



Preserving the past in a digital age: Manuscript digitization at the Widya Pustaka Library of Pura Pakualaman, Yogyakarta

Prasasti Cahya Purbawani*, Andriyana Fatmawati

Universitas Islam Negeri Sunan Kalijaga Yogyakarta, Jalan Marsda Adisucipto, Yogyakarta, Indonesia, 55281

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Abstract

Purpose. This study examines the implementation and challenges of manuscript digitization at the Widya Pustaka Pura Pakualaman Library, Yogyakarta.

Methods. This qualitative descriptive study examines the digitization of ancient manuscripts at the Widya Pustaka Pura Pakualaman Library in Yogyakarta. Data were collected through semi-structured interviews with six purposively selected informants, observation, and documentation between February and April 2025. Validity was ensured through triangulation and member checks, while analysis followed the Miles and Huberman (1984) model.

Findings. The study's findings show that the Widya Pustaka Library carries out digitization in three main stages: pre-digitization, digitization, and post-digitization. In its implementation, challenges were encountered, particularly in the pre-digitization stage (lack of a dedicated studio, no written guidelines on the equipment used, and no standardization of metadata file naming), the digitization stage (no written SOPs or technical guidelines, damaged or tightly bound manuscripts, lighting, manual editing process), the post-digitization stage (digitization results not yet available online), and other challenges such as limited funding.

Implications. Digitization is an effective strategy for preserving ancient manuscripts at the Widya Pustaka Library because it maintains the authenticity of the content while increasing access without physically handling the fragile manuscripts. Despite several technical challenges, the digitization process remains a crucial step in preservation efforts and can serve as a reference for other institutions with similar collections.

Keywords: Digitization; Ancient manuscripts; Widya Pustaka Library; Preservation

1. Introduction

Indonesia is an archipelago comprising more than 17,000 islands, making it rich in social, cultural, ethnic, and religious diversity (Khoeron, 2022). This cultural diversity is the result of the development of human intellect (Kemdikbud, 2016). One form of cultural heritage that has emerged is the collection of ancient manuscripts scattered across various regions of Indonesia. According to Law No. 43 of 2007, ancient manuscripts are written documents that have not been printed or reproduced by any other method, whether originating from within or outside the country, are at least 50 years old, and hold

* Corresponding author.

Email addresses: aprasastichya14@gmail.com (P. C. Purbawani), andriyana.fatmawati@uin-suka.ac.id (A. Fatmawati).

significant value for history, culture, and science (Perpusnas, 2021). Ancient manuscripts are a vital source of knowledge because they chronicle the long history of the Indonesian nation. Among various other cultural artifacts, ancient manuscripts reflect the ideas, knowledge, customs, and behaviors of past societies, making them a form of cultural heritage with historical, scientific, and cultural value (Nofrizal, 2020).

According to data from the National Library of Indonesia, a total of 82,158 ancient manuscripts have been identified and are housed in libraries, museums, historic buildings, religious sites, and private collections (Perpusnas, 2023). However, the majority of these manuscripts have suffered damage due to inadequate care. Oman Faturrahman, as cited in Gandhawangi (2022), explains that the public still regards ancient manuscripts as sacred objects and is therefore reluctant to open them. Additionally, Made Ayu Wirayati, as cited in Perpusnas (2023), notes that many ancient manuscripts in regional areas have been damaged by ink corrosion or inadequate storage conditions. This situation is exacerbated by Indonesia's humid tropical climate and the high risk of natural disasters (Gandhawangi, 2022). According to Martoatmodjo (1994), manuscript deterioration is also influenced by biological, physical, and chemical factors, as well as human activities.

In this context, preservation efforts are crucial to ensure that the information contained in these manuscripts is safeguarded and can be passed down to future generations. Preservation is part of library management, which encompasses the collection, processing, dissemination, and preservation of library materials (Oktaningrum & Perdana, 2017). *The National Library of Australia* (Windy Smith), as cited in Wakhid (2022), explains that preservation encompasses all actions aimed at extending the lifespan of library materials while maintaining their informational content. This study focuses on content preservation to maintain information so it remains intact, accurate, and accessible over the long term. According to Ikbal (2022), the preservation of library collections is an organized, systematic effort to ensure that library materials remain well-maintained so they can be used sustainably.

With the advancement of information technology, content preservation is increasingly carried out through digitization, the process of converting manuscripts from analog to digital formats. Digitization not only protects the information content but also reduces the frequency of use of the original manuscripts, thereby minimizing physical damage while expanding access to the information they contain. Thus, digitization is understood as an integral part of content preservation strategies, not merely a technical process of media conversion.

In Indonesia, the digitization of ancient manuscripts continues to grow, yet it still faces various challenges. In 2023, the National Library of Indonesia provided preservation assistance for 806 ancient manuscripts spread across 11 provinces. Nevertheless, limitations in infrastructure and budget, and a shortage of human resources, meant that by 2022, only about 19,726 of 82,158 ancient manuscripts had been successfully preserved (Perpusnas, 2023). This situation indicates that the implementation of digitization in Indonesia is still influenced by individual institutions' capacity to manage preservation programs.

The Widya Pustaka Pura Pakualaman Library in Yogyakarta faces similar challenges; it houses two main categories of cultural heritage collections: manuscripts and old printed

materials. The manuscript collection consists of 270 items written on traditional media such as paper and daluang using handwritten scripts. Meanwhile, the collection of old printed materials comprises 525 items produced by mechanical printing processes.

