Future of archives: The impact of computerization on archival development in Vietnam and experiences from Germany

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Preface

This dissertation is an original and independent work by the author under the supervision of PD. Dr. Detlef Briesen and Mag. Dr. Irmgard Christa Becker. Some of the results are discussed in Chapter II. Literature reviews were presented in the book's article: "*Changing Archives in the 21st Century: Navigating Digital Transformation"*. Archival Science and the Digital Transformation in Vietnam: Legal and Practical Issues for the 21st Century, Vietnam – Politics and Economics, Nomos Publishing, 2024, and "*Digital Transformation in the Archival Sector: Emergence and Some Development Trends*". Proceedings of the National Scientific Conference "Data and Archival Records Management in the Context of Digital Government Development in Vietnam", Vietnam National University Press, Hanoi, 2025. The data reported in Chapters V and VI were collected and synthesized by the author in accordance with the principles of good scientific practice, as outlined in the Statute of Justus Liebig University Giessen for Ensuring Good Scientific Practice.

Summary of the Dissertation

This study, "*Future of Archives: The Impact of Computerization on Archival Development in Vietnam and Experiences from Germany*," is an empirical investigation that examines how computerization reshapes archival development in Vietnam and Germany. It traces the field's shift from traditional to digital archives, clarifying the opportunities and risks that arise along the way. Rather than treating computerization as a purely technological shift, the study conceptualizes it as a socio-institutional transformation that redefines archival authority, lifecycle management, and public access.

In Vietnam, the research focused on the activities of the four National Archives Centers, namely Centers I, II, III, and the National Archives Center for Digital and Preventive Records, as well as selected provincial and local historical archives. The author conducted a six-month internship at the National Archives Center III to observe digital operations and professional practices. In Germany, the Hessian State Archives (Hessisches Landesarchiv, HLA) serves as the primary case study, representing a mature, standardized, and legally integrated model of digital archiving.

Methodologically, the study adopted a comparative case-study methodology, combining qualitative and documentary approaches. Data were collected through 24 semi-structured interviews with archivists, policymakers, IT experts, and institutional leaders, complemented by an analysis of relevant primary and secondary sources. This empirical design provided a comprehensive understanding of archival development in both countries, revealing how legal frameworks, institutional arrangements, professional capacities, technological infrastructures, and user-oriented factors interact to shape their trajectories toward digital transformation.

Building on the Socio-Technical systems theory, Institutional Theory and Isomorphism, and Innovation Diffusion and Technology Acceptance Model frameworks (Chapter II), the study conceptualizes computerization not merely as a technological shift but as a socio-institutional process that redefines archival practices, professional competencies, and user engagement.

The analysis (Chapters V, VI, and VII) reveals that HLA represents a coherent and OAIS-conformant digital ecosystem that integrates DIMAG for preservation and Arcinsys for access. In Vietnam, digital transformation has accelerated significantly in recent years, particularly with the adoption of the 2024 Archives Law and related implementing regulations. This normative modernization represents a major institutional milestone. However, implementation remains uneven across administrative levels. While the legal framework provides a comprehensive foundation, operational standardization, interoperability, hybrid professional capacity, and preservation infrastructure consolidation require further strengthening. The key divergence between the two countries, therefore, lies not in legal recognition of digital archives but in the degree of governance consolidation and operational coherence.

In both contexts, the digital transformation of archives reflects multiple interconnected developments: (1) digitization of analog materials; (2) online discovery and metadata dissemination; (3) remote access to digital surrogates; (4) governance of born-digital records; and (5) adoption of emerging technologies such as AI and digital platforms (Chapter IX). These advances improve accessibility and automation, but heighten risks related to authenticity, privacy, cybersecurity, sustainability, and ethics, requiring continuous investment and governance innovation (Chapter X).

This dissertation approaches the future of archives not as a fixed or prescriptive concept; however, within this field, the study identifies the hybrid archives as a context-specific model of archival future, one that reflects the co-existence of analog and digital logics, the interaction of technology and institution, and the balance between continuity and innovation (Chapter VIII). Policy recommendations emphasize (i) legal reform and standards for transfer/metadata; (ii) trusted digital repositories and OAIS-aligned preservation; (iii) workforce transformation toward hybrid competencies; (iv) user-centered services and open access; and (v) cybersecurity and ethical frameworks (Chapter VII, Chapter X). The comparative analysis suggests that experiences from German archives, particularly the HLA, provide valuable and transferable insights for

informing the future development of archival institutions in Vietnam. Despite its specific focus on Vietnam and Germany, the study also contributes to broader discussions concerning the integration of digital technologies into archival systems and the institutional adaptation of archives in the digital age.

Declaration

I hereby declare that I have completed the submitted doctoral dissertation independently, without any unauthorized outside help, and only with the help referred to in the thesis. All texts quoted verbatim or by analogy from published writings and all details based on verbal information have been identified as such. In the analyses I have conducted, and to which I refer in this dissertation, I have followed the principles of good scientific practice, as stated in the Statute of Justus Liebig University Giessen for Ensuring Good Scientific Practice.

Erklärung

Ich erkläre: Ich habe die vorgelegte Dissertation selbstständig, ohne unerlaubte fremde Hilfe und nur mit den Hilfen angefertigt, die ich in der Dissertation angegeben habe. Alle Textstellen, die ich wörtlich oder sinngemäß aus veröffentlichten oder nicht veröffentlichten Schriften entnommen habe, sowie alle Angaben, die auf mündlichen Auskünften beruhen, sind als solche kenntlich gemacht. Bei den von mir durchgeführten und in der Dissertation erwähnten Untersuchungen habe ich die Grundsätze guter wissenschaftlicher Praxis, wie sie in der „Satzung der Justus-Liebig-Universität Gießen zur Sicherung guter wissenschaftlicher Praxis“ niedergelegt sind, eingehalten.

Gießen, 18/06/2026 Candidate’s signature

Vu Dinh Phong

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With profound appreciation, I extend my heartfelt thanks to the numerous individuals and organizations that have played instrumental roles in bringing this research to fruition. My most profound gratitude extends to my esteemed academic supervisors, PD. Dr. Detlef Briesen and Dr. Irmgard Christa Becker. Their knowledge, expertise, and experience have significantly enriched this work, and I am genuinely thankful for their dedication.

I would like to express my gratitude to the Vietnamese Government and the German Academic Exchange Service (DAAD) for their generous financial support. I sincerely thank my colleagues at the University of Social Sciences and Humanities (Vietnam National University, Hanoi), Faculty of Archival Science and Office Management, for their support, which paved the way for the realization of this project. Special recognition is extended to the leaders and archivists at the State Archive of Hessen, State Records and Archives Department of Vietnam, Vietnam National Archives Center I, II, III, National Archives Center for Digital and Preventive Records, Provincial Historical Archives Centers of Bac Giang, Bac Ninh, Ha Tinh, and Long An, for their gracious hospitality and invaluable assistance during my research.

Gratitude is also owed to my Vietnamese friends in Gießen and to my two closest German companions, Simon Bloemers and Sebastian Fritsch, whose unwavering support has been constant since I arrived in Germany.

Last but not least, my deepest thanks are due to my parents, my unflagging pillars of support and encouragement, and to my wife and our two sons. Their enduring love, dedication, and encouragement have been constant motivators, urging me to strive for excellence every day. This dissertation is dedicated to them with all my love.

Table of Abbreviations

	English	German
AIP	Archival Information Package	Informationspaket für die Archivierung
APE	Archives Portal Europe	Archivportal Europa
Arcinsys	Archive information system	Archivinformationssystem
ARK	Conference of the Directors of the Federal and State Archives	Archivreferentenkonferenz
BarchG	Federal Archives Act	Bundesarchivgesetz
BDSG	Federal Data Protection Act	Bundesdatenschutzgesetz
BRD	Federal Republic of Germany	Bundesrepublik Deutschland
CCSDS	Consultative Committee for Space Data Systems	Beratender Ausschuss für Weltraumdatensysteme
DDR	German Democratic Republic	Deutsche Demokratische Republik
DHA	Hessian Digital Archive	Digitales Archiv Hessen
HLA	State Archives of Hessen	Hessisches Landesarchiv
DIAS	Digital Information Archival System	Digitales Informationsarchivierungssystem
DIMAG	Digital storage/archive	Digitales Magazin
DIP	Dissemination Information Package	Informationspaket zur Verbreitung von Informationen
dLZA	Digital long-term archiving/preservation	Digitale Langzeitarchivierung

DOMEA	Document management and electronic archiving in IT-supported business processes	Dokumentenmanagement und elektronische Archivierung im IT-gestützten Geschäftsgang
GLAM	Digital heritage institutions: galleries, libraries, archives, and museums	Einrichtungen des digitalen Kulturerbes: Galerien, Bibliotheken, Archive und Museen
HADIS	Hessian Archive Documentation and Information System	Hessische Archiv-Dokumentations-und-Informationssystem
HarchivG	Hessian Archives Act	Hessisches Archivgesetz
HeDok	Hessian e-document management	Hessische e-Dokumentenverwaltung
HMWK	Hessian Ministry of Science and the Arts	Hessisches Ministerium für Wissenschaft und Kunst
HRZ	University Computer Center	Hochschulrechenzentrum
HTML	HyperText Markup Language	HyperText Markup Language
ICA	International Council on Archives	Internationaler Archivrat
ICT	Information and communication technology	Informations- und Kommunikationstechnologie
INSAR	Information summary on Archives	Zusammenfassung der Informationen über Archive
IT	Information technology	Informationstechnologie
METS	Metadata Encoding and Transmission Standard	Standard für die Kodierung und Übertragung von Metadaten

MIX	Metadata for Images in XML Schema	Metadata for Images in XML Schema
MoW	Memory of the World	Erinnerung an die Welt
NESTOR	Competence network for digital long-term archiving	Kompetenznetzwerk digitale Langzeitarchivierung
NISO	National Information Standards Organization	Nationale Organization für Informationsstandards
OAIS	Open Archival Information System	Offenes Archiv-Informations-System
OPAC	Online Public Access Catalog	Öffentlich zugänglicher Online-Katalog
PDF	Portable Document Format	Portable Document Format
PREMIS	Preservation Metadata: Implementation Strategies	Metadaten zur Bestandserhaltung: Umsetzungsstrategien
SAA	Society of American Archivists	Gesellschaft amerikanischer Archivare
SIP	Submission Information Package	Informationspaket zur Einreichung
XML	eXtensible Markup Language	eXtensible Markup Language

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Note on Terminologies and Translations

This thesis includes translations from German and Vietnamese into English, executed solely by the author, with exceptions explicitly noted. Parenthetical insertions have been employed to incorporate relevant German and Vietnamese quotations. A considerable effort has been made to translate and integrate German and Vietnamese designations of government agencies, offices, institutions, organizations, programs, and names of legal documents, books, articles, and papers within the text while preserving the original German and Vietnamese nomenclatures and acronyms in the accompanying notes. For instance, the Hessische Archiv-Dokumentations-und Informationssystem is referred to as "The Hessian Archives Documentation and Information System" in the main text yet retains its acronym "HADIS" for brevity and familiarity.

Appendix

CHAPTER I. INTRODUCTION

1.1. Research Background and Problem Identification

National heritage is an essential component of each nation's identity (Kamatula et al., 2013, p. 1). In this context, archival records, as evidence of history, are not only unique assets but also a special form of cultural heritage, containing abundant, highly reliable information that comprehensively reflects various aspects of social life. In today's knowledge-based society, the role of archives has become even more crucial in ensuring transparency and accountability, which are indispensable foundations of modern democracies.

The Universal Declaration on Archives, adopted by the International Council on Archives (ICA) and endorsed by UNESCO in 2011, affirms in the global context that archives[1]:

> *"record decisions, actions, and memories; constitute a unique and irreplaceable heritage passed from one generation to another; are managed from their creation to preserve their value and significance; are an authentic source of information supporting transparent and accountable administration; play an essential role in the development of society by safeguarding and contributing to individual and community memory. Open access to archives enriches our understanding of the human condition, promotes democracy, protects citizens' rights, and enhances the quality of life."* (ICA, 2011).

Archives serve not only as repositories of information but also as institutions of cultural memory and knowledge that actively contribute to

[1] In this Declaration, the term "archives" is defined and understood as archival records or documents. It is widely acknowledged that the term 'archives' has two distinct connotations: [1] Archives as a physical repository where records and documents are stored, as represented by the German term "Archiv"; and [2] Archives as archival records or documents, which archival institutions preserve permanently, as represented by the German term "Archivgut". This thesis adopts the former definition of "archives" to refer to physical repositories such as archival institutions and archival repositories. The definition of "archives" will be subjected to a more in-depth examination in Chapter II.

shaping social development at both the personal and community levels. (Basu & De Jong, 2016, p. 10).

To fulfill these functions, modern archives are expected to undertake two core tasks simultaneously: (1) ensuring the physical preservation and informational integrity of archival materials; and (2) facilitating user access to and utilization of these materials. As Millar (Millar, 2017, p. 93) has pointed out, if archival materials are not properly protected and are exposed to dust, insects, or mold, they may be lost forever to future generations. However, if archives focus solely on preservation without providing public access, they also fail to fulfill their social mission. Preservation and access, therefore, cannot be separated; they must be regarded as two closely interconnected functions that support and reinforce each other.

The history of archival development demonstrates that this field is in a state of constant transformation, particularly under the influence of technological advancements. (Szekely, 2017, p. 1). Among technological advancements, computer technology has emerged as a driving force behind the modernization of archives. The integration of digital and information technologies, collectively referred to as computerization, has shaped profound changes in contemporary archival practice. In this study, the concept of computerization[2] is understood in a broad sense, encompassing aspects such as the digitization of analog records, the use of archival management software, the automation of records processing, the development of digital repositories, the provision of online access, and the extension to more advanced technologies such as artificial intelligence (AI), big data analytics, cloud storage, and blockchain-based authentication systems.

The impact of computerization on society as a whole, as well as on both public and private archival institutions, is profound and irreversible. (C. A. Bailey, 1988, p. 1). The digitization and dissemination of archival materials via the Internet not only support the development of the information society but

[2] A more detailed conceptualization of this term will be provided in Chapter II.

also help reshape the public image of archives. (Sobczak, 2016a, p. 5). From being perceived as dusty repositories filled with yellowed paper records, archives are now regarded as flexible and dynamic information ecosystems. (Hill, 2011, p. 17). This transformation is not merely technical; it demands a profound redefinition of the archivist's role and how traditional archival functions are carried out. (Deparga & Gonzalez, 1992, pp. 156–157).

The emergence of electronic records systems since the late 1960s has compelled the archival profession to confront inevitable changes. According to De Parga and González (De Parga & González, 1992, p. 156), this process is evident in the integration of new media formats into archival collections, as well as in the use of modern technologies to organize and process information. The application of technology has transformed the creation, processing, storage, and access of records, leading to the emergence of entirely new types of records.[3] (de Gruyter Saur, 1993, p. 168). Although some archivists were initially apprehensive about technology, as Peterson (Peterson, 1984, p. 384) noted, the relentless advancement of technology has compelled the profession to shift its mindset from passive to proactive. In this context, digitization has emerged as a central strategy, not only enabling the long-term preservation of archival materials but also expanding public access, while simultaneously contributing to the redefinition of the social role of archives in the digital era.

In Vietnam, the process of archival computerization is being gradually implemented in close connection with administrative reform and the development of e-government. Electronic records management has become a focal point not only for the archival sector but also for modernizing the national administrative system. However, to date, the application of digital archival principles in practice still faces numerous challenges in terms of institutional frameworks, organizational capacity, and technical implementation. Although

[3] Commonly referred to as "digital records," which is frequently employed in this project. Various nomenclatures are utilized interchangeably or as synonyms, including "electronic archives" and "digital archives," as well as "digital records," "electronic records," and "machine-readable records." The latter term, "machine-readable records," was first introduced and widely used prior to the 1990s. It is important to note that the concepts and terminology discussed in Chapter II of this dissertation will be clearly delineated and explicated in the context of archival terminology.

the Vietnam Archives Law of 2024 officially came into effect on July 1, 2025, marking a significant shift in the approach to electronic records, a considerable gap remains between regulation and practice. Operational mechanisms, human resources, technological infrastructure, and, in particular, organizational culture in many archival institutions are not yet truly prepared to adapt to these revolutionary changes. From a researcher's perspective, I believe the greatest challenge lies not solely in technical capacity but in the lack of alignment among the three pillars: legal framework, organizational structure, and awareness. If one party seeks to operate digital archives in accordance with international standards, while the other continues to adhere to a traditional, paper-based administrative mindset, implementation is unlikely to be coherent or effective.

Meanwhile, in developed countries such as Germany, the process of archival computerization began in the 1970s and has since resulted in a stable, structured digital archival ecosystem integrated into public administration, scientific research, and citizens' right of access to information. The German archival model demonstrates that digital transformation is not merely the application of technology, but a comprehensive shift in the way archives are conceived as essential data and public service platforms. In this context, conducting comparative studies with countries such as Germany is essential, not to replicate their model, but to identify core principles that can be adapted to suit Vietnam's specific conditions. This is also an important step toward narrowing the digital gap between developing and developed nations, while enhancing the capacity to preserve and provide information in a proactive, transparent, and modern manner.

Moreover, from an academic perspective, I observe a significant gap in research on the digital transformation process in developing countries, particularly in the field of public archives. Most existing literature still focuses on the practices of advanced nations, while the ways in which countries like Vietnam approach, adapt to, and independently develop their transformation

models have not been thoroughly analyzed.[4] Therefore, this study aims not only to contribute to the body of international archival scholarship but also to propose practical recommendations, at both policy and organizational levels, to enhance the effectiveness of digital transformation in Vietnam.

Under the title *"Future of Archives: The Impact of Computerization on Archival Development in Vietnam and Experiences from Germany"*, this study adopts a comparative case approach to comprehensively examine the transition from traditional archives to modern digital archives. By combining theoretical analysis with practical investigation, the research aims to identify key challenges and opportunities, while proposing strategic directions that can foster a sustainable, efficient, and well-adapted archival system for Vietnam in the digital era.

1.2. Research Statement

Computer technology has profoundly reshaped the structure of contemporary society, not only transforming modes of work and communication but also influencing the ways information is produced, preserved, and disseminated. In the archival field, this technological transformation, commonly referred to as computerization, has led to a restructuring in both theory and practice, compelling institutions and professionals to reconsider traditional archival principles and operational models that have been established for decades.

The rapid growth of digital records has fundamentally transformed the archival environment, driving the shift from traditional repositories to hybrid archival organizations, where paper records, digitized materials, and born-digital records are managed simultaneously. This transition not only raises new issues related to authenticity, long-term preservation, and accessibility, but also requires archivists to acquire new technological competencies and to reposition their professional roles in a constantly evolving context. These developments

[4] Chapter II. Literature review: will comprehensively present the previous publications relevant to this theme.

necessitate a profound reevaluation of how archives are organized, managed, and adapted in the digital age. A particularly important aspect of this evolutionary process is the emergence of the hybrid archival model, institutions that exemplify the "transitional" state between traditional archival practice and digital archiving. From a research perspective, hybrid archives offer an ideal lens through which to observe and analyze the broader impact of technology on archival principles and practical operations, while also reflecting the gradual shaping of a new archival model in the digital age.

Although recent years have seen numerous studies addressing digital preservation and archival modernization, a comprehensive and systematic understanding of how computerization is affecting archival institutions across different national contexts remains lacking, particularly in countries like Vietnam, where the process of digital transformation in the archival sector is still in its early stages. In contrast, in countries such as Germany, archival computerization has been implemented continuously over several decades.

From a personal perspective, I believe that the gap lies not only in the level of technology adoption but also in the degree of standardization and the development of a systemic mindset toward digital archiving. Comparative research, therefore, is not merely about replicating the model of a developed country, but about identifying foundational principles that can be adapted and localized within Vietnam's cultural, legal, and organizational context. Therefore, this dissertation aims to provide a comprehensive analysis of the challenges and opportunities that computerization presents for the development of the archival field, with a focus on the case of Vietnam. By drawing on lessons learned from archival practices in Germany, the study will examine the evolving archival landscape and propose strategic recommendations for designing a future-oriented archival model, one that aligns with Vietnam's specific characteristics and developmental needs in the digital age.

1.3. Research Scope

Based on the research background and aims articulated earlier, this study adopts a comparative and historically grounded approach to examine how archives in Vietnam and Germany have evolved in response to the impact of computerization.

1.3.1. Temporal Scope

In Germany, this research encompasses a temporal scope extending from 1990 to the present. The selection of this timeframe is grounded in two key considerations. *Firstly*, while the widespread application of computer technology in German archives became prominent in the 1990s, its influence on the archival field began much earlier, during the 1960s. This early influence set the stage for the significant advancements in digital technology and the marked shift toward computerizing archival processes witnessed in the 1990s. *Secondly*, the unification of Germany in 1990 marked a seminal moment in the development of German archives, signifying the emergence of a new phase in their evolution. The reunification consolidated archival practices and standards, setting the stage for the integration of advanced digital technologies. However, it is also deemed crucial to provide a brief historical overview of the computerization of German archives since the 1960s to contextualize these developments within a broader historical framework.

The study looks at Vietnam from the Đổi Mới (Renovation) reforms of 1986 to the present. Đổi Mới, which began in 1986, was a significant step toward a market economy with a socialist bent. It also led to increased international cooperation and easier access to new technologies worldwide. These changes made it possible for modernization efforts to begin in various areas, including archival work. Not only did Đổi Mới change the way the government thought about running the country, but it also created space for new approaches to managing archival records. From the late 1990s onward, it has become increasingly clear that technology is being used in Vietnam's archival work. This is demonstrated by projects to digitize documents, the development of

electronic records management software, and the advancement of e-government initiatives.

The selection of the above timeframes is intended to ensure that the comparison between the two countries is not only synchronic but also historically grounded. This approach highlights both the similarities and differences, as well as the structural factors that have shaped and continue to shape the process of computerization in the archival sector in Vietnam and Germany.

1.3.2. Spatial Scope

From a geographical standpoint, the research is carried out through case studies of selected representative archival institutions in both nations, chosen to illustrate diversity in administrative levels, digital infrastructure capabilities, and organizational preparedness in the processes of computerization and digital transformation.

In Germany, the study focuses on the Hessian State Archives (Hessisches Landesarchiv) as a representative example of a state-level archival system operating within a distinctly decentralized governance framework, with a well-established history of implementing systematic digitization and computerization strategies. It stands as one of the pioneering institutions in integrating digital technologies across the full range of archival operations, from records processing and document preservation to providing online access for users.

In Vietnam, the research examines the following archival institutions: National Archives Centers I, II, and III (covering both regions of North and South); the National Archives Center for Digital and Preventive Records, under the State Records and Archives Department of Vietnam; and several Provincial Historical Archives Centers in Bac Giang, Bac Ninh, Ha Tinh, and Long An. This selection aims to provide a comprehensive overview of the digital transformation process in the archival sector, encompassing both central and local levels, while reflecting the differences in infrastructure, human resources, and policy across regions, as well as between various organizational models of archives.

