

Challenges of digital preservation for library collections: literature review

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ABSTRACT

This study explores the main challenges in the digital preservation of library collections and utilises the DCC Curation Lifecycle Model to identify structural weaknesses. The method used in this study is a literature review approach by analyzing eight articles from 2013-2025 and obtained from the Scopus and Google Scholar databases. A literature review was carried out with keywords relating to digital preservation, library collections and preservation problems. The findings suggest that the demise of digital formats, the volatility of storage media, metadata inconsistencies, organizational challenges, legal issues, and the absence of digital curation skills among library staff are the main obstacles to sustainability of digital collections. Analysis of mapping with the DCC Curation Lifecycle Model shows that these challenges tend to occur at the Preservation Planning, Description and Representation Information, Curate and Preserve and Access, Use and Reuse stages, indicating that preservation issues are systemic and interrelated. The study shows that digital preservation should be taken up as an institutional process by strengthening the policies, developing human resource competency, building sustainable infrastructure, and legal management. In general, the results of the study confirm that digital preservation is an organisational mandate that must be carried out continuously through collaboration.

Keywords: digital preservation; challenges; library collection

ABSTRAK

Penelitian ini mengkaji tantangan utama dalam pelestarian digital koleksi perpustakaan dan memanfaatkan Model Siklus Hidup Kurasi DCC untuk mengidentifikasi kelemahan struktural. Metode yang digunakan dalam penelitian ini adalah pendekatan tinjauan pustaka dengan menganalisis delapan artikel dari tahun 2013 hingga 2025 yang diperoleh dari basis data Scopus dan Google Scholar. Tinjauan pustaka dilakukan dengan menggunakan kata kunci yang berkaitan dengan pelestarian digital, koleksi perpustakaan, dan masalah pelestarian. Temuan menunjukkan bahwa kemunduran format digital, ketidakstabilan media penyimpanan, ketidakkonsistenan metadata, tantangan organisasi, masalah hukum, dan kurangnya keterampilan kurasi digital di kalangan staf perpustakaan merupakan hambatan utama bagi keberlanjutan koleksi digital. Analisis pemetaan dengan Model Siklus Hidup Kurasi DCC menunjukkan bahwa tantangan-tantangan ini cenderung terjadi pada tahap Perencanaan Pelestarian, Deskripsi dan Representasi Informasi, Kurasi dan Pelestarian, serta Akses, Penggunaan, dan Pemanfaatan Kembali, yang mengindikasikan bahwa masalah pelestarian bersifat sistemik dan saling terkait. Penelitian ini menunjukkan bahwa pelestarian digital harus dijalankan sebagai proses kelembagaan dengan memperkuat kebijakan, mengembangkan kompetensi sumber daya manusia, membangun infrastruktur yang berkelanjutan, dan manajemen hukum. Secara umum, hasil studi ini menegaskan bahwa pelestarian digital merupakan mandat organisasi yang harus dilaksanakan secara berkelanjutan melalui kolaborasi.

Kata Kunci: Preservasi Digital; Tantangan; Koleksi Perpustakaan

A. INTRODUCTION

Nowadays, library collections change over time, as more and more items are susceptible to damage if they are not preserved and maintained. Data shows that there are collections that have been damaged due to a lack of maintenance. In this case, there are around 2,933 copies that have suffered minor or severe damage. This is caused by several factors, including human factors, biological factors, and the placement of collections (Sumarno 2019). Furthermore, Putra and Widya (2023) emphasise in their research that digital preservation is a form of effort to preserve the integrity of document content, where printed collections are fragile, and there are problems with storage media or tools in digital collections, thus requiring digital preservation by libraries. In addition, the findings of Aulia and Salim (2023) also state that digital preservation itself requires hardware and software that must be updated regularly, so this becomes a challenge that libraries must consider in the future. Therefore, implementing digital preservation itself is still a major consideration for libraries.

On the other hand, in terms of maintaining the collection itself, the factors causing damage to the collection itself are one of the things that must be considered. Inappropriate temperature and humidity can be factors that cause damage to digital collections (Fatmawati 2018). In addition, Zelinan et al. (2021) mention that factors such as biology, physics, chemistry, and damage by humans themselves often occur in printed collections because the materials are fragile. Other studies say that the factors causing damage to digital collections are vulnerability and obsolescence, and as time goes by, digital collections continue to grow, making their storage media vulnerable (Denanty et al. 2023). Therefore, it is important for libraries to carry out digital preservation activities to address these issues.

