

Balancing Sustainability Factors in the Implementation of Digital Libraries for Malay Manuscripts: A Framework Proposal

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Abstract. This paper aims to explore and understand the factors that affects the implementation of Digital Libraries of Malay Manuscript in libraries. It discusses the issues related to the risk management of digital resources in Malaysian documentary heritage institutions. The study employed a descriptive-qualitative approach to explore how the DLMM is operated in five selected information institutions in Malaysia. Three types of data collection techniques were used: interviews, observation, and document analysis. Fourteen informants were interviewed likely using a semi-structured approach with open-ended questions and probes to gather qualitative data. At same time field observation was done during the same period as the interviews, suggesting that researchers observed real-world situations or events related to their research topic and documents were collected from the annual reports, standard or guide and ICT meeting report/management meeting. The research findings and discovery are significant in highlighting the crucial elements which need to be addressed to ensure the sustainability and successful implementation of any digitization project.

Keywords: Digital preservation, Malay cultural heritage, library management, digitization.

1 Introduction

One of the most significant current discussions in the information management context is digital library especially with the advent of pandemic COVID-19 and the closing of libraries around the world. A considerable amount of literature has been published on Digital Library (DL). However, far too little attention has been paid to the Digital Library of Malay Manuscript (DLMM) (Zahidah, 2011; Ding, 2014; Awang, 2020).

Malay manuscript is defined as hand-written document in Jawi script from early 14th century till early 20th century (National Library of Malaysia, 2015). Study on the development of the DLMM in many senses is vital for digitization professionals, digitization managers, and librarians who would like to pursue digitization and digital preservation projects, especially those agencies that have the collection of Malay manuscript namely the National Library of Malaysia, National Archive of Malaysia, University of Malaya's library, The National University of Malaysia's library, University of Islamic Science Malaysia's library, International Islamic University Malaysia's Library, University of Sultan Zainal Abidin's library, Institute of language and Literature, Terengganu Museum and Islamic museum particularly to get themselves acquainted with the challenges.

While research on the digital library has been greatly reported in the literature, gaps still exist in a number of areas. However, there has been little discussion about the challenges for the implementation of DL focused on Malay manuscript collection in developing countries from the perspective of practitioners. The research to date has tended to focus on digital library of book, journal and thesis collection (Ghamouh, 2015; Agosti et al, 2018; Singeh, 2020).

Studying the factors that affect the implementation of DLMM has become an important issue in determining the value of digitization. There have been a limited number of studies that have been conducted to analyse the economic, social, cultural, technological and organizational factors that affected the implementation of DLMM in libraries or digitization of documentary heritage (Voutssas, 2011; Masenya, 2020). The digitization professionals, digitization managers and librarians should have proper knowledge about the factors that affect the implementation of DLMM before they decide to implement DLMM in their institution to reduce unnecessary cost.

Based on the previous research on DL, it was seen that there have been several conceptualized and proposed frameworks for the design, development, evaluation and interaction of digital libraries (Levy and Marshal, 1995; Moen, and McClure, 1997; Marchionini and Fox, 1999; Saracevic, and Covi, 2000; Fuhr, 2001, Blandford et al, 2004). However, it is not comprehensively including the economic, social, cultural, technological and organizational aspects in their framework. As stated by Manaf (2010) although there is a Department Digitization Policy developed by the National Library of Malaysia in the year 2000, this policy is not comprehensive enough to serve as a guideline by cultural institutions. It does not include the selection criteria, the principle guidelines and the most important elements, the standard and protocol to be used by the institutions in their digitization projects.

This study focuses on the RQ "What is the current development of digital library of documentary heritage in libraries?"

2 Literature Review

Documentary heritage represents a large proportion of the world's cultural heritage. Many of these resources have lasting value and significance, and therefore constitute a heritage that should be protected and preserved for current and future generations.

UNESCO (2010) defines documentary heritage as items that are moveable; made up of signs, codes, sounds and images; capable of preservation; reproducible; and they are products of deliberate documentation process. A further definition is given by Edmondson (2015) who describes documentary heritage as comprises those single documents – or groups of documents – of significant and enduring value to a community, a culture, a country or to humanity generally, and whose deterioration or loss would be a harmful impoverishment. The significance of a document may become clear only with the passage of time. For each state, its documentary heritage reflects its memory and identity, and thus contributes to determining its place in the global community. This definition is close to that of Robert (2016) who defines heritage as “our legacy from the past, what we live with today and what we pass on to future generations”.

Manuscript can be categorized as one of valuable asset and historical documentary heritage. Malay manuscript is defined as a handwritten document in the Jawi script which surfaced in the beginning of the sixteenth century and ended in early twentieth century with the coming of the west and the introduction of printing machines. Sitti Munirah (2018) has defined MM as “all kinds of hand written materials in any of the Malay languages using the jawi script concerning the Malays and their civilization that are at least a hundred years old”. According Chambert-Loir (2011), Malay manuscript tradition comes from the tradition of Arab and Indo-Persian. Manuscripts generally refer to unpublished original sources and have the characteristic of being unique. Unlike books, journals and other resources typically collected by libraries, manuscripts typically do not exist in multiple copies (Hilmi, 2007). Most of the Malay manuscripts were written in Jawi scripts. Historically, Jawi scripts are taken from Arabic language and Persian and it had been added five new letters that made it suitable for Malay to use. In earlier times, Malay manuscripts were usually written by royal and religious people (Zahidah, 2013; Samsu, 2021). According to the historians, when British came to Malaysia, the Malay manuscripts had been spread all over the world. The number of collections that had been found had developed from time to time. Prof Dato’ Ismail Hussin, an expertise in Malay manuscript stated that it was about 2000 of manuscripts that had been taken by Raffles, Farquhar, Maxwell, Klinkert and Voorhoeve on the 19th century.