The manuscripts include *babad*, *Islam*, *piwulang*, *primbon*, literature, and others. At the same time, the old printed books consist of collections categorized by language, *bundelan*, historical stories, Islamic stories, Islamic law, magazines, *panji*, *piwulang*, *primbon*, literature, history, vocal arts, dance, genealogy, ceremonies, *wayang*, and others. These two collections represent the total heritage collection maintained by the library, not the number of items digitized. Both collection categories are part of the Paku Alam family's heritage and of donations from other royal courts, thus holding significant historical and cultural value. To date, the digitization program at the Widya Pustaka Library has focused solely on manuscripts. At the same time, the collection of old printed books has not yet been included in the digitization program. The selection of manuscripts as a priority is based on their physical condition.

Based on observations, the physical condition of most ancient manuscripts at the Widya Pustaka Library has deteriorated and become fragile due to age, so they are stored in acid-free black boxes to reduce the risk of further damage. Based on an interview with N2 and supported by activity documentation, the library has been carrying out digitization since September 2020 through early 2024 to preserve the information content while minimizing use of the original manuscripts (N2, personal communication, March 18, 2025). The digitization process utilized high-resolution cameras and involved library servants working alongside partners with expertise in handling ancient manuscripts. According to library records and an interview with N2, by mid-2025, 145 out of 270 manuscripts had been successfully digitized.

Nevertheless, the digitization implementation at the Widya Pustaka Library still faces various challenges. Not all of the collection has been digitized due to funding constraints. Additionally, the digitized materials have not yet been integrated into an online system that would allow for broad public access. As a result, access to the digitized materials remains limited and is available only on library-provided computers. This situation indicates that, while digitization has indeed been undertaken as a preservation effort, the results remain largely confined to internal use. To date, the digitized materials have primarily been used by *Abdi Dalem* (traditional palace *abdi dalem*) for transcription and translation activities. This situation indicates that the challenges of manuscript preservation are not only related to the digitization process but also to resource management, access provision, and the sustainability of preservation programs.

Based on this description, it is clear that the issue of preserving ancient manuscripts in Indonesia is not only related to the threat of physical damage to the collections but also to the implementation of digitization at each institution that houses ancient manuscripts. The Widya Pustaka Library is one such institution that has developed digitization as a preservation effort, yet its implementation still faces various challenges.

Therefore, this study aims to examine the preservation of ancient manuscript collections through digitization at the Widya Pustaka Library of Pura Pakualaman in Yogyakarta and to identify the obstacles encountered in the process. This study is expected to provide an empirical overview of the implementation of manuscript digitization at the

institutional level and serve as input for the development of ancient manuscript preservation programs in Indonesia.

2. Methods

This study employs a qualitative, descriptive research method. It was conducted specifically to examine the implementation and challenges encountered in preserving ancient manuscript collections through digitization at the Widya Pustaka Pura Pakualaman Library in Yogyakarta. The data sources for this study consist of primary and secondary data. Primary data were obtained through interviews with 6 informants, among them:

Table 1. Informants

Code	Position	Role
N1	The library director	Person in charge
N2	<i>Abdi dalem</i>	Implementation coordinator
N3	<i>Abdi dalem</i>	Manuscripts selector
N4	<i>Abdi dalem</i>	Providing technical and administrative support
N5	Digitization partner	Photographer
N6	Digitization partner	Digitization assistant

All informants were selected through purposive sampling because they were directly involved in the digitization process of ancient manuscripts and were therefore considered capable of providing information relevant to the study's focus. Meanwhile, secondary data were obtained from observations, documentation, and the literature on the digitization of ancient manuscripts.

The data collection techniques used in this study include observation, interviews, and documentation. The data collection process was conducted directly by the researcher between February and April 2025. Observations were conducted to directly examine the digitization process, the equipment used, the storage formats of ancient manuscripts, and other related aspects. Interviews were conducted using a semi-structured approach with selected informants to obtain in-depth information regarding digitization activities. Documentation involved recording and transcribing the interview process, as well as photographing the observed objects. To ensure data validity, the researcher employed credibility checks through source triangulation, methodological triangulation, and member checks. Additionally, the researcher assessed transferability, dependability, and confirmability. Data analysis was conducted using the Miles and Huberman model, which comprises three stages: data reduction, data presentation, and conclusion.

3. Results and Discussion

The results of this study were obtained through three data collection techniques: observation, interviews, and documentation. Observations were conducted directly at the site where ancient manuscripts were being digitized, and of the equipment used for

digitization. Interviews were conducted with the library director, *Abdi Dalem*, and digitization partners. Data from the interviews served as the primary source for explaining the digitization implementation process, while observations and documentation were used as supporting data and authentic evidence regarding the findings.

3.1 Results

3.1.1 Implementation of the Ancient Manuscript Preservation through Digitization at the Widya Pustaka Pura Pakualaman Library in Yogyakarta

The digitization of ancient manuscripts at the Widya Pustaka Library was initiated in response to the COVID-19 pandemic in 2020. Based on an interview with N2, the pandemic led to the suspension of various cultural activities at Pura Pakualaman, prompting the idea of redirecting part of the budget toward preservation efforts by digitizing ancient manuscripts. Observations also revealed that several manuscript collections, particularly primbon and literary manuscripts, had sustained such severe physical damage that digitization was difficult or impossible.

