Trends in Technology Integration in University Museums in Indonesia: Opportunities and Challenges

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Information	ABSTRACT
  How to cite: Setyawan, H. (2024). Trends in Technology Integration in University Museums in Indonesia: Opportunities and Challenges. Khizanah Al-Hikmah : Jurnal Ilmu Perpustakaan, Informasi, Dan Kearsipan, 12(1). https://doi.org/10.24252/kah.v12i1a16 DOI: 10.24252/kah.v12i1a16 	This research aims to explore technology integration within university museums in Indonesia, focusing on preserving original artifacts while leveraging technological advancements. Adopting a qualitative approach, the study conducted in-depth interviews and open-ended questionnaires at six university museums across Indonesia. The findings reveal that university museums in Indonesia generally possess valuable collections of original artifacts that require preservation. Technology is crucial in supporting the museums' business processes, enhancing preservation and visitor engagement. Museum managers are driven to develop their institutions by seizing various opportunities presented by technological advancements despite facing several challenges. This study underscores the importance of technology in the evolution of university museums in Indonesia, highlighting the proactive measures taken by museum managers to overcome obstacles and achieve their development targets. **Keywords:** Museum; university museums; museum development

1. INTRODUCTION

Cultural heritage is a cornerstone in enriching human understanding and societal development, encompassing tangible artifacts and intangible traditions. Its preservation and dissemination are paramount, as underscored by UNESCO's global concerns regarding the threat of irreversible loss due to natural calamities and human activities (Pérez-Hernández et al., 2020). In response, various cultural institutions, including museums, have emerged worldwide, serving as custodians of humanity's collective heritage.

Museums are pivotal institutions, bridging the past, present, and future, offering immersive experiences that transcend traditional education paradigms. Evolving from their conventional roles, museums have become dynamic centers of non-formal education, catering to diverse audiences and fostering cultural appreciation (Monteagudo-Fernández et al., 2021). Within the university landscape, museums assume a dual role, preserving institutional history and offering unique educational opportunities (Govekar Okoliš, 2022). Unlike conventional

cultural institutions, university museums prioritize acquisition for research and teaching, facilitating interdisciplinary exploration and critical thinking (Jacobs & Porter, 2021).

Museums serve as vibrant hubs for experiential learning, offering immersive encounters that stimulate cognitive engagement and emotional connection. These interactive environments transcend traditional didactic methods, nurturing lifelong learning and intergenerational exchange (Teichert et al., 2021). By intertwining history, science, and cultural narratives, museums catalyze dynamic learning experiences that resonate with diverse audiences, both within and beyond academic settings (Kissel et al., 2019). Through innovative pedagogical approaches, university museums empower students to explore and interrogate historical narratives, fostering critical inquiry and fostering inclusive learning environments (Arriaga & Aguirre, 2020).

In an era of rapid technological advancement, museums must embrace digital innovation to enhance visitor engagement and accessibility. Leveraging internet technology and human-computer interaction, museums can transcend physical constraints and offer immersive digital experiences (Zhao et al., 2023). The integration of virtual and augmented reality, artificial intelligence, and mobile applications holds transformative potential, democratizing access to cultural heritage and redefining museum experiences (Schaper et al., 2018). However, despite the vast opportunities afforded by technology, many museums, including university museums in Indonesia, need to catch up in harnessing digital tools (Surin, 2018). Addressing this gap necessitates concerted research efforts to guide the strategic integration of technology while upholding the core mission of artifact preservation and educational enrichment (Fontanella et al., 2020).

This study explores several critical aspects of university museums in Indonesia. It examines the general condition of these museums, providing an overview of their current state. Additionally, it investigates the strategies employed by university museums to promote their collections while ensuring sustainability in the technological era. The research delves into the technological trends integrated into these institutions, highlighting the motivations behind adopting technology in their exhibitions and programs.

Furthermore, the study identifies university museums' opportunities, challenges, and obstacles in integrating technology. It also explores the methods used to overcome these challenges. Lastly, the research outlines the development targets university museums in Indonesia set for the next five years, offering insights into their plans and objectives.

This research reveals the complexity and variation in the use of technology in university museums, both nationally and globally. Although technology has transformed the museum landscape by extending the reach and increasing the interactivity of collections, the research confirms that technology adoption and implementation remain highly diverse. Preliminary studies reveal that university museums in Indonesia use various technologies. The implications of this research are significant for museum and education stakeholders, with the potential to identify challenges and opportunities in improving accessibility, visitor experience, and education in university museums.

