

The Urgency of Digitizing Ancient Indonesian Manuscripts in Libraries: A Literature Review

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Abstract

Ancient Indonesian manuscripts are invaluable intellectual treasures that reflect a rich cultural and historical heritage. In libraries throughout Indonesia, collections of these ancient manuscripts serve as crucial sources of information for studies in history, linguistics, anthropology, and various other academic disciplines. Thus, researchers conduct an investigation into the digitization of ancient manuscripts in Indonesia through a literature review.

The research method employed in this study is a systematic literature review (SLR). The SLR method is carried out systematically by following stages that allow the literature review process to be free from bias and the subjective understanding of the researcher. The techniques used in the systematic literature review process include planning, conducting, and reporting. Data are collected from scholarly publications available on Scopus and Google Scholar with the topic of digitizing ancient manuscripts in Indonesia.

The study concludes that the digitization of Indonesian ancient manuscripts is crucial. First, digitization provides broader access to ancient manuscripts. Researchers worldwide can access and study Indonesian ancient manuscripts without having to visit a physical library. Second, digitization is used to preserve ancient manuscripts. Ancient manuscripts are prone to damage due to time and environmental factors. By producing secure digital copies, the risk of losing manuscripts is significantly reduced. Third, digitization facilitates deeper text analysis. With the assistance of natural language processing technology and data analysis, researchers can unveil hidden information in ancient manuscripts. This information may include language relationships, themes, or historical trends. Finally, digitization supports the development of digital libraries and institutional repositories.

Keywords: Digitization, Ancient Manuscripts, Indonesia, Libraries

Introduction

Indonesian ancient manuscripts, known for their cultural and linguistic diversity, represent an invaluable intellectual treasure (Dinesh et al., 2023; Hanif et al., 2023). These texts provide a window to the past, offering profound insights into Indonesia's cultural evolution (Sunarno & Rachman, 2023), history (Dinasheva et al., 2022), religion (Shamakhay et al., 2019), and science (Schettino et al., 2023). Libraries and cultural institutions nationwide play a pivotal role in preserving and disseminating these ancient texts (Kuswara, 2018; Tronchin & Fabbri, 2017). However, in the rapidly advancing digital age (Savino et al., 2018), a fundamental question arises: Are Indonesian ancient manuscripts adequately prepared to meet the challenges of this ever-changing era?

This article examines the urgency of digitizing Indonesian ancient manuscripts in libraries through a literature review approach. Digitization, in this context, refers to the process of converting physical manuscripts into a digital format that can be accessed electronically (Choroś & Jarosz, 2018; Cruz-Perez et al., 2012). This literature study seeks a deeper understanding of why digitizing Indonesian ancient manuscripts is critical and the benefits that can arise from such initiatives.

The richness of Indonesian ancient manuscripts includes various forms such as palm leaf manuscripts (Pageh et al., 2022), stone inscriptions (Justnes & Rasmussen, 2020), classic literary texts (Justnes & Rasmussen, 2020), and more. However, without concrete efforts to ensure their sustainability, preservation, and broader access, we risk losing a highly valuable cultural heritage (Koppel et al., 2016). Challenges such as physical degradation, limited access, and a lack of understanding of these ancient texts call for the adoption of innovative solutions (Tajuddin et al., 2023).

Further exploration of the urgency of digitizing Indonesian ancient manuscripts in the context of libraries is essential to investigate (Al-homed et al., 2023). It is important to understand the benefits of digitization in addressing various issues related to these manuscripts (Makhfi et al., 2011) and to discuss the role of information technology in preserving and utilizing this priceless cultural heritage (Cissé, 2020; Fermanian et al., 2022). This literature study hopes to provide a better understanding of why digitizing Indonesian ancient manuscripts is not only important but also an urgent step to ensure that this cultural heritage remains alive and relevant in the modern era.

This article has significant urgency in several aspects relevant to cultural heritage and scholarly research. First, Indonesian ancient manuscripts are an invaluable part of cultural legacy. Second, the digitization of these manuscripts will open up broader access to researchers, students, history enthusiasts, and the general public (Puspita et al., 2018). The article discusses how digitizing ancient manuscripts can enrich research across various disciplines (Mannoni, 1996). It highlights the importance of information technology in overcoming challenges in the preservation and utilization of ancient texts (Kumar et al., 2022). The fact that some countries have succeeded in their digitization efforts demonstrate the substantial benefits of such initiatives (André, 2003). This aligns with the research findings that strengthen the arguments in this study.

In this context, this article aims to raise public awareness about the importance of preserving ancient manuscripts as an integral part of Indonesia's cultural identity. Indeed, it intends to promote the preservation of ancient manuscripts in Indonesia as historical sources and cultural treasures.

