



DIGITAL TRANSFORMATION OF THE CULTURAL HERITAGE OF THE MATARAM KINGDOM

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DOI: <https://doi.org/10.62567/micjo.v2i3.946>

Article info:

Submitted: 23/06/25

Accepted: 20/07/25

Published: 30/07/25

Abstract

Digital transformation of cultural heritage is a strategic step in preserving and promoting cultural wealth to present and future generations. This study aims to analyze the digitalization efforts of the cultural heritage of the Mataram Kingdom, both in tangible and intangible forms, and to assess its impact on the preservation and increasing accessibility of cultural information. The research method used is a qualitative study with a descriptive approach through interviews, observations, and documentation studies. The results of the study indicate that the digitization of artifacts, manuscripts, historical sites, and historical narratives of the Mataram Kingdom has made a significant contribution to building public awareness of the importance of cultural preservation. This initiative also opens up opportunities for the development of culture-based ecotourism through digital media, such as applications, interactive websites, and augmented reality. However, challenges such as limited technology, funding, and human resources are still obstacles that need to be overcome through collaboration between the government, academics, cultural communities, and the private sector. Thus, digital transformation is an important means of maintaining the sustainability of the cultural heritage of the Mataram Kingdom in the modern era.

Keywords: Digital Transformation, Cultural Heritage, Mataram Kingdom, Preservation, Digitalization

1. INTRODUCTION

Cultural heritage is a reflection of collective identity that represents the values, norms, and history of a society's civilization. Cultural heritage includes not only objects (tangible heritage) such as sites, temples, and artifacts, but also intangible heritage (intangible heritage) such as language, oral traditions, music, and rituals (UNESCO, 2003). The Mataram Kingdom,



as one of the great kingdoms that once reigned in the archipelago, inherited a very diverse and valuable cultural wealth for the development of national character.

However, the development of the era and modernization have brought serious challenges to the extinction of cultural heritage. Various studies have shown that minimal access, limited documentation, and low awareness of the younger generation are threats to the preservation of local cultural heritage (Kusumawati, 2020). In this context, digital transformation is present as an adaptive strategy in efforts to protect and preserve culture. Digital technology allows the recording, storage, and dissemination of cultural information more effectively, interactively, and inclusively (Rahmawati & Sari, 2022).

The digital transformation of cultural heritage not only plays a role in conservation, but also opens up new spaces in education and promotion of culture-based tourism. Innovations such as digitizing ancient manuscripts, 3D modeling of historical sites, and the use of augmented reality applications have been shown to increase public participation in learning about the history of their nation (Yudhistira, 2021). Digital heritage is a strategic instrument to expand the reach of access to cultural wealth, including the heritage of the Kingdom at the Mataram site, one of which is located in the big city of Bantul, Yogyakarta.

2. RESEARCH METHOD

This study uses a qualitative descriptive approach with a case study as its main strategy. This approach was chosen because it is appropriate to explore in depth the social and cultural phenomena that occur in the process of digital transformation of the cultural heritage of the Mataram Kingdom in Kotagede. This method also allows researchers to contextually understand how digitalization is carried out, the actors involved, and its impact on the preservation of local culture. The selection of Kotagede as a case study location is based on its status as the initial center of government of the Islamic Mataram Kingdom and the existence of various cultural sites that are still preserved to this day. Digital transformation in this area, such as 2D/3D artifact scanning, virtualization of Tomb sites, and promotion through social media, are the main focuses of the study.

Data collection technique

Data were obtained through three main techniques:

1. Direct observation, namely observing the physical condition of cultural sites in the field, including digital documentation that has been carried out.
2. In-depth interviews, conducted with key informants, such as local community leaders, cemetery caretakers, managers of cultural preservation communities (for example Kotagede Heritage Trail), and representatives from the DIY Cultural Service.
3. Documentation and literature studies, including history books, cultural reports, journal articles, digital photos, online archives, and technology-based cultural preservation policies.

Data Analysis Techniques

Data were analyzed using Miles and Huberman's (1994) interactive analysis model which includes three main stages, namely:

1. Data reduction, which is the process of selecting and simplifying important information.
2. Data presentation, in the form of thematic narratives, interview quotes, and visualization of digital artifacts.



3. Drawing conclusions, through interpretation of patterns, meanings, and relationships between actors in the digital transformation of culture.

3. RESULTS AND DISCUSSION

The results of the study show that the process of digital transformation of the cultural heritage of the Mataram Kingdom has been carried out through various media and digital technologies.