Table 2. Physical Condition of the Handwritten Manuscripts

Manuscript Type	Total	Physical Condition
Babad	48	Good
Islam	14	Good
Piwulang	46	Good
Primbon	12	10 Good and 2 Severely Damaged
Sastra	101	99 Good and 2 Severely Damaged
Lain-lain	30	Good
Masjid	19	Good
Total	270	

The digitization process began with a funding proposal submitted to the Special Status Fund. According to an interview with N2, the initial phase also included cultural rituals such as nyekar and wilujengan. N2 carried out the *Nyekar* ritual by visiting Pasareyan Hastana Kitha Ageng in Kotagede and the Girigondo Cemetery in Kulon Progo. This involved scattering flowers and offering prayers for the Paku Alam ancestors buried at these sites. Following the *Nyekar ritual*, a *wilujengan* ceremony was held at the Pura Pakualaman complex as an expression of gratitude and a prayer for the smooth execution of the upcoming activities, while also honoring the ancestors who contributed to the creation, preservation, and transmission of the ancient manuscripts housed at the Widya Pustaka Library. This phase was carried out by N2, N5, N6, and the abdi dalem from the Suronggomo abdi dalem, who are tasked with supporting the implementation of traditional and religious activities within the Pura Pakualaman complex (N2, personal communication, March 18, 2025). In addition to cultural preparations, administrative permissions were also sought from Kanjeng Gusti and Gusti Putri as a form of institutional formality before the digitization process (N3, personal communication, February 25, 2025).

In implementing the digitization process, a digitization implementation team was first formed, consisting of internal members (Abdi Dalem, namely N1–N4) and external members (digitization partners, namely N5 and N6). According to an interview with N2, the digitization partners were selected based on several qualifications because the management of Pura Pakualaman is private and requires great caution. Therefore, digitization partners were selected based on credibility, philological competence, and technical expertise in photography (N2, personal communication, March 18, 2025). The library's staff members serve as collection managers and experts on manuscript characteristics, while digitization partners provide technical support for photography and digital image processing.

The digitization process then began with a pilot phase involving five manuscripts. Based on interviews with N5 and supported by documentation of the activities, digitization began between September and December 2020 as a means of learning and deepening understanding of digitization techniques. In addition, the digitization team also participated in online training and received feedback from digitization experts Mr. Nida and Mr. Mumu. Following that, the digitization project officially began in March 2021 and was carried out every Saturday (N5, personal communication, April 24, 2025).

Before the digitization process was fully implemented, the digitization team first established the working guidelines to be used throughout the process. Although the Widya Pustaka Library does not yet have written Standard Operating Procedures (SOPs), the digitization process follows guidelines from The British Library. It comprises three main stages: pre-digitization, digitization, and post-digitization (see Figure 1).

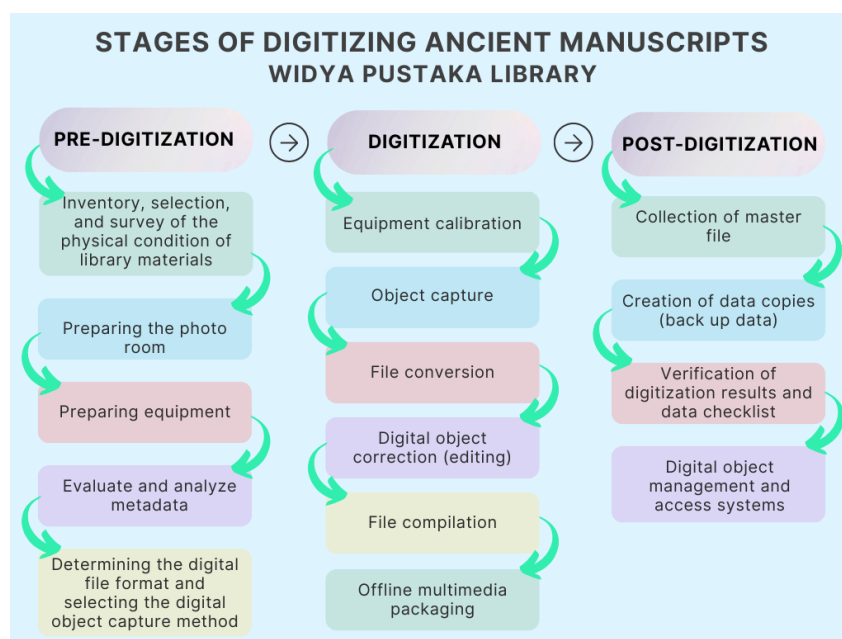


Figure 1. Stages of digitizing ancient manuscripts

3.1.1.1 Pre-digitization

The main activities in this phase include: (1) Inventory, selection, and assessment of the physical condition of library materials. According to Abdi Dalem, the main criteria used to determine digitization priorities at the Widya Pustaka Library are the value of the manuscript's content (especially those originating from Pakualaman), the manuscript's physical condition (whether it is damaged), and internal needs such as transcription. In addition, digitization partners also consider technical and operational aspects such as workload and project duration. (2) Preparing the photography room. The digitization process is carried out in a library room that is kept free of visitors. Although it is conducted when library services are closed, the room remains open for urgent patron needs. Consequently, the presence of patrons sometimes disrupts the digitization process. (3) Preparing the equipment. At this stage, all digitization equipment to be used during the image capture process is set up. Based on observations and documentation, technical hardware included a Canon 6D Mark II camera with a Canon 40mm lens, a spare camera battery, a battery charger, a Godox light, a Godox flash trigger (transmitter and receiver), a Godox softbox, a Godox light stand, a 42-inch Smith-Victor copy stand, a gray and full-color color checker, an HP Core i5 laptop, a mouse, a mousepad, a TV monitor, a camera-to-laptop connection cable, a soft brush, foam padding, a black cloth, a cable reel, an air dust blower, a battery pack, a small acrylic sheet, an anti-reflective glass, latex gloves, a mask, an external hard drive, an SD card, and a PC. The software used included EOS Utility, Digital Photo Professional, Adobe Photoshop for image cropping, and Klinometer for measuring flash tilt. This equipment was then systematically prepared and set up. This process involved configuring the camera, arranging the lighting setup, and positioning the black fabric as the background (see Figure 2).



