Digital Ecosystem Transformation: Building An Integrated Jakarta Museum Tourism

Lia Mazia
Digital Business, Faculty of Economics and Business
Nusa Mandiri University
East Jakarta, Jakarta Capital Special Region
lia.lmz@nusamandiri.ac.id

Ari Puspita
Information Systems, Faculty of Engineering and Informatics
Bina Sarana Informatika University
Central Jakarta, Jakarta Capital Special Region
ari.arp@bsi.ac.id

Ida Zuniarti
Management, Faculty of Economics and Business
Nusa Mandiri University
East Jakarta, Jakarta Capital Special Region
ida.idz@nusamandiri.ac.id

Nova Yudha Andriansyah Putra
Tourism, Faculty of Economics and Business
Bina Sarana Informatika University
Central Jakarta, Jakarta Capital Special Region
nova.noy@bsi.ac.id

***Abstract*— Technology is increasingly permeating every aspect of life, digital ecosystem transformation has become an urgent need for various sectors, including the tourism and culture industries. The use of technologies such as augmented reality (AR) and virtual reality (VR) to enhance tourist experiences, such as virtual tours, historical simulations or enhanced city navigation. In the context of Jakarta, a city rich in history, culture and heritage, building an integrated museum tour through digital ecosystem transformation is a strategic step that can elevate the city's image as an attractive cultural tourism destination. By utilizing the latest technology such as augmented reality (AR), virtual reality (VR), mobile applications and other online platforms, museums in Jakarta can provide a more immersive and memorable experience for visitors from various backgrounds. A digital ecosystem for tourism integrates various digital technologies and platforms to enhance the travel experience for tourists and streamline operations for businesses within the tourism industry. Methodology plays a crucial role in the process of digital ecosystem transformation, particularly in the context of building an integrated Jakarta museum tourism experience. The development of the Conceptual Model "Digital Ecosystem Transformation: Building Integrated Jakarta Museum Tourism" aims to provide a comprehensive conceptual framework for understanding how digital ecosystem transformation can influence the development of integrated tourism museums in Jakarta.**

Keywords*— *Digital Ecosystem, Tourism, Museums

I. INTRODUCTION

In an era where technology is increasingly permeating every aspect of life, digital ecosystem transformation has become an urgent need for various sectors, including the tourism and culture industries. In the midst of rapid global development and demands for a more connected experience, the Jakarta Museum can no longer survive using conventional methods alone. As an integral part of Indonesia's cultural and historical heritage, museums in Jakarta have great potential to attract domestic and foreign tourists.

The Internet has drastically transformed the distribution and marketing of tourism products [1]. According to [2], smart tourism is closely related to smart cities because the development of the smart tourism concept is based on the existence of the smart city concept first. It relies on infrastructure and strengthens the linkage of each subsystem to the smart city.

However, the challenges are getting bigger. As visitor preferences become increasingly sophisticated and digitally connected, traditional museums must adapt quickly to remain relevant. Digital ecosystem transformation is the key to building an integrated and attractive museum tourism experience for visitors.

The recent developments in the economic conditions and market growth have paved way for tourism industry to explore more opportunities around the world. The Internet technology has broken the barrier of geography while helping tourism enterprises to have a global reach [3].

In the context of Jakarta, a city rich in history, culture and heritage, building an integrated museum tour through digital ecosystem transformation is a strategic step that can elevate the city's image as an attractive cultural tourism destination. By utilizing the latest technology such as augmented reality (AR), virtual reality (VR), mobile applications and other online platforms, museums in Jakarta can provide a more immersive and memorable experience for visitors from various backgrounds.

However, this transformation process is not easy. Requiring collaboration between government, museum institutions, the private sector, and the general public, building integrated museum tours requires solid digital infrastructure, skilled human resources, and effective marketing strategies. Challenges such as lack of digital accessibility, lack of understanding of the potential of technology, and changes in organizational culture must be overcome with strong commitment and close collaboration.

By combining the power of digital technology and its rich cultural heritage, Jakarta can create a unique, informative and inspiring museum tourism experience for visitors from all over the world. Through digital ecosystem transformation, Jakarta Museum Tourism is not only a place to see artifacts and historical objects, but also a space to celebrate cultural diversity, strengthen local identity, and promote peace and cross-cultural understanding.