One concrete form of digital transformation of the cultural heritage of the Mataram Kingdom found in this study is the digitization of historical artifacts through two-dimensional (2D) and three-dimensional (3D) scanning technology. This process has been applied to several cultural sites in the Kotagede area, Yogyakarta, which was the center of the early establishment of the Islamic Mataram Kingdom in the late 16th century.

This digitization includes artifacts such as the tombs of the Mataram kings, ancient tombstones, wood carvings in the Mataram Kotagede Mosque, and distinctive architectural elements such as gates and paduraksa gates. The site management collaborates with universities and the digital legacy community in conducting 3D scans of building structures and stone artifacts using LiDAR and photogrammetry technology. Meanwhile, 2D scanning was carried out on historical documents and archival photos stored in several houses of descendants of the Mataram nobility.

Current Buildings:



Figure 1. Gate building
(3D Source 2025)

Yudhistira (2021), the use of 3D scanning technology in cultural conservation is able to capture the physical form of artifacts with high precision, which is useful in restoration, research, and digital-based tourism promotion. On the other hand, this digitalization also plays a role in



mitigating the risk of physical damage to artifacts due to time, weather, and human activities. However, there are several technical obstacles identified, including limited human resources who understand scanning technology, lack of digital management budget, and the lack of integration of digital data into the national cultural heritage database system. This is in line with the findings of Rahmawati & Sari (2022) who emphasize the importance of institutional and policy support so that the results of digitalization are not only documentary, but also applicable and sustainable.

Table 1. Table of List of Relics of the Mataram Kingdom in Kotagede Yogyakarta Indonesia

No	Cultural heritage	Type	Year
1	The Tomb of the King of Mataram (Panembahan Senopati, Sultan Agung)	Historical and religious sites	Around 1601 AD
2	The Great Mosque of Mataram, Kotagede	Religious buildings	1589 M
3	Seliran Spring	Sacred water source	16th century
4	Kotagede Fort and Baluwarti Complex	City defense structures	17th century
5	Paduraksa Gate	Traditional architecture	17th century
6	Traditional Kalang House	Architecture of the manor house	19th century
7	Inscriptions and Tombstones	Historical and epigraphic artifacts	17th century
8	Kotagede Square	Public spaces & traditional ceremonies	17th century

Table 2. Bibliography of Mataram Kingdom Heritage in Kotagede

No	Heirloom Name	Type	Estimated Year
1	The Spear of Kyai Pleret / Tombak Kyai Pleret	Royal weapons	17th century
2	Keris Kyai Naga Sasra	Heirloom weapon	16th century
3	Payung Agung Mataram	Royal attributes (status symbols)	17th century
4	Bende Mataram	Ceremonial musical instruments	17th century
5	Kelambu Makam Panembahan Senopati	Dining equipment	17th century
6	Clothes and Turban of Panembahan Senopati / Baju dan Sorban Panembahan Senopati	Heirloom clothing	17th century
7	Gate Gate of the Tomb / Pintu Lawang Gapura Makam	Pusaka arsitektur simbolis	17th century
8	Kitab dan Manuskrip Kuno	Historical documents	17th century

Digital transformation not only involves government institutions such as the Cultural Service and the Cultural Heritage Conservation Center of the Special Region of Yogyakarta



Province (BPCB), but also universities, cultural communities, application developers, and creative industry players. This collaboration demonstrates a **pentahelix-based synergy model** that supports sustainable cultural preservation.

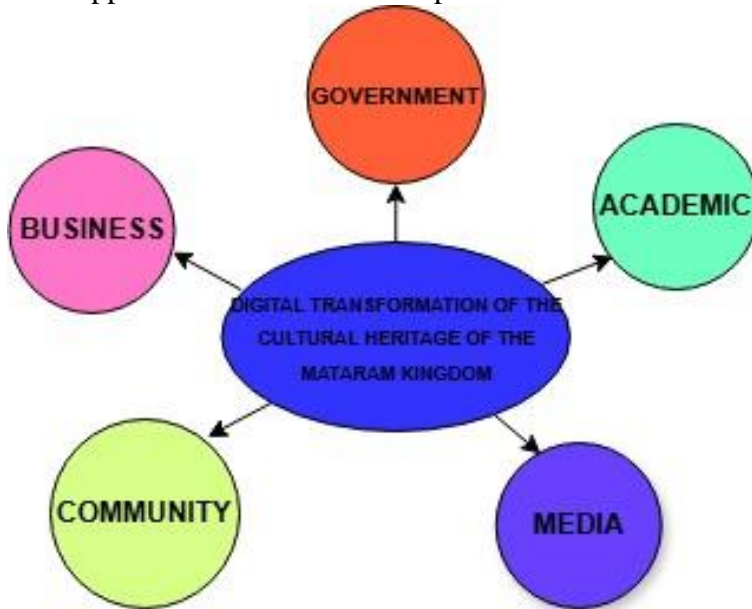


Figure 2. Pentahelix model

Cultural preservation in the digital era cannot be done sectorally or individually. It requires structured and sustainable multi-party synergy. One relevant approach to answer this need is the pentahelix model, which involves five main elements: government, academics, business world, community/society, and media. This model can effectively support cultural preservation based on collaboration and sustainability, as has begun to be implemented in the management of the cultural heritage of the Mataram Kingdom in the Kotagede area, Yogyakarta.