Figure 2. Digitization equipment

(4) Metadata evaluation and analysis. Metadata was organized in Windows Explorer using a structured system, comprising folders named after the day and date of digitization, subfolders named after the manuscript titles, and sub-subfolders labeled COVER, RECTO, and VERSO. Each file was then named consistently using the EOS Utility application to facilitate data search and processing. (5) Determination of digital file formats and selection

of capture methods. Files are saved in two formats: RAW files for long-term preservation and JPEG for accessibility.

3.1.1.2 Digitization

Based on an interview with N5, this process involves high-quality imaging, file processing, and packaging of the digitized data (N5, personal communication, April 24, 2025). The following are the activities involved in the digitization phase: (1) Equipment calibration. Before photography begins, technical adjustments are made to the camera and supporting devices, including settings for ISO, shutter speed, white balance, flash position, and a clinometer, as well as the use of a color checker to ensure color accuracy. This step is essential to avoid distortion and maintain image quality. (2) Object capture. Object capture begins by arranging the manuscript layout and adjusting color calibration to ensure the digitized output matches the manuscript's original colors. After that, the manuscript is positioned in portrait orientation, the color checker is placed, and visual details are adjusted. The scanning process begins with the cover page, followed by the recto, and then the verso. This process includes image quality checks by verifying white and gray values every 10 scans to ensure the sharpness and accuracy of the scanned images. Once scanning is complete, verify that the total number of cover, recto, and verso files matches (see Figure 3).



Figure 3. Digitization process

(3) File conversion. After image capture, RAW files are converted to TIFF format. TIFF was chosen because it offers higher quality and smaller file sizes than RAW files, while still outperforming JPEG in sharpness and compatibility (N5, personal communication, April 24, 2025). (4) Digital image editing. The files converted to TIFF format are then manually edited using Adobe Photoshop to crop the images. This editing aims to standardize the size, maintain aesthetic appeal, and prepare the images for potential future conversion to a flipbook format (see Figure 4).



Figure 4. Digital object correction process (editing)

(5) File compilation. The edited files are then compiled into folders based on manuscript type and title. Files are named in systematic page order to facilitate management and access. Cover pages, blank pages, and other pages are named 00a, 00b, and so on, while the first page is numbered 1, 2, 3, and so on, until the end (see Figure 5).

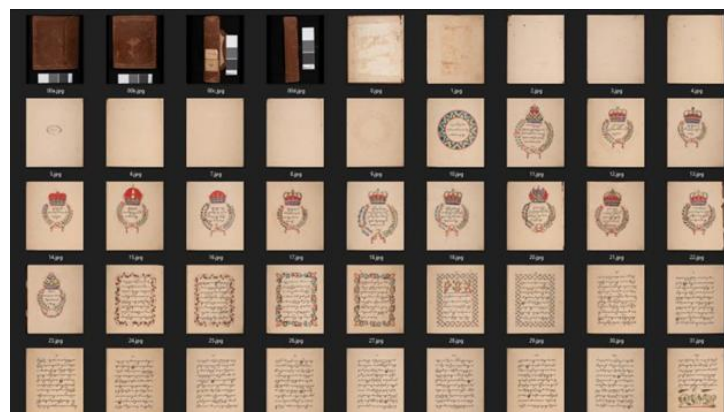


Figure 5. Compilation of digitized files

(6) Offline multimedia storage. All digital files are then stored on an external hard drive for offline storage. This medium was chosen because of its large capacity, fast access, and independence from the internet, making it effective for initial data security and internal data mobility.

3.1.1.3 Post-digitization

The post-digitization phase encompasses a series of important activities following image capture. The following are the steps in the post-digitization phase: (1) Collection of master files. Master files in high-resolution format are collected and stored in a structured manner on a master hard drive. The goal is to preserve the data's originality as the primary

archive. (2) Creating data backups. Digital files are copied to two backup media: Backup Hard Drive 1 and Backup Hard Drive 2. (3) Verification of digitization results and data checklist. Abdi Dalem double-checks each digitization result. Then, every activity performed by digitization partners is documented in a daily logbook to ensure the accuracy and transparency of the process (see Figure 6).

28 Home checklist
Digitisasi naskah

NO	HARI TANGGAL	NASKAH	Galih PC				Rakon				LENGKAP Telicopy
			PHOTO		TIFF	CROP	PHOTO		TIFF	CROP	
			RAW	JPEG			RAW	JPEG			
1	Ko, 110321	B. Sineida	✓	✓	✓	✓	✓	✓	✓	✓	304
2	Ju, 120321	B. Bionutan	✓	✓	✓	✓	✓	✓	✓	✓	378
3	So, 130321	P. Sestradiluhul	✓	✓	✓	✓	✓	✓	✓	✓	528
4	So, 200321	S. Tasulaloh	✓	✓	✓	✓	✓	✓	✓	✓	636
5	So, 270321	B. Marawis	✓	✓	✓	✓	✓	✓	✓	✓	796
6	Ju, 030421	B. PA 1	✓	✓	✓	✓	✓	✓	✓	✓	974
7	So, 030421	B. PA 2	✓	✓	✓	✓	✓	✓	✓	✓	139
8	So, 030421	B. Mangkudigri	✓	✓	✓	✓	✓	✓	✓	✓	253
9	So, 030421	B. Mangkudigri	✓	✓	✓	✓	✓	✓	✓	✓	101
10	So, 030421	Sestradiluhul	✓	✓	✓	✓	✓	✓	✓	✓	377
11	So, 170421	B. Paurayan	✓	✓	✓	✓	✓	✓	✓	✓	357
12	So, 170421	S.A. Adikotana	✓	✓	✓	✓	✓	✓	✓	✓	37
13	So, 240421	Buku Jampi	✓	✓	✓	✓	✓	✓	✓	✓	482
14	So, 240421	PAISARA	✓	✓	✓	✓	✓	✓	✓	✓	253
15	So, 240421	Mintaraga	✓	✓	✓	✓	✓	✓	✓	✓	245
16	So, 240421	S. Karakanda	✓	✓	✓	✓	✓	✓	✓	✓	94
17	So, 240421	S. Wihid	✓	✓	✓	✓	✓	✓	✓	✓	487
18	So, 010521	B. Warawara	✓	✓	✓	✓	✓	✓	✓	✓	471
19	So, 010521	Lakopdila	✓	✓	✓	✓	✓	✓	✓	✓	121
20	So, 080521	Bab. Baktinuk 6	✓	✓	✓	✓	✓	✓	✓	✓	171
21	So, 080521	Bab. Baktinuk 7	✓	✓	✓	✓	✓	✓	✓	✓	145
22	So, 080521	S. Pasindhar	✓	✓	✓	✓	✓	✓	✓	✓	193
23	So, 080521	S. Pasindhar	✓	✓	✓	✓	✓	✓	✓	✓	193

