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Virtual Tours and Public Information Transparency: Driving Innovation and Digital Transformation in Indonesia's Tourism Technology

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ABSTRACT

Digital transformation in the tourism sector has encouraged public institutions to develop technology-based service innovations that extend beyond promotion and embody the principles of public information transparency. One prominent innovation is the integration of virtual tour features into official institutional websites. This study examines virtual tours as a manifestation of public information transparency and as a strategy for innovation and digital transformation in Indonesia's tourism sector. This research employs a qualitative approach through literature review and content analysis of public institution websites, focusing on the National Museum of Indonesia and the Youth Pledge Museum. These institutions provide free virtual tour access, enabling the public to explore cultural collections digitally. The analysis explores how virtual tour services reflect transparency, accessibility, and the application of digital technology in expanding cultural and educational services. The findings reveal that virtual tours function not only as tools for information dissemination but also as instruments for democratizing access to national cultural heritage. By integrating immersive digital technology into official platforms, public institutions can reduce geographical and economic barriers, enhance cultural literacy, and broaden inclusive tourism experiences. However, technical limitations such as unequal internet infrastructure and bandwidth disparities in remote areas remain challenges to broader accessibility. Overall, virtual tours strengthen institutional transparency, support digital tourism ecosystem development, and contribute to sustainable tourism transformation in Indonesia.

Keywords: *Virtual Tour, Tourism, Digital, Innovation*

.1. INTRODUCTION

Indonesia's tourism sector constitutes a strategic pillar of national development, contributing significantly to economic growth, job creation, and cultural diplomacy. Recent studies indicate that tourism generates a strong multiplier effect on the national economy, particularly in increasing regional revenues and fostering the development of the creative economy (UNWTO, 2022; WTTC, 2023). With more than 17,000 islands and extraordinary diversity in ethnicity, language, and culture, Indonesia's tourism assets encompass natural landscapes, maritime destinations, historical monuments, religious heritage sites, and museums. These advantages position Indonesia as one of the world's leading destinations, particularly in the context of cultural and nature-based tourism (OECD, 2020; Damanik & Yusuf, 2022). Cultural tourism, in particular, plays a central role in shaping Indonesia's national identity and projecting its cultural heritage to a global audience.

Museums occupy a unique position within Indonesia's cultural tourism ecosystem. As institutions of preservation, education, and public engagement, museums function not only as repositories of artifacts but also as knowledge infrastructures that disseminate collective memory and national narratives. However, in the digital era, museums face increasing challenges related to accessibility, audience engagement, and information dissemination. Physical visits remain constrained by geographical barriers, infrastructure gaps, and socio-economic limitations. These conditions underscore the urgency of digital transformation in expanding access to cultural heritage.

Several museums in Indonesia have begun implementing virtual tour technologies to address these

challenges. The National Museum of Indonesia, widely recognized as one of the most comprehensive ethnographic and archaeological museums in Southeast Asia, has developed a virtual exploration platform that enables users to navigate exhibition spaces and access contextual descriptions of artifacts remotely. This digital transformation aligns with global trends in which museums adopt virtual technologies to enhance accessibility and expand audience reach (Ivanova, 2021; Styliani et al., 2020).

Similarly, the Youth Pledge Museum (Museum Sumpah Pemuda), which commemorates a pivotal moment in Indonesia's independence movement, offers interactive digital tours that allow users to explore historical collections online. These initiatives demonstrate how cultural institutions are increasingly adopting immersive technologies to extend public engagement beyond physical spaces and create more participatory and meaningful visitor experiences (Trunfio et al., 2022; Bekele et al., 2021).



Figure 1. National Museum of Indonesia

The emergence of virtual tours in Indonesian museums is also aligned with broader transformations in digital governance and public information policy. Law Number 14 of 2008 on Public Information Disclosure mandates public institutions to provide information that is accessible, accurate, and timely. This legal framework establishes transparency as a democratic imperative, reinforcing accountability and public trust. Museums, as state-funded institutions, are subject to these obligations, including the dissemination of information related to collections, operational standards, ticketing policies, and educational programs.