Indeed, digital preservation is considered very important because it can reduce the amount of damage to library collections. According to Safri (2020), digital preservation in libraries is an effort to preserve and maintain the content or documents so that they can be used for a relatively longer period of time. According to Cyntyawati, Ginting, and Suhartika (2023), digital preservation is not only carried out on printed collections but is also important for digital collections as an effort to preserve and maintain information so that it can be used for a long period of time. Nur Pramudyo and Perdani (2022) also explain that digital preservation activities are important for libraries to ensure the sustainability of their collections. Thus, it can be concluded that digital preservation is important for libraries to preserve and maintain information content for future information needs.

Certainly, digital preservation can not be separated from technology because it requires hardware and software for storage, but this has become a problem because the media used is not low-cost and requires maximum maintenance. There is research that states that the challenges of digital preservation are related to the age of storage media and the obsolescence of hardware, which only lasts about 10 years. There is also increasingly sophisticated technology that does not prevent data breaches, resulting in the spread of data security, and it is possible that device or media errors will cause digital collections to be lost (Cyntyawati, Ginting, and Suhartika 2023). Another study mentions that the maintenance of media used for digital collections is very expensive and much more difficult. This is due to several factors, such as an unstable environment and the fact that older media technology is certainly less competitive than newer developments or updates (Harahap et al. 2024). Likewise, Motai (2017) also explains that there are several problems that must be dealt with in digital preservation, including the limited availability of adequate infrastructure in various libraries (Makmur et al. 2024). It can also be

interpreted that in digital preservation, the most pressing challenges are that the devices or media used require high costs as well as large and durable storage.

On the other hand, previous studies have focused more on the challenges of digital preservation from various perspectives, such as technological limitations and storage media; they remain descriptive and focus on identifying challenges in isolation without linking them to the overall digital curation process. Consequently, there remains a limited understanding of how these various challenges arise and are interrelated at each stage of digital preservation. To address this gap, this study employs the DCC Lifecycle Model as an analytical framework. This model views digital preservation as a continuous process, as it positions digital preservation as a framework encompassing engagement ranging from technological aspects to resource management. Theoretically, the use of this model allows digital preservation challenges to be understood as part of an interconnected curation cycle, thereby helping to identify vulnerabilities that affect the sustainability of digital collections.

Based on this gap, this study seeks to answer the research question: How can digital preservation challenges in library collections be mapped using the DCC Lifecycle Model? Therefore, this study aims to identify and map digital preservation challenges in library collections using the DCC Lifecycle Model through a literature review approach. The uniqueness of this study lies in the use of the DCC Lifecycle Model as a framework for mapping digital preservation according to its lifecycle stages. Additionally, this study demonstrates the relevance of the DCC Lifecycle Model as an approach to understanding existing digital preservation challenges and examining how libraries can address them. By identifying gaps in the relevant literature linking digital preservation and its challenges, this study offers new insights that can be used to help libraries prepare for or address challenges that will arise from implementing digital preservation activities on their collections.

B. LITERATURE REVIEW

Library Collections

Library collections are a fundamental element of libraries that serve to meet the information needs of library users. According to Sentiana et al. (2025), a library collection is defined as a collection of library materials that are managed systematically, including the processes of acquisition, processing, storage, and provision of access so that libraries can meet the information needs of the community. In addition, the collection is the core resource that supports all service activities, ranging from education, teaching, research, to community service. Government Regulation No. 43 of 2007 concerning Libraries states that a library collection is all information in the form of written works, printed works, and recorded works in various media that have educational value, which are collected, processed, and served. Results from Ulfa et al. (2025) confirm that collections must be managed through cataloguing and classification so that collection management and access for library users can be carried out effectively and efficiently. In studies on Indonesian libraries, library collections are also viewed as a strategic component that must be in line with the vision and mission of the parent institution. The library's collection of materials must also provide benefits and be continuously used by library users. Therefore, its management must be aligned with the vision and mission of the parent institution (Santoso, 2021).