2. METHODS

This study uses a qualitative case study approach. This research focuses on some selected university museums known to the public for their commitment to preserving cultural heritage. This research was conducted on six university museums in Indonesia. Data was collected through interviews, document studies, and observations of museums at Universitas Negeri Yogyakarta (UNY) in Yogyakarta, Universitas Negeri Malang (UM) in Malang City, Universitas Gadjah Mada (UGM) in Yogyakarta, IPB University in Bogor City, Universitas Airlangga (Unair) in Surabaya City, and Universitas Ahmad Dahlan (UAD) in Yogyakarta. These universities have

museums with different names and focus. This research wants to reveal the trend of technology integration in museums founded by universities in Indonesia.

Data was collected through in-depth interviews and open questionnaires of museum directors, curators, educators, and technology experts to gather insight into the motivations, challenges, and strategies involved in incorporating technology. Apart from that, observations were made at the museum, which were used to gain a contextual understanding of the use of technology. Observation notes and technology implementation plans will be analyzed to understand the university museum development process comprehensively. Table 1 presents the data collection.

Table 1. The data collection

No	University	Data Collection
1	Universitas Negeri Yogyakarta	Direct interview with the Head of the Museum and Curator and observation
2	IPB University	Open questions via the museum's official email
3	Universitas Airlangga	Open questions via the museum's official email
4	Universitas Gadjah Mada	Open questions via the museum's official email
5	Universitas Ahmad Dahlan	Open questions via the museum's official email
6	Universitas Negeri Malang	Open questions via the museum's official email

3. RESULTS AND DISCUSSION

Results

This research was conducted on six museums from six universities in Indonesia. The university museum referred to in this research was founded by a university. This research does not explicitly show the details of technology integration in each university museum but looks at the overall technology integration trend. The six universities' museums are presented in Table 2.

Table 2. The university museums

No	Official Name of the Museum	University	City
1	Museum Pendidikan Indonesia	Universitas Negeri Yogyakarta (UNY)	Yogyakarta
2	Museum dan Galeri IPB Future	IPB University	Bogor
3	Museum Etnografi dan Pusat Kajian Kematian	Universitas Airlangga	Surabaya
4	Museum Universitas Gadjah Mada	Universitas Gadjah Mada (UGM)	Yogyakarta
5	Museum Muhammadiyah	Universitas Ahmad Dahlan (UAD)	Yogyakarta
6	Museum Edukasi	Universitas Negeri Malang (UM)	Malang

Brief Overview of University Museums in Indonesia

In general, university museums in Indonesia are in good condition. These museums were founded at different times. A total of 1 museum is less than five years old, three museums are 6-10 years old, and two museums are more than ten years old. The focus and collections of museums also vary. Some museums have a focus and collections related to their founding universities. Several others focus on the field of educational museums. Apart from that, some focus on the journey of Islamic religious organizations in Indonesia, namely Muhammadiyah.

Figure 1. The best artifact at the Museum Muhammadiyah
Source: https://museum.muhammadiyah.or.id/highlight/desain

Through interviews and open questionnaires, this research discovered that all museums display original artifacts and then complement them with technology. They believe that original artifacts attract the attention of visitors, ancient artifacts that are now rarely found, such as correspondence tools with leaves, writing tools with stones, etc. They argue that retaining unique original artifacts will help visitors engage with the past. Although technology has developed, it can be integrated with traditional displays of artifacts without removing them altogether.

Figure 2. A writing instrument made of stone called a *sabak* and *grip*
at the Museum Pendidikan Indonesia
Source: https://mpi.uny.ac.id/koleksi/sabak-grip

Museum Promotion and Preservation Strategies in the Technological Era

Museum promotion strategies at various universities include the use of social media and various online/offline activities to expand the reach of promotion and increase community participation in cultural activities. IPB University, for example, utilizes platforms such as Instagram, the official website, TikTok, Youtube, and Twitter to promote the IPB Future Museum

and gallery while also holding various online/offline activities such as open houses, photo exhibitions, virtual campus tours, and webinars/seminars.

On the other hand, the Museum Muhammadiyah at the Universitas Ahmad Dahlan utilizes social media such as Instagram, Twitter, and the official website for promotion, with the number of Instagram followers reaching more than 4,000, which is used as a base for promotion. In addition to promotion through social media, the museum is also active in various per-museum activities, such as the compulsory museum visits organized by the Bantul Cultural Office, in which Museum Muhammadiyah is actively involved. With this comprehensive approach, the university managed to increase the visibility of its museum and encourage community participation in enriching cultural and educational experiences.

