Digital Preservation of Qur'anic Manuscript: Developing the Manuscript Al-Qur'an Digital Application (MAQDA)

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Notes	ABSTRACT
  How to cite: Aini, A. F., PrajawinantiPrajawinanti, A., Sulton, A., & Alifa, A. Z. (2025). Digital Preservation of Qur'anic Manuscript: Developing the Mobile Application of the Digital Al-Qur'an Manuscript (MAQDA). Khizanah Al-Hikmah : Jurnal Ilmu Perpustakaan, Informasi, Dan Kearsipan, 13(1). https://doi.org/10.24252/v13i1a4 DOI: 10.24252/v13i1a4 	This article addresses the critical need for the preservation of Qur'anic manuscripts, focusing on the role of media transfer or digitization in safeguarding these valuable artifacts. The paper explores two main questions: the most effective preservation methods for ancient manuscripts and the contribution of mobile-based applications in disseminating information about these heritage objects. A qualitative research approach, combining philological and facsimile methods, was employed. The research focused on Qur'anic manuscripts held by individual collectors and pesantrens in the East Java region. Data were analyzed using the Miles and Huberman technique, involving stages of data arrangement, organization, and categorization. The findings revealed that mobile-based applications offer an efficient and cost-effective solution for preserving Qur'anic manuscripts, which are in deteriorating conditions. More than ten manuscripts observed in this study face inadequate storage and maintenance conditions. The development of the MAQDA digital application is a strategic and practical step for preserving these manuscripts. The study also emphasizes the need to make privately held manuscripts publicly accessible, raising awareness about the importance of preserving tangible cultural heritage. This paper contributes to the field of manuscript conservation, preservation, and digitization, highlighting the urgent need to safeguard numerous manuscripts, other than Qur'anic texts that are at risk and remain in private hands without infringing on ownership rights. **Keywords:** Digital Preservation; Digital Mobile Application; Qur'anic Manuscript

1. INTRODUCTION

Indonesia holds a rich and diverse heritage from the past, particularly in the form of manuscripts. Ancestors across the archipelago handwrote these manuscripts, which are found in nearly every region of the country. These writings are not only numerous but also diverse in form. Each manuscript preserves knowledge that once flourished in its time (Baried et al., 1994). Therefore, it is essential to convey this information to contemporary society to inspire a sense of responsibility in preserving these historical artifacts. Raising awareness can motivate individuals to actively participate in safeguarding the continued existence of this valuable cultural heritage.

Figure 1. Manuscripts of the Qur'an
Source: personal documentation

Law Number 5 of 1992 of the Republic of Indonesia concerning Cultural Heritage affirms that ancient manuscripts must be preserved, safeguarded, and protected. However, in practice, many of these manuscripts are in alarming physical condition and remain highly vulnerable to deterioration. Their rapid degradation results not only from natural causes but also from human negligence, particularly a lack of knowledge regarding proper preservation methods and limited awareness of their historical significance. These factors collectively contribute to the ongoing loss of ancestral heritage. Given these challenges, it is crucial to preserve both the physical form and informational content of these valuable manuscripts.

Transferring content to digital media serves as an effective solution for preserving relics of past knowledge. Manuscript digitization transfers the original physical form into digital form (Bermansyah & Antoni, 2016). Digitization offers a viable solution for manuscript preservation, particularly when the physical form can no longer be maintained in the future. This process safeguards the manuscript's content from extinction, facilitates data backup, supports academic research, and serves as a medium for promoting cultural heritage. Almis & Wijayanti, (2023) state that digitisation is an effective method for preserving information in ancient manuscripts. However, its implementation faces challenges in terms of policy, funding, human resources, facilities, and the physical condition of the manuscripts. Therefore, collaboration between the government, educational institutions, and the community is needed to overcome these obstacles (Smith, 2015).

