



## Optimizing electronic arc ICT-Based Optimization of Electronic Archive Management to Strengthen Educational SDGs Implementation

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### ABSTRACT (Bold, TNR 10)

The rapid advancement of information and communication technology (ICT) has fundamentally transformed archival management practices within educational institutions. This study aims to examine the optimization of electronic archive systems in enhancing administrative efficiency and strengthening educational governance. Employing a qualitative approach based on an extensive literature review, the study critically analyzes key concepts, system frameworks, and regulatory dimensions associated with the implementation of electronic archival systems. The findings indicate a significant transition from conventional manual record-keeping to integrated digital systems, resulting in improved data accessibility, operational transparency, and long-term sustainability of institutional records. Such transformation is essential, as effective electronic archive management not only enhances institutional responsiveness and decision-making processes but also aligns with the evolving demands of modern education systems. Furthermore, the adoption of ICT-driven archival practices contributes to the development of digital literacy among stakeholders, ensures secure and continuous access to academic records, and supports broader institutional accountability. Importantly, these advancements are closely linked to the achievement of the Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education), which emphasizes inclusive and equitable education, and Goal 16 (Peace, Justice, and Strong Institutions), which highlights the importance of transparent, accountable, and effective governance. In this context, the integration of electronic archive systems serves as a strategic mechanism for fostering innovation, improving service delivery, and strengthening institutional resilience. Therefore, educational organizations are required to adopt proactive and adaptive strategies in leveraging ICT to remain relevant, competitive, and sustainable in an increasingly digital and data-driven environment.

**Keywords:** Electronic Archives; ICT Optimization; Educational Governance; Digital Transformation; SDGs

### Article history

Received:

date 18/01/2026

Revised:

date 13/04/2026

Accepted:

date 25/04/2026

Published:

date 30/04/2026

**Citation (APA Style):** *Rahmda Efendi et al. (2026). Optimizing electronic arc ICT-Based Optimization of Electronic Archive Management to Strengthen Educational SDGs Implementation. Journal of Comparative Education Nexus, 1(1), pp.14–7. DOI: <https://doi.org/10.24667/jcen.v1i1.26>*

## 1 INTRODUCTION

The optimization of electronic archive management has become a crucial element of institutional governance in the digital era, as archives function as repositories of institutional memory that support administrative, legal, and strategic decision-making. With the rapid advancement of information and communication technology (ICT), traditional manual archiving systems have progressively shifted toward electronic formats, enabling faster access, remote retrieval, and improved efficiency. This transition represents not only a technological upgrade but also a paradigm shift in how organizations—particularly in the education sector—manage documentation in a more integrated and sustainable manner. Consequently, the role of ICT in institutional systems has been widely discussed in recent

studies (Abdulmuhsin et al., 2025; Arciosa, 2022; Bolaji & Ajia, 2023; Dwiana et al., 2022; Gbadeyanka et al., 2024; Ibarrientos, 2024; Ibrahim et al., 2025; Wanjara & Ogembo, 2024). In this context, electronic archives enhance traceability, data security, and lifecycle management while supporting transparency and real-time access to information (Hakim, 2025).

Previous research has examined electronic archives from technical, legal, and organizational perspectives. The shift from manual to digital systems has been emphasized due to inefficiencies and vulnerabilities associated with physical records (Sutirman, 2015), while challenges related to long-term digital storage and preservation remain significant (Berisha, 2025). Legal considerations, including the authenticity and admissibility of electronic records, have also been highlighted. International institutions such as the National Archives and Records Administration (NARA) and the Australian Archives define electronic archives as machine-readable records created and maintained through digital technologies, serving both as documentation and legal evidence of institutional activities. Despite these advancements, barriers such as limited infrastructure, insufficient digital competencies, and organizational resistance persist, particularly in educational institutions (Syafitri, 2025).