Library collections are generally divided into three main groups, including printed collections, non-printed collections, and digital collections. Print collections include general

collections, reference collections, periodical collections, and government publications (Wahyuni and Rahmah, 2012). Print collections remain the core of many libraries because of their tangible, stable nature and independence from specific reading devices. They also include reference collections such as encyclopedias, dictionaries, and handbooks. In addition to print collections, libraries also provide non-print collections that include image recordings (films, videos, microfilms), sound recordings (vinyl records, CDs), and data recordings (floppy disks, and online databases). The findings of Santoso (2021) note that digital collections are the easiest to serve because they can be accessed online and can be accessed anywhere and anytime. Digital collections can be in the form of e-books, e-journals, institutional repositories, or media conversions from printed collections.

The characteristics of a library collection make it important in supporting the sustainability of services. The main characteristics of a collection include relevance, completeness, currency, and cooperation as the basis for providing a collection that meets user needs (Wahyuni and Rahmah, 2012). The relevance of the subject matter is an indicator of whether the collection is able to respond to current information needs in accordance with the academic or social context of each library. Accessibility is also an important characteristic, because the collection must be processed and presented according to a specific system so that information can be easily retrieved (Santoso, 2021). In addition, longevity is an increasingly important characteristic because the longevity of a collection is closely related to preservation activities or long-term management actions, including media conversion to digital form as a strategy for saving information. Therefore, the library collections are the basis of the information services and must be well managed to ensure that they are available for future use. Libraries are confronted by greater challenges as digital collections expand in size and scope to ensure information remains accessible and sustainable in an era of change and new media technologies. Thus, digital preservation has become a key part of collection management and is necessary to ensure access and usability of digital resources, while preserving their relevance over time.

Digital Preservation

Digital preservation is the process of storing data in digital form to ensure the usefulness, durability, and integrity of the information contained therein can be accessed over a long period of time (Nwanapayi, 2016). The purpose of preservation in libraries is to protect valuable information so that it is easily accessible to current generations and can be useful in the future (Anyaku et al, 2019). In addition, according to Winastwan (2020), digitisation is part of preservation activities aimed at extending the lifespan of information. This shows that digitisation is a strong foundation for sustainable collection management. This concept is reinforced by research conducted by Pasqui (2024), which states that information institutions must develop methodologies, strategies, and techniques for long-term digital preservation to deal with the complexity of the ever-increasing volume of digital collections.

Digital preservation requires management that considers the entire life cycle of digital objects. Research by Zahara and Salim (2022) shows that digital archives have several vulnerabilities, ranging from bit rot, data corruption, and dependence on certain formats and technologies, which make proactive preservation planning necessary. This planning is important to ensure that access to and integrity of digital content are maintained alongside technological developments. For example, hardware and software must also be updated regularly so that digital files remain readable, recorded, and usable into the future.

The digital preservation process is carried out systematically to ensure that data can be accessed, used, and maintained throughout its life cycle. In this case, institutions often refer to conceptual frameworks such as the Digital Curation Centre (DCC) Lifecycle Model, which provides guidelines on the steps of digital data curation from creation, processing, storage, and maintenance. The DCC cycle includes continuous actions consisting of Preservation Planning, Community Watch and Participation, and Curate and Preserve. Meanwhile, the sequential actions follow a structured progression that includes Conceptualise, Create and Receive, Appraise and Select, Ingest, Preservation Action, Store, Access, Use and Reuse, and Transform (Higgins, 2008). The DCC Lifecycle Model consists of continuous actions that support the entire curation process and sequential actions that represent the lifecycle stages of digital objects.

Continuous Actions:

1. Preservation Planning: Plan for preservation throughout the curation lifecycle of digital material. This would include plans for management and administration of all curation lifecycle actions (Higgins, 2008).
2. Community Watch and Participation: Maintain a watch on appropriate community activities, and participate in the development of shared standards, tools and suitable software (Higgins, 2008).
3. Curate and Preserve: Be aware of, and undertake management and administrative actions planned to promote curation and preservation throughout the curation lifecycle (Higgins, 2008).