Since the 1990s, researchers and institutions dedicated to ancient manuscripts have undertaken digitization efforts, initially using microfilm as the primary medium. The form of digitization at that time began through microfilm media (Ekadjati & Darsa, 1999; Florida, 1993). In the early 2000s, manuscript reproduction transitioned to digital technologies,

utilizing tools such as digital cameras and scanners. One prominent institution engaged in manuscript digitization is the British Library, which has actively conducted such efforts since 2004. Each year, the library allocates funding to academics, collectors, and manuscript preservationists around the world to support the digitization of valuable manuscripts. The digitisation results in this institution have produced a lot of research on the objects of the digitisation results of the institution, like research of Amiq and Arif Maftuhin (Ahyad, 2015; Maftuhin, 2023). This shows that the presence of manuscripts in this digital space provides benefits for manuscript scholars. The digitisation results make it easier to gain access to ancient manuscripts and expand research on them.

The digitization process is an effort to preserve manuscripts that have been altered through the photographic process (Fathurahman & Putten, 2022). It requires careful planning and consideration, such as equipment, availability of manuscripts, and the impact of digitization (Piazzoni, 2024; Prastiani & Subekti, 2019). The digitization process generally involves three main stages. The first is the preparation stage, which includes collecting manuscript data and preparing the necessary tools (Butterworth et al., 2018). This stage ensures the use of high-resolution cameras with appropriate scale and bit depth to produce quality digital images (Kapeller & Schön, 2017). The second stage is the digitization process itself, during which the manuscript is converted into a digital format. This step also involves generating metadata, which plays a critical role in enhancing accessibility (Rogers, 2016). The third stage is post-digitization, which forms the focus of this research. This stage concerns how the digitized manuscripts are presented and made accessible to users (Supriyanto, 2024; Syarifudin et al., 2015). The outcomes vary, with some manuscripts becoming fully accessible, while others are available only in partial or limited form.

Given the vast number and diverse forms of Qur'anic manuscripts across Indonesia, many of which remain undigitized and face threats from natural degradation, improper storage, and limited preservation awareness, this study focuses specifically on Qur'anic *mushaf* manuscripts located in Jombang, Kediri, and Lamongan. To address these preservation challenges, the researchers digitized selected manuscripts and developed an open-access mobile-based platform, the Manuscript Al-Qur'an Digital Application (MAQDA). This digital repository plays a critical role in ensuring the long-term preservation and accessibility of these valuable texts, particularly those held outside formal archival institutions. Beyond its preservation function, MAQDA also serves educational purposes by enhancing public engagement and promoting the appreciation of historical Qur'anic manuscripts, especially among younger generations and academic communities.

A review of existing literature reveals gaps in current research. While scholars such as Setyawati (2023), Zahara and Salim (2022), and Verticchio et al. (2021) emphasize preservation and digitization, they often overlook the urgency of Qur'anic manuscript digitization and public accessibility. Prior studies by Kuswati (2021) discusses general digitization practices without focusing on specific religious texts. Similarly, Bustamam (2017) and institutions like DREAMSEA and the British Library have digitized Islamic manuscripts broadly, but without a particular focus on Qur'anic *mushaf*.

Maisya and Rohman (2021) examined LPMQ's efforts in Qur'anic pentashihan, but did not explore public dissemination. Kurnia et al. (2020) developed a Qur'an application for the visually impaired, yet research on historical Qur'an digitization for broader academic use remains limited. Most existing efforts prioritize physical preservation or internal collections, lacking initiatives to make personal or community-held manuscripts digitally accessible.

This research, therefore, addresses a critical gap by focusing on the digitization of historically significant Qur'anic manuscripts and designing a user-oriented digital platform. The project not only preserves endangered cultural heritage but also fosters wider public engagement through digital technology (Supriyanto, 2024).

2. METHODS

This study employed a qualitative approach, focusing on approximately 55 Qur'anic manuscripts still held by individuals in the communities of Jombang, Kediri, and Lamongan. Due to the fragile condition of the manuscripts, the research adopts a probability-based convenience sampling technique.

The research process involves six main stages. First, it conducts observation and inventory to confirm the existence and physical characteristics of the manuscripts (Herlambang & Pramono, 2022). Second, each manuscript is digitized using a one-shot-per-page method to avoid duplication in sequencing (Fathurahman & Putten, 2022). Third, digitized manuscripts are grouped according to ownership. Fourth, study analyzes the distinct characteristics of each manuscript. Fifth, the application design begins in collaboration with a hosting provider, ensuring the platform allows users to view manuscripts by title and page, with additional features highlighting unique manuscript traits. Finally, the digital archive is deployed via an application accessible through the Play Store and App Store.

