitors after exploring the museum area. 
Role of Technology Utilization	Interactive quizzes, digital stamps, code scanning, and spaces for independent creative activities are implemented to strengthen storytelling and facilitate interactive understanding. These technologies reinforce the narrative, foster emotional engagement, and create memorable experiences. Their connection with the museum's narrative also facilitates visitors' understanding of complex economic concepts through active interaction, reducing dependence on text-based information.	

The content analysis shows that Museum Bank Indonesia has integrated digital technologies to support its educational, cultural preservation, and cultural tourism functions. The technologies include Kids Corner, Photobooth, Magic Wall, Augmented Reality (AR), QR Codes, Personality Quiz, and Digital/Physical Stamps. Each technology serves a specific function, ranging from simplifying educational materials through interactive and gamified approaches and presenting historical and artifact information digitally to creating more engaging and memorable visitor experiences (Putra et al., 2024; Nisa et al., 2023)

In terms of roles and functions, digital technologies are used to strengthen the museum's narratives and facilitate visitors' understanding of complex materials through active interaction. In the context of cultural preservation, Magic Wall, AR, and QR Codes enable information about artifacts, archives, and historical narratives to be presented digitally without directly intervening with physical objects. Meanwhile, Personality Quiz, Photobooth, and Digital/Physical Stamps provide recreational elements while enhancing visitors' experiences and memories during their museum exploration.

Dresden Regarding management and development, Museum Bank Indonesia develops its digital technologies through networking and benchmarking, including drawing inspiration from the National Museum of Singapore. Its development strategy prioritizes interactive technologies for educational purposes while promoting the use of creative digital media as part of its promotional activities Nugraha et al. (2023). The integration of technology is also aligned with the exhibition narrative and spatial arrangement. For example, the Magic Wall is placed in areas requiring more complex historical explanations, while AR and QR Codes are positioned near physical artifacts as supplementary sources of information.

The implementation of digital technologies still faces several challenges, particularly conservation regulations for cultural heritage buildings and the limited compatibility of some devices with newer technological systems. These challenges are addressed by adjusting the placement of devices without altering the building structure and involving external service providers when major technical damage occurs. Internal supporting factors include workflows covering planning, operation, and maintenance, while external support is provided through coordination among operational, public relations, and educational units.

Overall, digital transformation at Museum Bank Indonesia is reflected in the modernization of exhibition media through the integration of audio, visual elements, animation, and digital databases. This transformation aims to address the limitations of physical space, improve the effectiveness of educational activities, and maintain the museum's relevance amid technological developments. Technology use is evaluated through the Visitor Experience Index twice a year to assess visitors' experiences in interacting with multimedia technologies.

3.2.2 Content Analysis of the Use of Digital Technology at the Wayang Museum

Table 3. Content Analysis Digital Technology at the Museum Wayang

Aspect	Category	Field Data Findings
Utilization of Digital Technology	Types of Technology	Application of Diverse Digital Media: The use of screens/touchscreens, including distribution maps, interactive gamelan, smart modules, and smart wayang beber,

		as well as barcodes/QR codes for information access and collection management, and 360° immersive technology. 
	Interactive Technology and AI	The use of Photo AI, digital coloring games that are scanned and subsequently displayed on exhibition screens, treadmill racing featuring wayang characters, and floor motion tracking that enables interaction through motion sensors embedded in the floor. 
	Self-guided Tour	Efforts to improve technology-based facilities and infrastructure to enable visitors to conduct independent tours (self-guided tours) without having to be continuously accompanied by museum guides.