This wide range of space allows the dissertation to compare different levels of governance and types of organizations, highlighting the factors that affect computerization in each case. At the same time, although grounded in these specific research sites, the findings of this study extend beyond local significance. They are positioned to contribute to the global discourse on archival computerization. Many of the issues, developments, and opportunities discussed in this dissertation are also occurring in archival institutions worldwide, particularly in terms of the increased demand for digital access, long-term preservation, and public engagement.

From a personal research standpoint, I believe that examining these local cases in an international comparative context can shed light on issues that are important to everyone working in the field of archival digital transformation, where technical barriers are only one component of a larger set of challenges that are primarily institutional, perceptual, and organizational.

1.3.3. Thematic Scope

Computerization and digital technology have a significant impact on various aspects of archival practices. This thesis will investigate key aspects: *Digitization*, the conversion of analog archival materials into digital formats to enhance accessibility and preservation; *retro-conversion of finding aids*: The transformation of existing analog finding aids (such as catalogs and indexes) into digital formats to improve searchability and usability; *online access*: Providing digital access to archival materials through online platforms, facilitating remote research and use; *long-term digital preservation*: Ensuring the ongoing accessibility and integrity of digital records through preservation strategies like format migration and integrity checks; *AI applications*: the importance and trends of applying AI in archives to facilitate the archival work.

In examining the profound implications of computerization on archival practices, this research highlights the crucial collaboration between archivists and IT specialists. Archivists and IT specialists must work in partnership to successfully navigate the complexities associated with integrating digital

technologies into archival frameworks. Archivists contribute expertise in the areas of historical preservation, information management, and archival theory, while IT specialists bring technical proficiency in digital infrastructure, data management, and software development. Together, they work in a complementary manner to utilize technology to enhance archival processes, ensure the long-term preservation of cultural heritage, and facilitate broader access to historical records. It is essential to emphasize that this dissertation intentionally focuses on aspects beyond technical complexities. While recognizing the significance of digital tools and systems, the primary focus is on wider organizational, policy-related, and socio-cultural aspects. The research examines how institutions, policies, and professional roles are adapting to technological advancements, rather than focusing on specific technical frameworks or software capabilities.

From the author's viewpoint, this represents a strategic decision: emphasizing institutional context and human elements enables the understanding of computerization not just as a technological progress, but as a process that fundamentally alters the operational landscape of the archival sector. This perspective is especially pertinent to Vietnam, where the challenges and prospects of archival digital transformation frequently arise from organizational frameworks, legal structures, and professional attitudes rather than from mere technical proficiency.

1.4. Research Objectives

This research aims to investigate how digital technologies are reshaping archival development in Vietnam, with reference to lessons and experiences from Germany. The specific objectives are to:

- Identify the primary challenges and opportunities associated with the computerization of archival practices in Vietnam and Germany.

- Evaluate the current state of archival development in Vietnam and Germany in the context of digital technology. This will entail assessing the extent to which digital technology has been integrated into archival practices.

- Compare and contrast the archival practices of Vietnam and Germany under the impact of computerization, analyzing key similarities and differences as well as the contextual factors shaping them;

- Identify emerging trends and innovative practices from Germany that could inform the development of future archival models in Vietnam;

- Propose practical recommendations for enhancing the digital transformation of archives in Vietnam, drawing from the comparative analysis.

Identifying these objectives not only ensures a consistent study trajectory but also enhances the practicality of the final recommendations. This is especially important in the context of Vietnam, which faces the dual challenge of closing the digital divide with developed countries while also adhering to its own institutional conditions, resource capacities, and socio-cultural environment.

1.5. Research Questions

To address the above objectives, this study is guided by the following key research questions:

RQ1. What challenges and opportunities does computerization create for archival development in Vietnam and Germany?

RQ2. How do institutional environments influence the ways in which archival systems in Vietnam and Germany respond to computerization and digital transformation?

RQ3. What similarities and differences can be identified in the technological, legal, organizational, and professional responses of Vietnamese and German archival systems to computerization?

RQ4. How do different institutional responses to computerization shape possible trajectories for the future development of archives?

1.6. Research Hypothesis

Although this study primarily adopts a qualitative and comparative case study approach, a set of working hypotheses has been formulated to guide the

analytical framework, particularly in Chapter VII (Comparative Analysis), and to inform the synthesis and policy recommendations in Chapter X (Conclusion and Recommendations). These hypotheses reflect the researcher's initial expectations based on the literature review and preliminary observations and are subject to validation or revision through empirical findings. Rather than statistical verification, these hypotheses serve to structure the comparative inquiry and highlight key dimensions where differences or convergence may emerge.

Accordingly, the following research hypotheses are proposed:

H1. Computerization has significantly transformed archival development by influencing archival functions, preservation practices, access mechanisms, and service delivery.

H2. The impact of computerization on archival development is mediated by institutional environments, including governance structures, legal frameworks, organizational capacities, and professional norms.

H3. Differences in institutional environments contribute to different patterns of technological adoption and archival transformation in Vietnam and Germany.

H4. Future developments of archives will be shaped not only by technological innovation but also by the capacity of archival institutions to adapt to changing legal, organizational, and societal conditions.

These hypotheses will be revisited and assessed based on findings presented in subsequent chapters, contributing to a more nuanced understanding of how computerization is reshaping the archival landscape across different national settings.

1.7. Research Significance and Contributions

This study holds both academic and practical significance in the context of the ongoing digital transformation within the archival field. Situated as a meeting point of comparative archival development and technological innovation, this research helps us understand how computerization impacts not

only the workings of archives but also their relationships within society and with state governance.

Theoretical Contributions: The dissertation contributes theoretically by demonstrating that computerization does not transform archives in a uniform or deterministic manner. Instead, the study shows that the effects of technological innovation are mediated by institutional environments, including governance structures, legal frameworks, professional norms, and organizational capacities. Through a comparative analysis of Vietnam and Germany, the research provides an institutional explanation for variations in archival transformation and contributes to broader discussions concerning the future development of archives in the digital age.

Practical Contributions: This dissertation makes a significant practical contribution by providing a comprehensive empirical assessment of the current state of digital archiving in Vietnam. Drawing upon evidence collected from both central and provincial archival institutions, the study examines varying levels of digital preparedness, with particular attention to technological infrastructure, human resource capacity, professional development, and the implementation of archival standards. The findings offer a systematic understanding of how archival institutions across different administrative contexts respond to the opportunities and challenges of digital transformation. Furthermore, through an in-depth case study of the Hessian State Archives (HLA) in Germany, the dissertation identifies a number of transferable principles and institutional practices that may inform the future development of archival systems in Vietnam. Rather than advocating direct institutional transfer, the study proposes a strategic framework and an operational model that integrates international experiences with Vietnamese institutional realities. These recommendations may serve as practical reference points not only for Vietnam but also for other countries undergoing similar processes of archival modernization and digital transformation.

Policy Relevance: This study has broader implications for policy beyond its theoretical and practical relevance. Drawing on its examination of the links

between digital technologies and archival governance, it provides empirical analysis to inform recommendations designed to enhance archival policy development and inter-institutional coordination in Vietnam. The recommendations included embedding archival planning in national digital government strategies, updating the legal framework governing electronic records under a post-2024 Archives Law of Vietnam specialist project, and establishing sustainable models for digital preservation. The results are an indispensable resource not only for archivists and institutional administrators but also for policymakers, ensuring that archives remain essential, secure, and adaptable in the context of technological advancements.

In my opinion, this work is exciting because it is one of the few that positions Vietnam in an international comparative context and provides a means to connect theory with practice. Combining both approaches not only enriches the conceptualization of digital transformation in archives but also provides a solid, scientific, and methodological foundation for the successful implementation of this process at both national and global levels.

1.8. Structure of the study

The dissertation comprises ten interconnected chapters, systematically structured to reflect the logical progression from theoretical foundations to empirical analysis, comparative assessment, and strategic recommendations.

Chapter I: Introduction

This chapter establishes the research context by outlining the background, rationale, and significance of the study. It clearly defines the research objectives, scope, research questions, and hypotheses, highlighting the expected theoretical, practical, and policy-oriented contributions of this work. The chapter concludes by presenting this comprehensive overview of the study's structure.

Chapter II: Literature Review

This chapter offers an in-depth review and analysis of existing scholarly works on computerization and digital transformation in archives. It critically

examines core concepts, theoretical debates, and empirical studies, identifying significant gaps and issues that justify this research. Additionally, this chapter outlines the conceptual, theoretical, and research frameworks that guide subsequent analysis and discussions.

Chapter III: Research Methodology

This chapter outlines the methodological approach employed to address the research questions. It details the research design, data collection methods, including document analysis, interviews, and case studies, and describes the procedures used for analyzing qualitative data. This chapter also explains the selection criteria for archival institutions in Germany and Vietnam, ensuring the validity and reliability of findings.

Chapter IV. Computerization in Archives: Challenges and Opportunities

Chapter IV explores the overarching implications of integrating digital technologies into archival practice. It discusses both the transformative opportunities and the critical challenges faced by archives globally, setting the stage for detailed case studies presented in subsequent chapters.

Chapter V. Archival development in Vietnam under the impact of computerization.

This chapter offers an empirical examination of how Vietnam's archival institutions have responded to digital transformation. Drawing from primary data collected across central and provincial archives, it analyzes the extent of digital integration, identifies implementation challenges, and assesses the readiness of institutions and professionals to navigate digital change.

Chapter VI. Case study: Digital archiving practice at the Hessian State Archive, Germany (HLA)

Chapter VI provides a detailed exploration of archival computerization practices in Germany, with a specific focus on the HLA. It analyzes institutional strategies, practical implementation issues, and innovative approaches to long-

term digital preservation, highlighting successful experiences that could inform archival practices elsewhere.

Chapter VII. Comparative analysis: Germany and Vietnam

The principal objective of this chapter is to synthesize and compare the findings from the German and Vietnamese cases, systematically identifying similarities, differences, and underlying factors shaping each country's archival development. This comparative perspective enhances understanding of how contextual elements influence digital transformation in archival settings.

Chapter VIII: Proposing a future archival model for Vietnam

Chapter VIII of this study builds on insights from the comparative analysis, outlining potential pathways and practical models for Vietnam's future archival development. It integrates successful strategies from Germany's experience, adapting these to Vietnam's institutional and socio-cultural context to ensure feasibility and sustainability.

Chapter IX. Current and emerging trends in archival science

Chapter IX contextualizes the study's findings within broader international trends in archival science, exploring emerging technologies such as artificial intelligence, blockchain, and cloud-based preservation solutions. It discusses how these developments could further shape the future of archival institutions worldwide, providing a forward-looking perspective.

Chapter X: Conclusion and recommendations

Chapter X summarizes the main findings and revisits the research questions and hypotheses. It emphasizes the study's theoretical, practical, and policy contributions, acknowledges limitations, and offers clear recommendations for archival institutions, policymakers, and future researchers seeking to advance archival practices in the digital era.

CHAPTER II. LITERATURE REVIEW

2.1. Introduction

This chapter provides a critical review of the scholarly literature related to the computerization and digital transformation of archives, with particular attention to developments in Germany and Vietnam. A literature review serves not only to summarize existing knowledge but also to identify major theoretical perspectives, conceptual developments, methodological approaches, and research gaps that justify and guide the present study. (Feak & Swales, 2016, p. 3). In the context of archival science, reviewing previous research is especially important because digital technologies have transformed not only archival practices but also the ways archives are conceptualized, governed, preserved, and accessed. The growing integration of information technologies into archival work has generated a substantial body of international scholarship addressing issues such as electronic records management, digital preservation, online access, user engagement, and, more recently, artificial intelligence and other emerging technologies. At the same time, different national archival systems have responded to these developments in distinct ways, reflecting variations in institutional structures, legal frameworks, professional traditions, and technological capacities. Understanding these differences is particularly important for comparative research examining archival development across diverse national contexts.

To ensure a systematic and analytically rigorous review, this chapter adopts a metasynthesis approach following the typology proposed by Paré et al. (2015). This approach is particularly suitable for synthesizing qualitative findings across diverse strands of scholarship related to archival computerization, technology adoption, digital transformation, and institutional change. Rather than merely cataloging previous studies, the metasynthesis seeks to identify recurring themes, theoretical perspectives, methodological patterns, and areas of scholarly consensus and disagreement. Through this approach, the chapter aims to develop a coherent understanding of the current state of knowledge while revealing gaps that justify the present research.

This chapter pursues four interconnected objectives. First, it reviews major international debates and research trends concerning the digital transformation of archives. Second, it examines the contributions of German and German-speaking archival scholarship, which provide an important reference point for understanding the development of digital archiving in a mature archival environment. Third, it analyzes existing Vietnamese scholarship and identifies current achievements, limitations, and research needs. Finally, the chapter establishes the theoretical and conceptual foundations of the dissertation by discussing the principal theoretical perspectives, key concepts, analytical dimensions, and research framework employed throughout the study.

The chapter is organized into several interconnected sections. Following this introduction, Section 2.2 reviews previous research on computerization in archives, including major international research trends on archives in the digital age (Section 2.2.1), German and German-speaking scholarship on digital archiving (Section 2.2.2), and the development of archival research in Vietnam (Section 2.2.3). Section 2.3 presents the theoretical framework of the study. Section 2.4 discusses the principal concepts employed throughout the dissertation, while Section 2.5 develops the analytical dimensions used for comparison. Section 2.6 integrates these elements into a research framework that guides the empirical investigation. Section 2.7 examines broader changes in archival theory and principles in the digital age. Finally, Sections 2.8 and 2.9 identify the main gaps in the existing literature and summarize the chapter's key findings, thereby positioning the present study within the broader scholarly discourse on archival transformation.

2.2. Previous research on computerization in archives

2.2.1. International Research on Archives in the Digital Age

The digital transformation of archives has emerged as one of the most significant themes in contemporary archival scholarship. Over the past several decades, the archival profession has responded to the rapid expansion of information technologies by re-examining fundamental questions concerning

the creation, management, preservation, accessibility, and future role of archives. International research has gradually evolved from a focus on electronic records management toward broader discussions of digital preservation, user engagement, digital governance, and, more recently, artificial intelligence and emerging technologies. A metasynthesis of the international literature reveals four major and interconnected streams of research: (1) electronic records and authenticity; (2) digital preservation and long-term access; (3) access, participation, and user engagement; and (4) emerging technologies and the future of archives.

2.2.1.1. Electronic Records and Authenticity

Since the 1990s, the rapid growth of electronic records has fundamentally transformed archival theory and practice. The increasing volume of records created in digital environments raised important questions concerning reliability, authenticity, integrity, and long-term preservation. In response to these challenges, several influential international research initiatives were launched, including the University of British Columbia (UBC) Project (1994–1997), the Pittsburgh Project (1994–1996), the InterPARES Projects (1998–2012), and the PARADIGM Project (2005–2007). These projects collectively sought to clarify the conceptual nature of electronic records, establish requirements for trustworthy recordkeeping systems, and develop methodologies for ensuring the authenticity and integrity of records over time (Duranti & Blanchette, 2004). Their findings highlighted the vulnerability of digital records to technological obsolescence, manipulation, and loss, while emphasizing the importance of lifecycle-based approaches that involve archivists from the earliest stages of records creation and management.

As a result, international scholarship increasingly recognized that digital preservation could not be treated as a purely technical problem. Instead, it required a combination of technological, organizational, legal, and professional interventions throughout the records lifecycle. The concepts of authenticity, reliability, and integrity consequently became central themes in modern archival discourse.

2.2.1.2. Digital Preservation and Long-Term Access

A second major stream of international research concerns the long-term preservation of digital records and the development of sustainable preservation strategies. As governments, organizations, and individuals increasingly rely on digital information systems, archivists have faced the challenge of preserving records despite rapidly changing technologies, software environments, and storage media. Research in this area has focused on issues such as format migration, metadata management, digital repositories, technological obsolescence, and preservation standards. The archival community gradually moved beyond the traditional custodial model toward lifecycle-based preservation strategies that seek to ensure the continued accessibility and usability of records from creation through long-term preservation (Duranti & Blanchette, 2004). This body of literature has significantly contributed to the development of international standards, preservation frameworks, and professional guidelines that now form the foundation of contemporary digital archiving practices.

2.2.1.3. Access, Participation, and User Engagement

Alongside concerns about preservation, archival scholarship has increasingly examined how digital technologies transform access to archival materials and reshape relationships between archives and users. The proliferation of the Internet, web technologies, social media, and digital platforms has expanded opportunities for archives to provide remote access to collections and engage broader audiences. Technology has altered not only how archivists manage records but also how researchers and citizens interact with archival materials (Cox et al., 2007). This transformation has stimulated new discussions regarding Archives 2.0, participatory archives, open access, user-centered services, and the role of archives in democratic societies. Several influential publications have contributed to these debates, including works by Hill (2010), Brown (2018), Benoit and Eveleigh (2019), Dobreva (2019), Bailey (2008), and McLeod and Hare (2019). Collectively, these studies demonstrate a growing shift from viewing archives solely as repositories of records toward

understanding them as dynamic information environments that facilitate participation, collaboration, and knowledge creation.

2.2.1.4. Emerging Technologies and the Future of Archives

The most recent phase of international archival research has increasingly focused on the implications of emerging technologies for archival development. Scholars have begun examining the potential applications of artificial intelligence (AI), machine learning, natural language processing (NLP), blockchain technologies, cloud computing, the Internet of Things (IoT), and virtual or augmented reality in archival environments. (Becker et al., 2025; Jaillant & Caputo, 2022; Liu, n.d.; Rolan et al., 2019; Shinde et al., n.d.; Yeo, 2024). Research in this area explores how these technologies may support automated description, intelligent search, digital preservation, authenticity verification, and new forms of interaction between archives and users. At the same time, scholars have emphasized the ethical, legal, and professional challenges associated with automation, algorithmic bias, privacy, transparency, and trust. Viewed collectively, this emerging literature suggests that archives are increasingly evolving from passive repositories of information into complex digital information ecosystems characterized by automation, interoperability, and user-centered services.

2.2.1.5. Synthesis of International Research

The international literature demonstrates that archival scholarship has undergone a significant transformation over the past three decades. While early research focused primarily on electronic records and questions of authenticity, later studies expanded to encompass digital preservation, online access, participatory practices, and emerging technologies. Despite these advances, much of the existing literature remains concentrated on technological solutions, preservation frameworks, and professional practices. Comparatively less attention has been devoted to understanding how broader institutional environments influence digital transformation processes in archives, particularly in developing countries. Moreover, relatively few studies have

systematically compared how different archival systems respond to technological change under distinct legal, organizational, and governance conditions. These limitations provide an important point of departure for the present study, which adopts a comparative perspective to examine archival transformation in Vietnam and Germany.

2.2.2. German and German-Speaking Scholarship on Digital Archiving

Digital archiving has become one of the most significant challenges confronting archival institutions in German-speaking countries over the past two decades. What initially emerged as a largely theoretical discussion concerning electronic records and technological change has gradually developed into a mature field of archival practice supported by specialized infrastructures, professional networks, standards, and scholarly discourse. This transformation is reflected not only in the growing number of digital archive projects and preservation systems implemented throughout Germany but also in an increasingly rich body of literature addressing the organizational, legal, technical, and societal implications of archival computerization. A review of German and German-speaking scholarship reveals four closely interconnected areas of concern: digital preservation and trusted repositories; electronic records and digital government; archival information systems and digital access; and, more recently, emerging technologies and the future development of archives.

2.2.2.1. Digital Preservation and Trusted Repositories

One of the most prominent themes within German archival scholarship concerns the long-term preservation of digital records. German archivists recognized relatively early that born-digital records require preservation strategies fundamentally different from those applied to traditional paper-based archival materials. As a result, considerable attention has been devoted to developing preservation frameworks, standards, repositories, and collaborative infrastructures capable of ensuring authenticity, reliability, and long-term accessibility.

Among the most influential initiatives is the Kompetenznetzwerk Nestor[5], established as a national competence network for digital long-term preservation. Nestor serves as a platform connecting archives, libraries, museums, research institutions, and technical experts concerned with preserving digital resources. Its publications address technical standards, preservation metadata, sustainable preservation strategies, and practical guidance for digital long-term archiving (H.Neuroth et al., 2012). Particularly noteworthy is the publication *Eine kleine Enzyklopädie der digitalen Langzeitarchivierung/ Small Encyclopedia of Digital Long-Term Archiving*, which provides a comprehensive reference work on concepts, standards, and practices in digital preservation.

Similar concerns are reflected in the publications of the KLA-Ausschuss Digitale Archive and in the extensive professional literature produced by German archival institutions. These contributions emphasize that successful digital preservation depends not only on technological solutions but also on organizational coordination, common standards, and long-term institutional commitment. (Dahlmanns & Naumann, 2018; KLA, 2015, 2022; Naumann et al., 2016).

The Workbooks (Werkhefte) series published by the Landesarchiv Baden-Württemberg provides an especially valuable illustration of this development. Over time, the series has documented the evolution of archival thinking from early discussions of electronic records and digital repositories toward broader questions concerning information systems, interoperability, digital access, and archives as cultural heritage institutions in the digital age. (Christian Keitel & Kai Naumann, 2013; Gerald Maier & Clemens Rehm, 2018; Hartmut Weber, 2000; Udo Schäfer and Nicole Bickhoff, 1999). Collectively, these publications demonstrate that German archival scholarship approaches digital preservation as an integrated process in which legal frameworks, institutional arrangements, and technical infrastructures evolve together.

[5] https://www.langzeitarchivierung.de/Webs/nestor/EN/nestor/nestor_node.html (Access: 12.08.2020)

2.2.2.2. Electronic Records and Digital Government

A second major area of research focuses on electronic records management and the relationship between archives and digital government. As public administration increasingly relies on electronic systems, German archivists have examined how archives can participate in records management from the earliest stages of record creation and ensure the long-term preservation of digital records generated within governmental environments. Particularly influential in this regard are the publications associated with the Marburg Archival Science Colloquia. Over the past decade, the thematic focus of these colloquia has evolved in parallel with broader technological developments. Topics have included digital recordkeeping, practical solutions for small and medium-sized archives, digitization strategies, online access, digital networking, cloud-based environments, born-digital materials, and artificial intelligence. (Becker et al., 2016; Becker & Koal, 2017; Irmgard Christa Becker et al., 2012; Irmgard Christa Becker, Karen Anderson, et al., 2018; Irmgard Christa Becker, Thomas Henne, et al., 2018; Irmgard Christa Becker & Stephanie Oertel, 2014). The 28th Archival Science Colloquium in 2024 focused specifically on born-digital materials and highlighted challenges related to defining archival units, metadata description, long-term preservation, and user access in digital environments. (Becker et al., 2025). The growing importance of artificial intelligence within archival science is reflected in the theme of the 29th Archival Science Colloquium held at the Archive School Marburg in May 2025: *KI im Archiv – Steht uns eine Revolution bevor?/ AI in the archives: Are we facing a revolution?* The colloquium brought together scholars and practitioners to discuss the implications of AI for archives, including its use by records creators, researchers, and archival institutions themselves. Particular attention was devoted to fundamental questions concerning the application of AI in archival work, emerging practical experiences, and the opportunities and challenges associated with technological innovation in archival environments[6]. Overall, the Marburg Colloquia provide a valuable record of how German archival

[6] https://www.archivschule.de/veranstaltungen/kolloquium/kolloqium (access: 06.02.2026)

scholarship has responded to technological transformation over time. Their thematic progression reveals a gradual shift from concerns about digitization toward broader questions concerning born-digital preservation, automation, and the future role of archives in increasingly digital societies.