In this context, this article poses the following questions:

RQ1. What is the current state of ancient manuscripts in Indonesia?

RQ2. What forms of Indonesian ancient manuscripts could be digitized?

RQ3. What is the urgency of digitizing ancient manuscripts in Indonesia?

The objectives are as follows.

1. Describe the condition of ancient manuscripts in Indonesia.
2. Describe the forms of ancient manuscripts in Indonesia that are suitable for digitization.
3. Describe the urgency of digitizing ancient manuscripts in Indonesia.

Theoretical Framework

Ancient Manuscripts in Indonesia

A civilization is not detached from its historical past, which contains many valuable relics that identify the level of its development (Kruczek et al., 2024; Zenucchini et al., 2024). These relics include inscriptions (Rodway, 2020), ancient manuscripts (Suryana et al., 2024), and other artefacts that should not be overlooked (Savino & Tonazzini, 2024; Utomo & Anindyarini, 2023). Consequently, various studies have examined these historical relics, especially those related to ancient manuscripts (Baroroh et al., 1985).

Manuscripts are an ancestral heritage that contains diverse information from different aspects of life in the past (Festa et al., 2023). These aspects may include philosophy, religion, beliefs, and even technical issues in life, such as building construction, teaching skills, and crafts (Miquel et al., 2024). Therefore, manuscripts have a universal benefit and role, meaning their content can be appreciated or utilized by anyone across various fields and disciplines of knowledge (Pageh et al., 2022b).

Indonesian Government Regulation No. 24 of 2014 on the Implementation of Law No. 43 of 2007 on Libraries outlines the policy towards ancient manuscripts. However, the term "ancient" in this law differs from the term commonly used in library and information science; what is referred to as "ancient" in the Regulation is often termed "kuna" (ancient). Nonetheless, this paper refers to the Regulation's use of the term "ancient." An ancient manuscript is defined as any written document that is not printed or reproduced by other means, whether located domestically or abroad, at least 50 years old, and possesses national cultural, historical, or scientific value.

In the field of library and information science, ancient manuscripts are often also referred to as manuscripts (from Latin "manu scriptus," meaning handwritten). A manuscript is an ancient document that is handwritten. Manuscripts contain authentic facts and evidence about knowledge, customs, and societal behaviours of the past. Therefore, knowledge—especially in the fields of literature and human social-political history—will be more objective when based on original sources, which in this case include ancient manuscripts (Alimin, 2010). From the various opinions presented, it can be concluded that manuscripts or ancient manuscripts are the thoughts of past societies in a region, encompassing historical values, customs, knowledge, and culture expressed in writings at least 50 years old, and their preservation is imperative.

Cultural Conservation Efforts for Ancient Manuscripts in Indonesia

The conservation of manuscript texts is a crucial activity. Conservation is the effort to preserve the information content of library materials. Therefore, an experienced and trained individual should carry out the conservation of a manuscript text due to the numerous potential degraders and destroyers from various factors, such as biological factors (rodents, insects, fungi), physical factors (light, dust, and humidity), chemical factors (chemical substances, acidity, oxidation), and other factors like humans, water, and fire. Several actions can be taken in the preservation of manuscripts.

1. Fumigation

Fumigation is a smoking action aimed at preventing, treating, and sterilizing library materials. Prevention means taking measures to avoid further damage. Treatment involves killing or eliminating all types of insects, germs, or similar entities that have attacked and damaged library materials. Sterilization refers to neutralizing conditions, for instance, removing bad smells and refreshing the air, to prevent disturbance or illness (Asaniyah, 2017).

2. Transliteration

Transliteration involves replacing one alphabet with another, letter by letter (Baried, SB., 1985). The purpose of transliteration is to introduce old manuscripts so they can be read and studied by all, including researchers, especially since most people are no longer familiar with regional scripts.

3. Digitization

Digitizing manuscripts is a form of appreciation and moral responsibility of the current generation towards the intellectual, cultural heritage of ancestors.

Digitization is also an effort to maintain cultural and intellectual resources for as long as possible. The digitization approach is a new concept that strives to design a manuscript in a digital/soft file format. The steps in digital conservation include (1) capturing images or photography with a digital camera, (2) image processing with Photopaint software, (3) creating Flipbook files, and (4) creating Web Design (Wirajaya, 2015).

The Role of Libraries in Indonesia in Preserving Ancient Manuscripts

According to the Library Law No. 43 of 2007, Chapter 1 and Article 1, a library is an institution that collects printed and recorded knowledge and manages it in a particular way to fulfil the intellectual needs of its users through various interactions with knowledge. Hence, it is concluded that a library is an institution that operates in the information field. Library activities range from collecting, processing, presenting to disseminating information to enable users to utilize this information effectively and efficiently.