This study aims to analyze the optimization of ICT-based electronic archive management to enhance institutional performance in the education sector. The concept of electronic archives encompasses records created, processed, and stored using digital technologies, whether born digital or digitized from physical formats, and designed for long-term preservation and accessibility (Berisha, 2025). In Indonesia, this concept aligns with global perspectives and is reinforced by legal frameworks such as ITE Law No. 11 of 2008, which recognizes digital documents as valid legal evidence. Furthermore, electronic archive management offers significant advantages, including improved accessibility, reduced physical storage, and systematic lifecycle management—from creation to disposal—ensuring accountability and consistency. By integrating these theoretical and practical foundations, this study contributes to strengthening digital transformation in education, supporting institutional efficiency, digital literacy, and the achievement of Sustainable Development Goals (SDGs), particularly Goal 4 and Goal 16.



Figure 1. Electronic Archive Life Cycle

To compare these processes with conventional archiving, Table 1 presents the distinctions between the life cycles of electronic and manual archives.

**Table 1.** The comparison of electronic archive life cycle and conventional archive

| Stage                    | Electronic Archive                           | Conventional Archive                |
|--------------------------|----------------------------------------------|-------------------------------------|
| 1. Creation              | Creating (digital format)                    | Creating (physical documents)       |
| 2. Storage & Rediscovery | Digital storage and metadata-based retrieval | Manual storage and physical search  |
| 3. Manipulation          | Editable with software tools                 | Physical annotation or copying      |
| 4. Distribution          | Instant sharing via network or email         | Manual duplication or hand delivery |
| 5. Depreciation          | Digital deletion or migration                | Physical disposal or destruction    |

Electronic archives streamline organizational processes by integrating stages such as creation, storage, and distribution into unified digital workflows, thereby enhancing efficiency while simultaneously introducing new complexities, particularly regarding authenticity and legal validity due to the absence of physical evidence, which often leads institutions to still prioritize manual verification methods. The transition from paper-based to digital systems also demands strong institutional capacity, including policy readiness, infrastructure, and digital literacy, alongside robust security measures to mitigate risks such as data corruption, cyber threats, and technological obsolescence (Syafitri, 2025). A major challenge arises when digital transformation is treated merely as a technical shift, resulting in fragmented implementation and neglect of managerial, human, and ethical dimensions, thus requiring a comprehensive understanding of the electronic records lifecycle supported by continuous capacity building (Rifauddin, 2026). In this context, information and communication technology (ICT) plays a transformative role, reshaping work processes, communication patterns, efficiency perceptions, and knowledge management practices, while enabling flexible deployment of archive systems across institutional scales (Berisha, 2025). Furthermore, the emergence of multimedia and non-textual records introduces additional complexities in preservation and management, necessitating advanced strategies and strong regulatory frameworks to ensure integrity and accessibility. Therefore, electronic archive management must be understood as an integral part of a broader technological ecosystem, where balancing opportunities and challenges of ICT integration is essential for achieving institutional effectiveness, particularly in education and public service sectors.

## **2 METHOD**

This study employed a qualitative approach through a literature-based analysis to explore the optimization of electronic archive management in the context of ICT. The methodological approach followed the procedures outlined by Susilawati et al. (2025). Rather than collecting primary data, the study analyzed and synthesized existing theoretical frameworks, regulatory instruments, and research findings related to the management of digital archives. This method was selected because it allows for a comprehensive understanding of complex, interdisciplinary themes such as digital transformation, legal frameworks, institutional readiness, and educational governance.

Sources reviewed included academic journal articles, government regulations, digital archive standards, and institutional reports from both national and international bodies. The data collection technique was drawn from the previous studies (Al Husaeni & Nandiyanto, 2022; Al Husaeni & Al Husaeni, 2022; Rochman et al., 2024). Key references such as Law No. 11 of 2008 concerning Electronic Information and Transactions, Law No. 43 of 2009 concerning Archiving, and various guidelines from archival authorities like NARA and ARMA were used to frame the legal and technical foundations of electronic archive systems. The study also considered empirical observations from prior studies on the effectiveness and limitations of electronic archive systems in various institutional settings, especially within education and public administration.