The researchers selected a hosting platform that is easy to use, supports small file sizes for faster access, and allows the integration of additional features like audio. This choice aims to improve accessibility and make the digital manuscripts more widely available, especially to younger users.
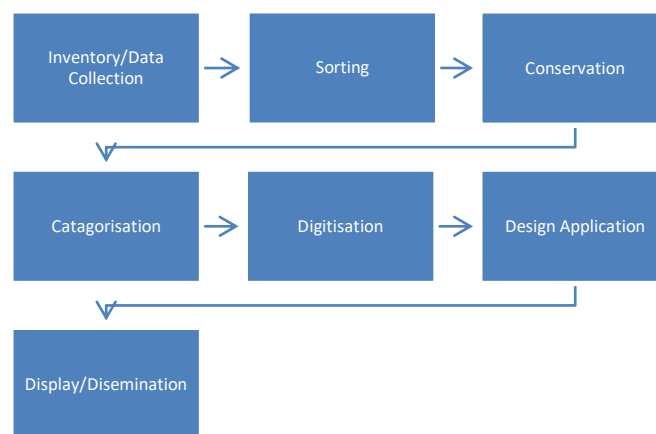

Figure 2. The steps of digitization

This study processed the data using a philological approach, supported by descriptive-analytical and interpretative methods. The researchers applied interpretative analysis to classify the Qur'anic manuscripts based on predetermined categories. After completing the digitization and classification stages, they will make the manuscripts freely accessible to the public through a digital application.

Prior to public dissemination, the application will undergo a series of testing phases to ensure its functionality and usability. The first stage involves assessing the application's access speed on server-based storage, taking into account variables such as file size and the

number of manuscript images displayed per page. The second stage focuses on user-side testing to verify that all features and menu options are fully operational and accessible. This user-centered evaluation is essential to guarantee a seamless experience for future users engaging with the digitized Qur'anic manuscripts.

3. RESULTS AND DISCUSSION

History of the Development of Qur'an Copies in the Archipelago

The introduction of the Qur'an marked a pivotal moment in the spread of Islam throughout the Indonesian archipelago. As the sacred text of Islam, the Qur'an holds central importance, serving as both a spiritual foundation and a practical guide for the daily lives of Muslims. Its early dissemination played a crucial role in shaping religious identity and practice in the region (Gusmian, 2013). Since the arrival of Islam in Aceh in 1290 AD, Islamic teachings began to take root and flourish, particularly during the rise of Pasai as the first coastal kingdom in the archipelago to officially embrace Islam. During this period, Islamic scholars (ulama) established *surau* and *langgar* as centers for religious instruction. Qur'anic education formed the foundation of early Islamic learning, introduced to students prior to teachings on religious practices (fiqh). This educational model reflects the central role of the Qur'an in Islamic pedagogy, as children were introduced to it from an early age through recitation sessions held in surau, langgar, and mosques established by the ulama of the time (Mursyid, 2019).

The development of Islam in the archipelago was increasingly rapid and gave birth to many great scholars who could write religious works, such as Nuruddin Ar-Raniri, Abdurrau'uf Singkil, Syamsuddin As-Sumatrani, Hamzah Fnasuri, Nawawi al-Bantani and others. They have compiled various Islamic teaching books ranging from *tafsir*, *shari'ah*, creed, and morals to sufism (Hakim, 2012).

In addition to the production of Islamic texts, the tradition of copying the Qur'anic *mushaf* holds a significant place in the Islamic intellectual heritage of the Indonesian archipelago. This practice is believed to have emerged as early as the late 13th century, coinciding with the establishment of the Pasai Sultanate. Although no Qur'anic manuscripts from the 13th century have been found, the oldest surviving *mushaf* dates to the 16th century, specifically Jumadil Awal 993 AH (1585 AD), from the collection of William Marsden (Bafadhal Ar, 2005). Traditional copying of the Qur'an continued until the end of the 19th century or early 20th century, which took place in various cities or regions such as Aceh, Palembang, Banten, Cirebon, Yogyakarta, Surakarta, Madura, Lombok, Pontianak, Banjarmasin, Samarinda, Makassar, Ambon, Bone to Ternate. The legacy of the past is stored in various places such as libraries, museums, Islamic boarding schools, heirs, and even manuscript collectors in large numbers.