		
	Rebranding of Characters	Efforts to change the image of wayang so that it is less frightening to children, including the addition of animal character options in the digital coloring feature and the incorporation of environmental education messages into animated films. 
Role of Technology Utilization	For museum management, digital technology plays a strategic role as an instrument of museum transformation to support government agendas and create memorable emotional branding for visitors. Its effectiveness is reflected in the ability of di	

The content analysis concludes that digital technology has become a strategic component of the transformation of Museum Wayang through the use of touchscreen displays, QR Codes, 360° immersive technology, Photo AI, digital coloring, treadmill racing, and floor motion tracking. This supports Nabillah et al. (2024), who emphasize the potential of interactive museum technologies in

creating tourism experiences within the Society 5.0 context.These technologies strengthen the museum's educational, cultural preservation, and cultural tourism functions by providing interactive and immersive experiences and supporting self-guided tours, particularly for younger generations.

In terms of management, the development strategy involves social media promotion, adapting technology to the needs of different generations, risk mitigation through CCTV monitoring and visitor regulations, and collaboration with technical experts. The integration of technology is intended to present cultural narratives in more engaging ways while maintaining the substance and cultural values of wayang.

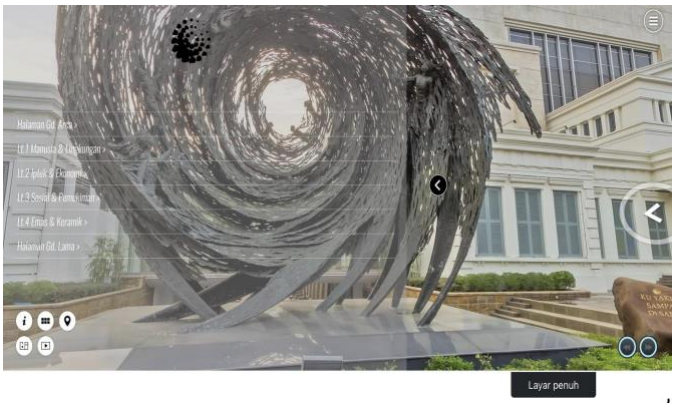
The main challenges include equipment wear, the risk of damage to interactive facilities, and gaps between visitor expectations and the museum's management system. These challenges are addressed through visitor briefings, CCTV monitoring, and regular technical maintenance. Supporting factors include management commitment, user experience development, and increasing interest among younger generations in digital media.

Overall, the digital transformation of Museum Wayang is oriented toward enhancing interactivity, strengthening the cultural relevance of wayang for younger generations, and increasing the museum's appeal as a cultural tourism destination, while maintaining a balance between technological innovation and the authenticity of wayang cultural values.

3.2.3 Content Analysis of the Use of Digital Technology at the National Museum

Table 4. Content Analysis Digital Technology at the National Museum of Indonesia

Aspect	Category	Field Data Findings
Utilization of Digital Technology	Types of Technology	Online Ticketing Website: Digitalization of transactions and marketing to improve visitor accessibility. 
	QR Code, Virtual Tour, 3D Technology, Audio Guide, and Smart Guide	Provision of dynamic, self-guided collection interpretation facilities, both within exhibition spaces and through virtual platforms.

		
	Artificial Intelligence (AI) Technology	Utilization of advanced audio-visual facilities as exhibition attractions based on historical reconstruction. 
Role of Technology Utilization	Digital technology functions as an intermediary medium to clarify the context of physical artifacts without compromising their authenticity. It also helps reduce visitors' psychological barriers through visual stimulation, making information easier to understand cognitively. Furthermore, the integration of digital media plays an important role in maintaining the resilience and sustainability of public engagement with the museum, particularly during periods of physical recovery or revitalization.	

Based on the analysis, the management of digital technology at the National Museum of Indonesia is directed toward strengthening the digitization of collections and services while enhancing visitor experiences through virtual tours, QR Codes, 3D technology, audio/smart guides, as well as audiovisual, AR/VR, and AI technologies. These technologies are integrated with collection narratives and exhibition layouts to expand access to information, strengthen educational functions, and create more interactive and immersive experiences.