Reflected by the ability of the traditional society at that time, highly skilled and capable of producing so many manuscripts. It should be noted that the manuscript is not just a diary, but the knowledge contained in it is very broad (Awang, 2020). It covers all aspects of daily life. Its content is comprehensive and extensive covering all fields such as law, administration, constitution, religion, prophecy, medicine, beliefs, storytelling as well as the history of the origin of the state, religion and descent. The authors of this script could be said as knowledgeable and educated person. They are considered as the expert in their subject.

Malay manuscripts are scattered and kept by the respective institutions and individuals in Malaysia, Brunei, Indonesia, Britain, Germany, France and South Africa. Several institutions that have Malay manuscripts in Malaysia such as the National Library of Malaysia, National Archive and Malaysian Institute for Language and Literature (Dewan Bahasa dan Pustaka) have published series of catalogs of Malay manuscripts

as reference documents for users. The distribution of Malay manuscripts is shown in Figure 1.

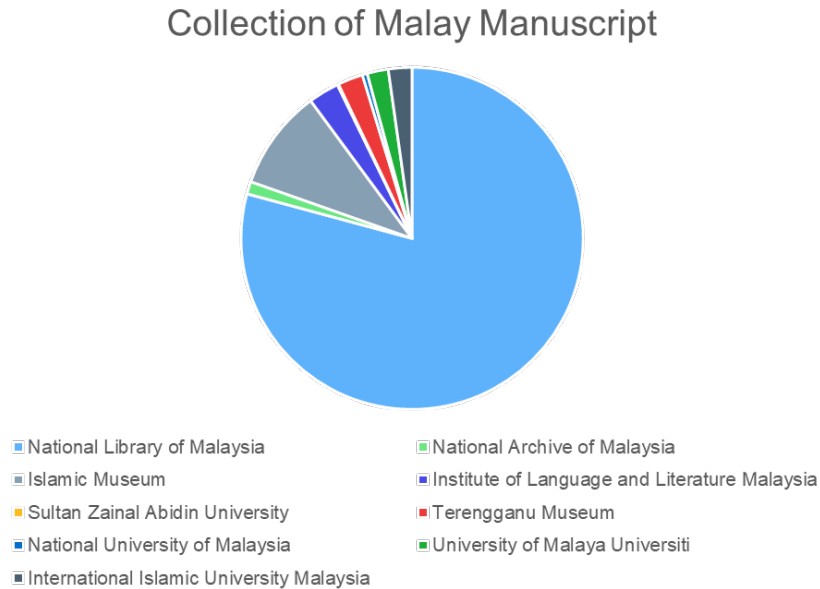


Figure 1: Collection of Malay manuscript in institution in Malaysia

It is of great importance to make cultural heritage available to people, particularly those who participate in disseminating the cultural heritage, notably the written cultural heritage, such as scholars, researchers, students, and so forth. For many years, libraries, museums and archive centers have played a significant role in preserving, organizing, and disseminating mankind's cultural heritage. Malay civilization, particularly in its golden age, which lasted for around fourteen centuries, has contributed much to subsequent civilizations, and some of its rich cultural heritage remains. Malay manuscripts are one of the remaining legacies of Malay civilization. This heritage has lasted until the present day because it is part of mankind's heritage, and many scientific fields still rely on this heritage as a fundamental source of knowledge.

In respect of the preservation of manuscripts, the Memory of the World Programme launched by UNESCO in 1992 is formed aimed at focusing world attention on the need to safeguard endangered and unique library and archives collection, to make it available for future generations and to improve its accessibility globally. It also aims to stimulate a responsible approach to the sources from which our historical consciousness grows and to contribute to the general availability of information about our history and culture. The Programme also seeks to develop products based on this documentary heritage and make them available for wide distribution, while ensuring that the originals are maintained in the best possible conditions of conservation and security. It establishes and maintains a World Register identifying documentary heritage of international, regional and national standards. As of December 2018, 381 documentary heritages had been

inscribed in the Register, with 274 of these from Europe and North America and 116 from Asia and the Pacific as displayed in Figure 2.

MEMORY OF THE WORLD

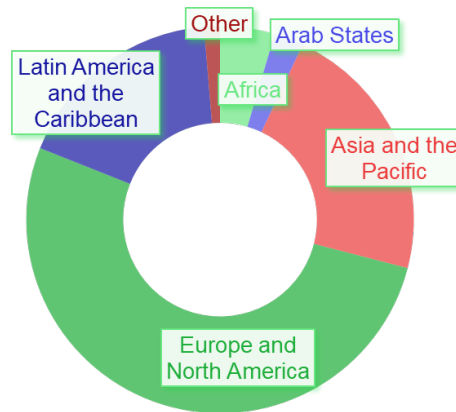


Figure 2: Documentary heritage in MOW

Malay civilization, particularly in its golden age, which lasted for around fourteen centuries, has contributed much to subsequent civilisations, and some of its rich cultural heritage remains. Malay manuscripts are one of the remaining legacies of Malay civilisation (Roza, 2019). This heritage has lasted until the present day because it is part of mankind's heritage, and many scientific fields still rely on this heritage as a fundamental source of knowledge.