Figure 6. Digitization partner logbook

(4) System for managing and accessing digital objects. Digital files are systematically organized based on manuscript classification. Access to this digital data is available only offline at the library to ensure security and control over the use of digitized materials, preventing misuse that could occur if access were widely distributed online. Currently, the results of digitization are used primarily for script transfer and translation. Based on interviews with N2 and N4, the use of digital copies allows courtiers to read the manuscript without often having to handle the original, thereby minimizing the risk of physical damage. In addition, the zoom feature in digital images helps with less-clear script and increases the efficiency of the script transfer process, as digital images can be displayed in conjunction with word processing applications. In addition, digitized materials are accessible to library patrons who visit the library in person, with a maximum of 10 pages allowed to be copied. This approach aims to avoid misinterpretations of symbolic meanings and preserve the historical context. Digitization partners are also prohibited from retaining copies of the data, ensuring that the library retains full control (see Figure 7).

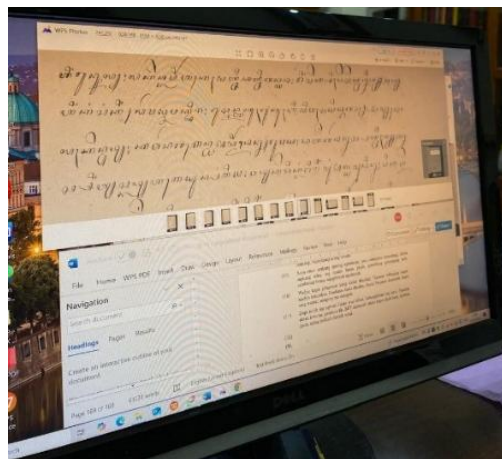


Figure 7. Transliteration using digitized images

3.1.2 Results of Manuscripts Digitization

By mid-2025, based on library documentation and interviews with N2, 145 of the 270 manuscripts.

Table 3. Digitized data

Manuscript Type	Already Digitized	Not Yet Digitized	Total
Babad	23	25	48
Islam	11	3	14
Piwulang	33	13	46
Primbon	7	5 (2 severely damaged)	12
Sastra	45	56 (2 severely damaged)	101
Lain-lain	26	4	30
Masjid	0	19	19
Total	145	125	270

3.1.3 Challenges in the Digitization Process

The implementation of ancient manuscripts digitization faces challenges at several stages. (1) Challenges during the pre-digitization phase, which include: a. There is no dedicated digitization studio, so library activities sometimes disrupt the process. b. There are no written guidelines regarding the digitization equipment that must be prepared. c. File naming is not standardized, leading to inconsistencies and requiring manual corrections. (2) Challenges during the digitization phase, which include: a. Lack of written guidelines regarding digitization procedures. b. The physical condition of the manuscripts, such as overly tight binding. c. Lighting issues, such as the use of anti-reflective glass, require the room to be completely dark. If the library lights are on, their shadows will be captured in the image, thereby compromising visual quality. d. The editing process is done manually, one by one, requiring time, extra effort, and a high degree of precision. (3) Challenges in the post-digitization stage, namely that access to the digitized materials is not yet available online. (4) Other challenges, specifically that funding is limited due to a

lack of collaboration with sponsors or external institutions.

3.2 Discussion

3.2.1 Digitization as a Strategy for Preserving Manuscript Information

The findings demonstrate that digitization at the Widya Pustaka Library serves as a content preservation strategy to maintain the informational value of ancient manuscripts while reducing direct handling of the original materials. By mid-2025, 145 of 270 manuscripts had been digitized. The resulting digital images are used primarily for transliteration and translation activities, allowing users to examine manuscript contents without repeatedly handling the physical manuscripts. The zoom function also facilitates reading of unclear scripts and supports transliteration by allowing digital images to be displayed alongside word-processing applications.

This finding is consistent with the concept of content preservation, which emphasizes maintaining the information contained in library materials rather than focusing solely on their physical condition (Mudassir et al. 2024). Yunita (2023) similarly explains that digitization can serve as a means of content preservation, as physical manuscripts are converted into digital formats, allowing their information to be preserved while the original materials deteriorate. In this context, digitization at Widya Pustaka provides an alternative means of accessing manuscript information while limiting direct interaction with the original materials.