The analysis was structured thematically, focusing on three core dimensions: (i) conceptual foundations of electronic archives, (ii) managerial and institutional practices in digital archiving, and (iii) the role of ICT in enhancing archive system efficiency and compliance. Through this structure, the study aimed to draw conclusions about best practices and propose strategies for effective implementation in educational institutions. By grounding discussion in documented experiences and regulatory insights, this method provides a robust basis for understanding how ICT can be leveraged to optimize archival functions in support of SDGs, particularly in advancing quality education and institutional integrity.

### **3 FINDINGS AND DISCUSSION**

#### **3.1 Shifting paradigms in archive management**

The transformation of archive management from manual to electronic formats represents a major shift in how organizations preserve, access, and utilize information. This shift has been driven primarily by advancements in ICT, which offer efficiency, accessibility, and security that traditional archiving methods lack. Institutions, particularly in the education sector, rely heavily on accurate documentation for decision-making, legal compliance, and knowledge continuity. Manual archive systems, characterized by physical storage, require significant space and are vulnerable to degradation, disasters, and mismanagement. As a result, electronic archives have emerged as a strategic response to overcome the limitations of manual systems and align with digital transformation initiatives across sectors.

In contrast to traditional archives, electronic records are dynamic and non-material. They require digital infrastructure and specific technical knowledge for their creation, management, and preservation. The change is not merely about format but reflects a broader paradigm shift in institutional governance and administrative culture. The adoption of digital archiving systems requires not only investment in technology but also a rethinking of roles, workflows, and compliance mechanisms. Institutions that fail to modernize their archive management risk inefficiency, information loss, and reputational harm, especially in an era where transparency and data-driven governance are increasingly expected.

To understand how digital archives operate over time, we refer to Figure 1 shown previously, which presents the life cycle of electronic archives. The figure illustrates five core stages: creation, storage and rediscovery, manipulation, distribution, and depreciation. These stages emphasize the need for systematic processes in managing digital records, from their inception to eventual disposal. Unlike manual records, which may remain physically intact regardless of use, electronic archives require active maintenance and periodic migration to preserve accessibility and format integrity.

The shift to digital archiving has also influenced how institutions perceive efficiency and accountability. Information that once required days or weeks to retrieve from physical storage can now be accessed within seconds through keyword searches or automated indexing. This efficiency translates into quicker decision-making, streamlined communication, and improved service delivery, particularly relevant for educational institutions that manage diverse records such as student transcripts, academic calendars, curriculum documents, and research outputs.

#### **3.2 Benefits and challenges of electronic archive systems**

The adoption of electronic archive systems offers numerous benefits across operational, legal, and strategic domains. Institutions benefit from reduced storage needs, lower risks of physical degradation, and enhanced ability to share documents across departments or campuses. These systems enable automated backup, version control, and real-time synchronization, making them far superior to static, manual archives in dynamic organizational environments.

At the same time, the implementation of electronic archives introduces new challenges. One of the main concerns is the legal recognition of digital documents. Despite advances in digital signature technologies and regulatory frameworks such as Law No. 11 of 2008 on Electronic Information and Transactions, some institutions still prioritize physical signatures and wet stamps as authentic proof of documentation. This resistance reflects both cultural and procedural inertia that must be addressed through capacity-building and institutional policy reform.

In addition, electronic records are inherently fragile in ways that differ from paper-based archives. They are susceptible to file corruption, virus attacks, hardware failure, and format obsolescence. For example, a document saved in a proprietary software format may become unreadable if that software is discontinued or updated without backward compatibility. Therefore, digital preservation requires a proactive strategy, including format migration, system updates, and redundant storage solutions.

To better understand these differences, Table 1 as shown previously compares the life cycles of electronic and conventional archives. The table highlights structural differences in how records are handled across both systems. In manual archiving, creation and storage are distinct processes, often involving multiple staff and physical handovers. Distribution typically requires physical transfer or duplication, increasing time and risk. In contrast, electronic archiving systems often merge these stages through software platforms where creation automatically links to storage and indexing. Distribution becomes instantaneous, facilitated by email, intranet, or cloud services. However, this ease of use also contributes to information overload and raises concerns about record authenticity and redundancy.