Malay civilization such as the Malacca, Pattani and Aceh which is scattered in the south eastern part of the Asian continent has its own unique heritage treasures (Amer, 2017). Although these treasures were once not so valuable because they are not envisaged commercial value, but its aesthetic value that stores a variety of tips and 'story' ancient ancestors of the Malays should guarantee the security of these treasures in the hands of the Malays. But the delay in understanding this fact can cause a large amount of money to be spent later to collect it back after the passage of time. It is not merely a theoretical predictable-bit or dire predictions are exaggerated, but a fact that has happened and bitter lesson that already had swallowed up by the Malays as a precious treasure, including manuscripts and historical documents, was taken home by Dutch after their arrival in the archipelago in 1596.

Malay manuscripts serve as an important source of understanding the intellectual and literary heritage of the Malays. Some of these works were later re-published in printed format when printing was introduced first in Java then Penang, Malacca and Singapore in the 19th century. Before the existence of a writing system, using only traditional Malay oral tradition to develop a story for them. However, this oral tradition is seen as not trying to be a legacy that is present in tangible form, instead it appears to be a 'little tradition'.

Since libraries have been close temporarily (some are partially open) since the outbreak of pandemic COVID 19, most libraries offer their services via digital as it is advised for society to practice social distancing and to avoid libraries from being too crowded (Rahimi & Rosman, 2020; Bhati, 2020). Other than sharing the information and awareness via the social media and official websites, most of the libraries in the world are focusing on their campaign to encourage their users to use the digital services. For example, the National Library of Spain is promoting its digital content that can be used to support education. On the other hand, the New York Public Library gives the initiative for users to use a mobile application to borrow research databases and access a multitude of online resources. The library provides a wide collection of digital offerings, including e-books for borrowing on their Simply E application, research databases, and access to a multitude of online resources.

Over the last decade, the social facilities integrated to traditional digital libraries have been seen. Users not only can access information by basic features but also they would need more advanced services from digital libraries (Gaona-García et al. 2017). As Pérez (2017) pointed out digital libraries will extend various services in order to support for knowledge sharing between users. An extended definition of a digital library from a workshop based on the social aspects is given by (Islam, 2014) “1. Digital libraries are a set of electronic resources and associated technical capabilities for creating, searching and using information 2. Digital libraries are constructed, collected and organized by (and for) a community of users, and their functional capabilities support the information needs and uses of that community.”

With rapid development of information communication and technology, manuscripts can now be preserved electronically through digitization for future keep, simultaneously making it accessible globally (Suleiman, 2013). Many libraries are venturing into digitization project which is new and costly. Rapid changes in computer technology offers a multitude of application devices for digitization. It is crucial to study and select the appropriate technology suitable for the needs of manuscript as the manuscripts are fragile and may endanger its physical condition. The most important thing is to define the formal rules which would be worldwide acceptable. Furthermore, this format must fit with the necessary standards for dissemination of data via Internet (Zahidah, 2013; Tatjana, 2017).

2.1 Issues and Challenges in implementing Digital Library of Malay Manuscript

A considerable amount of literature has been published on the challenges and barriers in implementing DL in libraries. These studies including the management of digital assets presents new challenges to the library community in terms of administering complex hardware and software, but mass digitization has not changed the fundamentals of library services (Pandey & Kumar, 2020). The ephemeral nature of digital items will require more expense and staff attention in meeting preservation commitments, but the relationship of user needs to item selection and organization remains essential. The complexities involved in supervising intricate information systems optimized to meet specialized user needs requires a strategic approach to management that takes into account the role of digitized collections within the larger context of the library and parent organization (Joselt, 2019). Guiding users to the items most suited to their information

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needs becomes a very different task as service points become more remote, but the digital environment brings with it increased possibilities to meet the traditional goal of providing personalized services to every user (Anuradha, 2017).

Furthermore, digitization of library resources poses a great deal of challenge to the major stakeholders, that is, the library management, employees and library users. Despite everything that digitization can accomplish, there are some good reasons librarians and archivists in developing countries may regret embarking on such project. Not everything in the collection is worthy of digitizing because the idea of an entire archives or library being digitized is a long way process. Successful digital project are the result of careful planning and evaluation of collections and the digitization of only those items that will provide the greatest benefits to the users.

Figure 3 depicts the mapping of barriers to digitization or digital library initiatives that emerge from issues discussed previously.