2.2.2.3. Archival Information Systems and Digital Access

A third important strand of German archival scholarship concerns the development of archival information systems and digital access services. As archives increasingly seek to provide online access to their holdings, researchers and practitioners have devoted growing attention to digital discovery systems, metadata management, interoperability, and user-oriented services. Discussions within the Verband Deutscher Archivarinnen und Archivare (VdA) have contributed significantly to these developments. Through annual Deutscher Archivtag conferences and related publications, German archivists have examined the impact of digital transformation on all major archival functions, including appraisal and acquisition, description and metadata management, preservation, and public access. (VdA, 2010b, 2010a). These discussions increasingly emphasize digital platforms as gateways for improving accessibility while simultaneously addressing legal, ethical, and professional concerns associated with openness and transparency. The practical implementation of these ideas can be observed in projects such as HADIS, Arcinsys, Archivportal-D, and related digital access initiatives. Such systems demonstrate a broader transformation in German archival thinking, in which access is no longer regarded merely as a final stage of archival work but rather as a central objective shaping the design of archival infrastructures themselves.

This user-oriented perspective is also reflected in wider discussions concerning participatory archives, virtual reading rooms, online archival services, and digital public engagement. (Julian Holzapfl, 2014; (Kathke, 2016, pp. 337–348); Joachim Kemper, 2016, pp. 219–223; Kurth-Bürgi, 2016, pp. 224–227); Andrea Roenz, 2018; Antje Diener-Staeckling, 2018; Joachim Kemper, 2018; Tim Odendahl, 2018; Unger, 2018; T. Wolf, 2018; Kate Theimer, 2018, pp. 6–12). These contributions suggest that digital transformation has

fundamentally altered relationships between archives and users by extending access beyond the physical reading room and enabling new forms of interaction with archival materials.

2.2.2.4. Emerging Technologies and the Future of Archives

More recently, German archival scholarship has increasingly engaged with the implications of emerging technologies for archival development. This growing interest is reflected in the activities of professional forums such as the Marburg Colloquia, AUdS, Nestor, and the VdA. The Arbeitskreis "Archivierung von Unterlagen aus digitalen Systemen" (AUdS), established in 1997[7], has become one of the most important professional forums for discussing digital archiving in Central Europe. Through its annual conferences and publications, AUdS addresses topics ranging from digital acquisition and preservation to database archiving, email archiving, internet archiving, and emerging technological challenges associated with born-digital materials. The forum has continuously provided opportunities for professional exchange and has contributed to the dissemination of practical experiences and technical innovations within the archival community. Recent discussions increasingly focus on artificial intelligence, machine learning, automation, and other emerging technologies. These developments are generally viewed not simply as technical innovations but as factors capable of reshaping archival workflows, professional competencies, and institutional strategies. At the same time, German scholars have emphasized the need to address questions concerning authenticity, transparency, accountability, and professional responsibility in technologically mediated archival environments.

2.2.2.5. Key Characteristics of German Scholarship on Digital Archiving

Taken together, German and German-speaking scholarship on digital archiving exhibits several distinctive characteristics. First, technological developments are consistently examined alongside organizational, legal, and institutional considerations rather than as purely technical matters. Second,

[7] https://www.sg.ch/kultur/staatsarchiv/Spezialthemen-/auds.html (Accessed: 12.08.2020)

considerable emphasis is placed on long-term preservation, standardization, interoperability, and sustainability. Third, collaboration among archival institutions, professional associations, and research networks plays a central role in addressing digital challenges. Finally, recent scholarship demonstrates a growing interest in artificial intelligence, automation, and the broader implications of digital transformation for the future of archives. Despite the richness of this literature, most studies focus primarily on the German archival context itself. Comparatively limited attention has been devoted to examining how these experiences might be interpreted, adapted, or compared across different institutional and developmental settings. This limitation is particularly relevant to the present study, which seeks to analyze archival transformation in Vietnam and Germany from a comparative perspective and to explore how different institutional environments shape the adoption and implementation of digital technologies within archival systems.

2.2.3. Research on Archival Computerization in Vietnam

Compared with many developed archival systems, research on archival computerization in Vietnam emerged relatively late and developed in close connection with the country's broader processes of administrative modernization, information technology adoption, and digital transformation. Over the past three decades, Vietnamese archival scholarship has gradually evolved from discussions of archival informatization and computer-assisted management toward more complex issues concerning digitization, electronic records, digital repositories, online access, and emerging technologies. The existing literature has been disseminated through a variety of channels, including monographs, state- and ministerial-level scientific research projects, professional journals such as *Vietnam Archives and Records Journal* (*Văn thư Lưu trữ Việt Nam*) and *Spots of Time* (*Dấu ấn thời gian*), conference proceedings, master's theses, and doctoral dissertations. A review of this literature suggests that Vietnamese scholarship on archival computerization can be broadly divided into three phases: early discussions on archival informatization, research on

digitization and electronic records management, and more recent studies addressing digital transformation and emerging technologies.

2.2.3.1. Early Discussions on Archival Informatization

The earliest studies concerning the application of information technology in Vietnamese archival work emerged during the period of administrative modernization in the late 1980s and 1990s. Research during this phase primarily focused on introducing computers into archival management, developing information systems, and improving administrative efficiency through technological applications. Among the pioneering contributions were *Informatics and Innovation in Archives Management* by Duong Van Kham (1994) and *Computerization of Archives and Library Work* by Le Van Nang and Duong Van Kham (1995). These publications introduced fundamental concepts concerning archival informatization and explored the potential role of information technology in supporting archival management and information retrieval. (Duong Van Kham, 1994; Le Van Nang & Duong Van Kham, 1995). At the institutional level, the State Department of Records and Archives of Vietnam undertook the state-level research project *Fundamental Issues in Building a National Automatic Intelligent Information System* (1989), which represented one of the earliest systematic attempts to examine the application of information technology in archival and information management (State Department of Records and Archives of Vietnam, 1989). These early studies established the conceptual foundations for archival computerization in Vietnam. However, research during this period largely viewed computerization as a means of improving archival management and administrative efficiency rather than as a transformative process affecting archival institutions, professional practices, and user access.

2.2.3.2. Digitization and Electronic Records Management

During the 2000s and 2010s, Vietnamese archival scholarship increasingly shifted its attention from general informatization toward digitization and electronic records management. This transition reflected both

the rapid expansion of digitization projects and growing concerns regarding the creation, management, preservation, and use of electronic records. A number of important scientific research projects contributed to this development. These included *Develop Requirements and Solutions for Managing Electronic Records* (State Department of Records and Archives of Vietnam, 2010); *Building a Basic Framework for Managing Records in the Context of E-Government*. (State Department of Records and Archives of Vietnam, 2018); and *Archiving Electronic Documents of State Agencies in the Period 2020–2025* (State Department of Records and Archives of Vietnam, 2020). Collectively, these projects provided conceptual, legal, and technical foundations for managing electronic records and implementing archival modernization initiatives in Vietnam.

Particular attention was also devoted to the authenticity and long-term preservation of electronic records. This concern was reflected in the international conference jointly organized by the State Department of Records and Archives of Vietnam and SARBICA in 2014 under the theme *The Authenticity of Electronic Records*. The conference generated numerous scholarly contributions addressing authenticity, security, risk management, and institutional coordination in the preservation of electronic records, including studies by Nguyen Thi Ha, Nguyen Trong Binh, Nguyen Quoc Tung, Nguyen Van Ket, Tran Danh Dai, Nguyen Thi Chinh, and Nguyen Lien Huong. (State Department of Records and Archives of Vietnam, 2014). Digitization itself became another major area of scholarly interest. Important contributions include Nguyen Thi Ha's ministerial-level project on digitizing rare and deteriorated archival records. (Nguyen Thi Ha, 2013); Luu Van Van's discussion of fundamental issues in archival digitization. (Luu Van Van, 2009); Duong Van Kham's studies on digitization and metadata creation (Duong Van Kham, 2013a; Duong Van Kham, 2013b); Vu Dinh Phong's research on the digitization of film materials (Vu Dinh Phong, 2013); and Hoang Quoc Tuan's work on managing digital records within the Party Central Committee Archives (Hoang Quoc Tuan, 2013). The significance of digitization was further highlighted during the 2009 SARBICA conference on *Digitizing Archival Records – Sharing Experiences*, where

participants presented practical experiences relating to the digitization of *Châu bản*[8], *Mộc* bản[9], film materials, and archival collections maintained by the Communist Party of Vietnam. (State Archives and Records Department of Vietnam, 2009). Collectively, these studies demonstrate a growing awareness of the challenges associated with electronic records, digital preservation, metadata creation, and archival digitization. At the same time, much of the literature remained strongly implementation-oriented, focusing primarily on technical requirements, legal frameworks, and operational solutions.

2.2.3.3. Digital Transformation and Emerging Technologies

Since approximately 2020, Vietnamese archival scholarship has increasingly adopted the broader concept of digital transformation. Research has gradually expanded beyond digitization and electronic records management to include discussions of digital archives, smart governance, blockchain technology, big data, artificial intelligence, cloud computing, and the future development of archival institutions. This trend is reflected in several recent scientific projects, including *Electronic Records Management from the Practice of the Ministry of Home Affairs* (Office of the Ministry of Home Affairs, 2022); *The Scientific Basis for Determining Technical Requirements of Digital Archives.* (State Department of Records and Archives of Vietnam, 2022); and *The Potential Applications of Blockchain Technology in Managing Electronic Archives Maintained by State Agencies.* (State Department of Records and Archives of Vietnam, 2021). At the same time, scholars have begun examining the implications of new technologies for archival work. Nguyen Thi Chinh (2018), for example, explored the relationship between big data and electronic records management in the context of the Fourth Industrial Revolution (Nguyen Thi Chinh, 2018). Other studies have investigated digital repositories, virtual

[8] Châu bản (archival chronicles of the Nguyễn Dynasty) are official administrative records compiled by the Nguyễn court from 1802 to 1945. These documents contain the signatures of the Nguyễn emperors (National Archives Center No.1 of Vietnam, 2018)

[9] A woodblock (Mộc bản) is a plate of wood on which words are carved in Chinese or in Chữ nôm (a logographic writing system used to transcribe the Vietnamese language). This method was a prevalent technique for printing books during the Nguyễn Dynasty (National Archives Center No.4 of Vietnam, 2018).

reading rooms, and archival databases, including the works of Nguyen Thi Thanh (2014), Do Thu Hien (2014), and Khuat Thi Kim Chi (2015); These studies indicate a gradual shift in Vietnamese archival scholarship from technological implementation toward broader considerations concerning organizational change, digital governance, user services, and the future role of archives in a digitally connected society. Emerging technologies are increasingly viewed not merely as technical tools but as factors capable of reshaping archival functions, services, and professional competencies.

2.2.3.4. Synthesis and Research Limitations

Vietnamese scholarship on archival computerization has undergone a significant evolution over the past three decades. Early studies focused on archival informatization and the application of computers in records management. Subsequent research concentrated on digitization, electronic records, metadata creation, and digital preservation. More recent studies have expanded these discussions to encompass digital transformation, blockchain technology, big data, artificial intelligence, and other emerging technologies. This body of literature has made several important contributions. It has established a substantial conceptual and legal foundation for electronic records management and digital archiving in Vietnam; generated practical knowledge concerning digitization workflows, metadata creation, and repository development; and stimulated discussion regarding the opportunities and challenges associated with emerging technologies. Despite these achievements, several limitations remain evident. Much of the existing literature focuses on technological implementation, legal frameworks, and practical solutions, while comparatively less attention has been devoted to explaining the broader organizational and institutional factors that influence archival transformation. Furthermore, international comparative studies remain relatively limited, particularly those examining how different archival systems respond to technological change under distinct governance structures and administrative traditions. Finally, theoretical perspectives are not consistently employed to explain variations in the adoption and implementation of digital technologies

across archival institutions. These limitations suggest the need for research that combines empirical investigation, comparative analysis, and theoretical interpretation. The present dissertation seeks to contribute to this area by examining the development of archives in Vietnam and Germany under the impact of computerization and by exploring how different institutional environments shape not only the adoption of technology but also the future role, functions, and organizational forms of archives.

2.3. Theoretical framework

Understanding the impact of computerization on archival development requires more than a purely technological explanation. Although digital technologies create new possibilities for records management, preservation, access, and service delivery, their implementation and consequences vary considerably across archival systems. Similar technologies may produce different outcomes depending on legal frameworks, governance structures, organizational cultures, professional traditions, and institutional capacities. Consequently, this dissertation adopts a multi-theoretical framework that combines Institutional Theory, Socio-Technical Systems Theory, and Innovation Diffusion and Technology Acceptance Model perspectives.

Among these theoretical perspectives, Institutional Theory serves as the primary explanatory framework of the study. While Socio-Technical Systems Theory helps explain the interaction between technological infrastructures and organizational practices, and Innovation Diffusion and Technology Acceptance Model Theory contributes to understanding processes of technological adoption, Institutional Theory provides the principal lens through which differences in archival transformation between Vietnam and Germany are interpreted. The central argument of this dissertation is that computerization does not transform archives in a uniform or automatic manner. Rather, technological change is mediated by institutional environments that shape how archives adopt, implement, and respond to technological innovations.

2.3.1. Institutional Theory

Institutional Theory emerged as an influential approach within organizational sociology and political science for explaining how organizations are shaped by broader social, political, legal, and cultural environments. Rather than viewing organizations as purely rational entities seeking maximum efficiency, institutional scholars argue that organizational behavior is strongly influenced by established rules, norms, values, and shared expectations (Scott, 2014; DiMaggio & Powell, 1983). Institutions can be understood as durable systems of formal rules, informal norms, professional standards, and cultural beliefs that structure human behavior and shape organizational decision-making. According to North (1990), institutions provide the "rules of the game" that influence how individuals and organizations operate. Scott (2014) further conceptualizes institutions through three interconnected pillars: regulative institutions, which consist of laws, regulations, and formal policies; normative institutions, which include professional standards and social expectations; and cultural-cognitive institutions, which encompass shared beliefs and taken-for-granted assumptions.

From this perspective, technological innovation alone cannot explain organizational transformation. New technologies may create opportunities for change, but institutional environments influence whether, how, and to what extent such opportunities are realized. Organizations frequently adapt technological innovations to existing institutional arrangements rather than fundamentally transforming themselves in response to technological developments. Consequently, technological and institutional change often proceeds at different speeds and may even generate tensions between innovation and continuity. This perspective is particularly relevant for archival research. Archives are not merely technical systems for storing information; they are public institutions embedded within legal frameworks, administrative traditions, professional cultures, and societal expectations. Decisions concerning appraisal, preservation, access, privacy, authenticity, and accountability are influenced not only by technological capabilities but also by institutional considerations. As a

result, the adoption of digital technologies in archives cannot be understood solely through technical or managerial perspectives.

Institutional Theory is especially valuable for comparative research because it provides a framework for explaining why similar technologies may produce different outcomes across national archival systems. Variations in governance structures, legal traditions, administrative cultures, professional identities, and organizational arrangements may lead archives to respond differently to the same technological developments. In the context of this dissertation, Institutional Theory helps explain why Vietnam and Germany have followed different trajectories of archival transformation despite being exposed to many of the same technological innovations. An important concept within Institutional Theory is institutional isomorphism. DiMaggio and Powell (1983) identify three mechanisms through which organizations become increasingly similar over time: coercive isomorphism, resulting from legal and regulatory pressures; normative isomorphism, arising from professional standards and education; and mimetic isomorphism, whereby organizations imitate perceived successful models under conditions of uncertainty. These concepts are particularly useful for understanding how archival institutions adopt international standards, preservation frameworks, and digital governance practices.

2.3.2. Socio-Technical Systems Theory

While Institutional Theory provides the principal explanatory framework of this dissertation, Socio-Technical Systems (STS) Theory offers an important complementary perspective for understanding the interaction between technological innovation and organizational change. Originally developed by researchers at the Tavistock Institute, STS Theory emphasizes that organizations consist of interconnected social and technical subsystems whose effectiveness depends upon their joint optimization rather than the dominance of either dimension (Trist & Bamforth, 1951; Appelbaum, 1997).

The central premise of STS Theory is that technological systems cannot be understood independently of the social environments within which they operate. Changes in technology inevitably affect workflows, professional roles, communication patterns, decision-making processes, and organizational structures. At the same time, social factors - including institutional culture, professional norms, managerial practices, and staff competencies - influence how technologies are adopted, adapted, or resisted (Appelbaum, 1997). Consequently, successful organizational transformation requires continuous interaction between technological development and social adaptation. This perspective is particularly relevant to archival environments because archives function simultaneously as information systems and as social institutions. Contemporary archives increasingly rely on digital infrastructures such as electronic records management systems, digital repositories, metadata frameworks, preservation platforms, and online access systems. However, the effectiveness of these technologies depends not only on their technical capabilities but also on the organizational contexts in which they are implemented.

For example, the introduction of an Electronic Archives Management System (EAMS) requires more than the deployment of hardware, software, and metadata standards. It also necessitates changes in staff competencies, workflow design, professional responsibilities, and inter-departmental communication. Similarly, the implementation of a trusted digital repository involves not only OAIS-compliant technical architecture but also governance mechanisms, preservation policies, access regulations, and institutional commitment to long-term stewardship. In both cases, technological innovation and organizational adaptation must occur simultaneously if digital transformation is to be effective and sustainable. Applied to archival computerization, STS Theory highlights that technological modernization alone cannot guarantee successful transformation. Archives must develop appropriate organizational structures, professional expertise, management practices, and support mechanisms capable of sustaining technological change over time. Consequently, archival transformation is understood not as a purely

technical process but as a socio-technical process in which technologies, people, organizational arrangements, and professional practices continuously influence one another.

Within the context of this dissertation, STS Theory contributes to understanding how technological infrastructures interact with archival operations and professional practices. It therefore complements Institutional Theory by providing a more detailed perspective on the operational and organizational dimensions of archival transformation in the digital age.

2.3.3. Innovation Diffusion and Technology Acceptance Model

A third theoretical perspective relevant to this study is Innovation Diffusion Theory and related models of technology acceptance. While Institutional Theory explains how institutional environments shape organizational responses to technological change and Socio-Technical Systems Theory emphasizes the interaction between technological and social systems, Innovation Diffusion Theory focuses on the processes through which innovations are introduced, communicated, and adopted within organizations.

The Diffusion of Innovations theory, developed by Everett Rogers (Fèvres, 2022; Karnowski & Kümpel, 2016; Robinson, 2009; Rogers, 2002), explains how new ideas, practices, or technologies spread within and across organizations. The theory identifies five stages of adoption: knowledge, persuasion, decision, implementation, and confirmation, and highlights several characteristics that influence the rate of adoption, including relative advantage, compatibility, complexity, trialability, and observability. Complementing the Diffusion of Innovations theory, the Technology Acceptance Model (TAM), proposed by Davis (1989) and further developed by Venkatesh and Davis (2000), focuses on individual-level determinants of technology adoption. According to TAM, technology acceptance is primarily influenced by perceived usefulness, the degree to which users believe that a technology will enhance their job performance, and perceived ease of use, the degree to which the technology is perceived as requiring minimal effort.

Within archival environments, these perspectives offer complementary insights into technological adoption. Diffusion of Innovations Theory helps explain organizational decisions to implement innovations such as electronic records management systems, digital repositories, artificial intelligence applications, and digital preservation frameworks. For example, the adoption of an OAIS-compliant digital repository may be influenced by its perceived advantages, compatibility with existing archival workflows, and opportunities for testing prior to full implementation. At the individual level, TAM contributes to understanding how archivists, records managers, and other users perceive and respond to new technologies. The introduction of an Electronic Archives Management System (EAMS), for instance, may be influenced by perceptions regarding retrieval efficiency, metadata automation, usability, and integration with existing work practices.

Together, these perspectives provide useful tools for understanding how digital technologies are adopted, accepted, and embedded within archival practice. They contribute to explaining variations in adoption rates, organizational readiness, and user acceptance across archival institutions. However, while diffusion and technology acceptance theories provide valuable insights into the processes of adoption and implementation, they offer more limited explanations concerning the broader institutional conditions that shape long-term trajectories of archival transformation. They help explain how innovations spread and how individuals respond to technological change, but are less effective in explaining why similar technologies may produce different outcomes across different archival systems.

For this reason, Innovation Diffusion Theory and Technology Acceptance Model are employed in this dissertation as complementary perspectives rather than primary explanatory frameworks. Their primary contribution lies in explaining patterns of technological adoption and acceptance, while Institutional Theory provides the principal framework for interpreting how different institutional environments shape the development of archives under conditions of computerization and digital transformation.

2.3.4. Theoretical Integration

The three theoretical perspectives discussed above address different but complementary aspects of archival transformation under conditions of computerization. Institutional Theory provides the principal explanatory framework of this dissertation. It focuses on how governance structures, legal frameworks, professional norms, and organizational cultures influence the ways in which archives respond to technological change. The theory is particularly useful for explaining variations in archival transformation across different national and institutional contexts. Socio-Technical Systems Theory complements this perspective by emphasizing the interaction between technological infrastructures and organizational practices. It highlights that successful archival transformation depends not only on technological innovation but also on the adaptation of organizational structures, workflows, and professional competencies. Innovation Diffusion Theory and Technology Acceptance Model contribute further insights into the processes through which technological innovations are adopted and accepted by organizations and individuals. These perspectives help explain variations in organizational readiness, user acceptance, and implementation processes.

Viewed as a whole, the three theoretical perspectives provide a comprehensive framework for examining archival transformation in the digital age. Institutional Theory explains why different archival systems may respond differently to similar technological developments; Socio-Technical Systems Theory explains how technological and organizational elements interact during transformation processes; and Innovation Diffusion and Technology Acceptance Model explain how technological innovations are adopted and embedded within archival practice. The integration of these perspectives enables a more comprehensive understanding of the impact of computerization on archival development and provides the theoretical foundation for the analytical framework presented in Section 2.6.