This digital ecosystem is further highly dependent on access to power. It is not only the smart city that has to think about the electric grid or individual power sources that have to support the functioning of the system but a smart destination also has to ensure its smart tourists have the battery power necessary to be able to actually engage with the smart tourism destination through their personal devices [4].

Augmented Reality (AR) technology is now being used in innovative ways for virtual tours, restoration displays and recreating historical artifacts. For example, the China Garden Museum's "Seeing Yuanmingyuan" digital experience exhibition employs AR to digitally reconstruct the Yuanmingyuan's overall layout, featuring 26 notable sites, including Qinzheng Qinxian, using advanced digital tools [5].

The integration of digital technology within the tourism sector has revolutionized traditional practices, offering immense potential for destination management and visitor experiences. This literature review delves into the evolving landscape of digital ecosystem transformation, specifically focusing on its application in Jakarta's museum tourism. By examining existing literature, this review aims to elucidate the multifaceted impacts, challenges, and opportunities associated with this transformative process.

This encompasses not only the political motivations behind these practices and experiences but also the social and technical roles played by tourists, service providers, and local communities. It also considers how the sharing economy affects destination infrastructure and capacity. The rise of new forms of agency within the sharing economy, such as the silent traveller previously mentioned, suggests that the lines between the roles of producers and consumers in this economy are increasingly blurred [6].

Technology-based tourism experiences represent a paradigm shift in the way travellers engage with destinations and attractions, offering enriched engagements that transcend traditional boundaries. By embracing digital innovations and addressing associated challenges, stakeholders can harness the transformative potential of technology to create more accessible, inclusive, and memorable tourism experiences for travellers around the globe.

Overall, interactive systems are expected to facilitate users in achieving their goals and ensuring their satisfaction. In the realm of Tourism 4.0, where technology plays a central role in shaping tourist experiences, there is potential for both exceeding goals and encountering limitations. Therefore, Human-Centered Design (HCD) for Tourism 4.0 technologies goes beyond merely achieving user satisfaction. It emphasizes preventing outcomes that might hinder goal achievement while promoting experiences that surpass user expectations [7].

In reality, the role of intelligence is to enhance tourist satisfaction. Alongside providing quick and reliable information, the quality of service is crucial for measuring success. Tourism fundamentally involves interpersonal communication, and only personalized service can effectively attract tourists and facilitate the evolution of traditional tourism [8].

This concept pertains to the city of Surakarta, which, as one of Indonesia's smart cities, has sought to apply the Smart Tourism concept within its tourism sector. To implement the smart city concept, the Surakarta City Government has partnered with Indosat and PT. StarOne Telecommunications (SMT) to support various initiatives such as e-government, e-tax, e-transportation, smart tourism, workforce management, and smart street lighting [Indosatooredo.com, 2015]. The Smart Tourism concept is exemplified by the Solo mobile application, launched by the Surakarta City Government through the Department of Transportation, Communications, and Informatics (Dishubkominfo). Since its launch in 2014, the Solo Destination app has garnered 10,000 downloads, indicating a significant interest in an efficient and accessible platform for tourism-related information and services [9].

II. LITERATURE REVIEW

A. Building Museum Apps With AI Technology

In recent years, the development of artificial intelligence (AI) technology has paved the way for innovation in various sectors, including in the world of museums. AI technology not only makes it easier to manage collections and convey information, but also creates a more immersive and personalized visitor experience. Some of the references that we use as the basis for our research include:

TABLE 1. PREVIOUS RESEARCH

Reference	Research Results	Deficiency
[10]	Augmented Reality Application for Object Recognition in Museums Based on Android is in accordance with the needs analysis, namely it can provide information about museums and museum objects, provide augmented reality services on the face by displaying 3D objects that are wearable on the face, and provide augmented reality services by displaying 3D objects on visiting leaflets/brochures.	Augmented Reality applications for object recognition in Android-based museums, without offering virtual tours
[11]	The North Sumatra Provincial State Museum Information System application is based on Android which can make it easier to find locations	Android information system to assist visitors in visiting the museum but Only limited to booking tickets does not provide an impressive experience in visiting activities
[12]	This application helps users access information about the collections at the Lampung Museum, enhancing visitor engagement and knowledge. The virtual guide app uses augmented reality to provide detailed information, including images and descriptions of the artifacts.	This research only assists visitors in accessing information about museum collections without providing virtual tour features.
[13]	Jakarta Maritime Museum only has a few obstacles, namely Generally, the only obstacles that are owned are signals, other than The development of digital smart tourism can followed by all ages due to the increase in the number of visitors in 2022 for 6 months a total of 9,041 people, in addition to the digital program which has been carried out by the Maritime Museum Jakarta can be said to be successful and helpful visitors to get information accordingly with the International Council of Museum (ICOM).	The article lacks a detailed methodology, making it hard to understand the research approach and data collection methods. It also misses a clear statement of the research problem or objectives, hindering the grasp of the study's significance. There is no comprehensive literature review to contextualize the research and identify gaps. The discussion on the findings' implications for museum information systems and their contribution to practice and research is also limited.

B. Technologies such as augmented reality (AR) and virtual reality (VR)

Today, there is significant advancement in computer-based technologies, including augmented reality (AR) and

virtual reality (VR). Among these, AR has been the first to gain widespread use. AR integrates 3D virtual objects into a real 3D environment in real time. It aims to "virtualize" images by blending them into the real world, effectively creating an augmented space around the user's view. This allows users to experience a world that combines their real surroundings with computer-generated graphics overlaying the actual scene [14].

The use of technologies such as augmented reality (AR) and virtual reality (VR) to enhance tourist experiences, such as virtual tours, historical simulations or enhanced city navigation. With the rapid technological advancements of recent years, new terms have increasingly emerged on news and tech platforms. While we have become somewhat familiar with concepts like artificial intelligence, others still remain confusing. Discussions around Virtual Reality (VR) and Augmented Reality (AR) often contribute to this confusion [15].

Recent technological advancements have led to a surge in new terminology appearing in news and tech media. Although we have become relatively acquainted with concepts such as artificial intelligence, other terms can still be perplexing. The conversations surrounding Virtual Reality (VR) and Augmented Reality (AR) often add to this confusion [16].

C. Technology-Based Tourism Experience

From a tourist's viewpoint, the role of smart technology in travel has grown significantly. Initially, tourists primarily utilized information and communication technology (ICT) for searching travel information and making decisions [17].

As information and communication technology (ICT) advances rapidly, the traditional tourism industry has transitioned into the era of smart tourism, with smart technologies now being widely adopted. These technologies offer innovative approaches to enhancing tourist experiences by expanding opportunities for collaborative creation at destinations [18].

Tourist experiences are situated within an industry that has long been reliant on technology. For many years, these experiences have been significantly influenced by information technology design, particularly through the use of specialized interactive systems such as destination management systems, in-room entertainment, and self-check-in kiosks [19].

Technology-based tourism experiences represent a significant evolution in the way travellers engage with destinations, attractions, and cultural heritage sites. This review delves into the essence and impact of technology-based tourism experiences, examining how advancements in digital technologies have reshaped the tourism landscape and transformed visitor interactions.

The Essence of Technology-Based Tourism Experiences:

The concept of "smart" in tourism refers to the integration of technologies, real-time data, and physical infrastructure into a cohesive environment, similar to a city, achieving significant advancements. Practical implementations of smart tourism often progress more rapidly than academic research, as they are driven by marketing strategies and government initiatives. However, there is no consensus in the literature on a single definition of smart tourism; the term can describe different aspects such as management approaches, trends, or information services [20].

The Internet serves as a tool for virtual reality, encompassing various forms such as the virtual world, with "Second Life" being a notable example. Virtual experiments and educational applications can be categorized into several types: educational virtual games, virtual theatre, virtual laboratories, virtual museums, virtual educational environments (including virtual classrooms, training halls, science circles, study libraries, virtual universities, and scientific conferences), virtual gardens, virtual space and aviation, virtual factories and vocational training centres, as well as virtual courts, virtual criminal justice scenarios, and virtual medical procedures [21].

Technology-based tourism experiences encompass a diverse array of digital innovations that enhance various facets of the visitor journey. From immersive virtual reality (VR) tours to interactive mobile applications and augmented reality (AR) experiences, these technologies converge to offer travellers enriched engagements with destinations and attractions. At its core, technology-based tourism experiences seek to bridge physical and digital realms, fostering deeper connections between visitors and the places they explore.