The copying of the ancient Qur'anic *mushaf* from the beginning was driven by the spirit of da'wah of the scholars in teaching the Qur'an. This is because, at that time, there was no technology for copying manuscripts in large quantities, so all manuscripts were handwritten. In history, three ties or write have been a part of the sponsored *mushaf*: kingdom, pesantren, and social elites. In ancient times, many *mushaf* al-Qur'an were written by scholars or artists on the orders of kings or sultans. In addition, the pesantren, which is the center of traditional Islamic education, plays an important role in writing the mushaf al-Qur'an, such as the mushaf al-Qur'an in the Tegalsari pesantren, Ponorogo, East Java, Pesantren Butet in Cirebon

and others. While from the social elite, such as *Mushaf Ibnu Sutowo* and Mushaf *at-Tin,* on the orders of President Suharto at that time (Hastuti & Hasan, 2020).

Copying the Qur'an was carried out at various levels of Islamic society by scholars, professionals, and santri. At the beginning of the 19th century, Abdullah bin Abdul Kadir al-Munsyi was among the first to copy the Qur'an. Copying was also carried out by scholars or students who were pursuing religious education in Makkah. In the 16th to 19th centuries, Makkah functioned as a place to perform the Hajj and as an educational center for Islamic studies (Lestari, 2016).

Now, *mushaf* copying has continued, spearheaded by government and private institutions, with more sophisticated designs and printing techniques. *Mushaf* started this era, followed by Mushaf Sundawi (West Java), Mushaf Jakarta, Mushaf Keraton Yogyakarta, and Mushaf Babakan Cirebon. The end of the nineteenth century and the beginning of the twentieth century was a transition period in the production techniques of the Qur'anic *mushaf*. At that time, traditional copying of the Quran was still carried out; on the other hand, printing technology began to flourish. The explosion of Qur'an printing began after independence, with the emergence of several new publishers such as Sinar Kebudayaan Islam, Bir & Company, Toha Putra, Menara Kudus, and others (Hakim, 2012).

Nowadays, many manuscripts of the Qur'an of the archipelago are kept in government institutions such as Malaysia, Indonesia, the Netherlands, and several other places. However, among the richness of the Qur'anic *mushaf*, the manuscripts in Indonesia remain the largest, namely around 300 manuscripts owned by individuals, museums, mosques, and Islamic boarding schools. The existence of the Qur'anic *mushaf* in various regions and layers of society proves that copying the Qur'an in the past was relatively evenly distributed in the archipelago (Lestari, 2016).

Figure 3. Mushaf al-Qur'an across eras with various variations
Source: Ali Akbar collection, take from
https://quran-nusantara.blogspot.com/2012/09/mushaf-cetakan-singapura.html

Manuscript Preservation and Digitization

Preservation involves efforts to maintain cultural and intellectual resources for long-term use, including the management of manuscripts, library materials, and archives through proper policies, funding, personnel, methods, and storage. In Indonesia, this effort is supported by legal frameworks such as Law No. 5 of 1992 on Cultural Heritage, Law No. 19 of 2002 on Copyright, and Law No. 43 of 2007 on Libraries. According to Article 1, paragraph 4 of the latter, ancient manuscripts are defined as handwritten, non-printed documents that are at least 50 years old and hold significant cultural, historical, or scientific value.

Preservation refers to the protection and maintenance of manuscripts to prevent loss, damage, or deterioration. Many manuscripts remain neglected on storage shelves, leaving them vulnerable to biological and environmental threats. Effective preservation and conservation are essential to ensure the continued accessibility and sustainability of the information contained in these materials (Elnadi, 2021). Biological damage is routinely fumigated, while ecological damage is done by maintaining the temperature and humidity of the storage room. More importantly, it is important to eliminate acidity caused by the nature and materials of the manuscripts, both ink and paper used.