2.4. Conceptual framework: A discussion of terms and concepts

A thorough discussion of the primary and relevant terms and concepts is essential. The present study aims to clarify the basic terms and concepts that will be utilized throughout this thesis, including but not limited to record, archive, computerization, information technology, digitization, and digital transformation in archives. The goal is to minimize any ambiguity or disagreement regarding the definitions of these terms and concepts. It is worth noting that our interpretations of these concepts are often influenced by our social and professional backgrounds, as well as the preconceived notions we bring to our observations of the world. Therefore, it is essential to establish a clear and shared understanding of these terms and concepts to avoid any potential misunderstandings or misinterpretations. (Yeo, 2018, p. IX). The understanding and definition of a concept can vary based on different perspectives, approaches, contexts, or types of entities involved. For instance, the concept of "*information*" can be explored in various fields, including public policy, business administration, philosophy, mathematics, computing, and information science, which has its roots in librarianship. Moreover, it is noteworthy that terms and concepts employed in various archival contexts articulated in their respective native languages exhibit considerable diversity and lack uniformity across different regions. Consequently, the imperative for a harmonized comprehension and utilization of archival terminology and concepts within the scope of this undertaking becomes increasingly evident and necessary. This project will examine related terms and concepts with great attention to detail, particularly from an archival standpoint.

With the rapid development of computer technology, new archival terms and concepts have emerged, necessitating a re-evaluation of the fundamental principles of archival theory. After discussing the terms and concepts, the author will proceed to examine the fundamental changes in archival theory and principles in the digital era, followed by a comprehensive review of the existing research literature. This process entails more than just listing activities and understanding various perspectives; we will also have to offer our insights into

the research subject. This dissertation focuses on the following terms and concepts:

2.4.1. Impact

The concept of "*impact*" is complex and multifaceted, encompassing the effect or influence of a phenomenon on another, often measured in terms of strength (how strong), size, or given radius/magnitude, etc. In this work, we define the term "*impact*" as the changes (positive or negative), both intentional and unintentional (direct/indirect effects; covert/overt effects), that are brought about by a developmental intervention within its context and how these interactions influence various components of change that contribute to development. Impact is a key component of the overall development discourse, which encompasses improvements in the quality of life and reductions in poverty, inequality, and social exclusion. Assessing the differential influences of developmental interventions is crucial to understanding their efficacy and ensuring that they address the underlying drivers of development problems, generate equitable solutions, and stimulate sustainable development. (Westhorp, 2014, p. 3). Various opportunities and challenges arise from the transition of traditional archives to digital archives. On the one hand, digital technology is beneficial for archiving, providing rapid benefits. Still, on the other hand, it is harmful in a significant way, which is referred to as computerization-related impediments, a series of new obstacles arising from the computerized process during archives digitization. For example, effects such as the loss of context or functionality in digital media, as well as the complexities associated with long-term preservation and accountability for digital records, manifest in various forms. Therefore, it is essential to recognize the limitations inherent in digital archiving in order to minimize its threats while developing resilient strategies against these risks. This way, archives can leverage the benefits of digital technology to enhance their activities and services while ensuring the sustainable, long-term preservation and accessibility of digital records. These activities align with the overall goals of the archival field, which emphasize the

extensive dissemination of information for transparency, accountability, and democratic governance throughout society.

2.4.2. Digitization/ Computerization/Information Technology Application/ digital transformation

Digitization, referred to as “Digitalisierung” in German, involves the conversion of analog materials, such as paper-based records, photographs, and sound recordings in cassette or reel-to-reel format, into digital formats. The purpose of digitizing archival materials is to support their preservation, storage, and access. (Millar, 2018, pp. 295–296). This process involves converting physical records into digital files using specialized equipment and software. The outcome of this process is commonly referred to as digitized records or “Digitalisat” in German. The significance of digitization is evident in contemporary times, as it not only facilitates the accessibility and storage of archival materials but also safeguards them against the wear and tear that often accompanies physical media. Moreover, digitization ensures that significant historical and cultural materials are accessible to a broader audience, both now and in the future.

According to Cook's (1986) definition, a computer is a mechanical or electrical device used for processing information. (Cook, 1986, p. 1). This definition highlights the significance of computers in the lives of individuals and organizations involved in information management. With the widespread dissemination of computer literacy, computers have become ubiquitous in nearly every aspect of life. Their versatility and processing power make them indispensable tools in a broad array of fields, including scientific research, data analysis, and knowledge management. Computers have revolutionized the way we process and interact with information, enabling us to store, retrieve, analyze, and transmit data with unprecedented speed and accuracy. As such, the role of computers in information management is likely to continue expanding and evolving as new technologies emerge and our understanding of information processing and management deepens. In today's technological landscape, computerization has become a ubiquitous trend across a wide range of fields.

Defined by the online dictionary (dictionary.com), computerization is essentially the act of making something electronic through the use of computers. (Dictionary.com, 2018). In this dissertation, computerization is defined as the process of performing, processing, storing, or controlling information through the use of computers. This also involves converting analog data and processes into electronic formats that can be easily manipulated, transmitted, and stored.

Information technology (IT) is defined as the use of hardware and software, mainly digital computers, to capture, process, store, and disseminate complex data in many forms, including audio, images, and text. (Richard Pearce-Moses, 2005, p. 205). Information technology today refers to the anticipated convergence of the computing, media, and telecommunications sectors (and associated technologies), as interpreted in the larger context of a surge of enthusiasm for the computer revolution, post-industrial society, and information society. (Webster, 2002, p. 2). In Vietnam, the term "information technology" (IT) was first defined in Resolution No. 49/CP, dated August 4, 1993, by the Government, which outlined the country's IT development plans for the 1990s. Accordingly, “IT is a collection of methods, scientific methods, modern technical means and tools, mainly computer and telecommunications techniques to organize, exploit and effectively use the vibrant and potential information resources in all areas of human and social activity.” (Government, 1993, p. 1). While the term “*application*” is understood as bringing theory into practice, *“IT application*” refers to the deployment and implementation of scientific methods, modern technical means, and tools, primarily in computer and telecommunications engineering, to organize, exploit, and effectively utilize information resources across all areas of human and social activities.

Although the exact meaning of “information technology” has shifted over time, most references to it have always been concerned with computers. From the above definitions, as applied to the archival field, computerization is considered the process of utilizing information technology to automate processes, store, and manage archives and their collections electronically. Within the Ministry of Information and Communications of Vietnam's

comprehensive guidebook on digital transformation, computerization is delineated as the systematic digitization of pre-existing business processes. This pivotal stage marks the initial stride in the overarching trajectory of digital transformation. (Vietnam, 2021, p. 21). Within the scope of this project, situated in the domain of archival science, the terms "computerization" and "information technology application" are treated as interchangeable concepts. These terms specifically pertain to the procedural aspects of converting records and archival materials into a digital format for preservation purposes. Moreover, they encompass the use of computer systems or archival information systems to efficiently manage, store, and facilitate access to digital archival content. This process typically involves converting paper-based records and other physical materials into digital images or data, and creating databases and other digital tools to help organize, search, and retrieve the information.

In this study, the term *"computerization" refers to the adoption and integration of information and communication technologies into* archival practices. While more recent literature has adopted broader terms such as *digital transformation* to capture the systemic and disruptive nature of technological change, this research retains the term *computerization* to maintain consistency. However, it should be understood in an extended sense that encompasses digitization, digital archiving, AI applications, and other technological advancements relevant to archival development.

From a technological perspective, digital transformation represents the next stage in the evolution of computerization, made possible by the remarkable advances of breakthrough technologies, particularly digital technologies. It can be affirmed that the emergence of digital transformation in the archival field did not occur instantaneously but is the result of a cumulative process of technological development and breakthroughs. This process can be divided into three main stages. (Vu, 2025, p. 16) :

Stage 1: Archival computerization (1960s–1990s) – Desktop computers, word processing software, and spreadsheets were introduced in archival work.

The primary goal was to automate traditional records management processes, create descriptive databases, and facilitate the retrieval of information.

Stage 2: Digitization (1990s–2010s) – With the development of the Internet and digitization equipment, archival institutions began converting physical records into digital formats for preservation and online access. Large-scale digitization projects were implemented in archival centers during this period.

Stage 3: Digital Transformation (2010s–present) – The advent of breakthrough technologies, including cloud computing, artificial intelligence (AI), blockchain, and big data analytics, has driven a comprehensive digital transformation process in the archival domain.

From a societal perspective, the growing demand from individuals and organizations for rapid, flexible, and unrestricted access to information has become a significant driving force pushing governments to reform public services, including the archival sector. Within the broader framework of building e-government and digital government, digital transformation in archives has become an essential requirement to enhance transparency, improve management efficiency, and raise the quality of public service delivery.

From the internal perspective of archival institutions, digital transformation is both a solution and an inevitable necessity in today's highly dynamic environment. For example, during the COVID-19 pandemic, the need to maintain operations under remote working conditions compelled archives to accelerate the adoption of technologies to digitize workflows and provide archival services with greater flexibility. Currently, digital records are increasingly replacing paper-based records in the operations of government agencies, organizations, and enterprises. This trend presents a significant challenge to traditional archival systems, which have been primarily designed to manage paper-based records. In this context, digital transformation has become a mandatory requirement for archival institutions to sustain and strengthen their role and position in society.

In sum, digital transformation in the archival sector has not emerged abruptly; rather, it is the cumulative outcome of long-term practical needs, technological innovation, and reforms in information governance. It represents an irreversible trend in the modernization of national archival systems.

2.4.3. Record

Records serve as a mechanism to secure information for managerial and production purposes. In a comprehensive context, records play an indispensable role across all facets of human social activity, aiding individuals in retaining knowledge and experiences throughout their lives, work, and endeavors to safeguard their rights. Records come into existence with the emergence of written language and its corresponding characters. In contemporary discourse, various perspectives exist regarding the definition of records. However, a record is generally construed as a medium that serves as a carrier containing information. The two elements within a record, namely the *information carrier* and *the information* itself, engage in a dialectical relationship. In this dynamic interplay, the substantive content of the information in the record assumes a decisive role in determining the overall value of the record.

When examining early definitions of the record concept, it becomes clear that they often focus on physical objects, such as wood and paper. In later illustrations, the information contained in the records is given more attention. Such attributes have been validated in the international standard ISO 15489-1:2016. Information and Documentation: Records management defines records as "*information generated, received, and preserved by an organization or individual as proof and information to comply with legal requirements or the conduct of business.*" (The International Standard Organization, 2016, p. 6), or defined by the ICA Committee on Electronic Records, "*A record is documented information created or received in the commencement, conduct, or conclusion of an institutional or individual activity and that contains content, context, and structure sufficient to give proof of the activity.*" (ICA, 1997, p. 21).

Although the record is defined differently, it has two outstanding features. *Firstly*, the information is fixed in the records with the conscious participation of the people. Thus, the record reflects the activities and management processes of the administration, organization, and individuals. Records are not just a simple collection of data but a result or product of an event. *Secondly*, as records reflect the results of the organizations' and individuals' activities, they can be used as **legal evidence**.

Within the context of Vietnam, we commonly acknowledge and categorize the record values into two primary groups: *practical and historical*. The practical value of a record lies in its ability to support the application of information for current societal pursuits, spanning political, military, economic, cultural, educational, scientific, and technical domains. In various nations, the practical value of records is commonly referred to as current value, indicative of their relevance in providing information for ongoing societal activities. The historical value of records manifests in their capacity to fulfill the demands for utilizing record information in the examination of the past and historical research. Records of historical significance are systematically transferred to the designated archives responsible for their permanent preservation, commonly referred to as historical archives.

In the German archival discipline, the designation "record" finds no direct counterpart; instead, the term "Unterlage" is employed as an overarching term encompassing a diverse array of materials. Alternatively, the terms "Akte" in singular form and "Akten" in plural form serve analogous functions within the discipline, providing specific nomenclature for the materials under consideration. According to the Terminology of Archival Science/ Terminologie der Archivwissenschaft, published by Archive school Marburg/ Archivschule Marburg, "*The term "Akte" is defined as the entirety of analog or electronic documents that arise during a specific business activity and are brought together, formed, based on an organizational pattern.*"(Archivschule Marburg, 2015). "Akte" refers to a file, dossier, folder, or a collection of documents or information related to a specific subject, person, or event. The file (Akte) has a file number

according to the file plan and a description of its contents.[10]. "Akte" can contain a variety of "Dokumente" such as reports, letters, and other forms of written information, which are organized and stored together, referring to information or evidence used to support decisions or provide information. Within the framework of this project, as previously stipulated, the term "record" in English is employed interchangeably with "Unterlage" in German. This terminology refers to a compilation of information that documents a specific transaction, event, or fact, substantiating decisions, actions, or accountability. Records encompass diverse types of information and may manifest in various formats, spanning traditional mediums such as paper to modern counterparts like electronic, audio, or video formats.

In the Vietnamese archival domain, records are systematically classified into three primary categories: the "current" or "active" phase, the intermediary "semi-current" or "semi-active" stage, and the concluding "non-current" or "inactive" state. Conversely, the German archival framework employs a more intricate four-tiered categorization system for records.

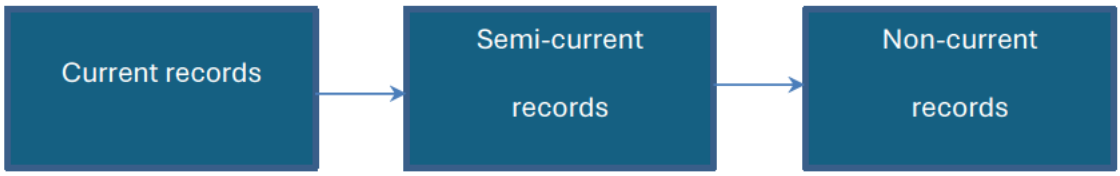


Figure 1. Phases of records

The current records are still used frequently enough to be kept in the office where they were created. Semi-current records are rarely used in day-to-day operations and are suitable for off-site storage. In contrast, non-current records are no longer used regularly but may be occasionally preserved and utilized for legal, historical, or operational purposes. (Richard Pearce-Moses, 2005, p. 100,266,357). The distinction between current, semi-current, and non-current records has implications for the roles of records managers and archivists. Records managers typically handle current and semi-current records

[10] https://forschung.archivschule.de/terminologie/index.html (Access: 18.12.2018)

in the field of records management, while archivists are responsible for non-current or inactive records. This understanding helps to differentiate between the two positions and their respective duties. In Germany, a file (Akte) is classified into four categories: current registry (laufende Registratur), old registry (Altregistratur), interim archive (Zwischenarchiv), and final archive (Endarchiv). A clear distinction is established between the current registry and housing.

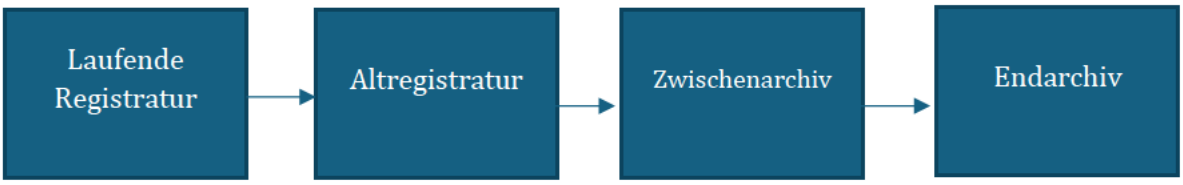


Figure 2. Phases of records in the German context

The ongoing business transactions, current files, and the old registry are designated for completed transactions or closed files. Public archives, however, deviate from the concept of an old registry, typically incorporating an interim archive. In this setting, "Akten" is overseen by the archives but remains under the jurisdiction of the registry designer. The duration for which "Akten" must be retained in the old registry is often governed by specified retention periods, frequently derived from registry regulations. These retention periods serve as guidelines dictating the length of time closed files must be preserved in the old registry, ensuring compliance with regulatory frameworks and archival standards. (Michael & Stropp, 2013, p. 1). After the retention periods have expired, "Akten" undergo a transition to the pertinent final archives, provided that "Akten" are deemed worthy of archival preservation. The Archives Law of the State Archive of Hessen stipulates that documents deemed archival-worthy under this law are those possessing enduring value for various reasons. Such documents are identified by their significance in the realms of politics, law, economics, society, or culture, thereby contributing to the research and understanding of history and the contemporary landscape. Additionally, archival-worthy documents play a crucial role in safeguarding the legitimate interests of citizens. Furthermore, they hold relevance for legislative, executive, or jurisprudential purposes. These criteria establish the parameters by which

documents are deemed worthy of preservation within the State Archive of Hessen, aligning with the broader objectives of historical research, citizen interests, and legal governance. (Ministerpräsident, 2022, p. 493). The terms “archival material” and “Archivgut” in German are typically used and reserved for records that have already been transferred from the originating organization to an institution tasked with preserving them permanently, that is, non-current or inactive records.

In general, all records of any physical type that are received or created by government entities are considered public property. However, from this vast pool of documentation, archives are carefully selected. Typically, only a small percentage of records, ranging from two to five percent, have sufficient value for administrative, legal, or research purposes to warrant permanent retention. These selected records are then transferred to the care of archivists, who are responsible for their long-term preservation and accessibility. Despite their small percentage, the non-current permanently valuable records selected for permanent retention possess tremendous value due to the critical information they contain. They serve as evidence of important legal and administrative transactions and obligations and offer valuable information beyond their initial creation for research and other purposes. These records are essential for documenting and developing the national identity, showcasing the government's efforts, and highlighting both successes and failures resulting from sustained human activity. A Contested Realm: The Nature of Archives and the Orientation of Archival Science, an article written by Terry Eastwood, published in Currents of Archival Thinking (Eastwood & MacNeil, 2010) explained that “archival materials” as being produced naturally as a result of the activities of their creator, are an outcome of human beings taking actions, conducting affairs, or accomplishing tasks in the world, and therefore speak in some, obviously circumscribed, measure of those actions, matters, or charges and the more significant events or experiences of which they were a part. They are to speak of past activities, affairs, tasks, and events that motivated the rise of modern institutions to preserve archives.

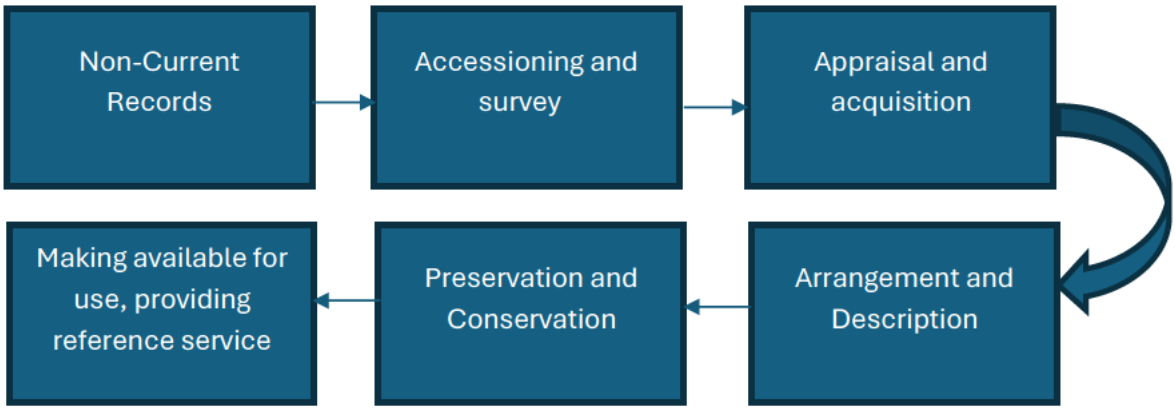


Figure 3. A general process of archival materials

2.4.4. Electronic records/ digital records

The rapid advancement of science and technology, combined with the transformative impact of information technology on administrative practices, has led to significant and exponential growth in the volume of electronic records. Electronic records have emerged as a significant concern within the archives sector and on a broader societal scale. In developed nations such as England, the United States, Germany, China, and Singapore, research into electronic records has been underway since the 1960s. In contrast, Vietnam's governmental archives management agencies have only recently begun researching electronic records and their management. According to the Archives Law 2024 of Vietnam, Electronic archival records include digital archival records (both born-digital and digitized records) as well as the records that are created, transmitted, received, and stored using means operating on information technology, electrical, electronic, magnetic, wireless transmission, optical, electromagnetic, or other similar technologies. (National Assembly, 2024, p. 21). It is important to note that electronic archival records constitute a subset of electronic records; not all records meet the criteria to be classified as electronic archival records. Electronic archival records are defined as electronic records with practical, scientific, and historical value that are selected for long-term storage in the Electronic Archival Management System.

With advancements in science and technology, the shift from electronic to digital technology has popularized the term "digital records." Technologically

speaking, the names of record types reflect the technologies and devices used in their creation. Electronic records are generated using electrical, electronic, magnetic, optical, digital, or similar technologies. These records have existed for many years, encompassing audio-visual documents, films, photographs, recordings, and administrative documents that are transmitted, stored, and accessed on tapes, discs, and other storage devices readable and viewable using computers. Digital records, on the other hand, are a subset of electronic records that utilize digital signals and are supported by digital technologies and devices. As digital technologies and devices replace their electronic counterparts, terms like "digital records" and "digital archival records" have gained prominence over "electronic records" and "electronic archival records." Conceptually, digital records fall within the broader category of electronic records.

In Vietnam, the terms electronic records, digital records, electronic archival records, and digital archival records are often used interchangeably to refer to records created, signed, and authenticated digitally within agencies and organizations. Whether discussing administrative or specialized records containing textual, numerical, or image-based information, Vietnam's archival and information technology community commonly uses the term "electronic records." In official research and legal contexts, the terms "electronic" and "electronic archival records" encompass both digital and digitized archival records.

Regarding the characteristics of Electronic Records: The characteristics of how information is represented vary depending on the intended purpose and audience. The information must be formatted appropriately for computer processing. In human communication, information often uses digits in the decimal system (0-9) and characters from the alphabet (A-Z, a-z). To make this information accessible to computers, a translation from decimal to binary is necessary. When a digital document is created and stored, it transforms from a human-readable format to a machine-readable one. This machine-readable version constitutes the recorded information within the document.

In computing, information is represented using a sequence of bits, also known as binary code. A binary sequence comprises two symbols: 0 and 1. In this system:

- The symbol 1 signifies a “signal” or the presence of something.

- The symbol 0 denotes “no signal” or the absence of something[11].

When input into a computer, information is transformed into a sequence of bits (binary code). The electronic data processing results are then converted into various forms, such as text, audio, or images, for human perception. The information stored in a computer is referred to as electronic records. Unlike other forms of information, such as paper records, electronic records occupy minimal physical space in a computer system. This compact size allows for managing substantial amounts of electronic records within relatively small storage spaces, often comparable to refrigerators, instead of the extensive warehouse storage required for paper records.

The compact nature of electronic records storage contributes to its cost-effectiveness and accessibility to many users. However, this convenience also presents challenges, including data security concerns, privacy issues, and the risk of data loss. Careful management of electronic records is essential to ensure their integrity and availability, while also mitigating potential risks.