Sequential Actions:

1. Conceptualise: which is the process of creating digital data that includes selecting file formats, metadata standards, and long-term preservation. If data is incompatible, it risks digital obsolescence, making the challenges even more complex, particularly given the diversity of data formats (Rhee, 2024).
2. Create and Receive: involves the creation or receipt of digital data along with its metadata, where the primary challenge lies in the quality of the metadata (Rhee, 2024).
3. Appraise and Select: involves determining whether data is suitable for preservation. The main challenge at this stage is errors in the selection process, which can lead to the automatic loss of important information (Rhee, 2024).
4. Ingest: involves inputting data into a digital repository, which includes checking metadata and data validity. This stage is critical because any errors can corrupt the existing data (Rhee, 2024).
5. Preservation Action: this stage aims to ensure the continued digital accessibility of the data objects; the primary challenge here is the rapid pace of technological change (Rhee, 2024).
6. Store: this phase is no longer viewed merely as a storage activity but has become an integral part of a continuous data management system. This storage not only ensures data security and integrity but also ensures the data's readiness for reuse in various contexts (Rhee, 2024).
7. Access, Use, and Reuse: ensures that the digital data remains usable and accessible in the future. The challenges in this stage include methods of access and technological changes (Rhee, 2024).

8. Transform: considered a key indicator that the data lifecycle is constantly evolving. This is evident in the fact that transformation involves not only changing data formats but also encompasses other processes such as integration, reinterpretation, and the creation of new data from old data (Rhee, 2024).

The DCC Curation Lifecycle Model shows that digital preservation is an ongoing and linked process beyond just the preservation of a digital object. The model illustrates that the sustainability of digital collections relies on the effective planning, metadata management, preservation activities, and long-term access strategies. Thus, the DCC model can be used as a meaningful analytical tool to understand the problem of preservation as it occurs throughout the various phases of the DCC lifecycle and affects the access to digital resources in the long term.

C. RESEARCH METHOD

The method used in this study was a literature review. Setiyatna and Melati (2021) explain that a literature review is a research technique in which researchers collect information from various literature relevant to the topic being studied (Parangu et al. 2025). Literature study is an important step after a researcher has determined the research topic. The next step is to conduct a review related to the theory of the research topic (Sutri and Zulminiati 2020 in Dewi and Pranoto 2024). The databases searched were Scopus and Google Scholar because both databases have a proven reputation and wide coverage, and the literature obtained is reliable. The keywords used were (“Digital preservation”) AND (“Library collections” OR “libraries” OR “Library”) AND (“Challenges” OR ‘Barriers’ OR “Issues”) and also using keywords in Indonesian "Preservasi digital" AND "Tantangan OR Permasalahan" AND "Perpustakaan OR Koleksi Perpustakaan" with a year range from 2013 to 2025 and document type set to articles with the languages used including English and Indonesian. The use of these keywords will help specify the article in accordance with the research topic. In addition, the use of these predetermined keywords serves to narrow the scope of the research so that it remains focused and more concentrated on the main topic of discussion. The time period limit used has a range of ± 10 years, which, according to Wang et al. (2023), is considered a realistic standard with broad coverage of developments in the selected topic. A total of 8 articles were obtained from Scopus and Google Scholar for review. One item is sourced from Scopus, while the remaining seven were located on Google Scholar. All eight articles met the criteria and were consistent with the specified keywords. The focus of this literature review is on the challenges of digital preservation in libraries, as identified through searches conducted on Scopus and Google Scholar. Scopus and Google Scholar were selected as the primary data sources because they enforce strict citation standards. The reputation of these two databases ensures that they present scientific articles with a higher level of validity than other databases. The results of this study will be conceptual in nature and aim to provide a mapping of discourse and recommendations based on theory and practice that have been documented in academic literature (Parangu et al. 2025).

D. RESULTS AND DISCUSSION

Based on articles searched using the specified keywords, there were eight articles with relevant titles. These eight articles will be analysed to identify gaps between articles that will be used as literature studies. The results of the analysis can be seen in Table 1.