Figure 2. Youth Pledge Museum

Traditionally, public information disclosure has relied on textual publications through printed materials or static websites. However, such approaches may limit user engagement and fail to reduce interpretative ambiguity, particularly when information is presented without visual and interactive context (Meijer, 2015; Grimmelikhuijsen et al., 2020). Virtual tours introduce immersive visualization as a complementary mechanism of transparency. By enabling users to explore spatial environments digitally, institutions provide verifiable visual evidence regarding facilities, exhibition conditions, and service quality. This immersive technology-based approach has been shown to enhance user understanding and strengthen perceptions of organizational transparency and accountability (Bekele et al., 2021; Flavián et al., 2021). Such immersive disclosure ultimately contributes to reducing information asymmetry and increasing institutional credibility in the eyes of the public.

Beyond museums, Indonesia's broader tourism sector is increasingly integrating digital technologies, including online booking systems, mobile applications, social media campaigns, and smart destination platforms. This transformation reflects the global trend of tourism digitalization, which focuses on enhancing tourist experiences and service efficiency through the use of information and communication technologies (Gretzel et al., 2020; Buhalis & Amaranggana, 2021). The Ministry of Tourism and Creative Economy has emphasized digitalization as a strategic priority, particularly in the aftermath of global disruptions such as the COVID-19 pandemic. Studies show that the pandemic has accelerated the adoption of digital technologies in the tourism sector as an adaptive response to mobility restrictions and shifting tourist behavior (Sigala, 2020; Gössling et al., 2021). Virtual tours have emerged as an adaptive solution, enabling destinations to maintain visibility and engagement despite mobility constraints, while also serving as an effective promotional tool in fostering post-pandemic visit intentions (Yung & Khoo-Lattimore, 2020; Flavián et al., 2021).

However, digital transformation in tourism should not be evaluated solely from the perspective of innovation, but also from the standpoint of governance and transparency. The adoption of digital technologies without an accountability framework risks reproducing information gaps or even exacerbating inequalities. Therefore, integrating virtual tour technologies with the principles of public information disclosure is essential.

This study examines the intersection between virtual tours and public information transparency within Indonesia's tourism technology landscape. It argues that immersive technologies can function as instruments of experiential transparency, supporting digital governance, innovation, and public value creation. The study explores conceptual foundations, analyzes museum case examples, and proposes an integrative model for a transparent digital tourism ecosystem.

2. LITERATUR REVIEW

2.1. Public Communication

McQuail (2010) defines public communication as the process of producing and distributing messages to a broad audience through various media channels, both conventional and digital. Meanwhile, Canel and Sanders (2012) emphasize that, within the context of government, public communication functions as a strategic instrument to build policy legitimacy and enhance public trust through transparency and accountability. In this framework, public communication is not merely informative but also persuasive and relational, particularly in bridging the interests between government and society.

In the context of public information disclosure, public communication serves as the primary mechanism to guarantee citizens' rights to obtain accurate, timely, and accessible information. Law Number 14 of 2008 underscores transparency as a fundamental principle of good governance. Grunig (2009) demonstrates that symmetrical, two-way communication is more effective in fostering long-term relationships between institutions and the public. This aligns with the concept of reducing information equivocality (Weick, 1995), where organizations are required to manage ambiguity through clear and structured communication processes.

The development of digital technologies has transformed the landscape of public communication into a more open, interactive, and network-based system. Castells (2010) describes this phenomenon as the network society, where information flows multidirectionally and in real time. In the tourism sector, technological innovations such as virtual tours have emerged as effective public communication media for delivering destination information in a visual, immersive, and participatory manner (Guttentag, 2010). Virtual tours not only enhance user experience but also strengthen public information transparency by providing broader access to tourism-related information without geographical constraints. Thus, the integration of public communication and digital technology becomes a key driver of innovation and digital transformation in Indonesia's tourism sector.