The factors that became agents of the destruction of manuscripts in the three places can be grouped into several factors. First, biological factors, namely termites, fungi, bookworms, and silverfish. Secondly, physical factors such as dust, temperature, and humidity. The third is humans and natural disasters. The fourth factor is the age of the manuscript itself. As stated by Saputra & Rahmah (2013), manuscript damage can be caused by internal factors (the material it is made of) and external factors (the environment, management, and disasters). Therefore, good care such as controlling temperature, humidity, cleanliness, and physical protection is very important in maintaining the durability of manuscripts.

Prevention from biological agents, which already exist, is done by applying camphor around the manuscript storage area. Camphor is a material that is quickly, cheaply available, and relatively easy to make. Physical factors are prevented manually by cleaning dust and dirt from the manuscripts and the room and installing a dehumidifier in the manuscript storage room. However, based on the results of the researcher's observations, this form of conservation needed to be carried out properly by the manuscript owners in the three places. One place provides mothballs on the shelves, but they must be cleaned and a temperature stabilizer installed.

Manuscripts are documents in the form of handwriting that, when they were produced or copied, technological conditions were not yet possible, so any form of saving a text was treated manually or handwritten. This handwritten manuscript can be considered one of the most relevant and authentic local sources in providing various historical information at a certain time (Latiar, 2018). This is why the manuscripts of our ancestors that have reached us today are very fragile or vulnerable; they are hundreds of years old, and even though the content of the text requires specific important meanings, they can be applied in the current era.

The preservation of ancient manuscripts, especially in terms of media transfer, results in the loss of important information (Pawoko, 2017). The preservation of manuscripts is crucial to saving the texts of our ancestors. Preservation is related to maintenance. The first step to preservation is to digitize the manuscripts (Amin, 2011). The process aims to keep an object safe from danger or loss damage and keep it in good condition for current and future use.

Preserving manuscripts serves several essential purposes. It enables society to honor and safeguard the cultural heritage passed down by previous generations. Through this effort, communities retain the intellectual legacy and collective memory embedded in rare manuscripts, ensuring that valuable knowledge continues across generations. Preservation also secures the written thoughts and lived experiences of our predecessors, allowing them to endure over time. Moreover, it offers future generations tangible traces of historical development, as each manuscript carries significant historical value. Most importantly, manuscript preservation protects the cultural and moral values contained within these texts, reinforcing their relevance in both present and future contexts.

Digital preservation is critical for current and future generations accessing information. Changes in organizations and their cultural priorities add risk to the continued ease of approach and long-term preservation of digital resources. Like print-based materials, digital resources can only survive with gaps in preservation efforts. Once the manuscripts have been saved in digital form, the next step is to create an application supported by the *App Store* or *Play Store* application. The primary purpose of digital preservation is to preserve rare manuscripts so that users can access them easily, only through mobile phones. The purpose of this application is as an archive or storage.

The term archive originates from the Greek word meaning "a place to store." Over time, the concept of archives has evolved to encompass several interrelated meanings. First, it refers to a designated space where records of activities are preserved as evidence. Second, it denotes a collection of documented materials such as images, writings, and graphics that capture the substance of past events. Third, archives function as repositories of memory, preserving materials that serve as reminders of historical, administrative, or cultural significance. Thus, creating a digital repository application in this research is part of preserving and archiving important documents from the past so that they are saved and technologically preserved.

Digital preservation is a set of procedures and activities ensuring a sustainable approach to information, existing records, and scientific and cultural heritage in digital format. Digitization entails an essential process that involves a range of different hardware and software technologies at each step.

Of the three places researchers observed, no preservation-digitization process was carried out by manuscript owners or study institutions. Manuscript scholars have not touched these manuscripts personally or from institutions. By looking at the physical condition of the manuscripts, preservation-digitization is very necessary.

The digitization technique is used to rescue manuscripts still in the hands of individuals in three places: Jombang, Kediri, and Lamongan. Some time was needed to inventory and sort manuscripts that could still be digitized. Before digitizing, the researchers conducted training by bringing in expert digitization instructors from the *Lajnah Pentashihan Mushaf Al-Qur'an* of the Ministry of Religion of the Republic of Indonesia in the manuscript archiving section and the Bayt al-Qur'an TMII museum. The training lasted one day on June 14, 2023, in Tulungagung.