The integration of technology also forms part of the museum's strategy to adapt to changes in institutional conditions and visitor characteristics. Virtual tours help maintain public

engagement when physical facilities undergo revitalization, while immersive experiences and AI-based technologies serve as attractions that enhance the museum's appeal. Technology is also positioned as a mediating tool that complements rather than replaces physical artifacts and the authenticity of collections.

The main challenges include the limited adoption of some technologies by visitors and the dependence of digital devices on infrastructure, particularly cooling systems and the environmental conditions of exhibition spaces. These challenges are addressed through a combination of physical and digital information, Wi-Fi support and educator assistance, routine maintenance, temperature control, and technical preparedness on site. Supporting factors include an integrated exhibition concept and strong public responses to digital attractions

Overall, the digital transformation of the National Museum of Indonesia demonstrates that technology can simultaneously function as an instrument for education, cultural preservation, visitor experience enhancement, and the strengthening of cultural tourism. The integration of technology with collections and cultural narratives has the potential to strengthen the National Museum's position as an urban cultural tourism destination in Jakarta, while maintaining a balance between digital innovation, collection authenticity, infrastructure readiness, and visitor needs.

And, the findings indicate that digital cultural preservation involves more than digitizing collections. It also concerns ow cultural knowledge is interpreted, communicated, and made accessible to contemporary audiences. In the three museums, digital technology functions as a complementary medium that connects physical heritage with changing forms of cultural engagement.

3.3 Digital Technology in Museum Management

The use of digital technology in the three museums is closely related to museum management, particularly in planning, development, maintenance, evaluation, and adaptation. Digitalization is therefore not limited to the provision of technological facilities but also requires organizational coordination and continuous management. The findings indicate that each museum develops its digital technology according to its institutional priorities, available resources, visitor characteristics, and operational conditions.

At Museum Bank Indonesia, digital technology management is reflected in the integration of interactive media with exhibition planning and educational activities. Technologies such as the Magic Wall, AR, and QR Codes are positioned according to the exhibition narrative and the characteristics of the museum space. The management of these facilities involves planning, operation, and maintenance workflows, as well as coordination among operational, public relations, and educational units. Technical problems that cannot be handled internally are supported by external service providers. The museum also evaluates visitor responses through the Visitor Experience Index conducted periodically to assess visitors' experiences with multimedia facilities.

At Museum Wayang, management strategies emphasize technology maintenance, risk mitigation, visitor adaptation, and collaboration. The use of interactive and immersive facilities requires monitoring because equipment may be damaged through intensive visitor interaction. CCTV, visitor regulations, technical maintenance, and visitor briefings are therefore used to reduce operational risks. The museum also monitors changes in visitor preferences and social media trends while adapting digital facilities to younger generations. Collaboration with external technical experts and other parties further supports the development and maintenance of digital facilities.

The National Museum demonstrates a broader integration of digital technology into visitor services, information access, and exhibition management. Online ticketing, QR Codes, virtual tours, 3D technology, audio guides, and Smart Guides are incorporated into the museum's service and interpretation systems. The management of these technologies also requires supporting infrastructure, including Wi-Fi connectivity, environmental control, temperature management, and routine maintenance. During periods of physical revitalization, virtual tours provide an alternative means of maintaining public access and engagement with the museum.

Across the three museums, several common management challenges were identified, including equipment maintenance, technological compatibility, infrastructure requirements, visitor adaptation, and the need for continuous evaluation. These findings indicate that technological availability alone does not determine the effectiveness of digital museum development. Management capacity, coordination between units, technical preparedness, and responsiveness to visitor needs are equally important. This is consistent with studies emphasizing that museum digital transformation requires the integration of technological development with organizational and visitor-oriented considerations (Li et al., 2024; Shangguan et al., 2024).