In library systems, the collection of library materials is one of the most important components as it contains highly valuable information. To ensure that the library materials can be used over a relatively long period, they need to be cared for and preserved. This ensures that the contained information is maintained and passed on to future generations.

Library Law No. 43 of 2007 stipulates that libraries are obligated to preserve their collections, including ancient manuscripts. Ancient manuscripts are the thoughts of past societies within a region, encompassing historical values, customs, scientific knowledge, and culture expressed in writings that are at least 50 years old and must be preserved (Bahar, H. & Mathar, 2015). Preserving library materials, whether physical documents or the informational value they hold, is crucial to prevent damage. Such damage can be caused by several factors, including the quality of the paper, storage environment, natural disasters, as well as animals, fungi, and humans.

Various public libraries in different regions, in addition to preserving documents and archives, also undertake the preservation of local culture or ancestral heritage. Koentjaraningrat (1999) stated that "culture is the whole and the result of human behavior regulated by behavioral rules that must be learned, all of which are organized in the life of society." This is because Indonesia is one of the countries with diverse socio-cultural aspects.

Indonesia's diversity is reflected in the variety of arts and cultures from different regions in Indonesia, and it is a valuable asset that gives Indonesia significant standing in the eyes of the world. To maintain this diversity, there needs to be an understanding among the public of the importance of exploring the noble values contained in arts and culture. One aspect of art and culture that needs preservation is ancient manuscripts, which contain cultural values and symbolic meanings important for affirming a nation's identity.

The cultural function of libraries is to store the nation's cultural treasures and to enhance cultural values and appreciation among the community around the library by providing reading materials. According to Sulisty-Basuki (1991), the expansion of the cultural function of libraries should aim at preserving cultural values. Therefore, the role of libraries as cultural repositories is crucial, serving as a link between the past and a meaningful foundation for the future.

Library material maintenance efforts often involve terms such as conservation, restoration, digitization, and cataloguing. Cataloguing can be performed by classifying collections that are very old and have been digitized. Digitization is the process of converting various information from analogue to digital format, making it easier to produce, store, manage, and distribute. Digital formats can be presented in the form of text, numbers, audio, and visual, encompassing ideologies, social aspects, health, and business. Meanwhil(Lasa, 2009).

Review of Literature

A lot of research has examined this issue. For example, Hakim & Ahmad (2022) have focused on ideological criticism in implementing city planning and preservation programs, specifically in the context of ancient manuscript preservation. Hasibuan & Matondang (2017) have discussed efforts to save scientific heritage through digitization, while Siregar & Yahaya (2023) have examined models for preserving the Betawi language, which is facing the threat of extinction. Further, Pietroni et al. (2023) have proposed innovative approaches to developing information related to ancient manuscripts, and Zheng et al. (2023) have emphasized the automatic reconstruction of ancient manuscripts.

Meanwhile, as expressed by Siregar & Yahaya (2023), there is ongoing development in the preservation model of the Betawi language, which is facing the threat of extinction. Moreover, Pietroni et al. (2023) have proposed an innovative approach in developing information related to ancient manuscripts. Similarly, Zheng et al. (2023) have emphasized automatic reconstruction of ancient manuscripts.

According to Nofrizal (2020), in the effort to preserve ancient manuscripts, the National Library of the Republic of Indonesia (PNRI) employs three crucial approaches: production, preservation, and digitization. Asaniyah (2017) revealed three methods to prevent damage to ancient manuscripts: digitization, restoration, and fumigation.

Furthermore, Khoerunnisa et al. (2023) have stated that libraries need to undergo three stages—pre-digitization, digitization, and post-digitization—in the digitization of ancient manuscripts. Nugraha & Laugu (2021) also assert that preventive efforts in preserving ancient manuscripts include digitization, duplicating manuscripts into hard copies, and manual cleaning.

Zakiyyah et al. (2022), explain the process of digitizing manuscripts conducted by the Sastra Lestari Foundation. The process involves two major phases: pre-digitization focusing on transliteration and medium conversion, and post-digitization. Khadijah et al. (2021) have also conducted research on the digitization efforts of ancient manuscripts by at the Bandar Cimanuk Museum.

Indeed, in that museum, the digitization of manuscripts by Syekh Abdul Manan has been carried out. Meanwhile, Yasin (2016) concludes that digitization of Al-Mutawassimīn manuscripts provides a detailed overview of the manuscript, including its physical condition, characteristics and current existence.