The current study prepared essential tools and followed structured procedures. The digitization process required both hardware and software components. For hardware, the team used a MacBook Air laptop with a durable battery and minimum specifications suited for digitization tasks. A Canon EOS M6 II digital camera, equipped with a CMOS chip, was used to capture high-resolution images. This camera allowed immediate image review and deletion if necessary. To support stable photography, a tripod was used, while softbox lighting ensured even illumination during the digitization process.

On the software side, the team employed Adobe Photoshop for image editing, JPEG format for efficient storage, and PDF to compile and preserve edited manuscripts after processing in Microsoft Word. With tools in place, the digitization workflow proceeded through six stages: pre-digitization and organization, manuscript arrangement, image capture (scanning), file saving, and final editing.

Figure 4. Digitization tools
Source: personal documentation

Once the necessary hardware and software were in place, the digitization process proceeded through six key stages: pre-digitization, manuscript arrangement, scanning, file saving, and editing.

1. Pre-digitization

Table 1. Operational procedures

Initial Procedure	Digitization	Data Preservation	Data Processing
1. Manuscript inventory and selection 2. Survey of the physical condition of manuscripts 3. Metadata evaluation and analysis 4. Determination of digital file format and repository form	1. Equipment calibration 2. Object capture 3. Editing digital objects 4. File conversion 5. File compilation 6. Input metadata and upload digital objects 7. Packaging of accessible smartphone-based repository applications	1. Master file collection 2. Back up data 3. Data migration 4. Refresh Media Data storage	Digital manuscript object processing and accessing system

One of the main obstacles encountered in the field was the lack of complete descriptive data, such as missing author names or dates of writing. To ensure preservation quality, the researchers adopted a digital format that meets preservation master standards, using high-resolution files, large sizes, and avoiding any compression processes.

2. Organizing

At this stage, the team carried out the digitization work process. The stages of the process involved: (a). Arranging or preparing the devices used for the digitization process; (b) checking the completeness of the manuscripts that will be the object of digitization, including checking the cover, checking the sheets tucked inside the manuscript, checking the manuscript paper if any are tucked in, etc.; (c) checking the condition of the manuscript to

avoid dust or other dirt. If the condition is dusty, then a cleaning process is carried out with a paintbrush with a certain softness. It can be ensured that the paintbrush is dry and clean.

3. *Organizing manuscripts*

Before the manuscript is scanned, it must be laid out on a table covered with black and white cloth. The manuscript is placed right in front of the camera lens.

4. *Scanning documents*

The team photographed the manuscript sheet by sheet. After the sheet is opened, click the camera on the laptop screen. This shooting process pays attention to the quality of the resulting file, among other things:

a) High-resolution file format selection

b) Exposure settings during shooting. Such as attention to the degree of focus, sharpness, and color conformity with the original object.

c) Checking the completeness of manuscript documents, such as page layout.

d) The process of rechecking the final quality.

5. *Saving files*

Save the file in JPG format to make the editing process more manageable. Before saving, it is necessary to back up the data in the form of original files, such as RAW and TIFF, with high-resolution quality.

6. *Editing*

This editing process obtains the quality of the results we want but does not change the shape of the letters. This editing uses the Adobe PhotoShop tool. This application aims to remove stains or ink marks found in photos.

MAQDA as Information Dissemination

After completing the digitization process, the researchers developed a mobile-based digital repository application. They designed this application not only as a data collection platform but also as a tool to enhance access to digitized Qur'anic manuscripts. According to Rifqi (2018), a digital repository functions as more than just a storage system; it plays a strategic role in improving academic quality, broadening access to scientific information, and supporting academic policies and national regulations. For this reason, effective repository management is essential to ensure the sustainability and advancement of scholarly research. The researchers submitted the digitized files to the respective manuscript owners and disseminated the results through the newly developed application, named the Manuscript Al-Qur'an Digital Application (MAQDA). This platform features rare Qur'anic manuscripts that have not previously appeared in any digital collection.
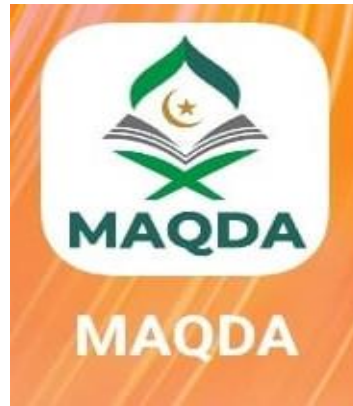
Figure 4. MAQDA application view
Source: personal documentation