The comparison further shows that digital maturity should not be understood solely in terms of the number or sophistication of technologies adopted. Museum Bank Indonesia demonstrates an emphasis on educational and interactive management, Museum Wayang on immersive experiences and adaptation to younger audiences, while the National Museum integrates digital services, interpretation, and virtual access more broadly. Thus, effective digital museum management depends on how technology is integrated with institutional functions, cultural content, infrastructure, and visitor needs. This management perspective provides the basis for understanding visitor experience in the following section.

3.4 Visitor Experience and Digital Museum Engagement

The use of digital technology influences not only the way museums present information but also how visitors interact with collections, exhibition spaces, and museum services. The findings sow thatt visitors experience digital technology through different forms of interaction, including visual, audio, interactive, immersive, and self-guided features. However, the contribution of technology to visitor experience depends on accessibility, clarity of information, ease of use, and the condition of the facilities.

Table 5. Comparative Exploratory Analysis of Visitor Experiences with Digital Technology Use in Museums

Category	Museum Bank Indonesia	Museum Wayang	National Museum
Experience Interaction with Digital Technology	○ Perception Advancement ○ Diversification Features ○ Inclusivity and ○ Engagement ○ Awareness Existence Digital ○ Practicality Features	○ inclusion Access Insight ○ Completeness presentation layout ○ Clarity visual and sensor audio	○ Museum Audio Material- Visual ○ Stimulation ImaginationVisual ○ Exhibition Digitalization (Adapting Audience Habits)

	○ Technical Obstacles ○ Guidance Instructions Complete ○ Disparity Technology		

The comparative exploratory analysis of visitor experiences in the use of digital museum technologies at Museum Bank Indonesia reveals diverse experiences, characterized by perceptions of technological advancement, feature diversification, inclusivity, engagement, and the practicality of digital features (Nisa et al., 2023; Leo d'Alessio, 2023; Lu et al., 2023). However, several challenges remain, including technical issues, the need for more comprehensive guidance, and uneven technology implementation across different areas of the museum.

At Museum Wayang, visitor experiences are more strongly associated with accessibility and inclusivity, the availability of information about the museum layout, and clear sensory experiences through visual and audio media. This indicates is consistent with Wiatuti et al. (2020),who argue digital technology can facilitate visitor' access to information and enhance their understanding of museum collections through interactive and multisensory experiences.

Meanwhile, the National Museum emphasizes the use of audio-visual materials and visual stimulation to enhance visitors' imagination and engagement with museum collections. The digitalization of exhibitions also reflects efforts to adapt the presentation of cultural information to changing audience habits. As Widarsyah et al. (2024) suggest, the increasing use of digital media in everyday life has encouraged museum to develop more accessible and engaging forms of information presentation that correspond with contemporary patterns of media consumption.

Overall, the three museums demonstrate that digital technology contributes to enriching visitor experiences, improving access to and understanding of information, and creating more engaging visual, auditory, and multisensory interactions.

Beyond interaction with individual digital facilities, visitor experience is also influenced by the overall motivation and context of the museum visit. The finding in table 6 show that visitors come to the three museums for educational, recreational, cultural, social, and incidental reasons. Digital technology can function as an additional attraction, but it does not entirely replace the importance of collections, museum narratives, architectural settings, location, and recommendations from family, schools, or social networks.

Table 6. Comparative Exploratory Analysis of Visitor Experiences During Museum Visit

Category	Museum Bank Indonesia	Museum Wayang	National Museum
Visit Motivation	○ Education ○ Recreation	○ Spontaneous visits due to geographical factors ○ Influence of social media ○ Curiosity about museum updates	○ Need to complement school history materials ○ Curiosity about culture ○ Strong influence of family recommendations ○ Classmate voting/agreement ○ Viral trends on digital