The Museum Universitas Gadjah Mada (UGM) has implemented a comprehensive strategy, including regularly participating in Travel Dialogues and Temporary Exhibitions, as well as using social media such as its website, Facebook, Instagram, Twitter, YouTube, TikTok, and Reels for branding and promotion. In addition, the museum is also active in joint activities with a number of communities and conducts broadcasts on RRI radio and TV to increase visibility.

Museum Edukasi at the Universitas Negeri Malang emphasizes using social media, especially Instagram, Twitter, and TikTok, as the main promotional strategy. By partnering with accounts with high audiences and curating relevant content, the museum managed to attract young visitors and expand the impact of their promotions. With this diverse approach, the university managed to increase the visibility of its museum and strengthen sustainability in the age of technology.

The museum at the Universitas Airlangga actively uses websites, Instagram, and Facebook to provide information about museum activities. They also organize regular activities such as seminars and webinars to attract visitors. On the other hand, the museum at the Universitas Negeri Yogyakarta uses various social media platforms such as Instagram, TikTok, and websites, and it collaborates with the tourism and culture office to organize multiple promotional activities. From exhibitions in malls to TV talk shows, the museum tries to reach diverse audiences with various events, such as education festivals, photography competitions, vlog competitions, standup comedies, and English speeches. With this eclectic approach, both universities expanded their promotional reach and increased community participation in museum activities.

Figure 3. The statue of Prof. Dr. Sardjito as the First Rector of Universitas Gadjah Mada at the Museum Univeritas Gadjah Mada
Source: https://museum.ugm.ac.id/2023/05/21/suasana-kerja-prof-sardjito/

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The preservation strategy of the Museum and Gallery IPB Future collection focuses on two main activities. Firstly, the conservation of exhibits such as microscopes, Overhead Projector (OHP), and others is carried out systematically. Second, preserving exhibits in the form of books is also an essential focus in preservation efforts. Although it does not yet have a unique "Curator" human resource, the maintenance and preservation activities of the collection are carried out by the existing team led by the Supervisor of the museum and gallery management. Knowledge about conservation and preservation is obtained from various sources, including Government Regulations on Museums and Maintenance of Cultural Heritage Objects. The stages of conservation implementation include team formation, provision of knowledge and skills, preparation of schedules and technical plans, checking the condition of exhibits, preparation of tools and materials, and preparation of the space where conservation is carried out. In the conservation implementation stage, dust and rust from exhibits are removed carefully using various tools and materials suitable for the type of object to be conserved.

At the Museum Muhammadiyah of UAD, the collection preservation strategy is carried out regularly to ensure the collection remains in good condition. Each artifact in the collection is monitored periodically. If any signs of damage or poor condition are observed, measures are taken according to the type and classification of the artifact. This is done to ensure that each artifact receives appropriate care to maintain it in optimal condition.

The Museum at the UGM implements a collection conservation strategy with a primary focus on preventive conservation, prioritizing the prevention of damage to artifacts. However, if necessary, they also carry out curative conservation measures, but with an effort to minimize them as much as possible. Preventive measures are routinely carried out, including inspection of the collection before the museum opens to the public. In addition, a "Don't Touch Collection" policy is in place to safeguard the collection from touch damage, while eating and drinking areas are restricted to prevent potential damage from spills or leaks. The museum also implements Care and Handling Collections and Pest Management policies to safeguard the collections from damage by insects or pests. It also has a mini-conservation laboratory and two conservators responsible for the maintenance and care of the collections. In addition, the museum is equipped with fire extinguishers as a fire prevention measure that can harm the collection.

Museum Edukasi Universitas Negeri Malang implements a preservation strategy tailored to its collection type. They digitize collections such as old documents and photographs, replications, and other methods of preserving them. With this approach, they can ensure that the collections are preserved and made more widely accessible through digital platforms while the physical collections are also well maintained. Meanwhile, the preservation strategy of the museum materials at Universitas Airlangga includes approaches that focus on more than just direct display in the showroom. Not all collections can be physically displayed, mainly due to their scientific nature; the museum uses an informational approach in the form of writings and periodic exhibitions to convey content to visitors. In this way, the preservation of exhibits is maintained while the visitor's experience is enriched with knowledge delivered in an informative manner.