The integration of electronic archive management into educational institutions has shown particular promise. Schools and universities, with their complex administrative needs, stand to benefit greatly from streamlined documentation processes. Digital systems support accreditation, data reporting, academic performance tracking, and student services—all of which rely on timely, accurate, and accessible documentation. However, successful implementation requires proper training, leadership commitment, and alignment with broader institutional digital transformation strategies.

### **3.3 Institutional capacity and legal frameworks**

Beyond technical considerations, the successful implementation of electronic archives is heavily dependent on institutional readiness and regulatory alignment. Archive systems function within legal frameworks that define the authenticity, validity, and security of records. In Indonesia, the foundation for electronic records management is established through Law No. 43 of 2009 on Archiving and Government Regulation No. 28 of 2012. These regulations emphasize that archives must be managed professionally, systematically, and following technological developments.

Despite these mandates, many institutions struggle with limited human resources and infrastructure. The transition from paper to digital archives demands expertise in digital literacy, information systems, and records governance. Archival managers must understand both archival theory and ICT practice to ensure that records remain accurate, accessible, and legally admissible. Moreover, compliance requires institutions to continuously monitor changes in legal standards, technological innovations, and user expectations.

Efforts to professionalize archive management must include targeted training, technical support, and institutional incentives. Regulatory agencies such as the National Archives of the Republic of Indonesia (ANRI) play a crucial role in providing guidance, standardization, and certification for digital archiving practices. Such institutional collaboration is necessary to ensure that electronic archives serve not just internal operational needs but also public accountability, knowledge preservation, and educational sustainability (Muhidin, 2016).

### **3.4 Digital literacy and human resource readiness**

One of the key factors influencing the success of electronic archive implementation is the digital literacy of institutional personnel. Archive management is no longer limited to filing and storing documents; it now requires understanding metadata structures, digital security protocols, and software navigation. Many educational institutions face challenges due to the digital skill gap among administrative staff, who are often unfamiliar with archive life cycles,



content indexing, and document retrieval systems. As a result, even with adequate technological infrastructure, electronic archive systems remain underutilized or inconsistently applied.

Human resource readiness goes beyond basic ICT skills. Effective electronic archive management involves knowledge of records appraisal, classification systems, retention scheduling, and legal compliance. Institutions must therefore invest in continuous professional development through workshops, certifications, and collaboration with archival authorities such as ANRI. This ensures that archive managers do not merely act as system operators but as information custodians who understand the ethical and legal implications of their work.

In educational contexts, this readiness is particularly urgent. Academic institutions manage a wide range of records—student databases, staff employment files, accreditation documents, learning materials, and research outputs. Mismanagement or data loss can disrupt academic operations, affect institutional credibility, and even result in legal consequences. Therefore, enhancing digital literacy among archive personnel directly contributes to institutional resilience and academic service quality.

### **3.5 Automation and system integration**

The next evolutionary step in archive management involves not just digitization but automation and integration. Digitizing archives refers to converting paper records into digital formats, while automation focuses on streamlining workflows such as classification, metadata generation, version tracking, and document disposal scheduling. Integration ensures that electronic archive systems are linked with other institutional systems, such as human resource information systems (HRIS), academic information systems (AIS), and financial management tools. This interconnectivity enhances efficiency, reduces redundancy, and supports informed decision-making.

In the context of education, integration can improve administrative turnaround times. For instance, when student academic records are linked with the university's accreditation reporting system, data retrieval becomes instantaneous, facilitating compliance with external audits. Automation also minimizes the margin for human error, especially in assigning document codes, applying retention rules, and generating reports. However, these advantages can only be realized if institutions invest in robust ICT platforms and ensure interoperability among systems.

Moreover, integrated electronic archive systems allow for centralized control and decentralized access. This means documents can be accessed by authorized personnel across campuses or departments, supporting collaboration without compromising data security. Access control, encryption, and audit trails are essential components that must be built into the system to protect institutional data and ensure regulatory compliance.