The digital preservation of ancient manuscripts has also been studied by Hidayah & Saufa (2019). They conclude that the challenges of digitization include the absence of standardized policies for digital preservation implementation, necessitating the creation of individual SOPs, and a lack of human resources, leading to longer completion times. In their research, Purnama (2023) says that digitizing ancient manuscripts is a highly recommended option at UGM as a university with a substantial collection of ancient manuscripts.

Research Methodology

This research employs a systematic literature review (SLR). An SLR is conducted systematically by following steps that ensure the literature review process is free from bias and subjective interpretation by the researcher.

In a systematic literature review, there are three main stages: planning, conducting, and reporting. The planning stage consists of two parts: formulating the research question and developing an SLR protocol that contains the procedures for conducting the SLR. The conducting stage involves carrying out the SLR according to the predetermined protocol. The final stage is reporting or writing the results of the literature review.

The stages of SLR (Systematic Literature Review), as outlined by Wahono in 2015, are as follows:

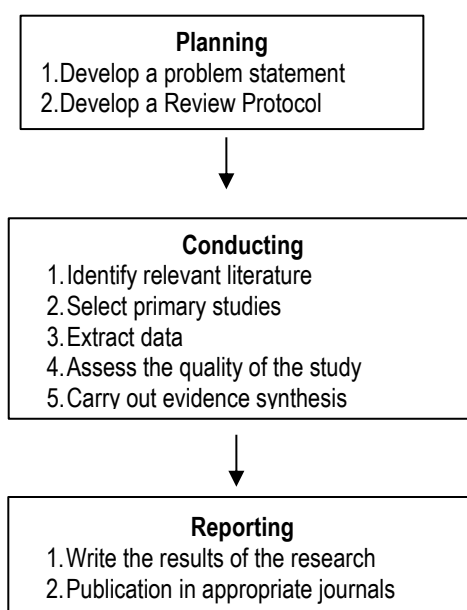


Fig. 1: Stages of Systematic Literature Review
Source: Author

During the conducting stage, the protocol developed includes Data Collection, Data Analysis, Finding Evaluation, and Finding Synthesis. For data collection, the steps are: 1) identifying literature sources, 2) searching for secondary sources such as academic journals, books, research reports, and related scientific articles, 3) selecting literature sources, 4) applying selection criteria based on relevance to the research topic, 5) evaluating the quality of literature sources, and 6) reading and extracting relevant information from the selected literature sources.

In data analysis, the steps are: 1) classifying findings, 2) grouping findings according to themes and aspects relevant to the digitization of ancient Indonesian manuscripts. For finding evaluation, researchers 1) critically analyze findings from the collected literature sources. Finally, in the finding synthesis process, researchers summarize and integrate findings within the framework of relevant concepts and theories.

The selection of literature is based on three analysis requirements: (1) relevance to the topic of digitizing ancient manuscripts in Indonesia, (2) adequacy of analysis data, and (3) sufficient variation based on the predetermined subthemes. In this study, the literature used includes articles from international journals discussing ancient manuscripts. Literature was searched for and compiled using Scopus. Out of 448 published studies that included the term "ancient manuscript" in their title, abstract, or keywords, a selection was made.