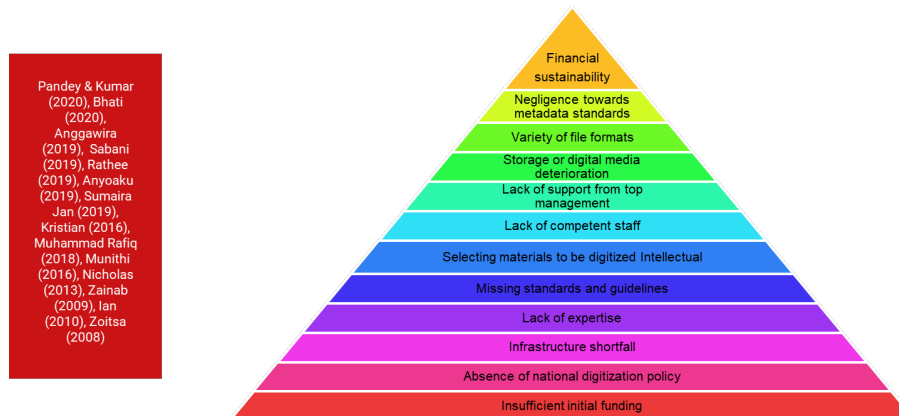


Figure 3: The Mapping of Barriers to Digitization or Digital Library

2.1.1. Insufficient initial funding

A primary reason why libraries and archives fail in digitization projects is a lack of funding or working capital (Pandey, 2020; Khan, Shafi and Ahangar; Rafiq, Ammen, and Jabeen, 2018). Pandey (2020) states that initial funding was including the cost of digitization in-house that is, with its own employees, equipment and within its facilities or to hire a provider specialized in these services. Similarly, a study by Khan et al (2018) found that inadequate funding for the library is one constraint against practical digitization of library materials.

2.1.2. Absence of national digitization policy

There is a significant need for standard policy or national-level policy, rules, and methods to bring uniformity. In the absence of policy, professionals feel confused, eventually leading to a loss of consistency in their work. Mesui, Andrade, and Waizenegger (2019) emphasised that despite awareness of Information Communication Technologies, there is a lack of ICT policy in heritage institutions in Tonga. Similarly, Rafiq,

Ammen and Jabeen (2018) explored that lack of established digitization plan, policies and procedures in Pakistan as one of the most important barriers in implementing DL.

2.1.3. Infrastructure shortfall

As infrastructure is the backbone of any countries progress, in the same way, the success of any project in the libraries cannot be imagined without proper infrastructure. Asogwa, Ali and Ezeani (2021) showed that only 12.5% of libraries in Nigeria have enough infrastructure for digitization and rest 82.5% do have not enough infrastructure. In the same context, Rafiq, Ammen and Jabeen (2018) in their study found that insufficient technological infrastructure as third major barriers to digitization initiative in Pakistan.

2.1.4. Lack of expertise

Lack of expertise is a crucial reason for the failure of any project or organization. Especially in the field of digitization and digital library, the lack of IT experts will lead to the unsatisfactory output of the project. Rachman (2018) found lack of expertise or limited technical knowledge was one of the key challenges in digitization especially in Indonesian's libraries. Likewise, lack of technical expertise was the fourth in the list of the obstacles in digital heritage preservation in the study done by Pandey (2020).

According Anuradha (2017), inadequate technical expertise is prevalent in many developing countries. There is shortage of personnel/human capital. Few librarians with computer science qualifications (computer engineers) work in libraries, hence the consequent frequent break down of ICT facilities and disruption of services in digitized libraries.

2.1.5. Missing standards and guidelines

In any organization, standards and guidelines are the protocols for professionals. Like business organizations, libraries also require standards and guidelines for keeping up uniformity in their administrations and practices. In this context, previous studies reported severe negligence in the implementation of standards and guidelines and termed it as one of the hindrances in the success of digitization projects. The survey conducted by Masenya (2019) in Africa analysed the responses of libraries with respect to the availability of standards on preservation and revealed that only 14.3% of libraries follow de facto standards while 85.7% do not support any standard. A few of them were even not aware of any standards.

2.1.6. Lack of competent staff

A competent workforce is one of the crucial forces for the completion of a project. Without sufficient and skilled staff, no project can be imagined. According to Jan (2019), lack of staff was another problem that contributed to challenges in the implementation of digitization policy in mostly university libraries in India. Likewise, Anyouka (2020) reported that 52.2% of the university libraries in Africa have lack of competent staff. This is a problem for many digitization projects in Africa, as studies in libraries in general and university libraries in particular have consistently reported inadequate level of information and communication technology skills as one of the major problems facing libraries in Africa.

2.1.7. Lack of support from top management

The administration is the backbone of an organization. The primary role of the administrator is to make connections among different sections and employees of the institution. Management is responsible for policymaking, decision making, and taking positions on current issues the organization is facing. A study conducted by Ogenga (2015) in Kenya analyzed lack of awareness and support from top management as a challenge in digital preservation. His study used structured questionnaires and interview schedule to collect data from 150 graduate students, 25 academic staff and 25 library staff. Findings from his study revealed that the management has not put up policies with regards to access and use of the repository resources. It shows that lack of support from top management has huge impact to the failure of DL project.

2.1.8. Storage or digital media deterioration

Deterioration of digital media is responsible for the disappearance of, or inaccessibility of digital information in the long run. This is because media deteriorates or decays within few years after digitization. Another challenge is that digital media get lost during disaster or virus attacks. Anuradha (2017) analysed the reason why re-digitization is inevitable is the likelihood that electronic resources created in previous years using older technologies may not be accessible or compatible with the new technologies. Furthermore, Toyo (2017) found that deterioration of content is a big concern in the conservation of manuscripts. In his study he sample size was forty-seven (47) library staff (professional and para-professional) from John Harris Library. The finding was that 97.9% of the respondents agree that deterioration of digital media as the major challenges in DL project.