Automation and system integration also play a role in environmental sustainability. By reducing the use of paper, physical storage, and manual transportation of records, institutions contribute to more sustainable operational models. This aligns with broader educational goals that promote environmental responsibility and digital transformation in support of SDG 13 (Climate Action) and SDG 12 (Responsible Consumption and Production).

### **3.6 Educational impact and institutional sustainability**

Electronic archive management contributes directly to educational service quality. Accurate and accessible records enable schools and universities to serve students, faculty, and external stakeholders more effectively. Academic transcripts, course documentation, and faculty credentials can be retrieved in real-time, facilitating academic mobility, credential verification, and inter-institutional cooperation. These improvements enhance institutional

credibility and align with the goals of modern education systems that value transparency, agility, and accountability.

Educational institutions are also expected to model good governance and information ethics. Implementing reliable archive systems reflects a commitment to these values. Furthermore, digital archives support pedagogical innovation by preserving instructional materials, research data, and intellectual property in ways that are searchable, shareable, and reusable. This contributes to continuous learning and knowledge dissemination, strengthening the institution's academic culture.

From a governance perspective, archive optimization enables leaders to make evidence-based decisions. Strategic planning, budgeting, and policy formulation all require accurate documentation. When archives are fragmented, outdated, or inaccessible, decision-making becomes reactive and speculative. Conversely, a well-maintained electronic archive acts as a decision-support system, enhancing the institution's ability to navigate uncertainty and drive sustainable growth.

The long-term sustainability of educational institutions is also influenced by their capacity to preserve their intellectual assets. Archives serve as repositories of institutional memory, capturing achievements, lessons, and milestones. In the context of higher education, where institutional histories can span decades or centuries, digital archiving ensures that this legacy is not lost due to material degradation or administrative turnover.

## **4 Discussion**

### **4.1 Institutional transformation through archival innovation**

The transition to electronic archive systems often acts as a catalyst for broader institutional reform. When properly implemented, digital archiving does more than improve data handling; it transforms organizational culture, encourages policy development, and embeds digital competence as a core capacity. Educational institutions, in particular, experience institutional learning as they navigate the technical, legal, and behavioral dimensions of digital archive adoption.

Digital archive systems prompt institutions to reconsider how they define access, confidentiality, and record value. In manual systems, accessibility may be limited by location, staff availability, or physical deterioration. With electronic systems, institutions can adopt role-based access controls and standardized metadata to ensure both openness and protection. This transparency reinforces accountability, while protection protocols uphold privacy and legal compliance.

Furthermore, institutions are encouraged to define record management policies that span the entire document lifecycle, from creation to disposal. These policies must include digital preservation strategies, data recovery plans, and audit mechanisms. The presence of such policies reflects organizational maturity and supports institutional accreditation and compliance with national education standards.

The process of establishing digital archive systems also promotes inter-departmental collaboration. Archiving no longer falls solely under administrative offices but requires joint effort from IT units, academic staff, legal counsel, and institutional leaders. This cross-functional collaboration fosters an integrative approach to governance and capacity building. Moreover, universities and schools that digitize their archives often position themselves as forward-looking institutions committed to quality assurance, digital transformation, and service excellence.

### **4.2 Information ethics and regulatory compliance**

Ethical considerations are essential in the management of electronic archives, especially in

educational environments that handle sensitive and personal data. Issues such as consent, data ownership, document manipulation, and retention periods must be addressed with clarity and consistency. For instance, student records often contain confidential information that should only be accessed by authorized personnel. A failure to protect this data can result in privacy violations, legal sanctions, and reputational damage.

Compliance with legal standards is equally critical. In Indonesia, the legal framework for electronic information management is set by Law No. 11 of 2008 concerning Electronic Information and Transactions, and Law No. 43 of 2009 concerning Archiving. These laws mandate that digital documents must be treated with the same level of integrity and responsibility as their physical counterparts. Institutions are required to maintain accurate logs of document access and revisions, employ encryption and digital signatures, and ensure backup procedures are consistently followed.