2.2. Virtual Tours in Tourism and Cultural Heritage

Virtual tours are immersive digital simulations of real-world environments developed 360 באמצעות-degree imaging, Virtual Reality (VR), Augmented Reality (AR), and interactive multimedia. Guttentag (2010) defines virtual reality in tourism as a technology capable of generating artificial environments that create a sense of presence and immersion. Recent developments indicate that such immersive systems not only enhance user experience but also significantly influence destination perception, expectation formation, and tourist behavioral intentions, including visit intention and travel decision-making (Flavián et al., 2021; Loureiro et al., 2020). Furthermore, the level of presence and interactivity in virtual tours has been identified as a key factor in fostering users' emotional engagement with the presented destinations (Yung & Khoo-Lattimore, 2020).



Figure 3. Virtual Tour of the National Museum of Indonesia

Tussyadiah et al. (2018; 2020) demonstrate that virtual environments enhance user engagement through psychological presence, which in turn increases satisfaction and intention to visit physical destinations. These findings are reinforced by other studies showing that VR-based immersive experiences can build emotional connections and perceptions of authenticity, thereby significantly influencing tourist behavior (Flavián et al., 2021; Loureiro et al., 2020). Beyond marketing functions, virtual tours also facilitate cultural preservation and educational outreach, particularly for heritage sites vulnerable to environmental degradation and human activity. The digitalization of cultural heritage

through immersive technologies enables documentation, conservation, and broader access without increasing physical pressure on the sites (Bekele et al., 2021; tom Dieck & Jung, 2021).

In the museum context, digital tours enable artifact visualization without physical handling, thereby reducing conservation risks while expanding public access. The digitalization of collections through virtual technologies has proven effective in supporting preservation efforts by minimizing direct interaction that may damage cultural objects (Bekele et al., 2021; Addison, 2020). These tours also integrate multimedia narratives, interactive labels, and multilingual features that enhance interpretative richness and the quality of visitor learning experiences. This approach strengthens users' cognitive and emotional engagement and allows museums to deliver more contextual and inclusive information to global audiences (Parry, 2021; Sylaiou et al., 2020).

2.3. Digital Transformation and Smart Tourism

Digital transformation refers to structural organizational changes driven by the integration of digital technologies into business processes, service models, and stakeholder interactions (Vial, 2019; Verhoef et al., 2021). In the tourism sector, this transformation is manifested in the development of smart tourism ecosystems that integrate ICT infrastructure, big data analytics, Internet of Things (IoT) sensors, and mobile connectivity (Gretzel et al., 2020; Buhalis & Amaranggana, 2021). Smart tourism emphasizes service personalization, real-time communication, and data-driven management to improve operational efficiency and enhance tourist experiences (Xiang et al., 2021; Li et al., 2020).

The adoption of immersive technologies reflects a broader shift toward experience-centered innovation, where value is created not only through products or services but through the quality of user experience (Pine & Gilmore, 2019; Verhoef et al., 2021). Digital platforms no longer merely distribute information but also co-create value with users through interaction and feedback. The concept of value co-creation highlights the active role of users in shaping experiences and meanings, particularly in interactive and immersive digital environments (Prahalad & Ramaswamy, 2004; Buhalis & Sinarta, 2019). In tourism and immersive technology contexts, direct user engagement has been shown to enhance experiences, increase satisfaction, and foster loyalty and visit intentions (Flavián et al., 2021; Neuhofer et al., 2020).