A tourism experience is a multifaceted one that goes beyond mere utility. Tourists can derive aesthetic enjoyment from the scenery, engage with others to appreciate the richness of life, explore and grow through role-playing, and enjoy worldly pleasures through various aspects of tourism consumption [22].

Impact on Visitor Engagement and Satisfaction:

The integration of technology within tourism experiences has yielded profound impacts on visitor engagement and satisfaction. Interactive elements such as AR-enhanced exhibits and gamified mobile applications captivate travellers' attention, encouraging active participation and exploration. Moreover, technology-based enhancements personalize the visitor experience, catering to diverse interests and preferences. By fostering deeper connections with destinations and attractions, these experiences often result in heightened levels of satisfaction and positive word-of-mouth recommendations.

Given the essential need to satisfy tourists, it is important for destinations to implement virtual interpretation methods to effectively address their emotional and technological experience requirements [23].

Enhanced Accessibility and Inclusivity:

One of the key benefits of technology-based tourism experiences is their capacity to enhance accessibility and inclusivity. Digital platforms and applications provide alternative modes of engagement for individuals with physical disabilities, offering virtual tours and audiovisual content that accommodate diverse needs. Moreover, technology-based solutions extend the reach of tourism experiences to remote or marginalized communities, enabling virtual exploration of destinations and cultural heritage sites from anywhere in the world.

Transformative Potential for Destination Management:

Technology-based tourism experiences hold immense transformative potential for destination management practices. By leveraging data analytics and digital platforms, destination managers can gain insights into visitor behaviour, preferences, and satisfaction levels. This data-driven approach facilitates informed decision-making and enables tailored marketing strategies that resonate with target audiences. Additionally, technology-based solutions

streamline operational processes, enhancing efficiency and sustainability within the tourism sector.

Challenges and Considerations:

Despite their transformative potential, technology-based tourism experiences present challenges and considerations that warrant attention. Issues related to digital infrastructure, connectivity, and technological literacy may hinder widespread adoption, particularly in developing regions. Moreover, concerns surrounding data privacy and security necessitate robust safeguards to protect visitor information. Furthermore, maintaining a balance between technological enhancements and the preservation of authentic cultural experiences is paramount to ensuring the integrity of tourism destinations.

Future Directions and Opportunities:

Looking ahead, the future of technology-based tourism experiences holds promise for continued innovation and collaboration. Emerging technologies such as artificial intelligence (AI), wearable devices, and immersive media offer new avenues for enriching visitor engagements and personalizing experiences. Furthermore, collaborative partnerships among stakeholders, including tourism authorities, technology developers, and local communities, can foster the co-creation of sustainable and inclusive tourism initiatives.

III. METHODOLOGY

The reliability and validity of a study's outcomes rely on a well-designed approach with an objective, dependable, and replicable methodology, along with proper execution, data collection, and analysis with logical interpretation. Flawed or incorrect methodology can render a study unacceptable and may even lead to the dissemination of erroneous information to clinicians [24].

Methodology plays a crucial role in the process of digital ecosystem transformation, particularly in the context of building an integrated Jakarta museum tourism experience. Here's an outline of the methodology that could be employed:

Study of literature:

Conduct a thorough literature review on museum tourism, digital ecosystem transformation, and related case studies in other cities. Analyze relevant literature on tourism marketing strategies, digital technology in the tourism sector, and innovative approaches to building integrated tourism experiences.

Conceptual Model Development:

Presents a conceptual model that summarizes research findings and provides a framework for understanding the transformation of the digital ecosystem in tourism museums in Jakarta.

Make practical recommendations and strategies based on the concept model to improve the museum tourism experience and strengthen the integration of digital technology in the tourism industry.

In this article Case Study Using case studies from other cities that have succeeded in integrating museums and digital technology in the tourism industry.

IV. RESULT AND DISCUSSION

The development of the conceptual model "Digital Ecosystem Transformation: Building an Integrated Museum Tourism Experience in Jakarta" aims to provide a comprehensive framework for understanding how digital ecosystem transformation can impact the development of integrated museum tourism in Jakarta. This model offers solid guidance for exploring the dynamics and interactions among various elements in the digital transformation of museum tourism in Jakarta. Using this model as a foundation, researchers, practitioners, and policymakers can formulate more targeted and effective strategies to advance the city's museum tourism industry.