The findings are also in line with Khadijah et al. (2021), who found that the digitization of ancient manuscripts at the Bandar Cimanuk Museum was undertaken to preserve the information they contain. Similar to the findings at Widya Pustaka, digitization in that study provided an alternative form for accessing manuscript information while supporting the preservation of the original materials. This similarity indicates that the use of digital copies to reduce reliance on physical manuscripts is a recurring function of digitization in the preservation of ancient manuscripts.

At Widya Pustaka, however, the use of digitized manuscripts remains primarily internal because the digital files are stored offline and have not yet been made available through an online access system. This condition shows that digitization does not automatically result in wider public access to collections. Hendrawati (2018) emphasizes that digitization is closely related to the preservation and management of digital objects; therefore, the creation of digital copies needs to be accompanied by appropriate management and access policies. In the context of Widya Pustaka, the restricted access reflects the characteristics of the collection and the institutional context of Pura Pakualaman. Thus, digitization currently primarily serves to preserve manuscript information and reduce the frequency of direct handling of fragile original materials.

3.2.2 Alignment and Adaptation of Digitization Practices

The digitization process at Widya Pustaka consists of three main stages: pre-digitization, digitization, and post-digitization. The stages include inventory and selection;

assessment of physical condition; preparation of the photography room and equipment; metadata organization; determination of file formats; equipment calibration; image capture; file conversion; editing; file compilation; offline storage; master file management; backup; verification; and access management. This workflow is broadly consistent with the digitization framework proposed by Hendrawati (2018), which divides digitization into preparatory activities, the digitization process, and the management of digital outputs.

The findings indicate that these principles have been adopted in practice even though the library does not yet have a formally written Standard Operating Procedure (SOP). The digitization team has developed an established working pattern based on practical experience and the guidelines used during the digitization activities. The implementation of established working practices demonstrates that digitization can proceed systematically even in the absence of a formally documented SOP. However, reliance on established practices rather than documented procedures may limit the ability to maintain consistency and ensure process continuity when personnel or working arrangements change.

The implementation also demonstrates adaptation to the physical characteristics of the manuscripts. The use of a copy stand, anti-reflective glass, color checker, controlled lighting, and camera-based image capture reflects an effort to obtain adequate image quality while minimizing physical pressure on manuscript bindings. This consideration is important because ancient library materials can be affected by various forms of deterioration, including biological, physical, chemical, and human factors (Martoatmodjo, 1994). Therefore, the technical implementation of digitization needs to balance image quality requirements with the safety of the original materials.

The findings are comparable to those of Khadijah et al. (2021), who also emphasize the importance of preparation and technical procedures in the digitization of ancient manuscripts. The similarity suggests that careful preparation is a fundamental component of manuscript digitization, although its implementation may vary depending on the collection's characteristics and the institutional environment. In the case of Widya Pustaka, the equipment and procedures have been adapted to the physical condition of the manuscripts and the available facilities.

Nevertheless, the current implementation does not yet incorporate all elements associated with comprehensive long-term digital preservation. Written SOPs, technical metadata, OCR, data migration, and online dissemination have not yet been fully implemented. The absence of these components suggests that the current process primarily focuses on producing, processing, and securing digital copies. The finding is important because digitization should not be understood solely as an image-capture activity; it also involves the subsequent management and sustainability of the resulting digital objects (Hendrawati, 2018). Therefore, further development is required for the digitization program to progress from creating digital copies to a more comprehensive digital preservation system.

3.2.3 Cultural Context in the Implementation of Manuscript Digitization

One distinctive finding of this study is that digitization at Widya Pustaka is not solely a technical process. The implementation is closely connected with the cultural context of Pura Pakualaman. Before the digitization activities, the team conducted cultural preparations, including *nyekar* and *wilujengan*, and obtained institutional permission from Kanjeng Gusti and Gusti Putri. The selection of external digitization partners also considered their credibility, philological competence, and technical photography skills. These practices demonstrate that the implementation of digitization is influenced by the collection's cultural and institutional characteristics.

This finding is consistent with Handayani (2023), who emphasizes the importance of local wisdom in preserving ancient manuscripts as part of efforts to maintain cultural heritage. Ancient manuscripts should therefore not be understood merely as physical objects of information but also as cultural artifacts containing historical, social, and cultural values. Nofrizal (2020) similarly explains that ancient manuscripts contain information concerning the ideas, knowledge, customs, and behaviors of past societies. Consequently, the preservation of manuscripts also involves maintaining the cultural information and values associated with them.

The presence of *nyekar* and *wilujengan* illustrates how local cultural values are incorporated into preservation activities at Widya Pustaka. In this context, digitization is not simply the transfer of information from a physical medium to a digital one. Rather, it forms part of a broader institutional effort to maintain the continuity of cultural heritage. This condition distinguishes the implementation at Widya Pustaka from approaches that primarily emphasize technological aspects of digitization.

The cultural and institutional context also influences the management and access of the resulting digital files. The collection is managed within the institutional environment of Pura Pakualaman, and access to both physical and digital materials is therefore subject to institutional considerations. The collection's institutional context and access considerations help explain why digitized manuscripts have not yet been openly disseminated through an online platform. The restriction does not necessarily indicate that digitization has failed to achieve its preservation function. Instead, it demonstrates that preservation and access need to be considered alongside the collection's authority, characteristics, and cultural significance.

The implementation further shows the importance of cooperation between internal collection managers and external technical partners. Library personnel contribute knowledge concerning the manuscripts and their institutional management, while external partners provide technical expertise in photography and digital image processing. The collaboration between library personnel and external technical partners demonstrates that manuscript digitization requires both collection-related knowledge and technical expertise. The finding reinforces the view that the success of digitization depends not only on the availability of equipment but also on the human resources involved in managing and processing the collection.