The characteristic of the connection between content and the medium carrying information is a defining trait of electronic records. Electronic records are closely intertwined with technology: their creation, management, and structure are all influenced by technological elements. Electronic records must be stored on a digital storage medium, such as a memory card or disk, that is compatible with the current network environment to facilitate access and processing. Notably, the information contained in electronic records is not permanently tied to a specific storage medium; it can be easily transferred from

[11] For instance, the number 10 is represented in binary as 00001010, and the letter A is encoded in binary as 01000001. Each 0 or 1 within the binary sequence corresponds to a specific on/off state or the presence or absence of a particular signal, enabling computers to encode and process information effectively using these binary digits.

one device to another. As a result, the physical structure of electronic records is dynamic and adaptable rather than fixed or immutable. While electronic records heavily rely on technology and the compatibility of digital storage media, they possess the flexibility to be transferred and accessed across different devices. This flexibility underscores their ability to evolve in tandem with technological advancements.

The primary concern addressed here is how to maintain the integrity of information in electronic records despite changes in their physical structure. The logical structure of an electronic record serves as the cornerstone for ensuring this integrity. The document creator typically establishes this structure on their computer screen and defines how the record is organized and formatted. For a record to be considered complete and verifiable, it must preserve this logical structure. When the record is converted back into a human-readable format, the computer system must accurately reconstruct the original structure. The logical structure of an electronic record is represented and stored as symbols or data, often in decimal characters. Therefore, ensuring continued access to the technical specifics of the encoding method is essential. In essence, safeguarding the integrity of electronic records hinges on preserving their logical structure. This structure must be upheld and protected throughout any changes in the record's physical manifestation. The technical details of the encoding method play a critical role in maintaining the accessibility and integrity of the record's logical structure during access or transformations.

Metadata, simply put, refers to data about data. When users interact with data, metadata provides essential information that enhances their understanding of its nature and context. This information empowers users to make informed decisions regarding their data usage. Metadata includes details such as the creation timestamp, creator identity, data content description, and guidelines for appropriate use. It serves as a crucial tool for organizing, managing, and interpreting data effectively. By relying on metadata, users can ensure they use data accurately and follow its intended purpose, thereby optimizing their interactions with data to be more meaningful and efficient. The

structure and content of metadata can vary significantly depending on the specific use case and the type of data. However, in general, metadata typically includes several basic types of information:

*Information about the metadata***:** This category includes details about the metadata record, such as its title, author, creation date, and update history. These elements provide users with insights into the origin and evolution of the metadata.

*Information about the data being described***:** Metadata describes the actual data it accompanies, which may encompass attributes such as data format, size, source, and relevant keywords or tags that describe the content.

*Information about individuals or organizations***:** Metadata often contains information about the individuals or organizations involved in creating, maintaining, or using the data. This can include names, affiliations, roles, and contact information related to the data's lifecycle.

These categories of information help users understand what the data is, where it came from, and who is responsible for it. This context is essential for effective data management and utilization, particularly when multiple users or systems need to share or access data. Metadata provides crucial context about the data's origin, attributes, and stakeholders, facilitating efficient data sharing, collaboration, and informed decision-making across various users and systems.

The term “metadata” is globally recognized and extensively studied, with standardized definitions in various contexts. According to ISO 15489, metadata refers to data that describes the context, content, structure, and management of records over time. This international standard underscores the importance of constructing metadata to facilitate the preservation and utilization of electronic documents by providing essential information on their creation, reception, and formation. (The International Standard Organization, 2016). ISO 15489 plays a critical role in establishing best practices for metadata management, ensuring effective organization and utilization of electronic records and information. Adhering to such standards enables organizations to enhance their data

management processes, improving their ability to access, preserve, and utilize data efficiently.

In traditional document storage contexts, metadata takes on several forms, such as catalogs of archives, which are directories or catalogs that detail the location of various documents or materials**.** They provide guidance on the physical location of items, helping users locate specific materials within a library or archive. File or record index**:** A record index is a comprehensive list that organizes and identifies the contents of files or records. It serves as a reference to the contents of each file or record, facilitating efficient retrieval of specific information. Informational publications introducing archival materials**:** These publications introduce and describe the materials stored within an archive or library. They act as metadata for the stored documents, offering context and information about the available materials.

In essence, these traditional forms of metadata help users navigate and comprehend the content and organization of physical documents and materials. They function similarly to how databases provide metadata for the information they house. Databases have their metadata, which outlines the structure and content of stored data, including field names, data types, and relationships between data elements. Whether in traditional document storage or digital databases, metadata enhances accessibility and manageability for users. It facilitates information retrieval and enables users to grasp the context in which data is stored.

In addition to the previously mentioned inherent characteristics of electronic documents, there are other significant features worth noting. These include their transient nature and susceptibility to technological obsolescence, the potential for data integrity to be compromised, and their capability for multi-accessibility, allowing multiple users to access the same document simultaneously.

2.4.5. Archives

To examine the changes in the activities and functions of archives, it is imperative first to establish a clear understanding of what an archive actually is. This requires a comprehensive examination of the objects and management structures that pertain to archives, as well as a well-defined frame of reference against which these changes can be measured. Furthermore, when considering the relationship between technology and archives, it is crucial not to overlook the various contexts in which the term "archive" may be employed. For example, the terms "electronic archives" and "digital archives" are often used interchangeably or synonymously, as are "computerized archives" and "digitized archives".

The term "*archives*" is widely discussed in various sources, and its meaning is well-established as [1] materials used and generated by individuals, families, organizations, governments, or other public or private bodies in everyday work and living are preserved because they are valuable as records of and sources of knowledge about events and actions (Millar, 2017, p. 4). Many scholars define the term "*archives*" as the collections housed within museums, libraries, and archival institutions, encompassing the entirety of the extant historical record, and differentiate between these entities: archives are repositories for documents, manuscripts, and images; libraries serve as repositories for published books, journals, and various media; and museums curate a diverse array of cultural artifacts. (Manoff, 2004, p. 10). [2] The organization or entity in charge of collecting, safeguarding, and making accessible materials from archives. [3] The structure or other repository where archival collections are kept. (Hirtle, 2014, p. 75; International Council on Archives, n.d.; The National Archives, 2016, pp. 4–5; Millar, 2017, p. 4).

While the term "*archive*" is commonly used internationally to refer to both the collections of documents and the institutions or buildings that collect them, in Germany, the term "*archive*" is mainly used to refer to the latter. According to the definition in "Terminologie der Archivwissenschaft" by the Archivschule Marburg, "*Archive*" refers explicitly to an institution or organizational unit. In

Germany, archives serve both an administrative function in safeguarding legal and administrative records, as well as a repository of sources for historians. Archives today are increasingly recognizing their role as service providers to society, preserving cultural memory and providing access to records that are essential for research, education, and public accountability. Archives not only maintain records for their historical, legal, and administrative value but also make them accessible to the public to promote transparency and accountability in government and other organizations. In this way, archives play an essential role in maintaining and strengthening democratic societies. (Archivschule Marburg, 2015). "Archive" is defined by Christian Keitel in the book "Zwölf Wege ins Archiv. Umrisse einer offenen und praktischen Archivwissenschaft" as *specialized institutions that receive documents and information and make them available to their users* (Christian Keitel, 2018, p. 71). Christian Keitel's definition is one interpretation of the term "archive," which emphasizes the function of archives as institutions that collect and provide access to documents and information. This definition aligns with the modern view of *archives as service providers* and *repositories of cultural memory*.

The term "*archive*" with the former definition is with the interchangeable German term called "*Archivbestand*'', "*Bestand*", or "*Archivgut*". It is defined in the Terminologie der Archiv Wissenschaft as "*a group of documents that are logically comprehensible, such as their origin (Provenance principle), their content (pertinence principle), formal or material characteristics…, combined into one unit…*" (Archivschule Marburg, 2015). This definition emphasizes the idea that archival materials are not just a random collection of documents but are organized according to specific principles such as provenance, pertinence, and material characteristics. The *provenance principle* means that records should be kept according to their origin, that is, who created them and in what context. The *pertinence principle* means that records should be kept based on their relevance or importance to the organization or individual who created them. Finally, the *material characteristics principle* refers to the physical or material properties of records, such as their format or media type, that can impact their preservation

and access. By following these principles, archives can provide meaningful access to documents and information for future generations.

From the above analysis, it is evident that the definition of the term "*archive*" has been subject to considerable debate among scholars. While there is no consensus on the meaning, the notion that archives are composed of recorded documents with long-term value and archives as a physical place has been widely accepted. In this thesis, we will adopt the German archival perspective, in which "*archive*" refers exclusively to a physical location. The terminology used in this context is consistent with the definition provided by the Terminologie der Archivwissenschaft, which defines an archive as an institution or organizational unit responsible for collecting, organizing, and preserving documents and information. The definition of an archive's holdings (archival materials) is referred to as "*Archivbestand*," "*Bestand*," or "*Archivgut*," which refers to a logically comprehensible group of documents based on their origin, content, and formal or material characteristics.

To summarize, it is worth noting that not all "*Akten*" qualify as archival materials. Only a fraction of them possess enough value to merit permanent retention and transfer to an archive for long-term preservation. Archival material, on the other hand, is distinguished by its long-term historical or cultural significance and national or regional importance and is deemed worthy of preservation for future use. Following the business process, files (Akten) enter the retention period. This timeframe is determined by anticipating when the administration might need to access a closed file. In Germany, the retention period typically spans a maximum of *thirty years*. However, in exceptional cases, the administration may decide that file access must extend beyond this thirty-year limit. The administration either legislatively mandates or internally regulates the specific duration of the deadline. It is essential to note that every public administration file is subject to a designated retention period.

Upon the expiration of the retention period, a file is transferred to a responsible archive (historical archive). The archiving process operates under the framework of archive laws applicable to all sixteen federal states and the

federal government. Archivists assess whether the offered file possesses archival value, determining its suitability by meticulously examining its lasting historical significance. If deemed archival-worthy, the file is preserved in the archive indefinitely and made accessible to interested citizens. Conversely, if the file lacks archival value, the issuing authority is responsible for its destruction. Unlike in Germany, Article 65 of the 2024 Archives Law of Vietnam stipulates that the standard retention period for records and documents within the creating agency or organization before their transfer to a historical archives is ten years, unless otherwise prescribed by sector-specific legislation or other applicable regulations requiring shorter or longer periods. It is essential to distinguish between the retention period within the creating agency and the time of transfer to the historical archives. The ten-year period represents the minimum duration for which records are to be kept by the originating body and does not imply that all materials will be transferred immediately upon its expiry. In certain domains, such as foreign affairs, national defense, security, or the judiciary, the timing of transfer and access arrangements may be subject to special provisions designed to meet requirements for confidentiality, information security, and the protection of national interests. (National Assembly, 2024, p. 38).

2.4.6. Computerized archives/ digitized archives/ digital archives

Digital archives have become essential for the safe management, integrity, and effective use of digital documents. The rise of digital documents has introduced specific requirements for their preservation, scientific organization, and utilization, resulting in the creation of digital archives. This section presents a perspective on digital archives and explores the differences between digital and traditional archives. A digital archive comprises infrastructure, hardware, software, databases, and network systems. It fully supports digital document collection, classification, and statistical analysis. Additionally, it ensures the valuation, exploitation, usage, information security, integrity, authentication, insurance, and preservation necessary to prolong the lifespan of digital records. (Nguyen Thi Kim Thu & Nguyen Thi Chinh, 2022, p. 6). The digital archive

possesses all the same features as a traditional archive; however, the documents are digitized (or initially produced in digital format) and made available for online access and exploitation.

By digital archives, we mean archives that encompass records that are created digitally (born-digital). The concepts "*digital archives*" and "*electronic archives*" are used synonymously.[12], encompassing all types of records created digitally, as opposed to computerized or digitized archives, which have a paper-based origin but have been converted to digital form. "Digitized archives" and "computerized archives" are also used synonymously. According to Noyes (Noyes, 2015, pp. 10–11), digital archives have a place but differ from physical buildings. While visitors are required to travel to the physical archives, a digital archive comes to the users; its location is mobile, not static, which complicates the idea of the archive as a physical place. (Noyes, 2015, p. 12). In Germany, archives have traditionally maintained separate systems for managing computerized/digitized and born-digital materials. For instance, the Hessian State Archives have established DIMAG and Arcinsys as dedicated systems for handling born-digital and digitized materials, respectively.[13] However, in recent times, German archives have been developing an integrated system that caters to both digitized and born-digital holdings, making them accessible and searchable as a whole. This enables the virtual reading room to become a reality. Archivportal-D (https://www.archivportal-d.de/), Deutsche Digitale Bibliothek (https://www.deutsche-digitale-bibliothek.de/), and LEO-BW (https://www.leo-bw.de/) are clear examples of such integrated systems. While DIMAG and Arcinsys continue to be used and improved by the archives, the prospect of integrating them into a virtual reading room is on the horizon, with Arcinsys slated to become such a platform in the near future. (Haberer, 2022, p. 14).

[12] A key distinction lies in the fact that *digital records* are generally a subset of *electronic records*: all digital records are electronic, but not all electronic records are digital. However, at the institutional level, the terms *digital archives* and *electronic archives* are often used interchangeably, with the focus placed less on the nature of individual records and more on the fact that the archival operations are supported and delivered through a digital infrastructure.

[13] This model is also the object of this research, namely "*Hybrid archives*"

Again, it is crucial to draw the distinctions between digitally created archives on the one hand and archives computerized from paper-based originals on the other hand. The concept "*digital archives*" refers to all types of archival material that are created digitally and digitized from physical sources, as opposed to "*computerized or digitized*" archives, which have a physical or analog origin (e.g., paper-based, wooden…), but which have been computerized in the last few decades. There is no analog version for digitally created archives (born digital) that can serve as a "backup," which is why technology-independent storage is critical for preservation. A fact is that computerized archives generally do not appear as raw data and, consequently, do not require any re-creation process before utilization. The computerization of paper-based archives serves several purposes; it will primarily enhance accessibility and distribution and reduce attrition on paper originals. Paper-based archives have been computerized to improve accessibility in general and for research purposes in particular. So far, computerization has never been carried out to destroy paper-based originals; the possible loss of a computerized version as a part of an archive represents no loss of information, as the paper-based original will always be accessible. For this reason, converting computerized data to a technology-independent format is not required to secure the information. Still, as computerization also involves an economic investment, the question of using technology-independent forms for computerized data is gradually becoming more apparent. In Vietnam, According to Article 34 of the Law on Archives 2024, a digitized copy of an archival document attains the same legal validity as the original only when all of the following conditions are met: (1) the information contained in the digitized copy remains intact and identical to that of the original document; (2) the copy is accessible and usable; and (3) it bears identifying marks indicating that it has been digitized and has been authenticated by a competent authority, organization, or individual. The law vests authentication authority in three categories of actors: (1) the agency, organization, or individual that created the original document; (2) the agency, organization, or individual that received the document from its creator; and (3) the historical

archives responsible for managing the document in question. (National Assembly, 2024, p. 22).

This marks a departure from the previously common assumption that digitized copies in Vietnam serve primarily for reference purposes. The current legal framework explicitly provides for the recognition of the legal validity of digitized copies, provided they are duly authenticated. This development imposes new requirements on digitization procedures, quality control, and the management of the chain of custody within archival institutions, while also creating opportunities to expand access to and use of digitized archival materials in the digital environment.

The digital archive shares the essential characteristics of a traditional archive, such as archiving, scientific organization, and facilitating the use of archival documents. However, due to the unique nature of preserving digital materials, the digital archive has distinct characteristics that differentiate it from the traditional archive, as outlined below:

Comparison features	**Traditional archives**	**Digital Archives**
Archival objects	- Mainly consists of paper-based records. - Paper-based records can be digitized to facilitate usage, but access is primarily on-site in the reading room.	- Primarily consists of digital records. - Any paper-based records must be digitized to enable online access and exploitation.
Forms of document management and exploitation	- Operates primarily in a physical environment. - Relies on physical preservation methods (with backup options typically limited to insured documents).	- Operates in online and virtual environments. - Utilizes digital preservation methods, including backup copies stored in data warehouses, with insurance

		backup options available for insured documents.
Design	- Utilizes physical equipment systems such as shelves, cabinets, boxes, and covers for paper storage. - Relies on finding aids within the warehouse. - Includes document transport equipment systems for handling physical documents within the archive.	- Relies on an information technology system that includes: - Hardware components, including mechanical equipment and storage devices. - Software for managing digital content. - Database systems for storing digital documents and metadata. - Network infrastructure to facilitate access and management of digital materials.
Inventory space	- Acts as a physical storage location for documents, utilizing equipment like shelves, cabinets, and document transport systems. Specialized archives are typically housed in buildings, while temporary archives occupy dedicated spaces within those buildings.	- It is the location for housing mechanical and storage equipment, software, and network systems. - Exists within a building or occupies a dedicated space, depending on archive size and requirements. - Occupies a compact area as it does not require physical document storage space.

	- A large area is required to accommodate the extensive volume of physical documents. - Storage design must adhere to specialized storage regulations and general construction standards.	- The warehouse design, where equipment is housed, must comply with specific regulations for data center construction and installation of information technology equipment.

Table 1. Comparison between traditional and digital archives

2.4.7. Hybrid archives

Have the state archives in Germany and Vietnam entirely transitioned into exclusively digital archives? The absolute answer to this rhetorical question is "*no*." However, it is crucial to recognize that these archives have evolved beyond the conventional, embracing a transformative journey propelled by computerization. The profound impact of digitization is evident in the ongoing efforts to digitize archival materials and finding aids. As a result, more historical records are becoming accessible in digital formats. The pace of digitization work is subject to the unpredictable nature of the task, necessitating a patient approach.

Consequently, archives are navigating toward a harmonious blend of traditional paper-based documents and electronic databases. The overarching goal is to extensively digitize historical archival holdings, making digitized materials accessible to users while refining virtual research systems concurrently. The commitment extends to the exploration and implementation of innovative services for electronic archiving. This amalgamation of traditional and digital practices creates a new paradigm, the *"hybrid archive*." In this paradigm, integrating archival materials in physical and digital realms becomes a strategic approach, fostering a dynamic and responsive archival landscape. The evolution toward a hybrid archive underscores the commitment to preserving historical records while embracing the benefits of digital advancements. As the digitization journey progresses, the archives continually

strive to enhance user experiences, introduce novel research systems, and pioneer new services in the ever-evolving landscape of electronic archiving. So, the term "hybrid" does not simply denote the parallel existence of physical and digital materials. Rather, it signifies a structural integration of records management, digital preservation infrastructure, metadata standardization, access systems, institutional coordination, and professional competencies within a single governance architecture.

2.4.8. Future of archives

The concept of the *"Future of Archives"* is not a fixed or monolithic notion. It should not be reduced merely to technical progress, but understood more broadly as a cultural, epistemological, and societal process of transformation. Throughout the history of archival science, the "future" of archives has never referred solely to the emergence of new technologies or improved professional methods; rather, it represents an ongoing process of self-reflection and redefinition of the archival discipline itself. (Hill, 2010). If the twentieth century was shaped by the foundational principles of Sir Hilary Jenkinson and Theodore Schellenberg (Hilary Jenkinson, 1922; Radoff & Schellenberg, 1957), who established the two major archival traditions of the modern world (the Continental European and the Anglo-Saxon), then the twenty-first century is characterized by profound shifts in the understanding of *the nature of records*, *the role of the archivist*, and *the relationship between archives and society.*

Within the framework of this dissertation, the *Future of Archives* is defined as a comprehensive transformation of archival theory, methodology, and social function under the influence of computerization and digital culture. It encompasses the transition from custodianship of physical ownership to management of data and knowledge ecosystems; from physical authenticity to digital authenticity, and from institutional memory to collective and participatory memory, thereby orienting toward an open, interactive, and sustainable archival ecosystem. Notably, while the *Future of Archives* is conceived as an open discourse, the Hybrid Archives proposed in this dissertation represent a context-specific model of archival future, a tangible

manifestation of how this discourse materializes differently within particular technological and institutional environments.

2.5. Analytical Dimensions

While the theoretical framework establishes the broader explanatory foundation linking technology, institutions, and society, the analytical framework translates these abstract constructs into five concrete dimensions. These dimensions allow the comparison of archival computerization in Germany and Vietnam to be both theoretically grounded and empirically measurable. To enable a systematic comparison between the archival systems of Vietnam and Germany, this study identifies five analytical criteria as the comparative framework:

- *Technological readiness*: the extent to which infrastructure, software, and digitization processes are in place to fully support the core archival functions;

- *Legal and policy frameworks:* the adequacy, coherence, and feasibility of the legal environment, policies, and national strategies for digital archiving;

- *Institutional capacity*: organizational, financial, and physical resources, as well as coordination processes, to ensure the sustainable operation of digital archives;

- *Professional development:* the qualifications, skills, and career development of archival personnel, particularly their ability to work in a digital environment;

- *User access and engagement:* the level of service provision, accessibility, and user engagement with archival materials, both in-person and online.

The selection of these five criteria stems from the distinctive characteristics of archival science, in which technological, legal, organizational, human, and social value factors are organically interconnected, mutually influential, and decisive to the quality and effectiveness of archival work. Technological readiness reflects the material and technical conditions for

implementing and sustaining a digital archival environment; Legal and policy frameworks establish the normative foundation, ensuring legality and consistency in implementation; Institutional capacity represents the operational and collaborative capabilities of archival institutions; Professional development provides a workforce capable of meeting the demands of digital transformation; and User access and engagement directly reflects the social value of archives and the extent to which they fulfill their mission of serving the public.

This framework not only comprehensively encompasses the essential components of an archival system but is also flexible enough to identify both similarities and differences between Vietnam and Germany, thereby deriving lessons and principles that can be appropriately applied to the Vietnamese context.

2.6. Research Framework

Building upon the theoretical framework presented in Section 2.3, this dissertation develops an analytical framework for examining the impact of computerization on archival development in Vietnam and Germany. The framework serves as a bridge between theoretical concepts and empirical investigation by translating abstract theoretical propositions into observable analytical dimensions. As discussed in the previous section, Institutional Theory provides the principal explanatory framework of the study. It is complemented by Socio-Technical Systems Theory and Innovation Diffusion and Technology Acceptance Model, which contribute additional insights into technological adoption and organizational adaptation. While these perspectives collectively inform the analysis, particular emphasis is placed on understanding how institutional environments mediate the impact of computerization on archival development. The framework assumes that computerization is not an autonomous technological force producing uniform outcomes across archival systems. Rather, technological innovations interact with institutional arrangements, organizational structures, professional practices, and user expectations. Consequently, the effects of computerization are shaped not only

by technological capabilities but also by the broader institutional contexts within which archives operate.