2.1.9. Financial sustainability

Digitization and digital preservation activity require a high level of investment from a financial point of view as the processes involve hiring outsourced human resources and procurement of equipment such as scanners and servers. In the reviewed literature, insufficient funds was reported as a significant constraint globally (Masenya, 2020; Anuradha, 2017; Peter, 2019; Rahman & Islam, 2020). Anyouku (2019) found that funding of projects like building IRs and sustaining the project is a major challenge universities face in Nigeria. Out of the 23 respondents, 56.5% indicated that there is no long-term funding in their digitization project. In the same context, a study done by Rafiq and Ameen (2018) identified major barriers as financial sustainability. In his study, two-thirds of the interviewees mentioned finances as the most important barrier in digitization activities.

Matrix for research objectives/research question					
RQ2: What are the challenges that libraries face as they relate to the implementation and development of DLMM?					
	Masanya T. (2020)	Akoiki-Owoyele (2020)	Rahman (2020)	Gkoumas (2018)	Khan (2017)
Purpose	To investigate the factors that can inform the implementation of sustainable digital preservation	To examine protection of Africa's cultural heritage through digital preservation	To build a model for Digital Content Management (DCM) in agricultural university libraries in Bangladesh	To analyze the challenges and obstacles of developing a digital archive of scientific publications	To explore the essential digital competencies for developing and managing digital libraries
Country	South Africa	Africa	Bangladesh	Greece	Pakistan
Theory (Principle)	Open Archival Information System (OAIS) reference model	N	N	N	N
Research design	A quantitative	A mixed method	A mixed method	A quantitative approach	A quantitative research
Strategy / research method	Online survey questionnaires	Survey and interview	Online survey questionnaires	Survey	Questionnaires
Sample	Twenty-seven academic libraries	66 staff and seven heads of various institutions who were either Directors, Deputy Directors or Heads of Departments	70 teachers and 175 students filled	636	132 university librarians
Finding	The findings show that academic libraries in South Africa are significantly affected by the changes in the digital environment	Cultural institutions in Nigeria are yet to make serious effort towards digital preservation of cultural heritage	The findings reveal some hindrances to the establishment of DCM, such as lack of constant power supply, limited bandwidth speed, some users have lacking fundamental IT knowledge and shortage of digital resources, in addition to some suggestions for improving DCM in these libraries.	The findings of this inquiry indicate that financial and human resources insufficiency, inadequate time frame and lack of promotion, have hindered the success of the project.	The findings of the study showed that digital competencies for developing and managing digital libraries fall into three main categories: digital competencies for developing digital libraries; digital competencies for managing digital libraries; and digital competencies to protect digital contents. The
Suggestion	Proposes a conceptual model for preservation of digital resources in academic libraries	The need for cultural institutions in Nigeria to be more focused on digital preservation of cultural heritage.	DCM model for agricultural university libraries of Bangladesh has been proposed and	A possible solution to cover the operational and management expenses, while offering quality digital services, is to charge subscribers with a small fee for using digital content	Joint efforts are required by library schools, library associations and different training groups to develop digital skills of university librarians.

2.2 Factors affecting the implementation of digital library Malay manuscript

We need to know about the factors that affected the implementation of DL of documentary heritage. According to Voutssas (2011), the factors that affect the preservation of long-term digital documentary can be categorized as economic, social, cultural, technological and organizational factors.

2.2.1 Cultural factor.

The main elements in this factor are the lack of sensitivity and understanding of the problem. Many of us tend to think that the dark ages are long gone, and that in particular our contemporary age, called by many the "information society" or "knowledge society" is far from that situation, and that today more than ever we are aware of the value of information. A lot of information is produced, distributed and consumed every day. Today many companies and millions of people live from the information. But, like many other resources, it is one thing to consume and another to preserve. In this society, we consume our natural resources disproportionately, but we preserve little of them.

2.2.2 Economic factor.

The second type of factor that affects the implementation of DLMM is economic. The first cost to establish during these processes is the cost of digitizing. This is the cost of converting a document that is in a traditional medium to a document in digital form. In some libraries, the cost of producing a digital material is also considered within these

costs, which does not necessarily come from a "traditional" original. When digitizing documents, the library always has two paths: one, to digitize intramural that is, with its personnel, equipment and within its facilities. The second option is to hire a provider specialized in these services. The decision must always be made under the best economic criteria that satisfies a pre-established quality criterion for that digitization. This is very important: a digitization project should not be decided simply based on the greater economy; a quality criterion must also be included. Ignoring this principle is the best way to get the institution a collection of poor quality digital material, which most likely will not serve as planned or which will have to be digitized again in a certain period of time.