Table 1. Data analysis results

No.	Title	Author	Year	Challenges of Digital Preservation
1.	Digital Preservation: Issues And Challenges On Libraries And Information Resource Centres In India	Velmurugan.C	2013	In this case, the challenge of digital preservation is more about depending on technology for a long period of time, the diversity of file formats and styles, and the considerable storage capacity of media, which will inevitably become obsolete over time. These issues will certainly prevent data or collections from surviving for a long time.
2.	Challenges of Digital Preservation in the 21st Century: The Case of Nimbe-Adedipe Library, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria	Wasiu O. LAWAL	2018	This study explains that the increase in digital information data requires devices that can be used for a long period of time. The challenges mentioned include limited funding for infrastructure, failure to maximize digital preservation policies, and laws on data collection licenses. Other challenges include outdated technology and unstable internet networks.
3.	Perpustakaan Digital “Isu Preservasi Digital” Alasan, Proses dan Tantangan Ke depan	Sumarni dan Lailatur Rahmi	2018	The main challenges in digital preservation include dependence on long-term investment, the risk of technology becoming obsolete due to rapid change, and the lack of mechanisms for migration and continuous updating. In addition, the digital literacy gap and the low level of institutional readiness in designing sustainable preservation strategies further reduce the effectiveness of efforts to preserve digital collections.
4.	Digital Preservation, Issues and Their Strategies for Libraries: A Modern Era	Sunatkari Nilesh and Sharmila Verma	2021	Challenges in digital preservation include the durability of technological devices as technology evolves, the existence of regulations related to long-term data storage licenses, the lack of digital preservation policies or protocols, and limited funds for infrastructure.
5.	Strategies for Overcoming Challenges in Digital Preservation of Electronic Theses and Dissertations in Public University Libraries in South-East Nigeria	Jerry Eyerinmene Friday, Monica Eberechukwu Eze	2022	This finding reveals that digital preservation challenges include the absence of adequate policy frameworks and institutional standards, insufficient funding to support long-term preservation cycles, and limited human resources with relevant technical expertise. In addition, the lack of metadata and representational documentation necessary to ensure sustainable access, as well as storage infrastructure that does not yet support continuous digital curation practices, further weakens the effectiveness of digital collection preservation activities.

6.	Digital Preservation and Conservation of Library Collections in the Digital Age: Issues and Challenges	Dr. Ravish Verma and Dr. Amit Kumar Sharma	2023	The challenges in digital preservation include the risk of media damage and hardware failure, inconsistent metadata standards that hinder interoperability, and limited funding that hinders the development of preservation infrastructure. The lack of experts with relevant technical competencies and legal barriers, including copyright issues that limit long-term access and format migration processes, further complicate efforts to sustainably preserve digital collections.
7.	Strategi Dan Tantangan Preservasi Digital Di Perpustakaan	Ni Ketut Nila Cyntyawati , Richard Togaranta Ginting , I Putu Suhartika	2023	Challenges in digital preservation include an imbalance between the pace of technological development and the ability of institutions to keep up, the absence of a layered storage system that ensures data redundancy, and a lack of technical documentation needed to support the long-term curation process. In addition, limited human resources, risks to data integrity, and various policy and regulatory barriers that affect access and sustainability of preservation are also major obstacles.
8.	Digital Preservation Challenges in the Era of Big Data: Strategies for Long-term Information Storage in Libraries	Ubogu, Justice Onyekachi , Obinna C. Ejimonye , ObioraChukwuemeka Hubert-Nwangwu , Ugochukwu C. Ekeh and Ijantiku, Charles Moses	2023	This article focuses on the challenges faced by libraries in preserving their collections. Some of the challenges mentioned include the surge in data as technology advances, requiring storage media with adequate capacity; the diversity of data, with file formats requiring special care; the obsolescence of technology over time; and issues surrounding the law and ethics of stored data collections.

The challenges of digital preservation in libraries reveal systemic and interrelated problems. Various studies show that the root of the problem lies in the unpreparedness of institutions to view digital preservation as a continuous process that requires simultaneous planning, infrastructure, policies, and competencies. Research by Sumarni and Rahmi (2018) confirms that digital preservation requires long-term investment, because without a consistent migration and technology update strategy, digital collections will be vulnerable to technological obsolescence. The rapid pace of technological change causes hardware, software, and file formats to lose compatibility, threatening the accessibility of collections even though they are still physically stored. This vulnerability is exacerbated by low digital literacy and technological gaps in many regions, which cause digitisation to proceed unevenly, with institutions' readiness to manage the results of digitisation sustainably.