To operationalize these theoretical perspectives, five analytical dimensions are employed: *technological readiness, legal and policy frameworks, institutional capacity, professional development, and user access and engagement*. These dimensions were derived from the literature review and theoretical framework and represent the principal factors through which archival transformation can be observed and compared. Technological readiness examines the technological infrastructures and digital capabilities available to archival institutions, including digitization initiatives, electronic records management systems, digital repositories, online services, and emerging technologies. This dimension is primarily informed by Socio-Technical Systems Theory and Innovation Diffusion Theory. Legal and policy frameworks focus on the laws, regulations, standards, strategies, and policy instruments governing archival computerization. This dimension reflects the regulative pillar of Institutional Theory and highlights the role of governance arrangements in shaping organizational behavior and technological implementation. Institutional capacity examines the organizational resources, governance structures, administrative arrangements, financial support, and strategic capabilities necessary to sustain archival transformation. Particular attention is given to the ways in which different institutional environments influence the implementation, coordination, and long-term maintenance of technological innovations. Professional development addresses the competencies, training systems, professional networks, and knowledge-sharing mechanisms that support technological change within archival institutions. This dimension reflects both normative institutional influences and socio-technical adaptation processes. User access and engagement examine how computerization affects the accessibility, usability, and public value of archival resources. It includes online access systems, digital services, user participation, and broader efforts to strengthen interactions between archives and society.

Together, these five dimensions provide a structured basis for the comparative analysis undertaken in this dissertation. They enable a systematic examination of similarities and differences between Vietnam and Germany while maintaining a clear connection between theoretical concepts and empirical findings. The framework further assumes that the cumulative interaction of these dimensions shapes the overall impact of computerization on archival development. These impacts are subsequently interpreted through the concept of the Future of Archives, which serves as the overarching interpretative horizon of the study. In this dissertation, the Future of Archives is understood not merely as a question of technological advancement but also as a process of institutional adaptation involving changes in archival functions, organizational roles, governance arrangements, preservation strategies, and relationships with users in increasingly digital societies. Figure 4 illustrates the research framework adopted in this dissertation.

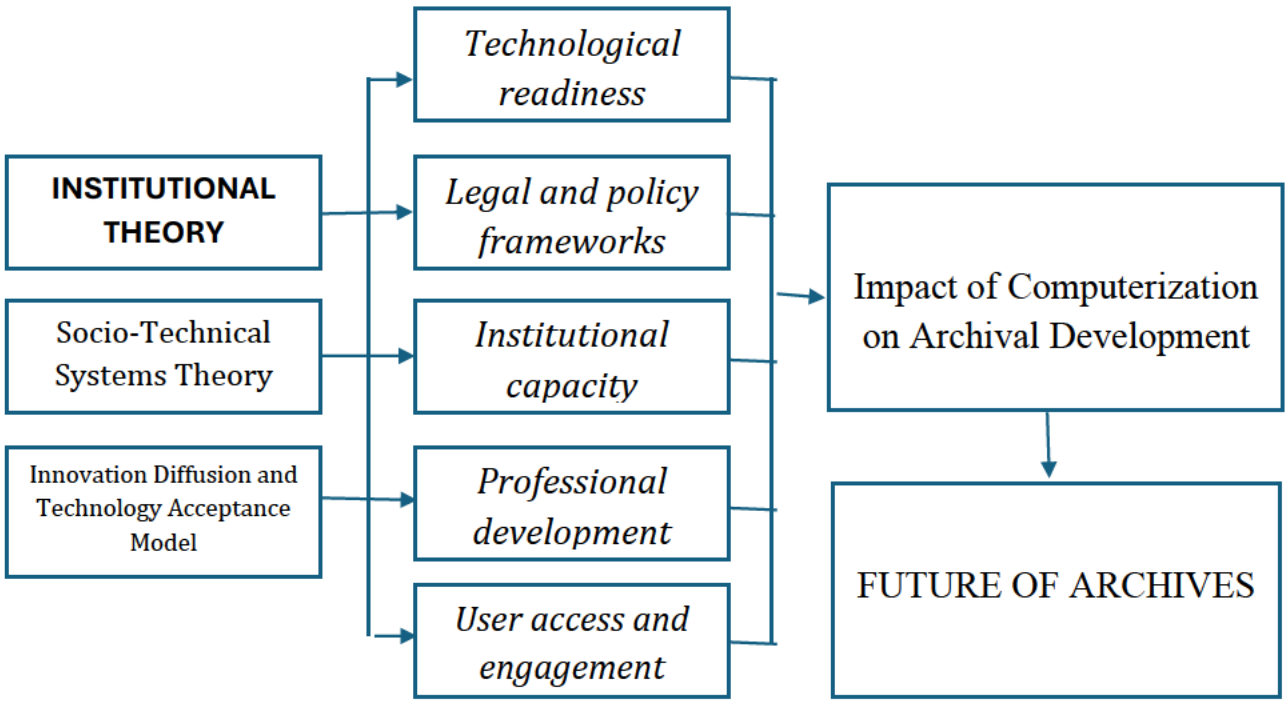


Figure 4. Research framework diagram

2.7. Changes in archival theory and principles in the digital age

From traditional archives to digital archives, what are the differences between them? This section will discuss the evolution of archival theories and principles in response to the impact of computerization on archives. Given the novel nature of electronic records, which possess distinct features and characteristics compared to traditional archival records, the theoretical and scientific foundations for managing electronic records diverge from those established for conventional records management. The advancement of science and technology necessitates theoretical adaptations to address the challenges arising in the practice of electronic records management. For instance, the traditional concept of records as the medium containing information and records management as the management of these media is no longer applicable to electronic records. The shift from viewing records as mere mediums of information to considering them as information, and consequently, electronic records management as information lifecycle management, has become a prevalent trend among researchers and practitioners in the field of archival information globally. This shift underpins the development of new theories that supplement the traditional archival theoretical framework, thereby refining the theoretical basis for managing archival materials across various types and formats, including electronic archival records.

As a result of computerization, today's society's significant records and documents are increasingly being created, reformatted, stored, described, and retrieved in electronic form. Familiarity with networking, telecommunications systems, hardware, and software is fundamental to performing archival functions in many institutional settings. An archive will turn from a traditional to a modern one, namely an “integrated or hybrid archive.” However, we should note that the functions of the archives are likely unchanged, including all the archivist’s activities to accession, arrange, describe, preserve, and make the

records in the archives available, as well as control and promote the use of archives and archival services[14].

As mentioned above**,** new types of records emerged alongside advancements in science and technology. As before, we only pay attention to traditional records (most commonly paper-based ones); electronic records and how to manage and preserve them are the topics of debate that attract society's attention. In terms of origin, electronic records encompass born-digital and digitized records, where the former are initiated electronically from the outset, and the latter are digitized from traditional records (such as paper, wood, and analog film). Digitization is the process of converting analog material into binary electrical (digital) form, particularly for use in a computer. (Richard Pearce-Moses, 2005, p. 120). It is essential to note that, in the context of this project, the terms “digitized” and “computerized” are used interchangeably to differentiate between materials that have been converted from their original analog form and those created in digital formats, also known as “born-digital” materials. This distinction is essential as it highlights the transformation of archival materials from their original media to digital formats. Digitization is distinguished from “data entry," which involves typing textual records into a computer system, often in forms designed to facilitate the process. (Richard Pearce-Moses, 2005, p. 120). Computerization and the introduction of digital materials have influenced and changed archival theory. During the 1970s, as electronic records became prevalent, many archivists argued for abandoning the archival approach. They believed that computer-generated records were so fundamentally different that archives could not possibly respond to the challenge of archiving them in traditional ways. Since the 1990s, archivists have rediscovered archival theory, applied it thoughtfully to computer-generated records, and developed archiving models.

[14] For more information on the functions of the archives. See: “Core Archival Functions”, published by Society of American Archivists (SAA) online at https://www2.archivists.org/node/14804 (accessed on 14.01.2019)

The impact of computerization on archival theory has led to a shift from physical, traditional archives, primarily consisting of paper-based records, to digital archives. This has led to new challenges and opportunities, as well as new approaches to managing, preserving, and accessing archival materials. One major challenge is the *authenticity and reliability* of digital records, as digital records can be easily altered, corrupted, or lost due to technological obsolescence. In contrast, paper-based records generally have a high level of authenticity and reliability due to their physical nature. Physical forms, such as handwritten documents, can be easily verified by examining the paper, ink, and handwriting, making it easier to determine their originality and authenticity. Furthermore, digital records can be easily duplicated and manipulated, making it challenging to decide on their authenticity and originality. At the same time, it is more difficult for paper-based records to be altered or manipulated, as changes to the original document are usually evident.

Additionally, under the impact of computerization, the vast amount of digital materials being produced requires new approaches to selection and appraisal, as well as the development of more efficient methods for organizing, describing, and providing access to digital records. The increased use of metadata and the application of advanced technologies can allow for more sophisticated archival descriptions and management. The increase of born-digital records has also prompted a rethinking of the nature of archives and the role of archives and archivists in society. (Terry Eastwood, 2010, pp. 3–22). In contrast, paper-based records can be challenging to access, especially when stored in remote locations or in physical formats that are difficult to read, such as microfilm. Digital technologies can promote users' access. However, increased access to archival materials also prompts a rethink of the concept of privacy and the need for new approaches to managing sensitive information.

The principle of provenance and respect for original order, which has been applied since the 19th century, has been rethought in the digital age. The principles have historically served as the foundation for Germany's appraisal (selection), organization, and description procedures for archival materials. The

provenance principle, or Provenienzprinzip[15] in German, is used to classify and organize archival materials or holdings based on their historical context of transmission and origin (Archive School Marburg, 2012). The fact that all the records in an archive are intricately linked to one another is a crucial aspect of an archive. (Schenk, 2018, pp. 10–11). This comprehension of the archives serves as the foundation for the provenance and original order concept, which honors their origins and contexts, thereby preserving the records' dependability and authenticity.

However, the principle of provenance and respect of original order in the digital age is not fully applied. The inability to access the aim of wholly ordered collections, detailed at the individual item level, is now a barrier to accessing archive collections. Online fonds or series descriptions, which follow standards developed for the paper paradigm, overlook the new realities of making it easier to access born-digital content and digitized collections. Both call for item-level descriptions; however, the former comes with pre-packaged information that lets readers access and use digital content without being aware of its context or source. New layout and description paradigms for the digital era must emphasize the user's experience and individual products. Using user-generated organization, description, tagging, and links to existing biographical, historical, and contextual materials are now ways to make it easier for people to comprehend and access context. (Higgins et al., 2014, p. 1).

For the mentioned reasons, the need for new authenticity standards and digital preservation strategies, as well as an increased focus on digital investigation, research, and data integrity for digital records, is required. Ensuring the authenticity and reliability of digital documents is vital for their use as evidence and for preserving cultural and historical information for future generations. The challenges associated with ensuring the authenticity and reliability of digital records require ongoing attention and investment.

[15] Terminologie der Archivwissenschaft: https://forschung.archivschule.de/terminologie/index.html (Access: 18.02.2019)

It often needs to be clarified when we want to distinguish between various archival concepts, as Elaine Samantha Marston Penn notes that many archival ideas may share a similar nature. However, the terms used to represent the multiple opinions differ from one language area and administrative context to another. (Penn, 2014, p. 21). The use of simple terms and straightforward exposition of concepts is different from archival science. Many of the archive words currently in use have roots in ancient record-keeping methods, and throughout the ages, they have evolved to reflect the ongoing developments in archival thought. When the necessity arose, archival science also appropriated language from other fields. Furthermore, debates on archive theory can easily result in misconceptions if the language is fluid and ever-changing. It is not unexpected to learn that archivists have difficulties working with digital materials, as they must also deal with the language of computer science, given how easily they may become perplexed when navigating their field's vocabulary. To some extent, the terms of computer science and archival science must be merged to apply archival theory to digital materials. As stated, the digitization of archival materials and the creation of born-digital records have generated a vast amount of digital information that requires management, preservation, and accessibility. This requires a new understanding of the digital landscape and the application of computer science tools and techniques. Being used to new terms and concepts helps archivists keep pace with the technological developments that are transforming the field of archives. It can be said that the integration of computer technology into archives has introduced new terms and concepts, blending traditional archival language with computer terminology. Considering the words "file" and "data" as an illustration, these phrases emerged comparatively speaking, in relation to the core archival terminology of "records," "archives," or "document" as a result of computerization. Other terms and concepts include digital archives, metadata, born-digital records, and digital preservation.

It can be said that, in light of the pervasive impact of computerization on archival science, it is incumbent upon the field to undertake a comprehensive

redefinition of its current terminology and to develop new terms that better reflect the complex and nuanced realities of digital archives. In this regard, Anna Sobczak (2016) has offered an illuminating example in the form of the German term "*Digitalisat*," which refers to a digital reproduction resulting from the scanning of an analog original in any physical form, including documents, vinyl records, Parchments, and other media. By contrast, less precise terms commonly employed to describe such digital reproductions include "copy," "digital form," "digital reproduction," and "scan" (Sobczak, 2016b, p. 210). Accordingly, the adoption of more precise and nuanced terminology, such as "*Digitalisat*", can serve to enhance the accuracy and consistency of archival discourse and facilitate more effective communication among scholars and practitioners in the field. A glossary of related terms and concepts, along with their definitions, is compiled in Appendix 1.

The intents of digitizing archival materials are various. Digitization enables wider access to archival materials, making them available to a broader audience and enhancing accessibility for individuals. By integrating born-digital and digitized holdings, they will be more easily managed, organized, and searched, increasing efficiency in the retrieval of information. The archives can be integrated with other digital resources and systems, improving interoperability and enabling more efficient cross-disciplinary research. Additionally, the digitization of archival materials is considered a means of preserving and conserving valuable historical documents, thereby reducing the risk of damage or loss due to handling or environmental factors. Digitization can also allow archives to reduce the physical storage space required for physical records, which can be costly and challenging to maintain. Additionally, digitization enables archives to share and collaborate on materials more easily with other institutions, researchers, and the general public, providing new opportunities for researchers to access and analyze archival materials and fostering discoveries and insights. Digitization can also enhance the discoverability of archival materials by utilizing metadata and improving indexing and search capabilities.

The preceding analysis suggests that digitization fulfills two principal goals within the realm of archival science: first, the preservation of original documents through their substitution with digital copies, and second, the provision of alternative channels for researchers to access the contents of such documents. However, in the context of the present inquiry, the latter objective is deemed to carry greater significance than the former. Archival digitization is understood to encompass the process of producing electronic duplicates of archival materials and presenting them on the Internet to facilitate researcher access to historical documents. The original archival materials may comprise textual, photographic, or audio-visual content, and digitization entails transforming these "originals" into a format that enables their dissemination via the internet. Digitization is a crucial component in expanding access to archival materials for a broader audience. In his article "Digisam - toward a Coordinated Digital Cultural Heritage in Sweden," Rolf Källman introduced the national strategy for digitization developed by the Swedish Government. This strategy encompasses a range of issues related to digitization. Still, it places a strong emphasis on the use and reuse of digital archival material, as the value of these materials lies in their accessibility to users. (Rolf Källman, 2015, p. 33,41). The goal of digitization is to make archival materials more accessible to a broader audience, regardless of geographical location, which is increasingly important in our digital age. With the rise of technology, the demand for digital access to archival materials has grown significantly, and digitization offers a practical solution to meet this need. Digitization of archival materials is a complex and ongoing process that requires careful planning, management, and investment. Nevertheless, it is a crucial step toward preserving and promoting the cultural heritage and historical knowledge stored in archives for future generations.

As mentioned, modern archival science has been influenced by various factors, including information technology, which has either been a guiding factor or a shaping factor in archival thinking and practice. This is described as a "paradigm shift" by the archive profession, which refers to a different way of seeing the same concepts. It occurs when previously unaccounted-for new

observations begin to raise concerns about the strength of the current framework. (Duranti, 2001, p. 41). Hugh A. Taylor (Hugh & Taylor, 1987, pp. 12–28), one of the first archival thinkers to discuss the concept of a paradigm shift in archives, in his paper entitled "Transformation in the Archives: Technological Adjustment or Paradigm Shift?" linked the archive to the context of technological change and its creation of records in electronic form. This view of records is based on the purpose of their creation and is linked to business processes.

The scope and delivery of information in the Western world are undergoing dramatic changes. The information paradigm shift in archival science refers to the change in the way archives are viewed, managed, and accessed due to advancements in information technology. It represents a change in the underlying concepts, theories, and practices of archival science brought about by the integration of information technology in the field. Under the impact of computerization, the information paradigm shift is the result of a move from physical archives, primarily consisting of paper-based records, to digital archives, leading to new approaches to information management. Studying archival science under the "information perspective" is also complemented by Christian Keitel, the author of the book "Zwölf Wege ins Archiv : Umrisse einer offenen und praktischen Archivwissenschaft" (Hering, 2021, pp. 34–76). By using the term "information" instead of "Unterlagen" or "Records," Keitel has expanded the definition of archives, which is interrelated to other memory institutions, such as libraries and museums, and includes both analog and digital data. The heterogeneity of these terms alone demonstrates the complexity of the subject area (Raulff et al., 2016, pp. 1–2). Although archives, libraries, and museums are three key institutions concerned with the acquisition, development, preservation, research, and communication of what is commonly called cultural heritage, unlike the other two, archives have special characteristics. Firstly, archives deal with unique, one-off, and one-of-a-kind material - not exclusively, but structurally relevant: it only exists once, and no edition, no digitization can replace the original correspondence. Secondly, the systematics of archives emerge more strongly from their genesis, material

structure, politics, and contingencies. They are less transferable than a library classification, even if formal rules can ensure minimum standards in archives. Thirdly, archives are more challenging to centralize or universalize than libraries, as they are often linked to specific places and territories, as well as to the conditions and intentions of their origin. It is only in this way that they can be read and understood. Traditionally, archives, libraries, and museums have generally operated independently of one another, although they often overlap in some regions of their work. Their characteristics are briefly examined to show that their digital preservation endeavors should no longer be viewed separately (Thorsten Wetzenstein, 2010, p. 8).

The advent of online resources has enabled more and better availability of information, resulting in new expectations for those newly informed and capable information consumers who access these resources. It can be said that the information paradigm has presented a change in the underlying concepts, theories, and practices of archival science, brought about by the integration of information technology in the field. It has increased access to archives, making archival material available to a broader audience and enabling more efficient cross-disciplinary research and collaboration.

Additionally, in the digital age, the focus of archival materials has shifted from the physical carriers (such as paper, wood, animal skin, and microfilm) to the content or information itself, as digital technology allows for the preservation, management, and access to information independent of its physical carrier. Although the information paradigm shift in archival science places a greater emphasis on the authenticity and reliability of digital records, requiring new standards and strategies for digital preservation and data integrity, the focus on information in the archival field reflects the trend and the future of archives.

The life cycle model of the records was developed by the US National Archives in 1940, based on the work of Emmett J. Leahy and Philip C. Brooks, and subsequently reinforced by the writings of Theodore R. Schellenberg (Penn, 2014, p. 21). The model represents the life of a record as analogous to that of a

living organism, with distinct stages from creation to final disposition. Different models of varying complexity exist, but all include phases of creation, use, and disposition. (Atherton, 1985, p. 3). In addition to identifying who was responsible for the records at each stage, the separate stages defined the records as current, semi-current, or archival/non-current. The life cycle approach clearly distinguishes between "records" and "archives" – a distinction that can be traced back to Theodore R. Schellenberg, a US archivist. He established two distinct types of value: primary value, which refers to the use made of records by the creator, and secondary value, which refers to the use of archives by researchers. Some archivists have argued that the life cycle model is ill-suited for twenty-first-century recordkeeping, as it cannot satisfactorily deal with digital records, which challenge the notion of fixed stages in a record's existence. (Penn, 2014, p. 22). In response, other archivists have re-conceived the life cycle model as essential for controlling and maintaining digital records. The work done by the InterPARES project at the University of British Columbia in Canada is a notable example. (Macneil, 2000, pp. 52–78).

In the German archival context, when archiving records (Akten), a distinction must be made between active records (aktiven Akten) and passive records (passiven Akten). Active records are the records that are used daily or at least regularly in the administration of a company. In contrast, passive records are no longer used but are retained due to a legal obligation. It often makes sense to manage active records digitally to enhance workflow efficiency. The life cycle of records is a crucial aspect of records management, with distinct variations between analog and digital files. As depicted in Figure 4, the life cycle of analog records unfolds in four different phases. The initial phase involves the creation or receipt of the analog records, which subsequently enter frequent use. The second phase, known as the semi-active phase, is characterized by infrequent or no usage of the records, which are typically stored in the registry. In the third phase, a decision is made regarding the disposition of the records, which may involve either destruction or transfer to the archives for permanent storage in the fourth or final phase.

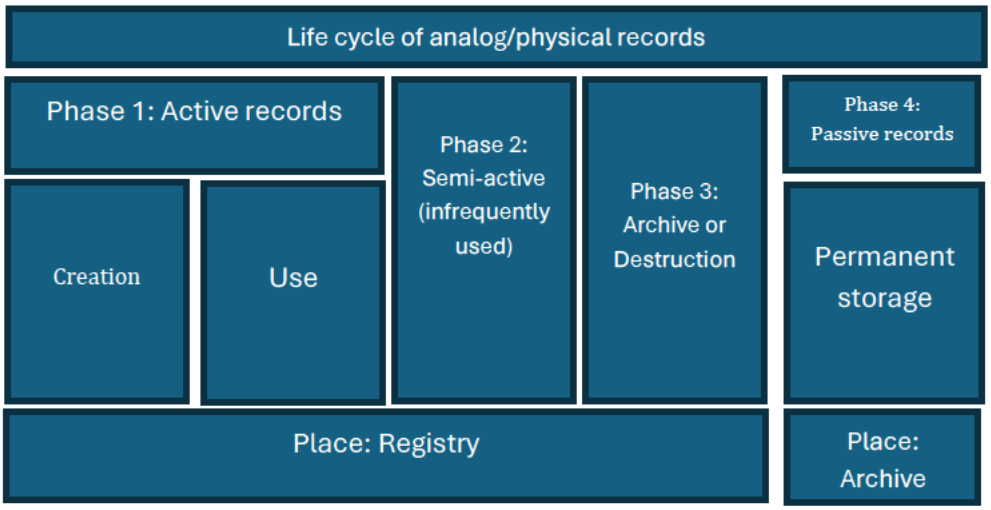


Figure 5. The life cycle of analog/ physical records

In the context of electronic files, a four-phase process is discernible, akin to their analog counterparts. The initial phase involves creating the file, where, unlike the reconstruction possibility in analog files, metadata must be specified to facilitate understanding and processing, as depicted in Figure 5. The second phase concludes the process by closing the file and placing it in the filing system. If the file is not subject to further processing, the second phase terminates with its transfer to the old registry. In the third phase, completed processes are shifted to other storage systems to reduce the inventory of active records. The final phase commences when the retention period has elapsed. At this point, the file is either transferred to digital storage or eliminated.