Following the establishment of our conceptual model for the AI system, the next step is to develop the supporting mathematical model. This mathematical model will provide a robust basis for our technical implementation. With the conceptual model as our guide, we will proceed to develop algorithms that align with the principles outlined. This phase will include designing the technical architecture for our AI system, selecting appropriate technologies, and preparing the infrastructure to support our computational and data storage needs.

The conceptual model is a crucial foundation for designing the AI prototype for museums, as it assists in defining objectives, identifying necessary data sets, and designing interactions between users and the AI system. A deep understanding of the conceptual model ensures that the AI prototype not only performs well technically but is also relevant and effective in the real-world museum context.

Our AI prototype design presents significant advantages over previous research. A study by [11] focused on an Android-based information system that facilitated ticket booking only, without providing a comprehensive visit experience. In contrast, our research introduces an innovative approach to museum tourism by offering immersive virtual visits. Previous research from [10] utilized Augmented Reality for object recognition but did not offer virtual tours. Our research, however, integrates historical architecture in digital form, providing information about artworks without the need for a tour guide, and features virtual videos for an online museum experience.

Through detailed explanations of the AI prototype design within the museum context and the developed conceptual model, it is hoped that readers will gain valuable insights into delivering an inspiring and immersive visitor experience through the integration of AI with cultural and historical content. Below is the design of the prototype we have developed.

Fig.1 Homepage

Fig.2 Search Page

Fig.3 Virtual Visit Page

Fig. 4 Painting Scan Page

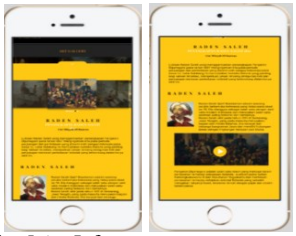

Fig. 5 Art Info

Fig. 6 Guided Visit

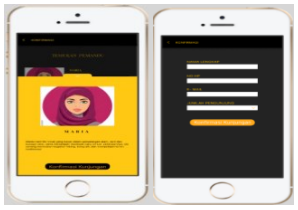

Fig. 7 Visit Confirmation

Fig. 8 Visit Status

REFERENCES

[1] S. Peter and A. I. Joseph, "Comparative content analysis of visual images on shopping festival websites: The case of Dubai shopping festival and Grand Kerala shopping festival," *J. Tour.*, vol. XVI, pp. 29–39, 2015.

[2] Y. L. Pu Liu, "Smart tourism via smart phone," in *Proc. 2016 Int. Conf. Commun. Inf. Manag. Netw. Secur.*, 2016.

[3] G. V. Kumar, K. Manohar, and Motupalli, "Inclusive tourism through website accessibility for the visually impaired tourists: An assessment of Indian Regional Tourism Organization websites," *J. Tour.*, vol. XVI, pp. 59–67, 2015.

[4] U. Gretzel, S. Kopera, and C. Koo, "Smart tourism challenges," *J. Tour.*, vol. XVI, pp. 41–47, 2015.

[5] B. Wang, "Digital design of smart museum based on artificial intelligence," *Mob. Inf. Syst.*, vol. 2021, 2021, doi: 10.1155/2021/4894131.

[6] T. van Nuenen and C. Scarles, "Advancements in technology and digital media in tourism," *Tour. Stud.*, vol. 21, no. 1, pp. 119–132, 2021, doi: 10.1177/1468797621990410.

[7] U. Stankov and U. Gretzel, "Tourism 4.0 technologies and tourist experiences: a human-centered design perspective," *Inf. Technol. Tour.*, vol. 22, no. 3, pp. 477–488, 2020, doi: 10.1007/s40558-020-00186-y.

[8] Y. Yang, "Application and development of big data, internet of things and cloud computing in tourism and its influence on traditional travel agencies," in *Proc. 2022 7th Int. Conf. Financ. Innov. Econ. Dev. (ICFIED 2022)*, 2022, doi: 10.2991/aebmr.k.220307.543.