An additional layer of regulation concerns document retention. Not all records need to be preserved indefinitely, archiving systems must incorporate retention schedules aligned with institutional and national policies. Some documents, such as financial reports or curriculum approvals, may be retained for a specified period, after which they must be archived offline or deleted to reduce digital clutter and comply with privacy regulations.

Information ethics also includes the right to information. Educational institutions are public service entities with an obligation to provide access to certain types of records for students, staff, and stakeholders. Balancing openness with protection requires well-designed access controls and clear communication protocols, ensuring that electronic archives contribute to both transparency and institutional integrity.

#### **4.3 The role of national archival institutions**

The optimization of electronic archive management cannot be undertaken in isolation by individual institutions. It requires the guidance, standardization, and oversight of national archival authorities. In Indonesia, the ANRI plays this crucial role by setting archival standards, providing technical assistance, and developing training programs for archivists. Through such coordination, ANRI ensures that institutions across sectors (including education) adopt consistent, lawful, and effective archiving practices.

ANRI also acts as a regulator that enforces compliance with national archival laws and evaluates the archival readiness of institutions. It provides templates for classification codes, retention schedules, and metadata standards that help institutions align with national policy. These efforts are essential in ensuring that archive systems are interoperable and that digital records from one institution can be understood, validated, and, if necessary, integrated by another.

Collaboration between ANRI and educational institutions extends to research and innovation. Through partnerships with universities, ANRI can co-develop software, conduct training for archival science students, and promote awareness of archive management as a professional field. Such synergy benefits both archival development and educational reform by embedding practical, real-world needs into academic curricula and institutional policy.

In addition, ANRI serves as a national memory repository. For educational institutions, this means that digital records such as historical enrollment data, accreditation results, and institutional reports may be preserved at a national level, ensuring long-term preservation beyond the lifespan of the institution itself. This supports public history, policy continuity, and intergenerational knowledge transfer.



#### **4.4 Anticipating future developments in archival technology**

The evolution of digital archives continues to be shaped by emerging technologies such as artificial intelligence (AI), cloud computing, and blockchain. These innovations offer potential for more intelligent document classification, automated metadata extraction, secure timestamping, and decentralized verification of document authenticity. While these tools are still in early stages of adoption in educational institutions, they hold significant promise (Yaman et al., 2022).

AI, for instance, can facilitate document recognition, categorize records based on content, and predict retention schedules using usage patterns. This reduces human error and increases processing speed. In educational contexts, this could support faster processing of student records, more responsive reporting to government bodies, and personalized information access for faculty and learners.

Cloud computing, already used in many universities, enables scalable storage and access from multiple devices and locations. This is especially useful for distance education models and satellite campuses that need centralized data access. However, cloud storage raises questions about data sovereignty, especially when servers are hosted outside national borders. Institutions must carefully consider legal implications and data protection policies before migrating entirely to cloud-based archive solutions.

Blockchain technology is increasingly explored for document authentication. With its decentralized ledger system, blockchain allows institutions to prove that a document has not been altered since its creation. This could be used for diploma verification, academic transcripts, or research publications, strengthening the credibility of educational records and reducing fraudulent claims (Yaman et al., 2022).

While promising, the adoption of these technologies should be approached strategically. Educational institutions must evaluate their technological readiness, human capacity, and regulatory alignment before integrating such tools. Additionally, collaboration with archival and IT professionals is necessary to translate these technologies into practical, sustainable applications.

#### **4.5 Integration of archival systems in educational curriculum**

Beyond its administrative and governance implications, electronic archive management offers pedagogical relevance that is often overlooked. Integrating archival literacy into the educational curriculum, particularly in fields such as information science, public administration, and educational management, prepares students to manage and evaluate institutional data effectively. As institutions adopt increasingly sophisticated systems, future graduates must possess competencies in digital documentation, metadata architecture, and legal compliance related to electronic records.