2.4. Public Information Transparency

Transparency is widely recognized as a cornerstone of good governance. Heald conceptualizes transparency as an instrumental value that enhances accountability and public trust (Heald, 2006; Grimmelikhuijsen et al., 2020). Empirical studies indicate that higher levels of transparency are positively correlated with increased institutional legitimacy and public trust in government (Cucciniello et al., 2017; de Fine Licht, 2014). From an economic perspective, Stiglitz highlights the adverse effects of information asymmetry, where unequal information distribution undermines efficiency and fairness in both markets and public governance (Stiglitz, 2000; 2017). Contemporary literature further emphasizes that reducing information asymmetry through effective disclosure improves decision-making quality and overall system efficiency (Kang & Hustvedt, 2014; Grimmelikhuijsen et al., 2020).

Digital governance expands transparency through online portals, open data systems, and interactive dashboards that enable real-time access to information and improve public comprehension (Meijer et al., 2020; Ruijer et al., 2020). In Indonesia, Law Number 14 of 2008 institutionalizes public information disclosure, requiring proactive dissemination and ease of access. In tourism governance, transparency includes clarity in ticket pricing, safety protocols, sustainability policies, and service standards. Studies show that information transparency in tourism plays a critical role in building tourist trust and influencing travel decisions (Gursoy et al., 2019; Farmaki et al., 2020). Museums and cultural institutions are obliged to provide accurate descriptions of collections and services, as the quality and clarity of digital information contribute to enhanced visitor experiences and institutional legitimacy (Parry, 2021; Bekele et al., 2021).

2.5. Experiential Transparency and Immersive Disclosure

The convergence of immersive technology and transparency gives rise to what can be termed experiential transparency. Unlike static text, immersive visualization enables users to verify information through direct digital exploration. Studies show that immersive technologies such as VR and AR enhance users' sense of presence and cognitive understanding by presenting information in contextual and interactive ways (Flavián et al., 2021; Bekele et al., 2021). This contributes to reducing information ambiguity while increasing clarity and trust in the information provided (Schnackenberg & Tomlinson, 2016; Grimmelikhuijsen et al., 2020). Thus, virtual tours function not only as promotional tools but also as governance instruments integrated within the framework of digital public value. Digital governance literature emphasizes that interactive technologies can strengthen transparency, participation, and public value

creation through more inclusive and data-driven user experiences (Meijer et al., 2020; Ruijer et al., 2020).

2.6. National Museum of Indonesia

The National Museum of Indonesia is the oldest and most representative cultural institution in portraying the richness of the archipelago's history and culture. Its origins date back to the establishment of the Bataviaasch Genootschap van Kunsten en Wetenschappen in 1778, which later evolved into the National Museum and was opened to the public in the 19th century. Following independence, the museum underwent institutional transformation and is now managed by the government as a center for national cultural preservation. Empirically, the National Museum houses more than 190,000 collections, including prehistoric artifacts, archaeology, ethnography, numismatics, ceramics, and other historical objects. This extensive collection makes it one of the largest museums in Southeast Asia and an essential source of knowledge for understanding Indonesia's cultural identity (Damanik & Yusuf, 2022).

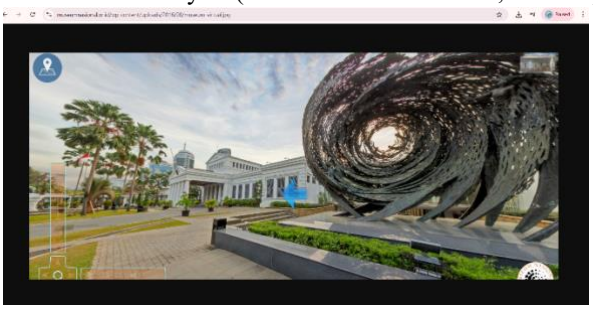


Figure 4. Virtual Tour Website of the National Museum of Indonesia

In recent years, the National Museum has experienced an increase in both physical and digital visits, particularly following the acceleration of digital transformation after the COVID-19 pandemic. The development of digital platforms such as 360-degree virtual tours, online catalogs, and official social media channels indicates a strategic shift from conventional approaches to technology-based service models. This trend aligns with global literature demonstrating that museum digitalization expands accessibility, enhances user engagement, and creates more immersive and interactive experiences (Ivanova, 2021; Styliani et al., 2020; Parry, 2021).