The preservation Museum Pendidikan of Universitas Negeri Yogyakarta (UNY) includes several approaches. Firstly, the museum implements a do-not-touch policy for the collections on display, and supervision is carried out through guides and CCTV. Visitors can also explore the museum without a guide, but museum staff can guide if needed. In addition, a cleaning process is carried out daily to maintain the cleanliness and preservation of the collections on display at the museum.

Types of Technology Integration in University Museums

There are various types of technology integration in university museums in Indonesia. In IPB museums and galleries, technologies integrated for the future include Virtual Reality (VR),

Augmented Reality (AR), and Smart Tables. Meanwhile, the Museum Muhammadiyah is equipped with augmented reality (AR) technology, which makes it a communicative museum for visitors.

At the UGM Museum, various technologies have been implemented to improve the visitor experience and support museum activities. One of them is using the Digital Visitor Book at the front office, which allows visitor data to be stored directly in the museum database for visitor satisfaction research and management. In addition, Museum Automatic Guide Plus (MAG+) is a web-based application that provides comprehensive information about the museum's collections and related research, accessible through a QR code scanner. Touch screens are used to explain the history and changing landscape of UGM, while hologram technology provides innovative explanations of the meaning of UGM symbols. Motion sensory technology allows visitors to listen to the Gadjah Mada Hymn automatically, while the audiovisual room uses audio-video technology to present the museum profile and other information productions. Integrating these technologies enriches the visitor experience and supports the museum's research, education, and promotion objectives.

Implementing technology at the Museum Edukasi Universitas Negeri Malang uses 360-degree virtual tour technology and independent collection information services. Meanwhile, the museum at Universitas Airlangga currently uses simple technology. The Museum of Education at UNY uses QR code narration with mobile phones, galleries such as touch screens, and self-lighting sensors.

Motivation for Technology Integration in University Museums

The interview results show that the motivation for technology integration in the IPB future museum and gallery is strongly influenced by the high enthusiasm of visitors, including from the academic community of IPB University and the general public, both from within and outside the country. IPB future museums and galleries have unique characteristics that honor the past while designing the future, becoming a key strength and differentiator from other museums. Visitors also show appreciation and care by providing messages, suggestions, and input at the end of each visit and utilizing the museum as a place to learn, research, and understand the history and development of IPB. Using the museum as a place for field studies by vocational students and for research by students, including from foreign universities such as Wageningen University, is also essential in encouraging managers to continue developing technology and digitalization in IPB future museums and galleries. This reflects the commitment to achieving the vision and mission of the IPB future museum and gallery through the innovative use of technology.

The motivation for technology integration at Muhammadiyah University Museum is not only limited to educational purposes but also to provide an enjoyable recreational experience for visitors. In this case, technology is important as an attraction to increase visitors' interest in the museum.

The motivations for technology integration at UGM Museum include several important aspects. Firstly, technology fulfills visitors' needs by providing an engaging and interactive experience, creating a more exciting atmosphere, and adding value to their visit. Second, technology helps to overcome physical space limitations in the museum by presenting information digitally, allowing visitors to explore the collection without being constrained by space limitations. Third, integrating technology provides an opportunity to build a database of collections more efficiently and structured, facilitating the management and research of museum collections. Finally, the use of technology at UGM Museum provides space for media development that supports the role of university museums as partners in implementing the Three Pillars of Higher Education, known as *Tridarma*, increasing the contribution of museums in education, research, and community service.

The primary motivation for developing technology at the Museum Edukasi of Universitas Negeri Malang is to maintain the museum's relevance to the changing needs of society.

Museums are often perceived as old-fashioned and outdated. Therefore, integrating technology is essential to provide a new outlook on the existence of museums in general. Utilizing the latest technology, the museum hopes to remain relevant and attractive to visitors and provide a more exciting and differentiated experience.

The motivation for technology integration at Universitas Airlangga Museum is to bring visitors a better understanding of the exhibits. Meanwhile, the motivation for technology integration at UNY Education Museum is the potential for 3rd party cooperation offers for museum development.

Opportunities and Challenges to Technology Integration in the University Museum

There are several obstacles and challenges in applying technology in the IPB Future Museum and Gallery. First, barriers related to the availability of adequate museum human resources both in terms of quality and quantity, where currently it is still recruiting human resources in the field of curators, and procurement of human resources in other fields is planned in the 2024 fiscal year. Second, there are limitations in supporting facilities and infrastructure in developing technology in the museum and gallery of IPB Future. Third, funding is a significant challenge because the application of technology requires considerable investment. Finally, the involvement of all stakeholders is another challenge that is needed in the early stages of implementation and the sustainable use of technology. By overcoming these barriers and challenges, IPB Future museums and galleries can optimize technology integration to improve the visitor experience and achieve museum goals more effectively.