		○ Incidental visits	media ○ Strategic location and accessibility
Attractions	○ Diverse currency collections ○ Use of technology and visual media ○ Museum architecture	○ Diverse collections and distinctive storytelling ○ Interactive technology ○ Nostalgic elements	○ Museum and personal identity attachment ○ Availability of modern technology and AI ○ Concise and effective narratives ○ Comfortable environment and physical facilities
Limitations	○ Malfunctioning technology ○ Lack of instructions for using digital features ○ Lack of structured navigation	○ Limited text accessibility ○ Lighting limitations ○ Incomplete information	○ Limited integrated canteen/dining areas within the museum complex ○ Technical infrastructure issues ○ Need for more detailed artifact descriptions
Revisit Motivation	○ Exploring digital features and exhibition materials more comprehensively ○ Fulfilling remaining curiosity ○ Providing educational experiences for accompanying visitors	○ Repeated educational needs ○ Expectations of updated facilities and exhibition collections ○ Friendly and supportive educator services ○ Satisfaction with the implementation of digital audio technology	○ Concrete educational benefits and learning outcomes ○ Richness of exhibition information ○ High curiosity among students about Indonesian history

The comparative exploratory analysis shows that visitor experiences at Museum Bank Indonesia, Museum Wayang, and the National Museum involve different motivations for revisiting. At Museum Bank Indonesia, visits are primarily driven by educational and recreational needs, with key attractions including the diversity of currency collections, the use of technology and visual displays, and the museum's architectural character. However, several challenges remain, including malfunctioning technology and a lack of clear instructions and structured navigation.

At Museum Wayang, motivations for visiting are more diverse, ranging from spontaneous visits influenced by geographical factors and social media exposure to curiosity about museum updates and incidental visits. Its main attractions include the diversity of collections and storytelling, interactive technologies, and nostalgic elements. Nevertheless, several limitations

were identified, particularly regarding text accessibility, lighting, and the completeness of information.

Meanwhile, visits to the National Museum are often motivated by the need to complement school history materials, curiosity about culture, recommendations from family and friends, digital trends, and its strategic location. The museum's appeal is strengthened by visitors' sense of identity, the availability of modern technologies and AI, concise and effective narratives, as well as the comfort of its physical environment and facilities. However, some limitations remain, including limited dining areas, technical infrastructure issues, and the need for more detailed information about the artifacts.

In terms of revisit intentions, all three museums demonstrate considerable potential for repeat visitation, although the motivations differ. These findings support Samosir and Novira (2023), who identify cultural attraction as an important factor influencing visitor interest, while Nugraha et al. (2023) and Achyarsyah et al. (2020) demonstrate the potential of digital and virtual museum experiences to maintain visitor interest and strengthen museum promotion. Visitors to Museum Bank Indonesia are encouraged to return to explore digital features and exhibition materials more comprehensively. At Museum Wayang, revisit intentions are influenced by repeated educational needs, facility and collection updates, and satisfaction with educator services and audio technology. Meanwhile, at the National Museum, the intention to revisit is primarily associated with educational benefits, the richness of information, and curiosity about Indonesian history.

The comparison indicates that digital technology strengthens visitors engagement when it is integrated with meaningful cultural content and supported by clear information and accessible facilities. Technology functions most effectively as a mediator between visitors and cultural collections rather than as an attraction isolated from the museum experience. Therefore, visitor experience emerges from the interaction between digital facilities, physical collections, exhibition environments, visitor motivations, and the cultural narratives communicated by the museum.

3.5 Digital Museum Technology and Urban Cultural Tourism

These themes demonstrate that digital technology is not used solely to modernize museum facilities but also to mediate the relationship between cultural collections, institutional functions, and visitor experiences.