However, most previous studies have focused on user experience and digital marketing aspects of virtual museums, while the dimension of transparency and public information disclosure remains underexplored. Bekele et al. (2021) and Flavián et al. (2021) highlight the role of immersive technology in enhancing presence and engagement but do not explicitly link it to transparency in public governance. Conversely, studies on public transparency (Grimmelikhuijsen et al., 2020; Meijer et al., 2020) primarily focus on data portals and administrative openness without considering the potential of immersive technologies as experiential transparency tools. This gap indicates that the integration of immersive technology and public information transparency remains relatively underexplored.

Addressing this gap, this study introduces the concept of experiential transparency, defined as a form of transparency that goes beyond textual information provision by incorporating visual and interactive experiences that allow users to directly verify information. In the context of the National Museum of Indonesia, virtual tours function not only as promotional and educational media but also as governance instruments that enable the public to objectively assess collection conditions, exhibition layouts, and service quality. This approach expands the understanding of transparency from mere access to information toward experience-based verification that reduces ambiguity and information asymmetry. Furthermore, the integration of virtual tours in the National Museum reflects a transition toward a smart tourism ecosystem driven by data and digital technologies. The utilization of user analytics from digital platforms enables institutions to understand visitor behavior, improve service quality, and design more adaptive communication strategies. Xiang et al. (2021) emphasize that knowledge creation in smart tourism ecosystems relies heavily on data utilization and digital interaction. Within the framework of digital governance, this contributes to enhancing transparency, participation, and public accountability (Meijer et al., 2020).

Overall, both literature and empirical evidence indicate that the National Museum of Indonesia is undergoing a transformation toward a digitally oriented cultural institution that emphasizes not only preservation but also information transparency and service innovation. Nevertheless, there remains a need for deeper examination of how virtual tours can be optimized as instruments of transparency in public governance. This study contributes to addressing this gap by integrating perspectives on immersive technology, transparency, and smart tourism into a comprehensive analytical framework.

2.7. Youth Pledge Museum

The Youth Pledge Museum is a cultural institution of high historical significance, representing a key milestone in Indonesia's national movement. Located in Jakarta, the museum occupies a historic building that hosted the Second Youth Congress in 1928, where the Youth Pledge was declared as a symbol of national unity. Historically, the museum functions not only as a

repository of artifacts but also as a medium of public education in fostering collective awareness of national identity and the history of independence.



Figure 5. Virtual Tour Website of the Youth Pledge Museum

The museum's collection includes various artifacts related to the Second Youth Congress, such as historical documents, photographs, the violin of Wage Rudolf Supratman used in composing "Indonesia Raya," and other objects representing the dynamics of youth movements during the colonial period. These collections hold strong educational value, particularly in understanding the construction of national identity through cross-ethnic and regional youth movements. From a museological perspective, narrative-based presentation of collections plays a crucial role in shaping visitors' interpretative experiences (Parry, 2021).

With the advancement of digital technology, the Youth Pledge Museum has begun adopting digital innovations, including virtual tours and online information platforms. This digitalization enables the museum to reach a broader audience, particularly younger generations accustomed to digital technologies. Studies show that virtual tours in historical museums enhance user engagement through more interactive and contextual content presentation (Styliani et al., 2020; Ivanova, 2021). Additionally, immersive technologies allow visitors to gain a deeper understanding of historical contexts through digital visualization of spaces and artifacts (Bekele et al., 2021).