Several institutions have digitised manuscripts and made them publicly available, such as Seamushaf, which focuses on the Qur'an manuscript and tafsir (exegesis), Lektur of the Ministry of Religious Affairs, which covers Islamic manuscripts in general, and https://khastara.perpusnas.go.id/, which stores Indonesian digital manuscripts. Dreamsea, a Southeast Asian digital repository, has a wider scope but is not limited to Islamic or Indonesian manuscripts. However, the collection of East Javan manuscripts, especially the Qur'an, is still limited. In terms of accessibility, some sites do not allow enlargement of manuscript images or have inefficient search systems. Seamushaf, despite its focus on the Qur'anic manuscript, still faces technical obstacles that hinder users. As a solution, this study proposes the MAQDA application, a more accessible mobile-based Qur'anic manuscript repository. This application will provide complete information about the origin of the manuscript and an initial description that facilitates searching, so that users can access the manuscript more practically and efficiently. Although the MAQDA application looks simple, it can be accessed via mobile phone so that users can open it anywhere. This application also makes it easier for readers to access manuscripts because each manuscript can be enlarged, making it easier to study codification and philological aspects. Thus, this manuscript will be more practical and economical.

Figure 5. Application menu display
Source: personal documentation

Mobile devices are an important part of the daily human activity process. Smartphone devices allow interactivity with various sources (Paulins et al., 2015). These devices provide ample memory storage, excellent performance, and data transfer speed. So, with the development of digital technology for m-learning, every user can access any information from the application installed on their *smartphone*.

This form of application is a form of dissemination of information to the public regarding the distribution of Qur'an manuscripts in the archipelago, especially East Java, which was the first base for Islam to enter. Dissemination activities through this digital *platform* are aimed at the public and researchers of the archipelago to obtain information, raise awareness, and accept and utilize the information for future research progress (Arifin, 2016). This dissemination can be done through *online* and offline media forms (Werner & Tankard, 2008).

The development of information technology influences information dissemination. Information dissemination is very diverse, one of which is digitization. To realize the dissemination of information on manuscripts that have yet to be touched and saved by several manuscript study institutions, this research conducts preservation in application-based digital media on smartphones. This is a form of prevention against various bad scenarios that may occur in the future against these manuscript relics.

The benefits of this digitization process include:

a) Provide easy access to researchers or the public

b) Saving both the physical form and the information in the manuscript.

c) The reading of the text will be easier

d) It is faster, more practical, and more economical.

To maximize the benefits of this repository application and the results of the analysis of several existing manuscript websites, it is necessary to add information about the manuscript's contents that the public can access (Prastiani & Subekti, 2017). There is a form of discussion that has yet to be present in the application of manuscript institutions, namely the dissemination of information about the research results on the character of each manuscript. So far, only the digital form of the manuscript has been displayed in all manuscript repository applications. Some applications display the manuscript identity study (although not all applications implement this part), such as Seamushaf, dreams, and religious literature. However, none of the apps display the results of the analysis of the manuscripts in the app. The discussion menu that was not covered by the previous application and that the researcher applied in this MAQDA application is the sub-menu on manuscript characters.
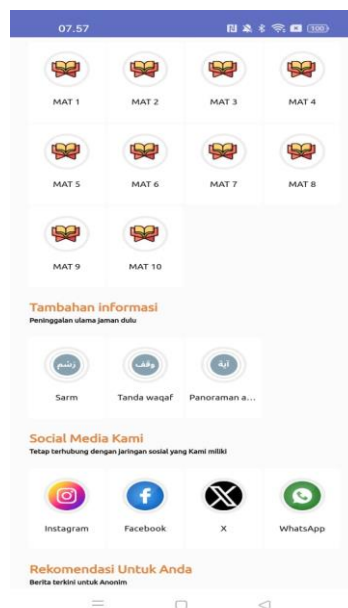

Figure 5. Manuscript character menu
Source: personal documentation

In developing the Manuscript Al-Qur'an Digital Application (MAQDA), the researchers utilized the Jagel platform to facilitate the creation of the mobile-based application, including the server and its integrated menu system. Jagel provided a user-friendly interface that allowed for the systematic development of the application without requiring advanced programming skills.