Archival education promotes not only technical proficiency but also ethical responsibility. Students trained in this area are more likely to understand the importance of transparency, traceability, and privacy in managing information. These values are essential not just in academic settings, but also in future workplaces across the public and private sectors. Thus, digital archiving becomes both a functional tool and a means of cultivating professional integrity.

Educational institutions that actively engage students in the archive system design or policy review can promote project-based learning and institutional development simultaneously. For example, students can participate in digitizing legacy records, evaluating software platforms, or mapping document flows across departments. This practical engagement reinforces academic learning while contributing to institutional goals. Moreover, as universities increasingly prioritize community engagement, digital archiving initiatives may

be extended to local governments or schools, creating opportunities for outreach and capacity sharing.

Embedding archive management within the curriculum also supports SDG 4 by expanding the scope of quality education to include digital and informational literacies. Such literacies are vital in the 21st century, where information is both an asset and a liability. Proper archival training ensures that graduates are equipped not only to consume information but also to protect, preserve, and ethically manage it (UNESCO, 2020).

#### **4.6 Overcoming institutional barriers to implementation**

Despite the growing awareness of the importance of electronic archives, many institutions continue to face structural and cultural barriers to full implementation. Resistance to change remains one of the most common obstacles. Staff accustomed to manual systems may be hesitant to adopt new technologies, fearing complexity, job displacement, or increased accountability. Addressing these concerns requires change management strategies, including stakeholder engagement, training, and gradual system integration (Muhidin, 2016; Syafitri, 2018).

Budget constraints also hinder implementation. High-quality electronic document management systems (EDMS), secure servers, and IT support staff require significant investment. Institutions must therefore prioritize archival transformation within broader digitalization agendas, ensuring adequate funding and policy support. This challenge is particularly acute in public institutions that rely on centralized budgeting and often face competing priorities.

Another key issue is the lack of national or regional interoperability frameworks. Even when individual institutions adopt digital systems, inconsistency in classification, metadata standards, and file formats limits the ability to share or migrate records. This problem undermines efforts to build a national education archive ecosystem and creates operational silos. Therefore, collaboration among educational institutions, government ministries, and archival authorities is essential to harmonize standards and promote sustainable implementation.

Legal uncertainty can also create hesitation. While laws such as the ITE Law provide foundational recognition for electronic documents, ambiguities remain regarding their evidentiary weight, especially in disputes or accreditation audits. This has led some institutions to duplicate archiving efforts (maintaining both paper and digital records, which defeats the purpose of efficiency and adds to the institutional burden. Clear guidelines, legal precedents, and regulatory assurance are needed to build confidence in digital-first or digital-only archiving models (Law Number 11 of 2008 on Electronic Information and Transactions, 2008; Law Number 43 of 2009 on Archiving, 2009).

#### **4.7 Toward a culture of documentation and sustainability**

The successful optimization of electronic archive systems ultimately depends not only on technology or policy but on cultivating a culture of documentation. In many educational institutions, documentation is treated as a routine or bureaucratic task, rather than a strategic resource. Changing this mindset requires sustained advocacy, leadership support, and clear demonstration of how archives contribute to institutional goals, such as accreditation success, administrative efficiency, and academic continuity.

When documentation is embedded into institutional routines and valued as intellectual capital, electronic archiving becomes more than a compliance mechanism. It becomes a dynamic platform for institutional learning, quality assurance, and strategic foresight. For example, longitudinal data on student performance, faculty development, or policy outcomes can inform future planning, research, and innovation. In this way, archives shift from being

static storage units to becoming active knowledge infrastructure (Rifauddin, 2016).