However, most studies on digital museums still focus on user experience and educational aspects, while the dimension of public information transparency in historical museums remains underexplored. As a public institution, the Youth Pledge Museum has a responsibility to provide accurate, transparent, and accessible information. In this regard, virtual tours have the potential to serve as transparency instruments that not only present information but also allow the public to directly verify collection conditions and exhibition layouts. Grimmelikhuijsen et al. (2020) argue that effective transparency enhances public trust, particularly when information is presented openly and accessibly.

Based on this perspective, this study identifies a gap between the use of digital technology in museums and its function in public governance transparency. The novelty of this research lies in integrating virtual tour technology with public information disclosure through the concept of experiential transparency, where information is delivered through digital experiences that enable users not only to receive but also to experience it directly. In the context of the Youth Pledge Museum, this approach is relevant for strengthening educational functions while enhancing institutional accountability through more interactive and verifiable information presentation.

Furthermore, the digital transformation of the Youth Pledge Museum can be understood as part of the development of a smart tourism ecosystem that emphasizes the integration of technology, data, and user experience. Gretzel et al. (2020) state that smart tourism relies on digital technologies to create more personalized and adaptive experiences. In this context, virtual tours function not only as promotional tools for historical destinations but also as digital learning media and governance instruments that support transparency and public participation.

Overall, the literature indicates that the Youth Pledge Museum holds significant potential in developing digital innovation through virtual tours as part of its institutional transformation strategy. However, optimizing the use of this technology requires a more integrative approach, particularly in linking user experience with the principles of public information transparency. Therefore, this study contributes to filling this gap by proposing an analytical framework that connects immersive technology, transparency, and digital governance within the context of historical museums in Indonesia.

3.1. Research Design

This study employs an integrative approach that combines multiple analytical perspectives to obtain a comprehensive understanding. First, a systematic literature analysis is conducted on the concepts of virtual tours and transparency by examining relevant empirical findings and theoretical frameworks within the context of immersive technologies and public information disclosure. This analysis aims to identify the conceptual relationship between the utilization of virtual tours and the enhancement of transparency quality, particularly in reducing information ambiguity and strengthening user experience.

Furthermore, this study undertakes a policy review of public information disclosure regulations in Indonesia, particularly Law Number 14 of 2008, to

understand how transparency principles are institutionalized within public governance. This review is complemented by a comparative examination of virtual tour implementations across selected museums, enabling the identification of best practices as well as variations in digital technology utilization. Through the combination of these approaches, this study seeks to develop an analytical framework that is not only conceptual but also contextual and applicable, in line with the standards of reputable scientific publications.

3.2. Data Sources

Data were collected from academic journals, Indonesian legal documents, and official museum websites.

3.3. Analytical Framework

The analysis in this study focuses on three interrelated dimensions to provide a comprehensive understanding of virtual tour implementation within the framework of transparency and governance. The first dimension is technological infrastructure, which includes the readiness and utilization of both hardware and software, such as digital platforms, 360-degree visualization systems, and the integration of supporting technologies such as virtual reality and augmented reality. This dimension is essential for assessing the extent of institutional technical capacity in developing and operating virtual tours effectively.

The second dimension is transparency features, which emphasizes the availability, clarity, and accessibility of information presented through virtual tours, including collection descriptions, interactive navigation, and contextual information that can be verified by users. The third dimension is governance impact, which examines the implications of virtual tour utilization on improving accountability, public trust, and the quality of institutional services. These three dimensions are analyzed in an integrated manner to identify the relationship between the adoption of immersive technologies and the strengthening of transparency principles in public governance.

4. FINDINGS AND DISCUSSION

4.1. Comparative Implementation of Virtual Tours in Indonesian Museums

The following table summarizes the key characteristics of virtual tour implementations in selected museums.