The process began with the installation of the Jagel.id application, freely available on the Google Play Store. Upon installation, users were required to complete a registration process by entering their email address, followed by the submission of personal information, including full name, username, and phone number. This registration enabled access to Jagel's app-building features.

Once registered, the researchers selected a suitable application template from several options provided by the platform—ranging from e-learning modules to online services. For this project, a template conducive to educational and archival purposes was chosen. The next step involved naming the application and uploading an appropriate icon. The researchers

designated the application as MAQDA (Manuscript Al-Qur'an Digital Application) to reflect its purpose and identity.

Following this, Jagel initiated a verification process via the registered email. Upon confirmation through the user's inbox, access was granted to the platform's website, where the verification status could be reviewed. Once verified, the application entered a preview stage, during which the researcher could test the application's initial layout and functionalities. After approval of the preview, the development phase continued with the customization of menus and visual elements according to the intended user experience. Upon completion of all necessary adjustments, the platform generated an APK (Android Package Kit) file, rendering the application ready for upload, distribution, and public use. Through this process, MAQDA was successfully developed to support both the preservation and dissemination of Qur'anic manuscript content in an accessible digital format.

The solution offered by the MAQDA application is not only a digital repository application that accommodates historical documents in the form of manuscripts but also an answer to technological developments. This technological development also touches the side of the community's religious model. This can be seen from the forms of contact of the Qur'an with digital media. Individuals and institutions have widely published smartphone and website access-based applications.

These application providers aim to facilitate the learning process of the Qur'an. Paulins' opinion regarding application devices becomes a way of transferring knowledge during current technological developments. Ozdamli and Cavus also state in their book that m-learning is a learning model that allows good effectiveness. This is not only a form of application for general learning media, but Qur'an learning has also penetrated this digital world, such as the Qur'an for Android, Qur'an kemenag, and Qur'an al-Hadi.

From the reality of the times, the repository of documents in the form of books has become an important part of the information dissemination process in the current digital era. This MAQDA application answers the scarcity of applications based on the learning process, but not the Qur'an that appeared after the Pentashihan and uniformity process by the Pentashihan Institute. This application teaches the public how to learn and copy the Quran occasionally, which, in reality, has many differences. An understanding of the diversity of differences in understanding the writing of the Qur'an will provide a new attitude from the public or society towards the process of understanding the diversity of society that is open to differences. Thus, this application is very relevant in disseminating the concept of religious moderation in the current era of digital space.

Thus, digitization based on *mobile applications* integrated with Google Drive is a new alternative that can be done to anticipate all the risks that will occur in the safety of past relics in the form of handwriting with manual media. This research emphasizes strategies for minimizing the risk of digitization results (Barateiro et al., 2010).

4. CONCLUSION

Technological developments are beneficial for preserving and conserving manuscripts as a cultural heritage of the past. Digitization is the answer to the anxiety about the form of saving the relics of the past that continue to age. The MAQDA application is not only a repository application for manuscripts still scattered in the community but also a forum for disseminating information about the results of critical reviews of these manuscripts that the

public can easily access. This application solves the anxiety of limited manuscript reviewers of abundant manuscripts. Thus, this Maqda application provides a menu about the character of the Qur'anic manuscripts. When present in the digital dissemination space, this menu is fundamental and practical in building the image of the oral discourse that continues to go hand in hand with the writing tradition. Thus, public insight into the 'sacredness' of the writing of the Qur'an or the Qur'an, which is believed to be tariff in the process of its decline and dissemination, can be conveyed to the public. In addition, the results of this study also show new things: digitization does not have to be in the form of archives collected in libraries or museums, but collections still in individuals also need to be digitized massively. This is so that the vision of disseminating historical information can be comprehensively conveyed.

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