Table 7. Thematic Analysis of Digital Technology in Museums in DKI Jakarta

Digital Technology Function	Museum Bank Indonesia	Museum Wayang	National Museum
Education	Kid Corner is designed to position the museum as an effective non-formal educational space for visitors of different	1. Screen/touchscreen: Distribution maps, interactive gamelan, smart modules, and smart Wayang beber enable visitors to	QR Code, virtual tour, 3D technology, audio guide, smart guide and AI-based technology strengthen public

	age groups. Interactive games (gamification) are used to simplify complex learning materials and make them easier to understand.	independently explore the geographical diversity of wayang and recognize different gamelan instrument sounds. 2. Barcode/QR Code System: Provides quick access to detailed descriptions of character narratives and the philosophical background of collections. 3. 360° Immersive Space & Smart Module: Presents historical narratives and character profiles, such as Arjuna, as well as contemporary educational issues such as environmental awareness through child-friendly animation. 4. AI & Digital Coloring Features:Develop children's motor skills and creativity through interactive coloring activities featuring wayang characters and animals.	learning across generations while maintaining synergy with museum guides.
Cultural Preservation	Magic Wall: Displays detailed artifacts, archives, and historical narratives in high-resolution digital formats without physically affecting the original objects, accompanied by supporting narratives.AR and QR Code: Facilitate visitor	1. Protection of Original Collections (Conservation): Reduces the risk of damage to physical gamelan collections caused by physical contact by providing digital simulations. 2. Digital Archiving: Supports collection documentation to	QR Code, virtual tour, 3D technology, audio guide, smart guide,and AI-based technology support artifact digitization as a form of secondary cultural protection (digital backup) to anticipate risks of physical damage or

	access to visual elements through personal mobile devices. AR can digitally reconstruct lost or damaged artifacts in 3D form.	prevent information loss and improve cultural heritage management. 3. Revitalization of Cultural Narratives: Revives old manuscripts, Wayang Beber, and classical epic stories through contemporary cinematic audio-visual formats. 4. Cultural Reinterpretation: Transforms perceptions of wayang characters as mystical or frightening figures into more familiar and approachable representations for younger generations.	disasters.
Cultural Tourism	Personality Quiz: Provides an entertaining learning experience through interactive questions that generate an IngLakon cultural character corresponding to the visitor's personality, making cultural values more relevant as a reward for participation.Photobooth:Provides digital photographs with themes relevant to the museum as a modern cultural tourism destination. Photographs can be accessed through QR codes in both digital	1. Provides engaging and user-friendly hands-on recreational experiences that encourage comfortable visitor participation. 2. Facilitates practical access to information according to visitors' individual pace and interests. 3. Functions as a key attraction that creates an aesthetic experience and a contemporary appeal for tourists. 4. Provides personalized digital outputs that can serve as memorabilia of the museum visit.	Online Ticketing Website:Modernizes operational management and facilitates the processing of visitor data to improve visitor satisfaction and the quality of tourism services.

	and physical formats.Digital/Physical Stamp:Functions as a validator that visitors have completed the museum exploration route and encourages them to explore the entire exhibition area as part of a sequential experience.		

The first theme, education, shows that digital technology helps museums communicate historical and cultural information in forms that are more interactive and accessible. At Museum Bank Indonesia, interactive games, the Kids Corner, Magic Wall, AR, and QR Codes support the delivery of historical and economic information. Museum Wayang provides more multisensory learning through interactive screens, gamelan, Smart Modules, QR Codes, immersive technology, AI, and digital coloring. Meanwhile, the National Museum combines digital interpretation with virtual tours, 3D technology, audio guides, Smart Guides, and AI-supported media. These findings indicate that digital technology can simplify complex information while providing visitors with opportunities to explore cultural content at their own pace. This is consistent with research emphasizing the educational potential of digitally mediated museum experiences (Nisa et al., 2023; Li et al., 2024).

The second theme, cultural preservation, indicates that digital technology can function as an additional mechanism for documenting, interpreting, and communicating cultural heritage. At Museum Bank Indonesia, digital media provide access to historical archives and collection information while reducing dependence on direct physical interaction with artifacts. At Museum Wayang, digital simulations, archiving, and audiovisual reinterpretation support the protection and contemporary communication of wayang heritage, particularly for younger audiences. At the National Museum, virtual tours, QR Codes, 3D technology, and digital interpretation extend access to collections while maintaining the importance of physical artifacts. Thus, digitalization does not necessarily replace material heritage; rather, it can provide complementary forms of documentation and interpretation (Kartika & Fajri, 2020; Shangguan et al., 2024).