Table 1. Comparative Implementation of Virtual Tours in Indonesian Museums

Dimension	National Museum of Indonesia	Youth Pledge Museum	Observed Implications
Platform Type	Web-based 360° interactive tour	Web-based virtual gallery	Both prioritize accessibility through web browsers
Information Layer	Artifact descriptions, historical narratives, spatial navigation	Historical documentation, thematic explanations	Supports contextual transparency
Accessibility	Accessible via official website	Accessible via official website	Aligned with Public Information Disclosure Law
Multimedia Integration	Images, zoom features, descriptive labels	Audio-visual narratives	Enhances experiential learning
Contribution to Transparency	Visual verification of collections and facilities	Public access to national historical archives	Reduces information asymmetry
Governance Integration	Linked to institutional website and public information menu	Integrated within museum information portal	Reflects alignment with digital governance

The comparison indicates that both institutions utilize virtual tours as extensions of their official websites, thereby strengthening public information dissemination. The National Museum places greater emphasis on artifact visualization and spatial navigation, while the Youth Pledge Museum highlights the contextualization of historical narratives.

4.2. Comparative Analysis of the National Museum of Indonesia and the Youth Pledge Museum

The National Museum of Indonesia and the Youth Pledge Museum are both public cultural institutions that play strategic roles in historical preservation and public

education. However, they exhibit distinct characteristics in terms of collection scale, curatorial approach, and level of digital transformation adoption. The National Museum of Indonesia, with more than 190,000 collections encompassing archaeological, ethnographic, and historical artifacts, represents the cultural spectrum of the Indonesian archipelago on a macro scale. In contrast, the Youth Pledge Museum has a more specific thematic focus on the Second Youth Congress of 1928, resulting in a narrative approach centered on the formation of national identity and the history of youth movements.

In the context of digitalization, both museums demonstrate a tendency to adopt technology, albeit with differing levels of complexity. The National Museum is relatively more advanced in developing digital platforms such as 360-degree virtual tours and online catalogs, enabling comprehensive exploration of exhibition spaces. Meanwhile, the Youth Pledge Museum has begun adopting simpler interactive digital tours, which remain effective in conveying historical narratives to the public. Literature indicates that museum digitalization contributes to increased accessibility and user engagement, particularly through immersive experiences that enable self-directed exploration (Ivanova, 2021; Styliani et al., 2020).

From a transparency perspective, both museums have the potential to develop what is referred to as experiential transparency, namely transparency based on digital experience. At the National Museum, transparency is manifested through users' ability to visually verify the condition of collections and exhibition layouts on a large scale. In contrast, at the Youth Pledge Museum, transparency is more focused on the clarity of historical narratives and the authenticity of the information presented. Studies suggest that immersive technologies can reduce information ambiguity and enhance user trust through more contextualized presentations (Bekele et al., 2021; Flavián et al., 2021).

However, there remains a gap in both literature and practice regarding the optimal integration of immersive technologies with public information disclosure frameworks. Most virtual tour implementations are still oriented toward promotional and educational purposes and have not been fully utilized as governance instruments to enhance accountability and public trust. Grimmelikhuijsen et al. (2020) emphasize that effective transparency requires not only the availability of information but also its accessibility and comprehensibility to the public. In this regard, both the National Museum and the Youth Pledge Museum have opportunities to develop digital strategies that are more closely aligned with public transparency principles.

Thus, this comparative analysis indicates that despite differences in scale and approach, both museums are on a similar trajectory of digital transformation toward strengthening transparency and user experience. These differences, in fact, provide opportunities to develop adaptive and contextual virtual tour implementation models tailored to the needs of each institution.

4.3. Transparency Outcomes

Virtual tours contribute to strengthening transparency through several interrelated mechanisms within the digital user experience. First, the aspect of visual verification enables users to independently assess exhibition conditions, spatial arrangements, and the quality of collection presentation through immersive exploration, thereby reducing reliance on textual descriptions alone. Second, virtual tours expand accessibility by allowing remote audiences to access cultural heritage without geographical constraints, thus supporting the principle of inclusivity in public information dissemination. Third, the integration of multimedia narratives, such as contextual text, audio, and interactive visuals, enriches educational value by enhancing users' cognitive understanding and engagement with the presented content. Fourth, the provision of virtual tours also serves as a signal of institutional accountability, demonstrating a commitment to openness and a willingness to be publicly evaluated through verifiable information presentation.