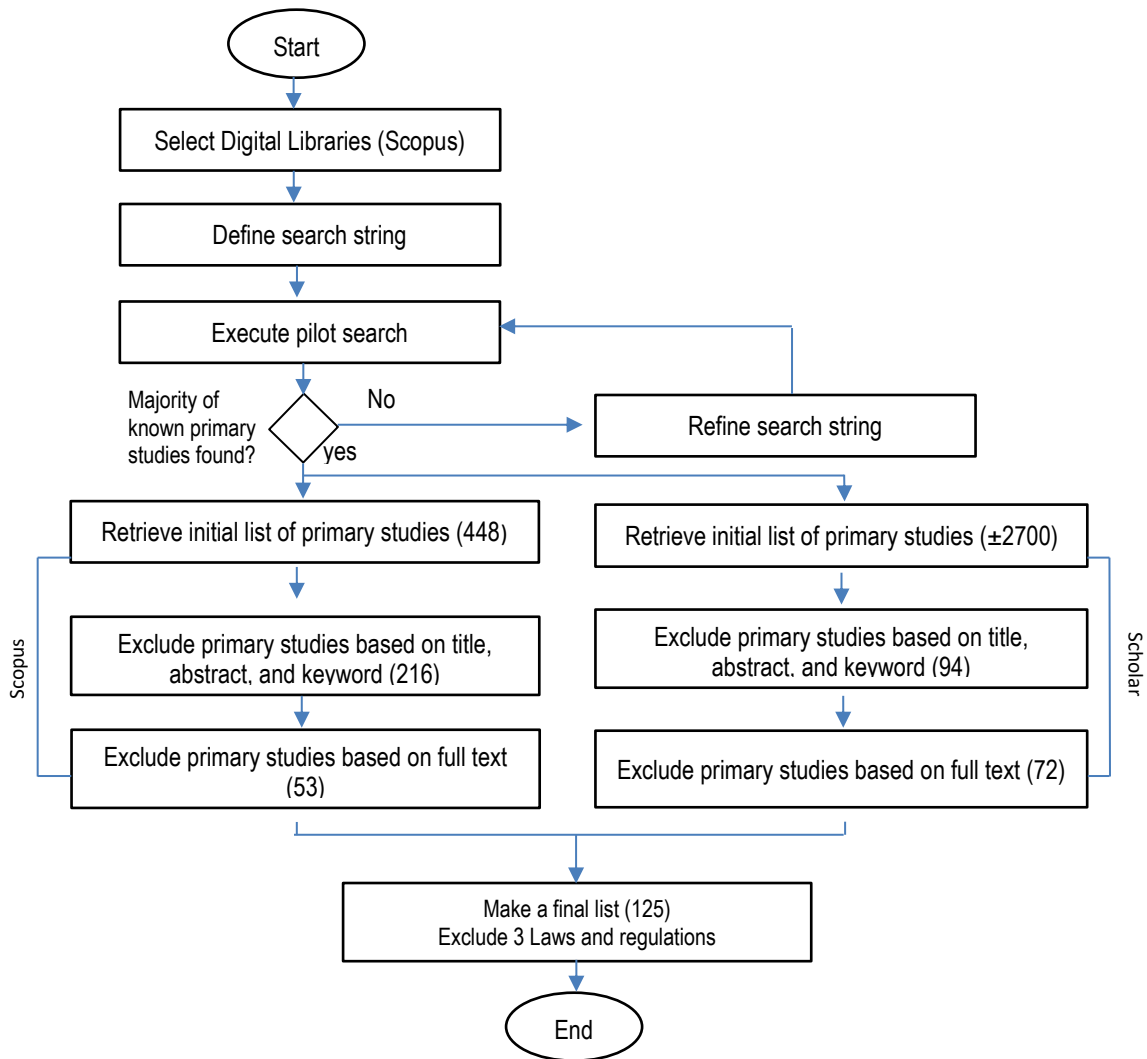


Fig. 2: Research Flow

Source: Author

Discussion

There are three main findings based on the content analysis of previous research:

- (1) the condition of ancient manuscripts in Indonesia,
- (2) the types of ancient Indonesian manuscripts suitable for digitization, and
- (3) the urgency of digitizing ancient manuscripts in Indonesia.

Table 1: List of Reference Articles

No	Research Findings	Artikel Referensi
1	The condition of ancient manuscripts in Indonesia	Ahmad & Hakim, 2022; Pageh et al., 2022; Hadi et al., 2017; Suadnyana & Darmawan, 2020; Sutramiani et al., 2020; Indarti & Hasibin, 2019; Laras, 2021; Hasan, 2020; Laila & Wahdah, 2019; L. M. Samsu et al. 2020; Handoko, 2015; Muslim, 2014; Kieven, 2014; Nugraha & Laugu, 2021; Widodo & Purwantoro, 2019; Fakhriati et al., 2022; Wicaksana & Wicaksandita, 2023; Nalan et al., 2023; Ottoman & Rochmiatun, 2020; Pradana & Setyadi, 2019; Sulaiman & Bastian, 2019; Setyanto, 2016; Paramarta et al., 2019; Sutramiani et al., 2015; Rasyid, 2020; Laras, 2021; Wajo, n.d.; Hidayani & Pinem, 2021; Sopian et al., 2017; Mahdi, 2018; Indriyani, 2018; Yusuf, 2012; Falahudin, 2018; Fatori, 2019, Mustika & Syahrin, 2020; Roza, 2016; Primadesi, 2012; Sunarno & Rachman, 2023; Hasibuan & Matondang, 2017; Wibowo & Christiani, 2018; Azhari, 2023.