3.2.4 Quality Control and Data Security in Digital Preservation

Quality control is incorporated into several stages of the digitization workflow at Widya Pustaka. The process includes equipment calibration, color checks, periodic assessments of image quality, verification of the number of digital files, checks of digitization results by Abdi Dalem, and documentation in a daily logbook. In addition, the resulting digital files are stored using a master hard drive and two backup hard drives. These practices demonstrate that the library has established measures to maintain the quality of digitization results and reduce the risk of data loss.

The implementation is consistent with the principle that preservation requires systematic management of collections and their information. Ikbali (2022) emphasizes the importance of systematic preservation management, while Hendrawati (2014) identifies file management and storage as important components of digitization. The use of master and backup copies at Widya Pustaka, therefore, indicates that the preservation process does not end with image capture but continues through the management and protection of the resulting digital files.

The use of multiple storage copies is particularly relevant to the preservation of manuscript information because the digital files function as representations of the original materials. If the digital files were lost, the preservation benefits obtained from digitization would also be reduced. Yunita (2023) identifies backup as one of the measures that can help preserve information when physical collections are damaged or lost. The storage practices at Widya Pustaka consequently provide an important basis for protecting the continuity of the digitized information.

However, the current storage strategy primarily focuses on protecting digital files from immediate loss and does not yet constitute a comprehensive long-term digital preservation strategy. Data migration and other forms of long-term preservation have not yet been implemented, while the digital files are not yet integrated into an online access system. This condition indicates that maintaining multiple copies is necessary but not sufficient to ensure the long-term accessibility of digital information.

Digital preservation, therefore, needs to be understood as an ongoing process that extends beyond the creation and backup of digital files. Hendrawati (2014) emphasizes the importance of managing digital objects, while Mudassir et al. (2024) highlight the need to maintain information so that it remains accessible over time. In the context of Widya Pustaka, future development of digital preservation would therefore need to consider the sustainability of storage media, data migration, technical metadata, and access policies.

3.2.5 Challenges and Sustainability of Digital Preservation

The findings indicate that the sustainability of digitization at Widya Pustaka is influenced by several factors, particularly infrastructure, human resources, procedures, access systems, and funding. The absence of a dedicated digitization studio means that the photography room may also be used for other library activities. The lack of written equipment guidelines and SOPs also means that some procedures continue to rely on the digitization team's experience. In addition, manual image editing requires time and precision.

These challenges are comparable with those identified in previous studies of manuscript digitization. Khoerunnisa et al. (2023) identified institutional and resource-related factors as challenges in the implementation of ancient manuscript digitization. At a broader level, Perpustakaan (2023) also indicates that infrastructure, funding, and human resources remain important considerations in manuscript preservation activities in Indonesia. The similarity suggests that the challenges experienced at Widya Pustaka are not solely related to technical implementation but also to institutional capacity.

The absence of written SOPs is particularly relevant to the sustainability of the digitization process. Although the team has established a working pattern, procedures that are primarily based on individual experience may be difficult to maintain when personnel or responsibilities change. Hendrawati (2018) emphasizes the importance of systematic procedures in manuscript digitization. Therefore, documenting existing practices as written SOPs would help maintain consistency and institutionalize the knowledge developed through digitization activities.

Access is another challenge in developing the digitization program. The digitized manuscripts are currently stored offline and are not yet available through an online access system. This condition allows the library to retain control over the digital files while simultaneously limiting broader use of the digitized information. The finding demonstrates that digitization and access are related but distinct components. The creation of digital copies does not automatically mean that the resulting information will be publicly accessible.

The program's sustainability is also influenced by funding. The findings show that the continuation of digitization is constrained by limited funding and the absence of collaboration with sponsors or external institutions. This condition is consistent with Perpustakaan (2023), which identifies funding as one of the factors affecting manuscript preservation activities. Therefore, the sustainability of digitization requires institutional commitment not only to the initial creation of digital copies but also to the maintenance of equipment, storage media, and human resources, as well as to digital preservation procedures.

Overall, the findings demonstrate that digitization at Widya Pustaka has provided an important foundation for preserving the informational and cultural value of ancient manuscripts. The implementation combines technical practices with the cultural and institutional characteristics of Pura Pakualaman. However, several aspects still require development, particularly the preparation of written SOPs, the improvement of facilities, the standardization of metadata and file management, the development of long-term digital preservation strategies, and the strengthening of sustainable funding. Thus, the effectiveness of manuscript digitization should be assessed not only by the number of manuscripts converted to digital form but also by the institution's ability to manage, protect, and sustain the resulting digital information.

4. Conclusion

This study examined the digitization of ancient manuscripts at the Widya Pustaka Library, Pura Pakualaman, Yogyakarta. The findings demonstrate that digitization has been

systematically implemented through three interrelated stages: pre-digitization, digitization, and post-digitization. As a content preservation strategy, digitization has reduced direct handling of fragile manuscripts, minimized the risk of physical deterioration, and supported transliteration and manuscript studies while ensuring continued access to their informational value.

Despite these achievements, the implementation of digitization remains constrained by several technical and institutional challenges, including limited infrastructure and funding, the absence of written standard operating procedures (SOPs), and restricted public access to the digitized collections. These findings suggest that the effectiveness of manuscript digitization depends not only on technical processes but also on institutional readiness, management policies, and the long-term sustainability of preservation programs.

This study contributes to the growing body of knowledge on digital preservation in traditional heritage institutions by demonstrating how digitization can be adapted to local institutional contexts while maintaining preservation objectives. Although direct observation was limited due to the temporary suspension of digitization activities, the findings provide practical insights that may serve as a reference for other institutions undertaking ancient manuscript digitization programs.