These findings are consistent with previous studies indicating that immersive technologies enhance perceptions of transparency, trust, and user experience quality in digital service contexts. Flavián et al. (2021) highlight that virtual reality-based experiences increase users' sense of presence and engagement, leading to deeper understanding of information. Bekele et al. (2021) further demonstrate that the digitalization of cultural heritage through immersive technologies not only supports preservation but also significantly expands public access. Grimmelikhuijsen et al. (2020) also find that more open and accessible information presentation contributes to increased public trust in institutions. Therefore, these findings reinforce the argument that virtual tours function not only as communication media but also as strategic instruments for reducing information asymmetry and strengthening transparency in public governance, as outlined in transparency theory and information economics.

4.4. Innovation and Digital Ecosystem Transformation

Virtual tours act as catalysts for innovation and transformation within the digital ecosystem, particularly

in the management of cultural and tourism institutions. Their implementation encourages cross-sector collaboration among museums, technology developers, and other stakeholders in designing interactive, user-centered digital experiences. Moreover, virtual tours integrate immersive media into official governance platforms, functioning not only as tools of public communication but also as components of broader digital service systems. The use of these platforms also enables the collection and analysis of user behavior data, such as virtual visit patterns, interaction duration, and content preferences, which can be utilized to improve service quality and support data-driven decision-making.

This transformation reflects the core characteristics of smart tourism, namely the integration of information and communication technologies, the utilization of big data, and the creation of adaptive and personalized experiences. Gretzel et al. (2020) emphasize that smart tourism ecosystems are built through digital connectivity and multi-stakeholder collaboration, enabling continuous data exchange and innovation. Buhalis and Amaranggana (2021) also demonstrate that technological integration in tourism destinations enhances operational efficiency while enriching tourist experiences. Furthermore, Xiang et al. (2021) highlight the importance of knowledge creation processes in digital ecosystems supported by user data analytics. From a public value perspective, Meijer et al. (2020) underline that digital transformation in public governance is not solely oriented toward efficiency but also toward enhancing transparency, participation, and collaboration between government and society.

However, this study also acknowledges several limitations related to the implementation of virtual tours within Indonesia's broader digital transformation landscape. Technical challenges such as uneven internet infrastructure, limited bandwidth in remote or rural areas, and disparities in digital literacy may hinder equal access to virtual tourism experiences. These constraints can reduce user engagement and limit the effectiveness of virtual tours as inclusive public service innovations. Additionally, the dependence on stable technological infrastructure may create accessibility gaps between urban and underserved regions, highlighting persistent digital inequalities. Therefore, while virtual tours offer significant opportunities for innovation, their transformative potential must be understood alongside the structural and technological limitations that shape digital adoption in Indonesia. Thus, virtual tours not only represent technological innovation but also serve as strategic instruments in building a digital ecosystem that supports sustainable public value creation.

5. CONCLUSIONS

Virtual tours in Indonesia's tourism and museum sectors demonstrate how immersive technologies can serve governance purposes beyond mere marketing innovation. By integrating virtual tours into official institutional websites, museums such as the National Museum of Indonesia and the Youth Pledge Museum demonstrate compliance with public information disclosure mandates while simultaneously enhancing accessibility and expanding educational outreach. Virtual tours reduce information asymmetry, strengthen institutional credibility, and generate digital public value.

The comparative analysis confirms that immersive digital platforms contribute to transparency through visual verification and contextual explanation. Furthermore, their integration within the smart tourism ecosystem accelerates digital transformation and innovation. Future research may employ quantitative methods to measure user trust levels and perceptions of transparency, thereby extending empirical validation of the proposed conceptual model.

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