The third theme, cultural tourism, becomes visible through the combination of digital attractions, museum collections, and physical visitor experiences. At Museum Bank Indonesia, the Personality Quiz, Photobooth, and Digital/Physical Stamp add interactive and recreational elements to the museum visit. Museum Wayang uses interactive and immersive technologies to make wayang culture more participatory and relevant to contemporary audiences. The National Museum combines online ticketing, virtual access, digital guides, and audiovisual technologies to improve access to services and cultural information. These findings suggest that digital technology can provide additional motivations for visiting museums and enrich the cultural experience offered within urban tourism environments (Arumsari et al., 2023; Veronica, 2025).

In this study, urban cultural tourism refers to tourism activities in urban areas that involve engagement with cultural resources, including museums, heritage, historical collections, and cultural narratives. Museum visits can therefore form part of urban cultural tourism when

visitors engage with these cultural resources as part of their recreational, educational, or cultural experiences. What distinguishes this form of tourism from urban tourism more generally is the central role of cultural meanings, heritage, identity, and interpretation rather than the urban setting alone. The three museums examined in this study represent different forms of cultural resources within Jakarta and demonstrate how digital technology can mediate visitors' engagement with those resources.

The relationship between digital technology and urban cultural tourism is particularly evident in the way technology connects physical collections with contemporary forms of cultural consumption. Digital interpretation, interactive media, immersive experiences, virtual access, and digital visitor services can increase accessibility while providing alternative ways of encountering cultural heritage. In this sense, technology extends the tourism function of museums beyond the conventional presentation of collections. It enables museums to respond to changing visitor expectations while maintaining their educational and preservation functions.

However, the findings also demonstrate that digital technology does not automatically increase the tourism value of a museum. Its contribution depends on the integration of technological facilities with cultural narratives, authentic collections, visitor needs, accessibility, infrastructure, and sustainable management. Technical problems, limited guidance, connectivity issues, equipment maintenance, and differences in visitor familiarity with digital facilities may reduce the effectiveness of digital experiences. Therefore, digital technology should be understood as a mediating instrument whose tourism contribution depends on how effectively it is integrated into the overall museum experience.

Overall, the thematic analysis shows that education, cultural preservation, and cultural tourism are not separate functions but interconnected dimensions of digital museum development. Educational technologies facilitate cultural understanding; preservation-oriented technologies extend documentation and interpretation; and tourism-oriented technologies enhance accessibility, attraction, and visitor engagement. The three museums apply these functions according to their respective institutional and cultural characteristics. Consequently, digital museum technology can contribute to urban cultural tourism in Jakarta by connecting cultural heritage with contemporary forms of access, interpretation, and visitor engagement while retaining the physical museum as an important site of cultural experience.

4. Conclusion

This study concludes that digital technology plays an important role in supporting museum development, particularly in improving cultural interpretation, visitor engagement, and urban cultural tourism. The comparison of Museum Bank Indonesia, Museum Wayang, and the National Museum of Indonesia shows that each museum applies digital technology differently, adapting it to its collections, institutional characteristics, and visitor needs. Digital features such as interactive media, immersive technology, audio-visual content, QR codes, virtual tours, and AI provide visitors with more accessible, interactive, and multisensory experiences.

However, the findings also show that technological implementation still faces challenges, including technical problems, limited accessibility, inadequate navigation and information, and infrastructure constraints. Therefore, digital transformation should not focus solely on adopting new technologies, but should integrate technology with cultural narratives, visitor needs, accessibility, and sustainable museum management. In this way, digital technology can function not only as a supporting facility but also as a strategic instrument for strengthening museums as cultural tourism destinations in Jakarta.

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