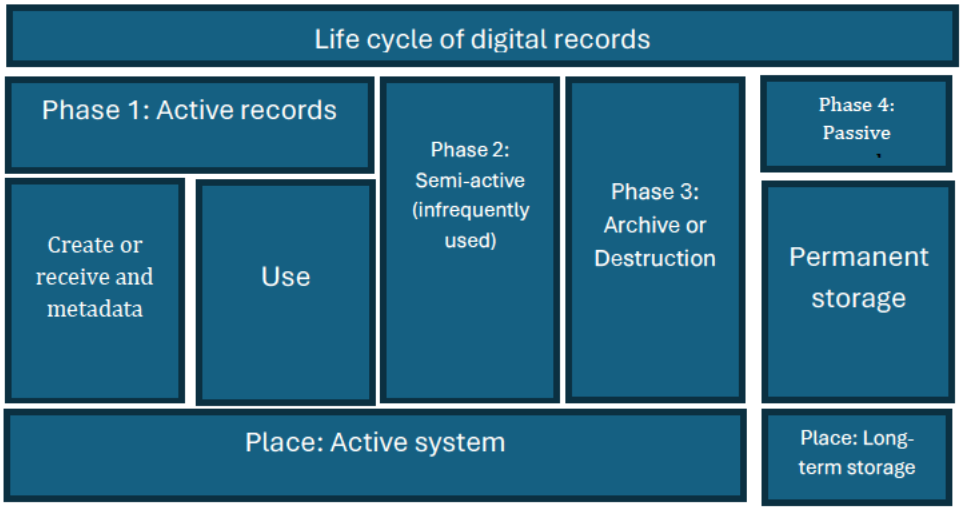


Figure 6. The life cycle of digital records

2.8. Gaps in existing literature

The impact of computerization on archives has been extensively examined in archival literature through various published works, including books, journals, and conference proceedings. However, despite the significant attention paid to this subject in Germany, Vietnam, and globally over the past decades, a considerable gap remains in our comprehension of the continuous and evolving effects of technology on archival practices. This research project aims to provide a comprehensive overview of the impact of computerization on German and Vietnamese archives, which scholars have not explored to date. By examining the effects of computerization on archival theory and practice, this study will assess the effectiveness of current archival practices and identify the challenges and opportunities presented by ongoing technological advancements. Additionally, this research aims to develop a prospective idea and model of future archives for Vietnam, based on current developments in German archival practices, thereby contributing to a more comprehensive and precise understanding of the subject. This research is both original and inherited, as the rapid pace of technological innovation necessitates constant adaptation and evolution of archival practices. Therefore, fostering ongoing dialogue and research in this area is crucial to ensure that archives can continue to evolve and remain relevant in the digital age. Therefore, constant study and discussion in this area are essential to ensure that archival practices remain practical and applicable in the face of technological advancements.

2.9. Summary

An archive refers to a specialized facility designated for preserving records with enduring value. The value of archival collections, regardless of their age, resides in their informational and evidential worth. As a repository of documents, archives represent a crucial aspect of societal memory, providing evidence for historical research. Typically, archival collections encompass a diverse range of materials, including manuscripts, photographs, audio and visual recordings, digital files, and other materials that document the activities of organizations, individuals, and communities. Archives play a fundamental

role in safeguarding and making accessible primary sources of information that support diverse fields of research, including history, sociology, anthropology, and literature.

The preservation of archival materials is a complex process that involves the application of specialized techniques to ensure the physical and intellectual integrity of the records. Archivists, professionals responsible for the management and care of archival materials, play a crucial role in preserving archives. They utilize various tools and methods, such as cataloging, digitization, and conservation, to maintain the integrity and accessibility of the records. By ensuring the safekeeping and accessibility of archival materials, archives contribute to the ongoing development of knowledge and promote transparency and accountability in society.

Computerization has had a profound impact on archives, resulting in a range of changes, including the transformation of archival theory, a shift in focus from preservation to access, the introduction of new terms and concepts, and a fundamental reimagining of the records management life cycle model. These changes reflect the profound impact of digital technology on archival practices, requiring archivists to rethink their roles and responsibilities and to develop new strategies for managing and preserving digital records effectively. In particular, the shift from a focus on preservation to a focus on access underscores the need for archives to strike a balance between ensuring the long-term preservation of records and enabling broad access to information. Moreover, the introduction of new terms and concepts reflects the emergence of new forms of digital records and the need for new vocabularies to describe and manage them effectively. The reimagining of the life cycle model for records management reflects the complex and dynamic nature of digital records, which require ongoing management and attention throughout their lifecycle to ensure their continued accessibility and usability. These changes underscore the ongoing and dynamic nature of archives in the digital age, as archivists continue to adapt and evolve their practices to meet the challenges of technological change.

The digitization of physical records is increasingly viewed as a solution to preserve and extend the lifespan of original documents, while also enabling centralized management and access to digital records. However, the management of born-digital records presents unique challenges and responsibilities that archives must address because of technological advancements. The emergence of digital records has led to the development of a new type of archive – the integrated or hybrid archive – that has specific roles and responsibilities in managing both digitally native and digitized content. This new type of archive necessitates a reevaluation of traditional archival practices and the development of innovative strategies and tools to manage and preserve digital records effectively. In Germany, there is notable enthusiasm to build a unified electronic environment that would provide national access to all archival holdings, including digitized copies of original archival records and born-digital records. Such an electronic environment would enable seamless access to a range of archival materials, streamlining research and promoting transparency and accountability in society. As archives continue to adapt to technological change, it is essential to recognize the critical importance of preserving and providing access to digital records, thereby supporting research and the development of knowledge for future generations. (Sobczak, 2016, p. 7).

While a substantial body of work exists on the application of information technology in archival activities, particularly electronic records management, a comprehensive and holistic study in this domain is notably absent. The field of electronic records management in Vietnam is still in its early stages, presenting unique challenges and opportunities. The proposed study, *"Future of Archives: The Impact of Computerization on Archival Development in Vietnam and Experiences from Germany*", continues existing scholarly efforts and innovative exploration, filling a significant research gap. Drawing on the sophisticated electronic records management practices of developed countries such as Germany is imperative for the evolution of archival practices in Vietnam. This study endeavors to fill the existing research gap by conducting an in-depth comparative analysis of archival computerization in Vietnam and Germany.

Through this analysis, the research seeks to extract valuable insights and lessons that can be adapted and applied within the Vietnamese archival context. The anticipated outcomes of this study are manifold. Theoretically, it will advance the academic discourse on digital archiving by integrating perspectives from developed and developing contexts. Importantly, it will offer actionable recommendations for enhancing electronic records management in Vietnam, with the potential to significantly improve the current practices.

CHAPTER III. RESEARCH METHODOLOGY

3.1. Introduction

This chapter describes the research approach adopted for this comparative study of the effects of computerization and digital technologies on the development of archives in Vietnam and Germany. It explains why we chose a qualitative research design and applied a comparative case study method, which is particularly useful when exploring complex, context-dependent processes, such as the technology-driven transformation of archival work.

This research is interdisciplinary; therefore, in addition to employing traditional archival science methodologies, the author also draws upon interdisciplinary knowledge from information technology, law, public policy, and professional practice. This loose yet structured framework enables a broad analysis of the shift to digital archives from various perspectives, including political, legal, and organizationally focused ones.

This chapter outlines the research design and methodological rationale, describes the data sources and techniques employed, including semi-structured interviews, document analysis, and field observations, and justifies their selection in terms of relevance, validity, and complementarity. Particular emphasis is placed on the empirical dimension of the research, including the author's six-month practical internship at the Vietnam National Archives Center III (from September 2024 to February 2025), which provided valuable first-hand exposure to archival digitization efforts and organizational practices in Vietnam. Finally, the chapter addresses key considerations of research ethics, reliability, and limitations, ensuring transparency and academic rigor throughout the study.

3.2. Research design and methods

3.2.1. Research design

This study employs a comparative, exploratory qualitative research design, reflecting the complex and context-dependent nature of archival development in the digital era. Rather than testing a single hypothesis

quantitatively, the research aims to explore how digital technologies have transformed archival institutions, practices, and policies across different national contexts. By employing a comparative case study approach, the study seeks to identify patterns, contextual variations, and emerging models, with a particular focus on Vietnam and Germany. Given the interdisciplinary nature of archival science, which intersects with information technology, law, public policy, and public administration, a qualitative approach enables a deeper contextual interpretation and the integration of multiple perspectives from institutional practices, policymaking, and professional experience.

The study employs a qualitative case study approach, drawing inspiration from the methodological frameworks of Yin (2018) and Stake (1995) (Stake, 1995; Yin, 2018). This qualitative case study is a research approach that enables the exploration of a phenomenon within its specific context by utilizing multiple data sources. This approach ensures that the issue is examined from multiple perspectives, thereby revealing and deepening the understanding of the phenomenon's various dimensions. (Baxter & Jack, 2015, p. 544). This approach is chosen because it facilitates the in-depth examination of complex institutional and socio-technical systems over time. In contrast to quantitative studies that seek statistical generalizability, the qualitative case study focuses on understanding phenomena in real-life contexts, which is especially pertinent when examining the nuanced processes of digital transformation in archives. Moreover, the case study approach allows the researcher to explore both individual cases (Hessian State Archives and selected Vietnamese archival institutions) and the institutional environment in which these cases operate. It is particularly suited to comparative studies where historical trajectories, legal frameworks, and operational practices differ.

The research design is structured around a logical flow that aligns the research problem, objectives, and questions with appropriate methods of data collection and analysis. This design is illustrated in the Research Flow Chart below, which outlines the sequential steps followed throughout the study:

Step 1: Identifying the research problem, focusing on the influence of computerization on archival practices.

Step 2: Formulating research objectives and questions that guide the study.

Step 3: Selecting a qualitative case study strategy as the overarching research framework.

Step 4: Employing multiple data collection methods, including semi-structured interviews, document analysis, and participant observation; Applying thematic analysis (Braun & Clarke's six-phase model) using NVivo software to code and interpret the data; Ensuring validity and credibility through triangulation of different data sources.

Step 5: Conducting a comparative interpretation of findings between Germany and Vietnam.

Step 6: Deriving Conclusions and Proposing a Future Archival Model tailored to the Vietnamese Context.

This structured design ensures coherence between research components and supports rigorous exploration of the research questions. By combining empirical evidence with comparative analysis, the study seeks not only to assess current archival practices but also to inform future directions in digital archival development.

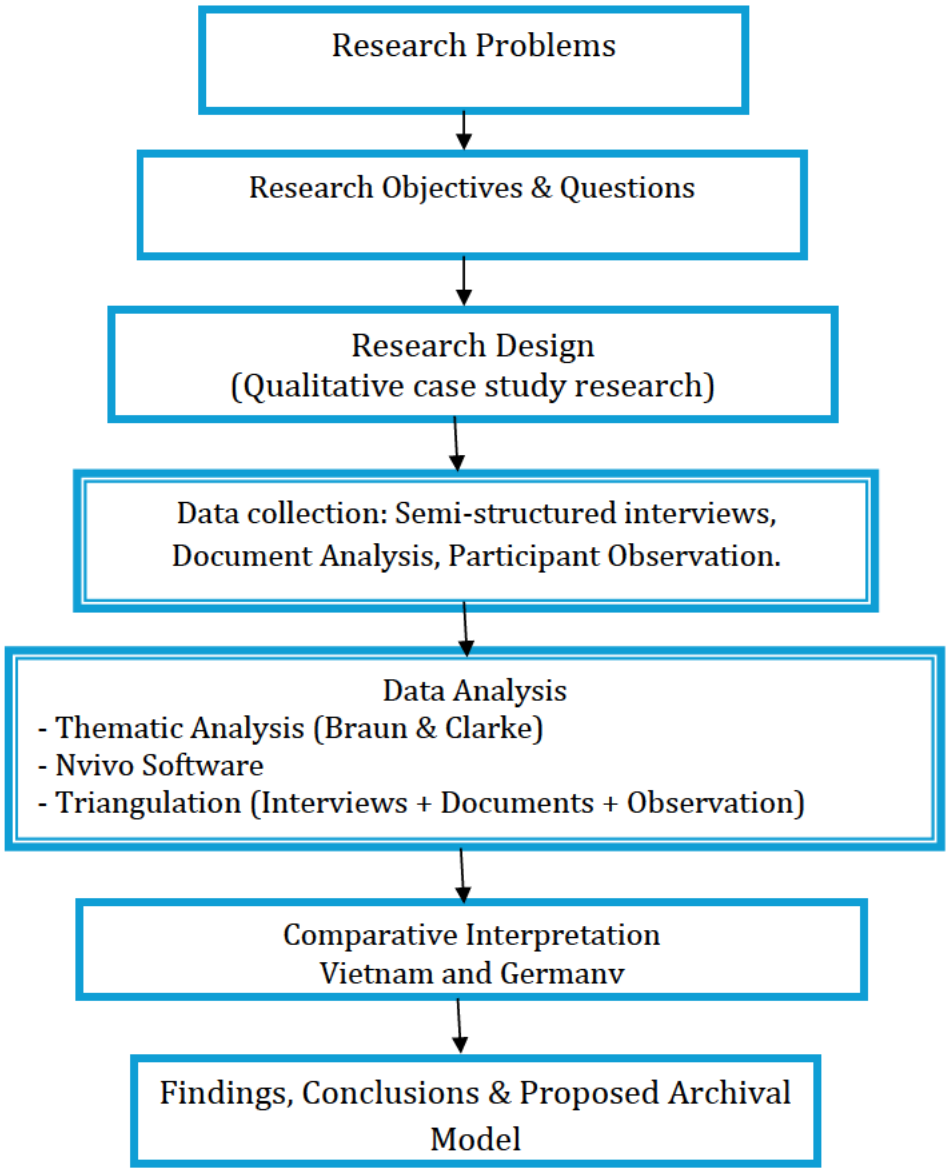


Figure 7. Research Flow Chart

3.2.2. Case Selection

This study examines two national archival systems, Germany and Vietnam, as the central comparative cases. Germany represents a developed archival system with a long-standing tradition of archival modernization and early adoption of digital strategies. In contrast, Vietnam represents a developing archival system, currently navigating its digital transformation under the constraints of limited resources, evolving policies, and organizational capacity. The Hessian State Archives is chosen as the German case study because of its active role in digital preservation, standardized procedures, and participation in national and European

digital infrastructure projects. It offers an illustrative example of how digital transformation is managed in a structured, resource-rich setting.

The archival system of Germany is a sophisticated and intricate entity that has undergone a process of continuous evolution since the Medieval period. In its current form, it aligns perfectly with the nation's administrative divisions. The Federal Archive (Bundesarchiv) serves as the repository of archival materials generated by the central agencies of the federal government, including its predecessors, such as the Ministry of Defense, as well as the archives of the film industry. On the other hand, the State Archives (Landesarchive) are responsible for preserving and making available the archival holdings of their respective regional governments. In addition to these two main groups, some archives have been established to specifically address the archival needs of a particular town, municipality, or district. The presence of church archives, business archives, personal and gentry archives, archives of parliament, political parties, associations, schools, academic institutions, and media organizations further enhances the diversity of the German archival landscape.[16].

The coordination of activities between the federal and state archive services is achieved through regular interactions between their respective Chief Archivists and the formation of joint working groups. The focus of this thesis is a comprehensive examination of the national archives' networks operating within the Federal Republic of Germany, with a particular emphasis on the operations of the State Archives of Hessen, located in the cities of Wiesbaden, Marburg, and Darmstadt. It is important to note that this thesis does not encompass other archival repositories, such as those maintained by religious organizations, corporations, and other entities. The examination of the computerization and digitization of archives in Germany is based on a case study approach, which provides an up-to-date overview of the challenges and opportunities faced by German national archives and other archival entities in

[16] For more information: Archives in Germany: an introductory guide (Available at: http://webdoc.sub.gwdg.de/ebook/p/2005/ghi/www.ghi-dc.org/guide13/index.html) (Accessed: 18.5.2017).

this domain. This is a critical issue that is currently being addressed by archivists throughout Germany and beyond. The integration of electronic aids within the realm of archival science has been a ubiquitous occurrence in Europe[17], with earlier archivists primarily dedicating their efforts to implementing such technology at the national, administrative, and local levels. The utilization of international standards for the description and exchange of archival information serves as a testament to the value and importance of these standards, as they play a pivotal role in enabling international collaboration and facilitating online access to essential finding aids and archival records. Without the implementation of such standards, achieving these goals would remain an elusive aspiration.

From the German side, this research spans a temporal scope from 1990 to the present. The selection of this specific period is premised upon two distinct considerations. Firstly, despite the advent of computer technology and its initial influence on the field of archives in the 1960s, its widespread implementation within German archives became a prevalent reality only in the 1990s. Secondly, the unification of Germany in 1990 marked a seminal moment in the development of German archives, signifying the emergence of a new phase in its evolution. However, it is also deemed crucial for the author to provide a concise historical overview of the computerization of German archives since the 1960s in this research endeavor.

On the Vietnamese side, the study draws on data from various central and provincial archival institutions, including the State Records and Archives Department of Vietnam, Vietnam National Archives Centers I, II, III, the Vietnam National Archives Center on digital and preventive records, and Provincial Archives Centers in Bac Giang, Bac Ninh, Ha Tinh, and Long An. These sites were selected to represent different administrative levels and regional conditions, reflecting the diversity and challenges of digital archival development in Vietnam. The research focuses on the post-Đổi Mới era, spanning from 1986 to

[17] A European portal called Archives Portal Europe was co-created by the German archivists: http://www.archivesportaleurope.eu.

the present. Vietnam initiated the Đổi Mới (Renovation) economic reforms in 1986, marking a significant shift toward market-oriented policies and increased openness to technology and international collaboration. This period saw increased efforts in modernizing various sectors, including archives. The Đổi Mới reforms catalyzed a transformation in Vietnam's approach to archival management, fostering an environment conducive to the adoption of digital technologies. This era has been characterized by a progressive integration of computerization in archival practices, driven by the need to enhance efficiency, accessibility, and preservation standards. The focus on this period allows for examining how Vietnam's archival sector has evolved in response to these reforms and subsequent technological advancements.

Comparative research methodology is employed to identify both common patterns and context-specific differences between two systems: Germany (a developed country with a mature archival infrastructure) and Vietnam (a developing country undergoing digital transition). This design enhances analytical richness by demonstrating how diverse institutional and cultural settings mediate the impact of the same global phenomenon: computerization. The comparative component is not merely descriptive; it is explanatory, aiming to understand why and how different systems respond differently to similar technological pressures and what lessons might be adapted across contexts.

3.3. Data collection methods

The research design is tightly integrated with a triangulated data collection strategy, including: Semi-structured interviews with archivists, IT professionals, and policymakers; Document analysis of legal frameworks, strategic plans, and implementation reports; Participant observation, particularly during the author’s internship at the Vietnam National Archives Center III (September 2024–February 2025). These methods support the depth and validity of the case study, enabling the analysis to generate insights grounded in both theoretical reflection and practical realities.

The author employed a synthesis method to gain an in-depth understanding of the context and historical background of computerization in German and Vietnamese archives. Document analysis constitutes a primary source of secondary data. The documents reviewed include: National laws, regulations, and policy documents related to archives and digital transformation; Strategic plans and technical guidelines issued by archival authorities; Reports, manuals, and internal communications from archival institutions in both countries; Conference proceedings, journal articles, and academic publications on computerization and digital archiving; International standards and frameworks. In particular, the data for this thesis were collected through a comprehensive analysis of annual, quarterly, and monthly reports officially provided by the archives in question. This method enabled the researcher to establish a thorough understanding of the context, track policy development over time, and identify key institutional narratives. Document analysis was also crucial in triangulating the strategy to identify gaps in this research.

A systematic approach was employed throughout the research to effectively collect and categorise all relevant materials in a coherent and organized manner. In the pursuit of acquiring in-depth knowledge and relevant information for this study, the author has meticulously scoured various sources, including German archives such as the State Archives of Hessen and the State Archive of Baden-Württemberg, and libraries, including Justus-Liebig Universität Gießen Library, Marburg Archive School Library, and the Vietnam National University Library. Additionally, the author has consulted the bibliography on archival science, a veritable treasure trove of information about German archival thinking and practice, published by the Marburg Archive School, which can be found at the following web address (URL: Uniform Resource Locator): https://hds.hebis.de/asmr/index.php. Additionally, the extensive database of Google Scholar (https://scholar.google.com/) was also utilized in this dissertation, as it offered access to a vast collection of academic articles, books, and research papers relevant to the study.

Sources have provided a bunch of helpful information and ideas for this project, such as:

- Contributions to the Archival Colloquium of the Marburg Archive School, at: https://www.archivschule.de/veranstaltungen/kolloquium.

- Der Arbeitskreis "Archivierung von Unterlagen aus digitalen Systemen (AUdS)"/ The working group "Archiving documents from digital systems (AUdS)", at: https://www.sg.ch/kultur/staatsarchiv/Spezialthemen-/auds.html.

- Blog: https://archive20.hypotheses.org/. The book "Deutsche Archive im digitalen Zeitalter. Partizipation, Offenheit, Transparenz "/ "German archives in the digital age: Participation, openness, transparency" is a collection of selected articles from this blog over 10 years (2012-2022).

- Nestor: Kompetenznetzwerk Digitale Langzeitarchivierung/ Competence network for digital long-term archiving, at https://www.langzeitarchivierung.de/Webs/nestor/DE/Home/home_node.html

- Number of publications published by VdA (Association of German Archivists/ Verband Deutscher Archivarinnen und Archivare e.V), at https://www.vda.archiv.net/publikationen.html.

- Publications by KLA-Ausschusses Digitale Archive (Konferenz der Leiterinnen und Leiter der Archivverwaltungen des Bundes und der Länd), at https://www.bundesarchiv.de/DE/Content/Artikel/Ueber-uns/Partner/KLA/kla-ausschuss-digit-arch.html.

- Articles are referred from various journal sources, such as the Der Archivar (https://www.archive.nrw.de/landesarchiv-nrw/ueber-uns/archiv-theorie-praxis), American Archivist (www.Americanarchivist.org), Archival Science (www.springerlink.com/content/105703), Archivaria (https://archivaria.ca/index.php/archivaria).

- German archives' websites: Landesarchiv Hessen at https://landesarchiv.hessen.de/; Bundesarchiv at https://www.bundesarchiv.de/EN/Navigation/Home/home.html; Landesarchiv Baden-Württemberg at https://www.landesarchiv-bw.de/; Bayerisches Hauptstaatsarchiv at https://www.gda.bayern.de/archive/hauptstaatsarchiv/.

Semi-structured interviews were conducted to obtain information not readily available in the archives' reports, books, journals, or other sources, thus offering valuable insights into the intricate issues under examination. Semi-structured interviews were conducted with a range of stakeholders involved in archival digital transformation, including Archivists and archival managers at national and provincial levels, IT professionals working in digital preservation and system development, policymakers, and representatives from state archival authorities, as well as experts from German archival institutions, particularly the Hessian State Archives. The semi-structured format allowed for a consistent thematic focus across interviews (e.g., on challenges, strategies, and innovations) while also providing flexibility to explore context-specific insights. Questions were informed by themes emerging from the literature review and document analysis. Follow-up questions were sent to selected interviewees to clarify or expand on their responses during data analysis. A total of 18 interviews were conducted in Vietnam and 6 in Germany. Interviews were carried out in person, online, or via email, depending on accessibility and logistical constraints.