2	Types of ancient Indonesian manuscripts suitable for digitization	Kuswati, 2021; L. Samsu & Sutriandi, 2016; Pageh et al., 2022; Hadi, Suryani, et al., 2017; Hadi, Darsa, et al., 2017; Indarti & Hasibin, 2019; Laras, 2021; Hasan, 2020; Laila & Wahdah, 2019; L. M. Samsu et al., 2020; Handoko, 2015; Kuswara, 2018; Jayanthi et al., 2017; Papaodyseus et al., 2014; Bhat & Seshikala, 2019; Kovalchuk, 2011; Hikmawati, 2016; Widyastuti & Saptono, n.d.; Maziyah, 2018; Abdel-Maksoud et al., 2023; Mohamed & Mohie, 2023; Ayu, 2019; Afriyanti, 2013; Rahayu, 2017; Suardiana, 2020; Suweta, 2019; Mulianawati et al., 2018; Buduroh, 2023; Fazarullah, 2016; Lolytasari & Istiqorriyah, 2018; Dewati et al., 2019; Taufiqurrahman & Hidayat, 2022.
3	The urgency of digitizing ancient manuscripts in Indonesia	Handayani, 2023; Fakhriati et al., 2022; Cheriet et al., 2013; Ćiuladienė et al., 2021; Savino et al., 2018; Doumat et al., 2010; Zakiyyah et al., 2022; Tajuddin et al., 2023; Rana et al., 2021; Siregar & Yahaya, 2023; Gaiani et al., 2022; Susilawati, 2017; Arnia et al., 2015; Prasetyo & Setiawan, 2016; Fitriyanti, 2023; Kristiani, 2023; Handayani, 2023; Sasmita et al., 2023; Lanier, 2020; Prasetyo & Setiawan, 2016; Rizqa & Mustofa, 2016; Tajuddin et al., 2016; Prasetyo, 2018.

Condition of Ancient Manuscripts in Indonesia

Content analysis of journal articles reveals several points regarding the condition of ancient manuscripts in Indonesia. The condition of ancient manuscripts in Indonesia varies widely, reflecting the nation's cultural and historical wealth (Ahmad & Hakim, 2022). Indonesian ancient manuscripts include various types, such as lontar (palm leaf manuscripts written with special ink) (Pageh et al., 2022; Hadi et al., 2017; Suadnyana & Darmawan, 2020; Sutramiani et al., 2020), stone inscriptions (Hardianti, 2021; Kuswara, 2018; Prasodjo, 2011; Sambodo et al., 2019), as well as paper (Ayu, 2019; Perdana, 2020) and leather manuscripts (Kozok, 2012; Mamat, 2017).

Indonesian ancient manuscripts are distributed across the Indonesian archipelago, which consists of thousands of islands (Muslim, 2014). Each region has its own manuscript heritage, reflecting its cultural and historical richness (Kieven, 2014). Some areas are known for their manuscript collections, such as Yogyakarta (Nugraha & Laugu, 2021; Widodo & Purwanto, 2019), Bali (Fakhriati et al., 2022; Wicaksana & Wicaksandita, 2023), Sumatra (Nalan et al., 2023; Ottoman & Rochmiatun, 2020), and East Java (Pradana & Setyadi, 2019; Sulaiman & Bastian, 2019). These manuscripts are written in various languages, including Javanese (Setyanto, 2016), Balinese (Sutramiani et al., 2015), Sanskrit, and others. The scripts used are also diverse, including Javanese, Balinese (Sutramiani et al., 2015), Pallava (RASYID, 2020), Kawi (Laras, 2021), Buginese (WAJO, n.d.), Batak (Hidayani & Pinem, 2021), Sundanese (Sopian et al., 2017), Lontara (Mahdi, 2018), Lampung (Indriyani, 2018), and Rejang (Yusuf, 2012).

Many Indonesian ancient manuscripts have suffered damage due to natural factors like humidity and insect attacks (Falahudin, 2018; Fatori, 2019), as well as human-induced damage (Mustika & Syahrin, 2020; Roza, 2016). Nonetheless, efforts have been made to preserve these documents through restoration and conservation (Primadesi, 2012; Sunarno & Rachman, 2023). Indonesian ancient manuscripts are valuable resources for understanding the history, culture, religion, and traditional knowledge of Indonesia (Hasibuan & Matondang, 2017; Wibowo & Christiani, 2018) as they contain classic literary texts, sacred scriptures, historical records, and classical knowledge that have played a significant role in shaping the national identity of Indonesia (Azhari, n.d.; Rozanah, 2017).

The condition of Indonesia's ancient manuscripts is a cultural heritage that needs to be protected and preserved. Many efforts are made by authorities, cultural institutions, and the community to preserve these manuscripts, such as documenting and digitizing them to ensure they are accessible to future generations and researchers.