Once the librarian has determined the cost of digitizing, he must move on to the second cost involved: the cost of editing. This cost is established based on leaving the documents as a useful digital object, according to his specifications. Once the librarian or digitization manager has determined the cost of editing, it is necessary to go on to establish the cost of registering; that is, the cost of preparing a formal record, catalogued graphically speaking, for each document. Obviously, there would be no point in creating our digital collection - large and important as it may be - if it cannot be located when required or if it should invest a lot of time in decanting information not relevant for our purpose. The next cost to be determined for the collection to be digitized is to store. It is about establishing how much it will cost the institution to have the collection stored on technological media, once it is digitized. To do this, it is necessary to first reflect on the fact that there are two main storage mechanisms, and that they directly affect the price: online storage and offline storage. The last of the costs to consider is the upgrade. Although this cost is never present when creating a new digital collection, it is inevitable that it will appear from time to time in our preservation costs, and will affect our annual budget from time to time, therefore we must keep it in mind to include it. in future years when relevant.

2.2.3 Technological factor.

Technological factors have to do with the rapid and constant change of devices and technological aspects related to electronic information. These are the factors related to the environment of that digital information, such as the equipment and programs that are required to reproduce them. Special mention should be made of the operating systems and multiple formats that have been created for the representation of various digital documents in all their types: text, audio, static and moving images, etc., and that appear and disappear with increasing rapidity.

2.2.4 Organizational factor.

Organizational factors have to do with the top management support, IT expert and staffing. At a more local or meso level, the size of the organization, infra-structure, organizational readiness and culture, capabilities and beliefs of the workforce were also identified as important when considering the application of the identified factors (Fennelly et al., 2020).

3 Result and Discussion

The analysis of the interview data in this paper follows a thematic approach that is underpinned by the Diffusion of Innovation Theory, as previously described in the method. The thematic analysis involves identifying and organizing key themes that emerged from the interview transcripts, allowing for a comprehensive exploration of the complexity surrounding the implementation of the Digital Library of Malay Manuscripts.

To provide a vivid understanding of the unique factors and challenges associated with this major digital library implementation endeavor, this article presents key themes along with illustrative quotes. These quotes are carefully selected to exemplify and illuminate the complexities and nuances of the participants' perspectives and experiences related to the digital library initiative.

The thematic approach and the use of illustrative quotes help create a rich and detailed narrative of the findings, allowing readers to gain a deeper understanding of the various dimensions and implications of the Digital Library of Malay Manuscripts. This presentation style helps to capture the diverse viewpoints, challenges, and opportunities expressed by the interview participants, contributing to a comprehensive exploration of the implementation process.

By employing a thematic approach and utilizing the Diffusion of Innovation Theory as a theoretical framework, the thesis ensures a rigorous and systematic analysis of the interview data. This approach not only facilitates the interpretation and understanding of the findings but also provides a solid foundation for drawing meaningful conclusions and implications for the Digital Library of Malay Manuscripts project.

No	Theme	Sub-theme	Interview transcript
1.	The challenge of developing a shared understanding of the need for change	<p>The conceptual level: convey information, knowledge and ideas to users.</p> <p>The preservation level: made accessible for future use.</p>	<p>“Without a doubt, manuscripts are a crucial part of comprehending a country's intellectual and cultural legacy. It exhibits perspectives on literature, history, religion Islamic teachings, medicine, court practises, and beliefs that reflect the Malays' strong cultural heritage and high level of intellectual achievement. I believe users aware about this.” – Informer 1</p> <p>“When trying to interpret and get meaning from digital texts, users must rely on their own social and cultural histories, linguistic abilities, and the surrounding context.” – Informer 9</p> <p>“In my view, digitization concept is the latest trend. The purpose of DL is to make it easier for users to access Malay manuscripts. Traditionally, if we want to access manuscripts, we have to go to the library for example manuscript in Leiden. After that, we also have to go through the bureaucracy with strict control. It is one of the efforts to facilitate users in accessing the manuscripts. The British Library, Leiden university and National Centre of Malay Manuscripts are digitizing the manuscripts collection” – Informer 2</p>
2.	Strategic decision-making	Supports the organization's mission	<p>“It is really important because top management is the policy maker. For example, regarding the issue of users downloading digitized manuscripts, full pages/half pages/10 pages, it is a starting point for upper management to understand the importance of Malay manuscripts.” – Informer 2</p>
	User Experience and Satisfaction	User-centric approach	<p>“Of course. we will make sure that digital library's plan, functionality, and services are matched to user demands, likings, and goals.” – Informer 6</p> <p>“We must make sure that the design, functionality, and services of our digital library are customised to match our user needs, preferences, and objectives thanks to this user-centric approach.” – Informer 10</p>
3.	Budget allocation	Comprehensive Cost Assessment	<p>“We have management provisions. Employee salary for the department that manages digitization. Human factor. For our machines there is provision for maintenance.” – Informer 6</p>
		Technology Infrastructure and External Partnerships & Collaborations	<p>“We get allocations from the ministry. Enrich digital content in-house from Budget Management (ABM). It is for the purchase of technology infrastructure for example hardware, software, storage systems, and networking capabilities.” – Informer 3</p>