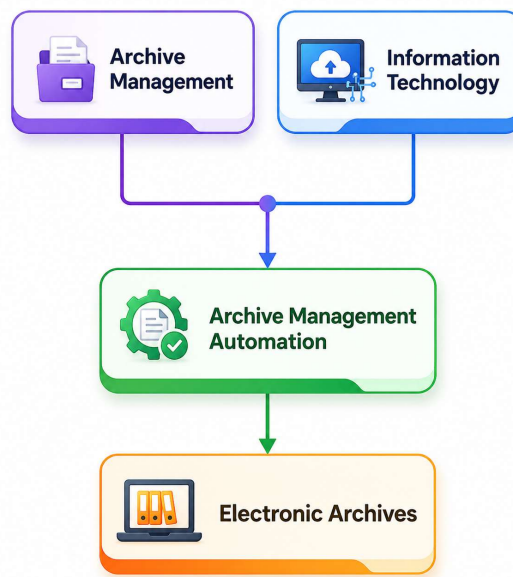
Moreover, embedding sustainability principles into archive management ensures that institutions remain adaptable in the face of technological, environmental, and societal changes. This includes not only reducing paper usage but also designing archival systems with scalability, resilience, and ethical use in mind. Sustainable archive systems minimize digital waste, respect data rights, and serve multiple generations of users. This aligns closely with the holistic vision of sustainability under the SDGs and positions education institutions as leaders in digital stewardship (UNESCO, 2020).

Optimizing electronic archive management through ICT is a multi-dimensional endeavor. It touches upon governance, pedagogy, ethics, technology, and sustainability. When approached strategically, digital archives can serve as the foundation for educational innovation and institutional resilience, ensuring that the past is preserved, the present is managed, and the future is anticipated.

#### 4.8 Supporting the Sustainable Development Goals (SDGs)

The optimization of electronic archive management through information and communication technology (ICT) directly supports several Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 16 (Peace, Justice, and Strong Institutions). In the context of SDG 4, reliable and well-organized archive systems ensure that educational processes, such as admissions, certification, curriculum documentation, and academic reporting, are handled efficiently and transparently. Institutions with structured digital records can better guarantee student rights, uphold academic integrity, and comply with educational standards (UNESCO, 2020).

To understand how ICT influences archival transformation within the SDG framework, we refer to Figure 2, which visualizes the progressive relationship between ICT platform development and institutional archive behavior. As technology advances, archival procedures shift from manual to digital handling, which in turn redefines how records are created, accessed, and preserved. The figure highlights the cascading impact of ICT on archival automation, access policy, data governance, and institutional adaptability. It reflects that effective digital archiving is not merely a technical upgrade but a structural shift that supports sustainable governance and equitable information access (Muhidin, 2016).



**Figure 2.** Influence of ICT Platform on Archive Management

Furthermore, electronic archive systems support SDG 16 by fostering institutional transparency, accountability, and legal compliance. Archives that are well-managed and digitized reduce the risk of data manipulation, document loss, and unauthorized access. They also facilitate audits, accreditation, and public access to information, key indicators of good governance in education. This transparency promotes trust among stakeholders, strengthens institutional credibility, and aligns with national and international policy frameworks (Law Number 11 of 2008 on Electronic Information and Transactions, 2008; Law Number 43 of 2009 on Archiving, 2009).

Additionally, digitized archives help reduce regional disparities by enabling remote access to records. Educational institutions in underserved or geographically isolated areas benefit from centralized, cloud-based archives that eliminate dependence on physical storage or in-person document handling. This contributes to SDG 10 (Reduced Inequalities) by improving digital inclusion and equitable access to institutional services across different regions.

In this way, optimizing electronic archives is not only about operational efficiency. It is about realizing a broader vision of sustainable, inclusive, and resilient education systems. Finally, this study adds new information regarding SDGs, as reported in Table 2.

## CONCLUSION

The optimization of electronic archive management through information and communication technology has become a crucial pillar in supporting institutional efficiency, transparency, and educational sustainability. This study has shown that digital archiving enhances data accessibility, legal compliance, and decision-making processes. Because electronic archives align with global standards and Sustainable Development Goals, particularly in education and governance, institutions must embrace digital transformation with strategic planning, professional capacity building, and ethical considerations. Ultimately, electronic archive systems are not just technical solutions but integral components of institutional resilience and long-term knowledge preservation.

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