5. Acknowledgment

5.1 Declaration of Generative Artificial Intelligence Use

During the preparation of this manuscript, the authors used ChatGPT (GPT-5, OpenAI) solely to assist with grammar improvement and writing structure. Generative AI was not used to collect, generate, process, or analyze research data, nor to interpret research findings. All data collection, data processing, analysis, and interpretation were conducted by the authors. Following the use of this tool, the authors carefully reviewed and revised the manuscript as necessary. The authors take full responsibility for the accuracy, integrity, and content of the published article.

5.2 Author Contributions

Prasasti Cahya Purbawani contributed to conceptualization, methodology, investigation, formal analysis, data curation, drafting the initial manuscript, and reviewing and editing the text. Prasasti Cahya Purbawani served as the corresponding author and was responsible for all communication with the journal throughout the submission and publication process. Meanwhile, Andriyana Fatmawati provided supervision and contributed to conceptualization. Both authors have read and approved the final version of the manuscript and accept responsibility for all aspects of the work, ensuring its integrity and accuracy.

References

- Gandhawangi, S. (2022, September 19). Community involvement in preserving ancient manuscripts is very important. *Kompas.id*.
<https://www.kompas.id/baca/humaniora/2022/09/19/libatkan-masyarakat-dalam-pelestarian-naskah-kuno>
- Handayani, F. (2023). Local wisdom dalam hakikat preservasi naskah kuno sebagai pelestarian warisan budaya bangsa. *Proceeding Fakultas Ushuluddin, Adab dan Dakwah IAIN Kerinci*, 1.
- Hendrawati, T. (2014). *Pedoman pembuatan e-book dan standar alih media*. Perpustakaan Nasional Republik Indonesia. <https://perpus.unimus.ac.id/wp-content/uploads/2017/03/Standar-Alih-Media.pdf>
- Hendrawati, T. (2018). Digitization of Nusantara manuscripts as preservers of the intellectual heritage of the nation. *Media Pustakawan*, 25(4), 21–29.
<https://doi.org/10.37014/medpus.v25i4.196>
- Ikbāl, M. (2022). Knowledge sharing "Preservasi koleksi bahan pustaka tercetak dan digital." *Politeknik STIA LAN Jakarta*. <https://stialan.ac.id/v3/knowledge-sharing-preservasi-koleksi-bahan-pustaka-tercetak-dan-digital/>
- Kementerian Pendidikan dan Kebudayaan. (2016). *Kebudayaan*. KBBI VI Daring.
<https://kbbi.kemdikbud.go.id/entri/kebudayaan>
- Khadijah, U. L. S., Apriliani, A., Anwar, R. K., Zulfan, I., & Rizal, E. (2021). Digital preservation of the ancient manuscripts of Legok Kolot Indramayu. *ResearchGate*, 7, 3712–3723.
- Khoeron, M. (2022, April 13). Islam, pluralism, and multiculturalism. *Kementerian Agama Republik Indonesia*. <https://kemenag.go.id/moderasi-beragama/islam-pluralisme-dan-multikulturalismenbsp-oqfeej>
- Khoerunnisa, L., Johan, R. C., Ramadhan, S. Y., & Wulandari, Y. (2023). Upaya digitalisasi naskah kuno di Perpustakaan Yayasan Pangeran Sumedang. *Journal of Documentation and Information Science*, 7(1), 56–68.
<https://doi.org/10.33505/jodis.v7i1.222>
- Martoatmodjo, K. (1994). *Pelestarian bahan pustaka* (Ed. 1). Universitas Terbuka.
- Mudassir, A., Hazan, I., Ikhsan, S., Jamaluddin, N., Handayani, S., Saputra, E., & Usman, A. Y. (2024). *Pelestarian bahan pustaka*. Ruang Karya Bersama.
<https://repository.uindatokarama.ac.id/id/eprint/3915/1/Buku%20Pelestarian%20Bahan%20Pustaka%20FIX.pdf>
- Nofrizal, N. (2020). Preservation of ancient Malay manuscripts in the archipelago: An industry perspective. *Al-Adyan: Journal of Interfaith Studies*, 15(2), 163–194.
<https://doi.org/10.24042/ajsla.v15i2.6110>

- Oktaningrum, E. D., & Perdana, F. (2017). Preservation of library materials affected by natural disasters at the Kudang Elementary School Library in Tasikmalaya. *Journal of Information & Library Studies*, 5, 23–36.
- Perpustakaan Nasional Republik Indonesia. (2021). Pengembangan koleksi naskah kuno Perpustakaan Nasional RI dalam rangka memperkuat koleksi nasional. <https://depbangkol.perpusnas.go.id/news/detail/pengembangan-koleksi-naskah-kuno-perpustakaan-nasional-ri-dalam-rangka-memperkuat-koleksi-nasional>
- Perpustakaan Nasional Republik Indonesia. (2023). Perpustakaan preservasi 806 eksemplar naskah kuno di daerah. <https://www.perpusnas.go.id/berita/perpusnas-preservasi-806-eksemplar-naskah-kuno-di-daerah>
- Wakhid, A. (2022). Pelestarian koleksi langka dengan metode digitalisasi. *Preservasi Perpustakaan Nasional RI*. <https://preservasi.perpusnas.go.id/artikel/127/pelestarian-koleksi-langka--dengan-metode-digitalisasi-->
- Yunita, V. (2023). *Proses kegiatan preservasi manuskrip di Perpustakaan Pesantren Jabal Nur Jadid Aceh Barat Daya* [Skripsi, UIN Ar-Raniry Banda Aceh]. Repository UIN Ar-Raniry. <https://repository.ar-raniry.ac.id/id/eprint/32763/1/Vera%20Yunita,%20180503119,%20FAH,%20IP,%20082370822368.pdf>