	Cost Reductions And Operational	Workflow Automation	<p>“When developing a budget for the technology infrastructure, it is important to take into consideration the scalability, dependability, and security requirements.” – Informer 9</p> <p>“My view, the ability to automate processes and workflows is a major benefit of digitization, as it allows for greater efficiency and lower manpower costs. Tasks such as metadata creation, indexing, and file organization can be automated, freeing up staff time for more value-added activities.” – Informer 12</p>
	Preservation of Documentary Resources	Preservation challenges	<p>“When compared to the preservation of tangible objects, digital documentary resources provide their own distinct set of issues. In order to maintain accessible over the long term, digital content needs to be actively managed, backed up on a regular basis, and migrated to other formats or platforms.” – Informer 8</p>
	The rapid and constant changes in devices and technological aspects relevant to electronic information	Advancements in digitization technology	<p>“We use the latest digitizing machines. Many suppliers do not come to Malaysia because it is expensive so far the only supplier that works, eg Zeutsel. There are small/large machines. The highest end is Zeutsel. Our flatbed is used for books. Some have no edge. It can scan up to the spine. In terms of resolution, the flatbed is clear so far. We can't afford to buy another one. – Informer 4</p>

3.1 Factors Affecting Social Landscape

There were three factors identified which affected social landscape and these were as follows: 1) the challenge of developing a shared understanding of the need for change; 2) the need to ensure that there is a safeguard valuable cultural artefacts, documents, and other historical materials; 3) identifying risk management strategy. Indeed, the implementation of digital libraries (DL) is influenced by social factors. As mentioned by Webb (2002), digital documents have two levels of significance: the conceptual level, where they hold meaning for human beings, and the preservation level, where essential elements must be maintained to ensure future access to the essence of each document.

At the conceptual level, digital documents are created to convey information, knowledge, and ideas to users. The understanding and interpretation of these documents are inherently social activities, as they involve human perception, cognition, and interaction. Users rely on their social and cultural backgrounds, language skills, and context to comprehend and derive meaning from digital documents. Thus, the successful implementation of DL requires considering the social aspects of how users interact with and understand digital content.

“Without a doubt, manuscripts are a crucial part of comprehending a country's intellectual and cultural legacy. It exhibits perspectives on literature, history, religion Islamic

teachings, medicine, court practises, and beliefs that reflect the Malays' strong cultural heritage and high level of intellectual achievement. I believe users aware about this.” – Informer 1

“When trying to interpret and get meaning from digital texts, users must rely on their own social and cultural histories, linguistic abilities, and the surrounding context.” – Informer 9

At the preservation level, digital documents need to be retained and made accessible for future use. This process involves preserving not only the content itself but also the essential elements that enable its interpretation and understanding. These elements may include metadata, context, relationships, and other contextual information that contribute to the overall meaning and significance of the digital document. Preserving these social components is crucial to ensuring that future users can access and comprehend the essence of the documents.

“In my view, digitization concept is the latest trend. The purpose of DL is to make it easier for users to access Malay manuscripts. Traditionally, if we want to access manuscripts, we have to go to the library for example manuscript in Leiden. After that, we also have to go through the bureaucracy with strict control. It is one of the efforts to facilitate users in accessing the manuscripts. The British Library, Leiden university and National Centre of Malay Manuscripts are digitizing the manuscripts collection” – Informer 2

3.2 Factors Affecting recognition and understanding of top management within an organization

There were five factors identified which affected the recognition and understanding of top management within an organization and these were as follows: 1) issues concerning strategic decision-making; 2) user experience and satisfaction; 3) the understanding of top management regarding the significance of the digital library function plays a crucial role in resource allocation; 4) integration with organizational activities and workflows, and lastly 5) empowers them to become advocates and promoters of the digital library both within the organization and externally

Strategic decision-making ensures that the goals and objectives of the digital library function align with the overall strategic direction of the organization. Top management identifies how the digital library supports the organization's mission, vision, and strategic priorities. This alignment ensures that the digital library's activities and initiatives contribute directly to the organization's overarching goals.

“It is really important because top management is the policy maker. For example, regarding the issue of users downloading digitized manuscripts, full pages/half pages/10 pages, it is a starting point for upper management to understand the importance of Malay manuscripts.” – Informer 2

Recognizing the importance of digital library content shifts the focus towards the needs and expectations of users. Top management understands that users are key stakeholders and their satisfaction is crucial for the success of the digital library. This user-centric approach ensures that the design, functionality, and services of the digital library

are tailored to meet user needs, preferences, and goals. For example, one project manager, in particular, mentioned that their ultimate objective of a digital library is for the sake of user satisfaction.

“Of course. we will make sure that digital library’s plan, functionality, and services are matched to user demands, likings, and goals.” – Informer 6

“We must make sure that the design, functionality, and services of our digital library are customised to match our user needs, preferences, and objectives thanks to this user-centric approach.” – Informer 10

3.3 Factors Affecting economic consideration

There were three factors identified that affected economic consideration and these were as follows: 1) cost-benefit analysis to figure out if a digitization project is financially possible and what kind of effects it might have.; 2) the need to ensure that there is a comprehensive cost assessment ; 3) the need identify how to organise, plan and work across scalability and growth considerations; 4) the need to bring about significant cost reductions and operational efficiencies for organizations 5) the difficulty of funding opportunities without collaboration 6) the need to measure the ROI of these digitization project.

Beginning by conducting a thorough assessment of all costs associated with digitization. This includes not only the upfront costs such as equipment, software, and infrastructure but also ongoing expenses like staff training, metadata creation, quality control, and maintenance. Consider both direct costs (easily quantifiable) and indirect costs (e.g., staff time, opportunity costs).