Types of Ancient Indonesian Manuscripts Suitable for Digitization

The process of digitizing ancient manuscripts is transforming the preservation of Indonesia's cultural heritage. The digitization process converts physical manuscripts into digital formats, such as images or texts accessible via computers or electronic devices. Below are various forms of Indonesian ancient manuscripts that can be digitized:

1. Palm-leafs

Palm-leaf manuscripts, inscribed on palm leaves, can be preserved digitally (Kuswati, 2021; L. Samsu & Sutriandi, 2016). The leaves are translated and scanned into digital formats to facilitate access and preservation (Pageh et al., 2022; L. M. Samsu & Fathurrahman, 2020). This helps in protecting the manuscripts which are susceptible to damage (Hadi, Suryani, et al., 2017; Hadi, Darsa, et al., 2017). The palm-leaf manuscripts found in Indonesia are diverse and scattered across various regions such as Java (Indiarti & Hasibin, 2019), Bali, Sulawesi, Lombok (Laras, 2021), Sumatra (Hasan, 2020), Kalimantan (Laila & Wahdah, 2019), Nusa Tenggara (L. M. Samsu et al., 2020), and Maluku (Handoko, 2015).

2. Stone Inscriptions

Ancient stone inscriptions spread throughout Indonesia are often photographed and preserved in digital form (Kuswara, 2018). Several articles discuss inscriptions as part of ancient manuscripts (Jayanthi et al., 2017; Papaodysseus et al., 2014; Bhat & Seshikala, 2019; Kovalchuk, 2011). Furthermore, we can see various inscriptions that have been examined (Hikmawati, 2016) on the Kedukan Bukit, Talang Tuo, and Telaga Batu inscriptions; (Widyastuti & Saptono, n.d.) on the Tugu inscription; (Maziyah, 2018) on the Kelurak, Kalasan inscriptions; among others.

3. Paper Manuscripts

Paper manuscripts are among the most vulnerable to damage; hence, conservation efforts are necessary. Ancient texts written on paper are often digitized through scanning processes (Abdel-Maksoud et al., 2023; Mohamed & Mohie, 2023). These scanning projects help to broaden access and preserve the manuscripts. Preventive conservation of paper manuscript collections has been undertaken by the Sonobudoyo State Museum in Yogyakarta (Ayu, 2019).

4. Classical Manuscripts and Literature

Many classical literary manuscripts in Javanese (Afriyanti, 2013; Rahayu, 2017), Balinese (Suardiana, 2020; Suweta, 2019), and other languages have been digitized. This includes manuscripts such as the "Ramayana" (Mulianawati et al., 2018), "Mahabharata" (Buduroh, 2023), and many other Indonesian classical literary works.

5. Historical Records and Archival Documents

Historical records (Fazarullah, 2016; Lolytasari & Istiqorriyah, 2018), government documents (Dewati et al., 2019), and historical archives (Taufiqurrahman & Hidayat, 2022) are often digitized for historical research and administrative purposes.

Digitization of Indonesia's ancient manuscripts offers substantial benefits, including cultural heritage preservation, enhanced accessibility for researchers, and safeguarding of texts at risk of damage or loss due to environmental factors, time, and human manipulation. This process ensures these manuscripts remain alive and useful for future generations.

The Urgency of Digitizing Ancient Manuscripts in Indonesia

It is noted that Digitalization of ancient manuscripts in Indonesia is crucial for cultural preservation, academic research, and social benefits. Here are several reasons why it is so essential:

1. Cultural Heritage Preservation

Indonesian ancient manuscripts are valuable cultural heritage assets (Handayani, 2023). Digitalization helps preserve these documents in a durable format, protecting them from physical damage caused by time, weather, and insects. Fakhriati et al. (2022) has found that manuscripts in remote areas of Indonesia are often in poor condition due to human and environmental factors, emphasizing the need for digital preservation. Manuscripts are key carriers of global cultural heritage, and their digitalization is being pursued worldwide to ensure their preservation and widespread access to their content (Cheriet et al., 2013).

2. Accessibility

Digitalization makes ancient manuscripts more accessible to the public. People from various backgrounds can access and study these documents without physically visiting their locations. This facilitates a broader appreciation and understanding of Indonesian history and culture. The scope of accessibility must continually increase to expand knowledge about these manuscripts (Čiuladienė et al., 2021). Digital archiving allows for the description, storage, access, and content-based search of all manuscript versions (Savino et al., 2018). Doumat et al. (2010) has presented a digital archive model and prototype for online annotation of ancient manuscripts.

3. Research and Education

Digitalization supports academic research and education (Zakiyyah et al., 2022). Researchers, students, and academics can easily access ancient manuscripts for various scholarly purposes, including linguistic analysis, literature studies, and historical research. Tajuddin et al. (2023) highlight the Sasak Baluk Olas script as an essential subject for students from primary to junior high school, which faces challenges due to the lack of digital technology integration.