[9] A. Farania, A. Hardiana, and R. A. Putri, "Kesiapan Kota Surakarta dalam mewujudkan pariwisata cerdas (smart tourism) ditinjau dari aspek fasilitas dan sistem pelayanan," *Reg. J. Pembang. Wil. dan Perenc. Partisipatif*, vol. 12, no. 1, p. 36, 2017, doi: 10.20961/region.v12i1.12212.

[10] Y. A. Pramana, K. Candra Brata, and A. Hendra Brata, "Pembangunan aplikasi augmented reality untuk pengenalan benda di museum berbasis android (Studi Kasus : Museum Blambangan Banyuwangi)," *Jurnal Pengemb. Teknol. Inf. dan Ilmu Komput.*, vol. 2, no. 5, pp. 2034–2042, 2018.

[11] B. D. E. Damanik and W. Ginting, "Aplikasi sistem informasi museum negeri provinsi Sumatera Utara berbasis android," *Kakifikom: Kumpulan Artik. Karya Ilm. Fak. Ilmu Komput.*, vol. 01, no. 2, pp. 67–72, 2019.

[12] S. Azzahra and F. E. Febriansyah, "Aplikasi pengenalan koleksi museum lampung berbasis android," *J. Komputasi*, vol. 7, no. 1, pp. 40–47, 2019, doi: 10.23960/komputasi.v7i1.1719.

[13] S. Aulia and R. N. Nugraha, "Development of digital smart tourism at the marine museum Jakarta," *J. Inov. Penelit.*, vol. 3, no. 6, pp. 6525–6532, 2022.

[14] P. R. Van Krevelen DWF, "A survey of augmented reality technologies, applications and limitations.," *Virtual Real*, vol. 9, pp. 1–20, 2010.

[15] R. R. Assad, "Virtual reality and augmented reality technologies : A closer look," *Int. Res. J. Sci. Technol.*, vol. 1, no. 2, pp. 1–10, 2021.

[16] T. K. Huang, C. H. Yang, Y. H. Hsieh, J. C. Wang, and C. C. Hung, "Augmented reality (AR) and virtual reality (VR) applied in dentistry," *Kaohsiung J. Med. Sci.*, vol. 34, no. 4, pp. 243–248, 2018, doi: 10.1016/j.kjms.2018.01.009.

[17] U. Gretzel, "Intelligent systems in tourism: A social science perspective," *Ann. Tour. Res.*, vol. 38, pp. 757–779, 2011.

[18] A. L. Barbara Neuhofer, Dimitrios Buhalis, "Conceptualising technology enhanced destination experiences," *J. Destin. Mark. Manag.*, vol. I, no. 1–2, pp. 36–46, 2012.

[19] V. K. Brian Lehaney, Steve Clarke, Sarah Spencer-Matthews, "The human side of information systems development: A case of an intervention at a british visitor attraction," *J. Organ. End User Comput.*, vol. 11, no. 4, pp. 33–39, 1999.

[20] C. K. Pai, Y. Liu, S. Kang, and A. Dai, "The role of perceived smart tourism technology experience for tourist satisfaction, happiness and revisit intention," *Sustain.*, vol. 12, no. 16, 2020, doi: 10.3390/su12166592.

[21] M. I. Ghosh, S.K., Bhuyian, M.T., Chowdhury, R., & Jabiullah, "On the use of virtual reality-based engineering education.," *e-Proceedings 2nd Connect. Conf.*, 2019.

[22] F. Lan, Q. Huang, L. Zeng, X. Guan, D. Xing, and Z. Cheng, "Tourism experience and construction of personalized smart tourism program under tourist psychology," *Front. Psychol.*, vol. 12, no. July, pp. 1–13, 2021, doi: 10.3389/fpsyg.2021.691183.

[23] N. S. Mohd, H. N. Ismail, N. Isa, and S. M. R. Syed Jaafar, "Millennial tourist emotional experience in technological engagement at destination," *Int. J. Built Environ. Sustain.*, vol. 6, no. 1–2, pp. 129–135, 2019, doi: 10.11113/ijbes.v6.n1-2.396.

[24] R. Garg, "Methodology for research I," *Indian J. Anaesth.*, vol. 60, no. 9, pp. 640–645, 2016, doi: 10.4103/0019-5049.190619.