“We have management provisions. Employee salary for the department that manages digitization. Human factor. For our machines there is provision for maintenance.” – Informer 6

Allocating budgets for the necessary technology infrastructure to support digitization activities. This includes hardware, software, storage systems, and networking capabilities. Considering the scalability, reliability, and security requirements when budgeting for technology infrastructure. As mentioned by one of the digitization managers in one of the information institution.

“We get allocations from the ministry. Enrich digital content in-house from Budget Management (ABM). It is for the purchase of technology infrastructure for example hardware, software, storage systems, and networking capabilities.” – Informer 3

“When developing a budget for the technology infrastructure, it is important to take into consideration the scalability, dependability, and security requirements.” – Informer 9

Digitization enables the automation of various processes and workflows, leading to increased efficiency and reduced labour costs. Automation makes it possible to free up staff time for higher-value operations such as the generation of metadata and indexes, as well as the organisation of files. Automation of workflows not only decreases the likelihood of making mistakes but also assures that digital transformation procedures are consistent.

“My view, the ability to automate processes and workflows is a major benefit of digitization, as it allows for greater efficiency and lower manpower costs. Tasks such as

metadata creation, indexing, and file organization can be automated, freeing up staff time for more value-added activities.” – Informer 12

Preserving digital documentary resources presents unique challenges compared to physical materials. Digital content requires active management, regular backups, and migration to new formats or platforms to ensure long-term accessibility. However, these preservation efforts are often overlooked or underfunded, leading to the loss of significant digital resources.

“When compared to the preservation of tangible objects, digital documentary resources provide their own distinct set of issues. In order to maintain accessible over the long term, digital content needs to be actively managed, backed up on a regular basis, and migrated to other formats or platforms.” – Informer 8

3.4 Factors Affecting Technology Landscape

There were seven factors identified which affected technology landscape and these were as follows: 1) the rapid and constant changes in devices and technological aspects relevant to electronic information; 2) the continuous evolution of media technology necessitates ongoing investments and costs for upgrading the digital infrastructure.; 3) identifying how to manage digital information; 4) the need to prioritize content-specific digital preservation strategies; 5) identifying data recovery, accessibility, and authenticity of digital content; 6) the need for storage system and 7) ensuring the security and integrity of digital collections.

The digitization industry relies on evolving technologies for scanning, imaging, and capturing various types of physical documents, such as books, manuscripts, photographs, and audiovisual materials. Technological advancements in hardware, software, and imaging techniques can improve the efficiency, speed, and quality of the digitization process.

“We use the latest digitizing machines. Many suppliers do not come to Malaysia because it is expensive so far the only supplier that works, eg Zeutschel. There are small/large machines. The highest end is Zeutschel. Our flatbed is used for books. Some have no edge. It can scan up to the spine. In terms of resolution, the flatbed is clear so far. We can't afford to buy another one. – Informer 4

Choosing appropriate digital formats and adhering to industry standards are essential in the digitization process. The selection of formats should consider factors such as file size, image quality, metadata standards, and long-term preservation requirements. Standardized formats and metadata practices facilitate interoperability and ensure the longevity and accessibility of digitized content.

“During the process of digitization, it is critical to select suitable digital formats and to adhere to the standards established by the industry. When choosing a format, it is important to take into account a variety of considerations, including file size, image quality, metadata standards, and the requirements for long-term preservation. Currently, we save digitized materials in pdf and jpeg format and they are stored in Network Access Storage (NAS) and DVD.” – Informer 3

Digital libraries often handle large volumes of data and require distributed processing capabilities to efficiently manage and process this information. ICT infrastructure, including powerful servers, distributed computing frameworks, and parallel processing systems, enables efficient data processing and analysis.

“In order to manage and analyse huge amounts of information effectively, digital libraries typically deal with large amounts of data, which necessitates the use of distributed processing capabilities.” – Informer 5

Metadata associated with preservation collections can include information about access restrictions, provenance, and the preservation actions taken. This metadata helps ensure the integrity of the records and provides an audit trail for tracking changes or access to the collections.

“The metadata that is associated with preservation collections includes information about access restrictions, provenance, and the preservation activities were performed to guarantee the integrity of the records. Additionally, the metadata provides an audit trail for tracking changes or access to the collections.” – Informer 7

By implementing these measures, librarians and preservation institutions strive to minimize the risk of accidental or mistaken loss of records and protect against unauthorized access, theft, destruction, or alteration. It's a continual process that requires vigilance, regular assessments, and adaptation to emerging security threats.

4 Conclusion

Through this study, it is obvious that the digital library field is a heterogeneous domain. The paper's findings and discovery are significant in highlighting the crucial elements which need to be addressed to ensure the sustainability and successful implementation of any digitization project. The findings of this paper contribute towards the dissemination of the new knowledge specifically in the management of digital preservation of documentary heritage available in Malaysia. Moreover, this study is very significant to professionals who are involved in archiving the digital documentary heritage as it can be a guide for managing risks in preserving the valuable digital resources. In the context of community, this study will also attempt to foreshadow the needs of community who are now conducting digital-based research that requires full-text analysis or large aggregations of “big data” (IFLA Rare Book and Special Collections Section, 2014).

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