These technical issues are compounded by organisational weaknesses that undermine digital preservation. Research by Friday and Eze (2022) shows that libraries face serious obstacles in the form of a lack of preservation policies, technical standards, and implementation guidelines. Insufficient funding and secondary storage infrastructure indicate that many

institutions still treat digitisation as a one-time project rather than a long-term commitment. The lack of training programs and the absence of a professional competency development ecosystem also create a skills gap among librarians, making institutions dependent on external vendors and unable to manage digital risks independently. Similar problems were found by Verma and Sharma (2023), who added the dimensions of legal and ethical risks in digital preservation. In addition to device failure and storage media vulnerabilities, such as hardware failure and media fragility, copyright barriers and unclear access policies make it difficult for institutions to provide long-term access to users. In the absence of clear national standards or institutional guidelines, libraries are caught between the need to preserve information and the legal obligation to restrict access.

Other research by Cyntyawati et al. (2023) reinforces this by highlighting that institutions are often unprepared for rapid technological developments. Many digital devices and applications become obsolete before libraries have had time to develop format migration strategies or consistent metadata standards. This unpreparedness is exacerbated by weak layered storage systems and the absence of technical documentation mechanisms, thereby increasing the risk of information loss. This is in line with the findings of Nilesh and Verma (2021), which state that the obsolescence of the devices used will make data or collections increasingly difficult to access in the future. On the other hand, legal barriers such as copyright and access restrictions reveal a fundamental tension between the goal of digital preservation to ensure long-term access and regulations that limit the use of digital collections.

In addition, research by Ubogu et al. (2023) emphasises the data explosion that hinders libraries from conducting digital preservation. The challenge of concern is that the surge in data volume continues to increase, making storage media and infrastructure capacity inadequate. A similar situation occurred at the Nimbe-Adedipe Library, which was also related to inadequate infrastructure (Lawal 2018). In addition, technological obsolescence is also a serious challenge because hardware, software, and file formats quickly become obsolete, meaning that data may not be accessible or reusable in the future. Obsolete technology makes data difficult to access and allows important data to be lost (Velmurugan, 2013). Furthermore, hacking of the system has caused a lot of important data to be lost, which will further hinder libraries in their efforts to preserve their collections in the long term. This shows that digital preservation needs to be carefully prepared so that collection preservation can be maintained without obstacles. In line with the DCC Lifecycle Model framework, these challenges can be overcome if libraries respond quickly in accordance with their stages or policies.

These challenges indicate widespread failures in the DCC Lifecycle Model, showing that digital preservation failures are localised at several critical points in the curation cycle. The absence of migration policies, standards, and strategies indicates weak Preservation Planning. The lack of metadata, representational documentation, and technical guidelines reflects disruptions in the Description and Representation Information stage, causing digital objects to lose context and become difficult to display in the long term. Funding constraints, human resource capacity, and weak governance indicate that the Curate and Preserve and Community Watch & Participation stages are not running optimally, as organisations have failed to build the infrastructure and competencies necessary for sustainable collection preservation. Meanwhile, copyright barriers indicate disruptions in the Access, Use, and Reuse stage, which limit the library's ability to provide long-term access to digital materials. Thus, this confirms that digital preservation is a holistic process that requires simultaneous intervention in aspects of planning, technology, human resource competencies, legal policies, and access management. The

challenges that arise in various studies are symptoms of an immature digital preservation ecosystem. Therefore, an integrated approach based on the DCC Curation Lifecycle Model is needed to ensure that all stages of curation are carried out consistently and sustainably.

E. CONCLUSION

The digital preservation of library collections faces challenges that are far more complex than simply storing files. Based on the overall findings, it appears that the core of this issue lies in the institutions' lack of readiness to establish a sustainable digital curation ecosystem. Theoretically, this study contributes to the development of digital preservation research by demonstrating that these various challenges can be systematically mapped through the DCC Life Cycle Model at the stages of Preservation Planning, Description and Information Representation, Curation and Preservation, as well as Access, Use, and Reuse. Practically, this study underscores the importance of developing integrated digital preservation strategies through the formulation of institutional policies, sustainable metadata management, strengthening of technological infrastructure, compliance with regulations and copyright laws, and enhancing the competencies of librarians. These efforts are necessary to ensure the long-term accessibility, authenticity, and sustainability of digital collections. Therefore, the success of digital preservation depends on an institution's readiness to establish organizational, technical, and policy foundations aligned with the principles of long-term digital curation. Further studies on the implementation of the DCC Life Cycle Model across various types of libraries in Indonesia, as well as studies on the effectiveness of policies, the use of metadata for preservation, and digital preservation competencies, are highly recommended for future research.

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