The government plays a key role as a regulator and facilitator in cultural preservation. Through institutions such as the Cultural Service and the Cultural Heritage Conservation Center (BPCB), the government determines the status of cultural heritage, provides a preservation budget, and supports the development of digital infrastructure such as virtual museums and digital archives. For example, in the revitalization program of the Mataram King's Tomb site, the government also facilitates the digitization of artifacts through 3D scanning technology.

Academics contribute through research activities, historical documentation, and the development of technological innovations for cultural preservation. Universities such as Universitas Gadjah Mada and the Indonesian Institute of the Arts Yogyakarta play a role in conducting cultural mapping, analyzing historical narratives, and designing prototypes of augmented reality (AR)-based applications for local cultural education.



The business world, especially the creative industry and technology sectors, is also an important element in this pentahelix model. Local startups collaborate with cultural communities to create virtual tour applications, develop digital cultural content, and promote cultural products through e-commerce platforms and social media. This collaboration not only supports preservation but also opens up economic opportunities through a culture-based creative economy.

Meanwhile, local communities and communities are the most authentic guardians of cultural values. Their role is very important in ensuring that preservation is not only symbolic, but also alive in social practices and daily rituals. In Kotagede, communities such as the Kotagede Heritage Trail and the Cultural Activists Forum actively assist in the process of digitizing oral history, the tradition of washing heirlooms, and compiling locality-based cultural narratives.

Finally, the media plays a role in disseminating cultural information to the wider public. Mass media, online media, and social media help build collective public awareness of the importance of cultural preservation. Digital campaigns, cultural documentaries, and coverage of local cultural activities help strengthen the position of cultural heritage as part of the national identity that must be preserved.

Omah UGM is one of the cultural heritage preservation initiatives based on higher education institutions, located in the Kotagede area, Yogyakarta. This building is a traditional Javanese house (joglo) that has been restored and used as a "living laboratory" by Universitas Gadjah Mada. The goal is to support the conservation of traditional architecture, strengthen cultural education, and become a collaborative space between academics, the community, and the government in an effort to preserve the cultural heritage of Islamic Mataram. Kotagede itself is a historical area that was once the capital of the Islamic Mataram Kingdom in the 16th century. There are many cultural remains such as the Tombs of the Mataram Kings, the Great Mosque of Mataram, and traditional Kalang houses that are symbols of the glory of architecture and socio-culture at that time. Omah UGM is present as a concrete form of the role of academics in maintaining and revitalizing this area through a heritage conservation approach.



Figure 3. Conservation
(Photo Source: Researcher Documentation 2024)

Discussion



This research was conducted in the Kotagede area, Special Region of Yogyakarta, which is an important site of the heritage of the Islamic Mataram Kingdom. Kotagede is known as the first center of government of the kingdom in the late 16th century, precisely since the reign of Panembahan Senopati, the founder of the Islamic Mataram Dynasty. This area still holds various authentic and historical cultural heritages, both in the form of physical artifacts, traditional architecture, and value systems that live in the local community.

The selection of the Kotagede location as the focus of the research was based on two main considerations. First, Kotagede is the initial location of the Mataram Kingdom, so it has a high concentration of artifacts and cultural sites that are relevant to historical studies and cultural preservation. Second, this area has become a model for community-based cultural conservation and has begun to adopt digital technology in the preservation process, such as digitizing the tombs of the Mataram kings, scanning artifacts, and creating virtual historical tours.

Observations and documentation were carried out at a number of important points such as the Mataram Kings' Tombs Complex, the Great Mataram Mosque, Baluwarti Fort, and the traditional Kalang house which is a symbol of the mixture of Javanese and colonial cultures. In addition, interaction with local cultural preservation communities such as the Kotagede Heritage Trail and local traditional figures is an important part of exploring the practice of preserving living culture (living heritage).