4. Language and Cultural Preservation

The languages and cultures in ancient manuscripts are vital parts of Indonesia's identity. Digitalization helps preserve languages and traditional knowledge at risk of disappearing. For instance, the nearly extinct Tankri script of Chamba, Himachal Pradesh, requires preservation through a digitized database (Rana et al., 2021). Similarly, the preservation of the Betawi language in Indonesia, partly through ancient Betawi manuscripts, necessitates digital archiving (Siregar & Yahaya, 2023).

5. Library and Museum Collection Preservation

Ancient manuscripts are integral to collections in libraries and museums (Gaiani et al., 2022). Many cultural institutions in Indonesia possess ancient manuscripts that require preservation. For example, one museum with 1,400 manuscripts is undertaking such efforts (Susilawati, 2017), and the Aceh museum has started digitizing ancient manuscripts to prevent damage to the originals (Arnia et al., 2015). Digitalization reduces the handling of original manuscripts, which can lead to deterioration.

6. Security and Redundancy

Digital copies of ancient manuscripts provide a backup in case the originals are damaged or lost due to natural disasters, fires, or theft (Prasetyo & Setiawan, 2016b). The fragility of these manuscripts, some centuries old, makes them susceptible to damage compared to other cultural artefacts (Fitriyanti, 2023). Digital security systems offer better protection for digitized manuscripts (Kristiani, 2023).

7. International Collaboration

Digitalization can facilitate international collaboration in preservation and research (Handayani, 2023). Indonesian ancient manuscripts are of great interest to the global community. For instance, Bali's Lontar Leaf Manuscript Library attracts both domestic and international tourists and researchers (Sasmita et al.,

2023). Digitalization allows for more effective international scholarly collaboration (Lanier, 2020).

8. Development of Modern Applications

Digital data can be used to develop various modern applications, such as databases for ancient manuscripts, educational applications, and creative projects that combine ancient texts with new technologies (Prasetyo & Setiawan, 2016a; Rizqa & Mustofa, 2016). For example, digital applications for ancient Sasak manuscripts have been developed in Lombok (Tajuddin et al., 2016), and Surakarta's libraries have developed applications to preserve ancient manuscripts (Prasetyo, 2018).

Considering the importance of digitizing Indonesia's ancient manuscripts, government agencies, libraries, universities, and cultural organizations have been implementing digitalization projects. Collaborative and ongoing efforts are essential to ensure the preservation and improved access to these treasures for future generations to enjoy.

Conclusions

The three main topics of discussion in this research include the condition of ancient manuscripts in Indonesia, the types of ancient manuscripts that may be digitized, and the urgency of digitizing these ancient texts. The literature review conducted has led to the following conclusions for these key topics:

1. Ancient manuscripts are a precious part of Indonesia's cultural heritage that needs to be preserved. The condition of ancient manuscripts in Indonesia varies greatly, reflecting the country's rich cultural diversity in terms of geography, culture, language, script, and history. These documents are an invaluable part of cultural heritage that warrants preservation.
2. Regarding preservation, many types of ancient manuscripts have been or can be digitized in Indonesia. Examples include palm-leaf manuscripts, stone inscriptions, paper manuscripts, miniature paintings, classic literature texts, religious texts, historical records, and archival documents. Digitization facilitates the access to and preservation of these manuscripts.
3. The digitization of ancient manuscripts in Indonesia is crucial as it supports their preservation, improves access for researchers and the general public, and aids in the research and preservation of Indonesian languages and cultures. Furthermore, the urgency of digitizing ancient manuscripts in Indonesia is significant, encompassing aspects of cultural preservation, accessibility, research, education, and other social benefits. Collaborative and ongoing efforts are necessary to maintain the preservation of Indonesia's ancient manuscripts. This also ensures better access for future generations and supports the development of modern applications that integrate cultural heritage with new technologies.

The strengths of this research encompass a profound focus on preserving Indonesia's cultural heritage, reflecting the richness of culture from various aspects. The identification of various forms of ancient manuscripts suitable for digitization indicates a comprehensive effort to preserve cultural heritage in a comprehensive manner. The benefits of digitization for access and preservation of manuscripts, as well as its support for research, education, and the preservation of Indonesian culture, provide substantial positive impacts. Moreover, the emphasis on collaboration and sustainability signifies an awareness of the complexity of preservation tasks and the importance of involving various stakeholders.

On the other hand, this research has weaknesses in the absence of more in-depth critical analysis of the impacts of digitization. This includes not delving into potential practical obstacles and challenges may limit the understanding of the effective implementation of digitization programs. Ethical issues related to digitization, such as copyright and data protection have not been thoroughly explored. Moreover, the lack of reference to financial sustainability could be a barrier to the implementation of sustainable programs. Although the

benefits of new technologies are mentioned, the research may need to delve deeper into optimal ways to harness this technology to effectively and meaningfully integrate cultural heritage.

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