The challenge of technology integration at the Museum Muhammadiyah is that although they have used technology, it is not maximized because it is not supported by adequate infrastructure. This indicates that there are challenges related to infrastructure that need to be overcome to optimize technology integration in the museum. Meanwhile, the UGM Museum currently needs staff who can realize the idea.

Meanwhile, at the Museum Universitas Negeri Malang, Universitas Airlangga Museum, and UNY Museum, one of the main challenges is the limited budget that needs to be fully sufficient to implement the latest technology in the museum. This indicates that the costs required for technology integration may be outside the available budget. In addition, at the UNY Museum, there are demands to keep up with the PTNBH (State Universities as Legal Entities) era, which demands profit sharing, additional visitors without increasing tariffs, and particular policies for UNY civitas. All of this creates challenges in implementing technology in university museums.

Development Goals for the University Museum Over the Next Five Years

IPB Future Museum and Gallery aims to continue providing benefits to the academic community, IPB citizens, and the broader community from within and outside the country. In the next five years, several development programs are planned to achieve the vision and mission of the museum. These programs include fulfilling the needs of human resources in the museum, improving facilities, including the construction of building offices and museum cafes, developing technology, including the Immersive Room, increasing the competence of existing human resources, museum promotion strategies, improving the quality of public service infrastructure, implementing museum studies oriented towards improving public services, increasing museum maintenance, adding museum collections, and making Standard Operating Procedures (POB) for the Museum that do not yet exist.

The development target of the Museum Muhammadiyah in the next five years is to gain recognition and support from various groups, not only from Muhammadiyah but also from the general public. The main focus is to increase awareness and understanding of the museum among the broader community so that the museum can become a place that many people like and recognize.

The development targets of UGM Museum in the next five years are: First, the museum is expected to be the spearhead of the university in presenting information about the history of development, achievements in the field of science and technology, as well as the role in solving the problems of the nation/state. Second, the UGM Museum is expected to become a partner that supports the implementation of the *Tridarma* of Higher Education. Third, the concept of a "museum without walls" is proposed, where the entire UGM area is used as a museum. Fourth, the museum is expected to be a friend that is awaited by the academic community and the wider community, providing a variety of inspiring and empowering stories. Thus, the UGM Museum is expected to become a comprehensive information center, an active partner in the *Tridarma* of Higher Education, and an inspiring friend for all parties involved.

The Museum of Universitas Negeri Malang is determined to continue to grow and become a significant reference on the history of education in Indonesia, capitalizing on its position as a museum within the oldest public educational institution. On the other hand, the Universitas Airlangga Museum will undergo development in line with advances in science, with plans to make changes to its display and add exhibit materials based on new research. Meanwhile, the Museum at UNY is also trying to keep up with the latest technological developments in the development of their museum. Thus, the three museums have various goals in their development, ranging from becoming a center of educational history, updating the appearance and content of exhibitions, to utilizing the latest technology.

4. CONCLUSION

Overall, university museums in Indonesia present a diverse panorama characterized by age, focus, and collection variations. Across these museums, there is a noticeable integration of technology, emphasizing enhancing visitor experiences alongside preserving original artifacts. Strategies for museum promotion and preservation in the digital age are comprehensive, spanning various platforms such as social media, online and offline activities, and collaborations with cultural entities.

However, challenges persist in integrating technology, including limitations in human resources, infrastructure, funding, and stakeholder involvement. Overcoming these obstacles is paramount for museums to leverage technology integration and fully achieve their objectives. The development targets for university museums in the coming five years are ambitious and multifaceted. They encompass initiatives such as expanding human resources, upgrading facilities, advancing technological capabilities, enhancing staff skills, implementing rigorous museum studies, bolstering maintenance efforts, enriching collections, and establishing operational protocols. These targets underscore a dedication to innovation, inclusivity, and sustainability in museum administration. Recommendations for future research and practice include addressing infrastructure deficiencies, empowering staff, exploring diverse funding avenues, and fostering robust stakeholder engagement. Continuous monitoring and evaluation of technology integration initiatives will be pivotal in ensuring their alignment with museum objectives and visitor expectations. By prioritizing these measures, university museums in Indonesia can evolve into vibrant centers of education, research, and cultural exchange.

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