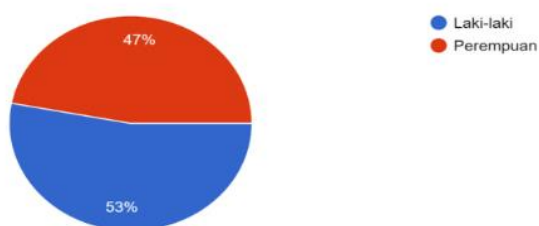
Through a qualitative approach, this study not only explores cultural objects physically, but also understands the dynamics of digital transformation that has begun to be carried out on cultural heritage in Kotagede, both by the government, academics, and the community. Thus, this study contributes to the understanding of the model of cultural preservation based on locality and technology in the context of the history of Islamic Mataram.

1. Gender

The characteristics of respondents based on gender are divided into two categories, namely male and female. Of the 100 respondents who participated in this study, it is known that 60 respondents (60%) were male, while 40 respondents (40%) were female.

This distribution shows that most of the respondents in this study were dominated by the male gender. This may reflect the tendency for higher participation or involvement of male society in activities or issues related to cultural preservation in the Kotagede area, or it may also be due to the sample being taken from a particular community or group whose members are mostly male.

Jenis Kelamin
100 responses





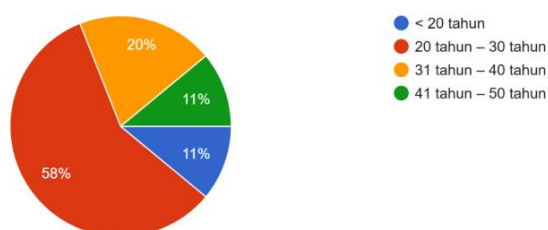
2. Age

The characteristics of respondents based on age are divided into four categories, namely: age <20 years, 20-30 years, 31-40 years, and > 40 years. Of the 100 respondents involved in this study, the following distribution was obtained:

- A total of 10 respondents (10%) were in the age group <20 years.
- The 20–30 age group is the largest category, with 45 respondents (45%).
- Respondents aged 31–40 years are 30 people (30%).
- While the remaining 15 respondents (15%) are in the age group > 40 years.

This distribution shows that the majority of respondents are in the productive age group, namely 20–40 years, who generally have a higher level of access and understanding of digital technology. This is important in the context of research on the digital transformation of cultural heritage, because this age group tends to be more active in technology and social media-based preservation activities.

Usia Saat Ini :
100 responses

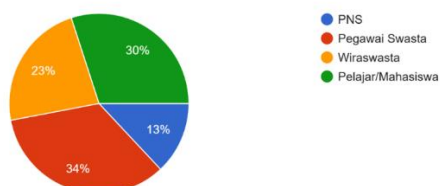


3. Occupation

The characteristics of respondents based on occupation show that the majority of respondents are private employees, with 34% of the total respondents. Furthermore, 30% of respondents are students, and 23% work as self-employed. The remaining 13% of respondents come from other job categories such as civil servants (PNS), freelancers, or not yet working.

This distribution shows that the private sector employee and student groups have a high level of participation in this study. This group generally has good access to information and involvement in cultural and technological issues that are the main focus of the study. Meanwhile, respondents with self-employed jobs are also a significant group, especially in the context of local community involvement in preserving culture based on the creative economy.

Pekerjaan Saat Ini :
100 responses





From in-depth interviews, it is known that the involvement of local communities and the younger generation is still relatively low. This is due to the lack of digital cultural literacy and the lack of facilitation support at the cultural village level. This finding strengthens Kusumawati's (2020) statement that community involvement is a crucial aspect in technology-based preservation.

4. CONCLUSION

This study shows that digital transformation is an effective strategic approach in supporting the preservation of the cultural heritage of the Mataram Kingdom in Kotagede in a sustainable manner. Various forms of digitalization, such as 2D and 3D artifact scanning, virtual documentation, and the use of digital platforms for cultural education and promotion, have begun to be applied to a number of cultural assets such as the tombs of the Mataram kings, the Great Mosque of Mataram, and other heirloom artifacts.

The implementation of this digital transformation involves cross-sector actors through a pentahelix synergy model, namely the government, academics, business actors, the community, and the media. This inter-sectoral collaboration has been proven to strengthen the preservation process while increasing public access and participation in local cultural heritage.

Several challenges still need to be considered, such as limited digital infrastructure, lack of cultural technology literacy at the community level, and the less than optimal integration of cultural data into the national system. Therefore, a more inclusive and collaborative policy is needed to encourage the digitalization of culture evenly and sustainably.

Overall, digital transformation is not only a means of protecting the physical cultural artifacts, but also an important bridge in passing on historical values to the younger generation through media that is more adaptive to the development of the times.

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