The following table summarizes the classification of interview participants by role, country, and organizational level:

No.	Role	Participant ID	Country	Organizational Level	Quantity
01.	Policymakers	P1 P2	Vietnam Vietnam	National National	2
02.	Director of the archival institution	D1 D2 D3 D4	Vietnam Vietnam Vietnam Vietnam	National National National Local	4
03.	Archivists	A1 A2 A3 A4 A5 A6 A7 A8 A9	Vietnam Vietnam Vietnam Vietnam Vietnam Vietnam Vietnam Vietnam Vietnam	National National National National Local Local Local Local Local	9
04.	IT professionals	I1 I2 I3	Vietnam Vietnam Vietnam	National National Local	3
06.	Head of Department/ Archivist/Officer	H1 H2 H3	Germany Germany Germany	State	6

		H4	Germany		
		H5	Germany		
		H6	Germany		

Table 2. Profile of interview participants

Furthermore, from September 1, 2024, to February 28, 2025, the researcher undertook a practical internship at the Vietnam National Archives Center III. During this period, the researcher observed digitization procedures and technical workflows, participated in meetings and discussions related to electronic records management, and interacted with staff on-site to gain an understanding of the institutional culture, infrastructure limitations, and decision-making processes. (*See Appendix V*). These experiences provided first-hand insights into the practical realities of digital transformation in Vietnam's archival sector. Informal conversations during this period also enriched the understanding of internal perspectives that may not be captured through formal interviews.

Data Management and Ethical Considerations: All data, interview recordings and transcripts, field notes, and documents were stored securely in digital format with appropriate backup and confidentiality measures. Interviewees were informed of the study's purpose, and their consent was obtained in line with ethical research standards. Names of individuals and sensitive institutional information were anonymized during analysis and reporting unless explicit permission for citation was granted.

In this academic endeavor, the translation of German sources into the English language is a crucial aspect that must be considered. Despite the proficiency of modern translation tools, there are still instances of German terminologies that lack proper English counterparts. Consequently, the development of a comprehensive German archival terminology list with detailed definitions is a vital requirement to ensure a seamless translation process and maintain the accuracy of the information being presented.

https://forschung.archivschule.de/terminologie/index.html;

and http://www.ciscra.org/mat/.

3.4. Data analysis

The data collected in this study were subjected to qualitative analysis techniques aimed at identifying key themes, patterns, and comparative insights related to the computerization and digital transformation of archival institutions in Vietnam and Germany. To ensure methodological rigor, the six-phase model of thematic analysis was adapted from Braun and Clarke. (Braun & Clarke, 2006). Furthermore, it was analyzed using NVivo, a qualitative data analysis software. NVivo was selected for its robust capabilities in managing large volumes of textual data, enabling systematic coding, categorization, and theme development.

3.4.1. Thematic Analysis

A thematic analysis approach was employed to analyze data from semi-structured interviews, documents, and observational notes. This method was selected for its flexibility in identifying recurring themes and meanings across different data sources. The process followed Braun and Clarke's six-phase model. (Braun & Clarke, 2006; Peel, 2020):

No.	Six-stage data collection and analysis	Braun and Clarke (2006)	Work on the Thesis
01.	Collect the data	Refer to all the data collected as the data corpus.	Data was gathered from semi-structured interviews with archivists, policymakers, and IT experts; documentary sources including official reports and archival policies; and field observations conducted

			during the researcher's internship at the Vietnam National Archives Center III (September 2024 – February 2025). In total, 24 interviews were conducted across both Vietnam and Germany. Interview recordings were transcribed verbatim and uploaded to NVivo for analysis.
02.	Engage with the data	Become familiar with the data by reading and re-reading transcripts, listening to audio-recordings, and noting any initial observations.	All interviews were transcribed, and documents were read multiple times to gain an in-depth understanding of the content. NVivo's memo and annotation features were used to record initial thoughts, highlight patterns, and identify potentially significant statements across interviews and documents.
03.	Code the extracts from the data	Generate initial codes and labels to represent essential features of the data	A combination of inductive and deductive coding was applied. Codes were generated based on both the conceptual framework

		relevant to the research questions.	and emerging themes from the data.
04.	Generate the code categories from the codes	Identify ideas and concepts that inform the semantic content of the data.	Once a sufficient number of codes had been generated, NVivo was used to group these into code categories. This step helped to construct a more organized framework for thematic interpretation.
05.	Conceptualize the themes from the categorized coded extracts	Search for themes as coherent and meaningful patterns in the data and define the nature of each theme in relation to existing literature.	Through NVivo's "node hierarchy" and "coding query" functions, broader themes were conceptualized based on relationships among code categories.
06.	Contextualize and represent the findings.	Weave together the analytic narrative and vivid data extracts to inform the findings.	Each theme was refined and interpreted within the comparative context of Vietnamese and German archival systems. The final themes were then integrated into the findings chapters (Chapters IV–VII), offering insights into how

			computerization has shaped archival development in both countries. Direct quotes, excerpts from documents, and field observations were used to illustrate each theme, ensuring richness and credibility of the analysis.

Table 3. Six-stage data collection and analysis

3.4.2. Comparative analysis

To address the cross-national nature of the study, a comparative analysis was conducted in Chapter VII. This involved:

- Identifying similarities and differences in archival digital practices between Vietnam and Germany;

- Comparing the influence of legal frameworks, funding models, organizational culture, and technological infrastructure;

- Evaluating how each context responded to everyday challenges, such as digital preservation, born-digital record management, and AI integration.

In this research, the comparative analysis is based on a structured comparative framework with five dimensions:

Comparative dimensions	**Description**
Technological Readiness	Level of ICT infrastructure, digitization capacity, and digital preservation systems.

Legal and Policy Framework	Existence and enforcement of legislation related to digital records and e-archives.
Institutional and Organizational Capacity	Governance structures, human resources, and leadership commitment.
Professional Development	Training programs, knowledge exchange, and skills development among archivists.
User Access and Public Engagement	Online services, transparency, and responsiveness to users.

Table 4. Comparative framework

These five areas were used to code and analyze data from both countries systematically. The comparative framework ensured analytical consistency and supported the identification of context-specific constraints and transferable innovations. The selection of the five comparative dimensions: *technological readiness, legal and policy frameworks, institutional capacity, professional development, and user access*, was guided by both theoretical foundations and empirical findings. These dimensions were derived from a synthesis of the literature on archival digital transformation, insights from international governance frameworks, and recurring themes identified through interviews and document analysis. Together, they form a comprehensive and analytically robust framework that enables a structured comparison between the German and Vietnamese archival systems. The comparative approach was designed not only to highlight differences but also to draw out transferable lessons, best practices, and emerging trends relevant to developing future archival models in Vietnam.

3.4.3. Triangulation

To strengthen the validity, credibility, and depth of the research findings, this study employed a triangulation strategy by systematically integrating data from three complementary sources: semi-structured interviews, documentary analysis, and field observations. This approach aligns with the best practices of qualitative research, particularly in comparative and interdisciplinary studies, and ensures that findings are not dependent on a single perspective or method.

The primary objective of triangulation in this study is to: Cross-verify findings across different data types to reduce bias; Capture complexity by incorporating institutional, legal, technological, and socio-cultural dimensions; Ensure coherence between what is said (*interviews*), what is prescribed (*documents*), and what is practiced (*observations*).

a. Triangulated Data Framework

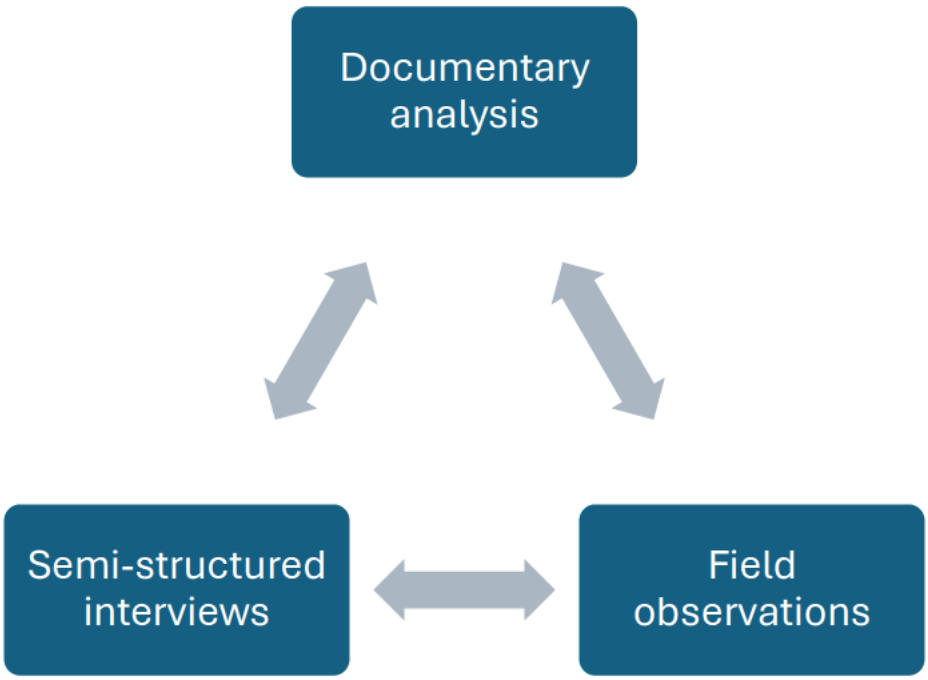


Figure 8. Triangulated Data Framework

b. Forms of Triangulated Data

Data Source	Nature of Information	Purpose in Triangulation
Semi-structured interviews	Perspectives from archivists, managers, and policymakers in Vietnam and Germany	Understand subjective experiences, institutional practices
Documentary analysis	Policies, official reports, archival guidelines, and digital strategy plans	Assess institutional discourse, legal, and strategic context.
Field observation	Practical insights from the researcher's internship at the Vietnam National Archives Center III	Ground-truth practices and compare with stated policies

Table 5. Triangulated Data

This interplay between sources proved critical in this study. For example, the official five-year development report of a Vietnamese provincial archives center stated that digitization efforts had been "completed." However, on-site observation revealed that while scanning machines were procured, they remained largely unused due to staff shortages and unclear workflows. Follow-up interviews with archivists confirmed these obstacles, citing a lack of training and low motivation as underlying causes. Through triangulation, the study moved beyond official narratives to capture the lived reality of digital implementation.

Similarly, in the case of the Hessian State Archives, internal documents highlighted the institution's role in co-developing the DIMAG system. Interviews, however, revealed that the Baden-Württemberg Archives initiated the initial design and piloting, and Hessen joined later as a strategic expansion. Cross-checking archival project histories with interview accounts enabled a

more nuanced historical reconstruction of inter-archive cooperation in Germany's digital infrastructure development.

In summary, triangulation in this research served not only as a method of verification but also as a tool for constructing a richer and more credible analytical narrative. It ensured that findings reflect both policy intentions and on-the-ground realities, while also strengthening the comparative validity between Vietnam and Germany.

3.4.4. Reflexivity and Researcher Positioning

Recognizing the subjective nature of qualitative research, the researcher maintained a reflexive approach throughout the data analysis process. Field notes and analytic memos were kept to reflect on the researcher's potential influence, interpretations, and biases, particularly during the internship period in Vietnam. This reflexivity was crucial in maintaining analytical rigor and ensuring transparency in the drawing of conclusions.

As a researcher of this study, I occupy a dual positionality that deeply informs the research process. I am a Vietnamese archival scholar who has undergone professional training and conducted fieldwork in Vietnam, while simultaneously pursuing doctoral research and academic development in Germany. This unique positioning has offered both notable advantages and certain limitations throughout this study.

On the one hand, my cultural and institutional familiarity with the Vietnamese archival system provided me with deep insights into its historical context, administrative practices, and the challenges posed by digital transformation. My ability to communicate directly in Vietnamese facilitated open and trust-based interviews, as well as participant engagement. This insider perspective enabled me to interpret nuances in policy, organizational behaviors, and archival realities that might not be fully accessible to external researchers. On the other hand, my academic immersion in Germany, primarily through my training at Justus Liebig University Giessen and empirical exposure to institutions such as the Hessian State Archives, enabled me to develop a

grounded understanding of German archival philosophies, digital infrastructure, and policy frameworks. This exposure also helped me develop a comparative lens, sharpened by theoretical knowledge and direct observation, to analyze institutional contrasts and convergences in a meaningful way.

However, this dual positioning also posed reflexive challenges. As an "*insider*" in Vietnam and a "*semi-outsider*" in Germany, I had to be aware of potential biases, such as idealizing German models or being overly critical of Vietnamese constraints. To address this, I employed several strategies:

- Maintaining a reflexive diary to document observations, reactions, and assumptions during the data collection process.

- Engaging in peer debriefing with fellow researchers in both countries to cross-examine interpretations and reduce subjectivity.

- Triangulating data from multiple sources (*interviews, documents, observations*) to ensure that findings reflect evidence rather than personal predispositions.

Rather than viewing this duality as a limitation, I approached it as a productive positionality, one that allows the research to bridge epistemological and practical gaps between a developing archival context and a more established system. This positional reflexivity also enhances the integrity of comparative analysis and informs culturally grounded recommendations tailored to Vietnam's specific conditions.

3.5. Ethical Considerations

This study adheres to established ethical standards for qualitative research, particularly when involving human participants such as archivists, policymakers, IT experts, and archival professionals. All participants were informed of the study's purpose, the voluntary nature of their participation, and their right to withdraw at any time without negative consequences. Informed consent was obtained before conducting any interviews.

To ensure confidentiality, participants' identities have been anonymized in all transcripts and reporting. Identifying information has been removed or coded to protect the privacy of individuals and institutions. The collected data, including recordings, transcripts, and notes, were securely stored and accessible only to the researcher.

Furthermore, institutional documents and archival policy reports used in this study were cited transparently and respected any access and usage restrictions. The study was conducted in accordance with the ethical guidelines established by the researcher's home university (University of Social Sciences and Humanities, Vietnam National University – Hanoi) and host institutions during the practical research phase in both Germany and Vietnam.

In particular, the researcher's six-month internship at the Vietnam National Archives Center III (from September 1, 2024, to February 28, 2025) provided an opportunity to observe archival practices in a real environment. All observational activities conducted during this period adhered to institutional protocols and did not disrupt daily operations. Information collected was used strictly for academic purposes and in full compliance with ethical and confidentiality requirements.

Ethical review and approval were obtained from the relevant academic authority prior to data collection, ensuring compliance with international standards for research integrity, data protection, and respect for human dignity.

3.6. Limitations of the Methodology

While the qualitative case study design and semi-structured interview approach proved effective in generating in-depth insights into the computerization of archival practices in both Germany and Vietnam, several methodological limitations should be acknowledged.

First, reliance on semi-structured interviews may have introduced a degree of subjectivity, both in participants' perspectives and in the researcher's interpretation. Although this method offers flexibility and rich, detailed data, it

is also highly dependent on participants' willingness and openness to share their experiences, factors that institutional or cultural constraints may influence.

Second, the scope of the comparative analysis is limited by access constraints. While the researcher was able to conduct fieldwork at the Vietnam National Archives Center III and gather observations from the State Archives of Hessen and related institutions in Germany, access to internal digital systems, strategic plans, or unpublished materials may have been restricted. This potentially affects the comprehensiveness and depth of the comparative findings.

Third, language and translation issues presented challenges during interviews conducted in both Vietnamese and English. Since German participants responded in English (which is not their first language), their answers may not have fully conveyed all of the insights or nuances they intended to share.

Ultimately, the study focuses on a select group of institutions. As a result, the findings may not fully reflect the diversity of archival practices across all regions and institutions in the two countries. Therefore, any generalizations beyond the studied cases should be made with caution.

Despite these limitations, the study employed data triangulation, thematic analysis, and strict adherence to ethical research procedures to enhance its reliability, validity, and credibility.

3.7. Summary

This chapter outlines the methodological framework guiding this comparative study of the impact of computerization and digital transformation on archival development in Vietnam and Germany. A qualitative, case study approach was adopted to enable an in-depth understanding of institutional practices, policy environments, and professional responses to technological change. Data collection methods, including semi-structured interviews, document analysis, and participant observation, were triangulated to enhance the validity and richness of the findings.

The use of thematic analysis, supported by NVivo, enabled a structured yet flexible interpretation of complex qualitative data. The chapter also detailed the coding process and the construction of analytical themes, supplemented by a comparative framework for cross-national analysis. Attention was paid to reflexivity and the dual positioning of the researcher, whose academic training in Germany and professional engagement in Vietnam facilitated access to both contexts, thereby enriching the interpretation of the results.

By clearly defining the research design, data sources, and analytical strategies, this chapter lays a solid foundation for the empirical chapters that follow. Chapter IV will initiate the analytical journey by examining the broader challenges and opportunities presented by computerization in archives, thereby forming the conceptual backdrop for the two-country case studies in Chapters V and VI.

CHAPTER IV: COMPUTERIZATION IN ARCHIVES: CHALLENGES AND OPPORTUNITIES

4.1. Introduction

This chapter provides a comprehensive examination of the intricate nuances of computerizing archival practices. It strives to offer a multifaceted understanding of the challenges and opportunities posed by digital technologies. Incorporating these technologies into archival systems represents a significant transition toward enhanced efficiency, accessibility, and preservation capabilities. However, this transformation is accompanied by several complex challenges that require careful consideration and strategic mitigation.

This chapter aims to elucidate the complexities inherent to digital archiving, thereby identifying the impediments that impede the advancement of archival computerization. These challenges are technical, organizational, and regulatory, and each requires bespoke solutions to ensure successful implementation. Technical challenges include issues related to digital preservation, such as format obsolescence, data integrity, and the sustainable management of digital assets. Organizational barriers frequently emerge as resistance to change within archival institutions. This is often due to concerns about workforce readiness, traditional operational norms, and the need to adapt existing practices to digital environments. Furthermore, regulatory complexities, including compliance with legal frameworks and adherence to international data security and privacy standards, pose additional challenges that must be effectively navigated.

Conversely, amidst these challenges, there are significant opportunities that demonstrate the transformative potential of digital archiving. The increased accessibility of archival materials through online platforms not only facilitates greater public access to information but also encourages broader engagement with historical records. The digitization of archives enhances preservation efforts by mitigating the risks of physical degradation and enabling

efficient duplication and storage. Furthermore, the implementation of digital technologies facilitates the optimization of archival processes, thereby enhancing operational efficiency and cost-effectiveness. The potential for collaboration and innovation is enhanced when archival institutions partner with technology firms, academic institutions, and cultural organizations, enabling the development of cutting-edge solutions and advancing archival practices.

This chapter aims to provide a critical analysis of the dual landscape of challenges and opportunities inherent in the computerization of archival practices. By elucidating these dynamics within a scholarly framework, it seeks to provide insights that inform strategic decision-making, policy formulation, and the advancement of archival methodologies. Through a systematic examination of global practices and localized contexts, this exploration aims to contribute to the evolving discourse on digital archiving and underscore its significance in preserving cultural heritage and facilitating scholarly inquiry in the digital age. To this end, we focus on several crucial aspects of computerization in archives, such as the digitization of archival materials, archival description, archival presentation, and digital preservation.

4.2. Introduction of computers and computerization in archives

4.2.1. Introduction of computers

The emergence of digital computers marked a decisive shift from simple numerical computation to comprehensive information processing, integrating processing power, storage, and network connectivity. These capabilities enable archives to manage extensive, complex collections with unprecedented speed, accuracy, and accessibility.

According to Akgül (Mehmet Akgül, 2017, p. 13), four characteristics define this technological transformation. First, change is continuous and inherent to the IT sector, driving constant improvement in archival tools and systems. Second, while technological innovations may disrupt established professional practices and cultural values, rejecting them outright is neither

feasible nor constructive; archival institutions must adapt policies and workflows to mitigate negative impacts. Third, advances in technology create new opportunities for professional development, public engagement, and innovative modes of knowledge dissemination, including digitization, online access, and participatory platforms. Finally, despite the rapid pace of change, technological effects can be guided and regulated through informed governance, professional standards, and long-term preservation strategies.

Bailey (S. Bailey, 2008, pp. 10–13) outlined five stages in IT infrastructure development that illustrate this trajectory:

- Electronic accounting machines (1930–1950) introduced automated data sorting and reporting, laying the groundwork for mechanized archival processes.

- Mainframe computers (1950s) enabled large-scale data storage and batch processing, influencing early experiments in digital cataloging.

- Personal computers (1970s–1980s) decentralized computing power, allowing archives to develop in-house databases and management systems.

- The World Wide Web (1990s) expanded access beyond physical repositories, making online catalogs and virtual exhibitions possible.

- Web 2.0 platforms (2000s onward) transformed the web into an interactive space, fostering user participation, collaborative metadata creation, and crowdsourced transcription.

The current stage, shaped by artificial intelligence (AI) and other disruptive technologies such as blockchain, cloud-native preservation platforms, and immersive interfaces, is redefining archival practice. AI-driven tools can automate content recognition, enhance search and discovery, and support predictive preservation. At the same time, disruptive innovations challenge traditional custodianship by decentralizing storage and enabling new forms of record authenticity verification. By situating computers within this socio-technical evolution, archival science can better assess how each technological phase has reshaped description, access, and preservation

practices, redefined user engagement, and expanded the institutional role in safeguarding collective memory.

4.2.2. Computerization in archives

4.2.2.1. Worldwide

The 1950s saw the emergence of several ideas related to the gathering of scientific and technical information, which had a profound impact on the global development of computerization. These ideas were driven by a recognition that access to scientific information was becoming an increasingly critical factor in a country's economic growth and development. As scientific knowledge advanced across various disciplines, it became clear that efficient and rapid routes for acquiring new information were essential to ensure continued progress and competitiveness. One key factor that emerged during this period was the need to establish a network for collecting and disseminating scientific information from various academic centers. This need eventually led to the creation of two major networks in the USA and Europe during the 1970s, which became the cornerstones of what would eventually become the Internet. In addition to scientific and technical information, the use of computers to compile and analyze data in the public sector also began to take hold during this time. This was particularly evident in the compilation of population statistics and mortgage registers by public administrations in the 1970s. The development of these systems was driven by a need for more efficient and accurate methods of data collection and analysis, which could support evidence-based decision-making across various policy areas. These trends reflect the growing recognition of the importance of information and data in driving economic growth and development, as well as the role that computerization has played in enabling more efficient and effective management and utilization of this information.

The early 1980s witnessed a substantial surge in computerization, marked by the widespread adoption of mainframe computer databases for mass data processing. This marked a significant turning point in the history of computerization, as it allowed for more efficient storage and management of

large volumes of data. With the increasing demand for information management and analysis across various industries, the use of computer databases has become an essential tool for businesses, governments, and research institutions alike. This trend toward digital information management paved the way for further technological advancements in the following decades, ultimately leading to the widespread adoption of personal computers, the internet, and other digital technologies that have revolutionized the way we live and work.

The 1990s marked a significant turning point in the commercial viability of the Internet, enabling global-scale virtual connectivity. The Internet's influence was no longer limited to the scientific realm, but instead extended to social, political, and economic spheres, as well as the military, its original intended use. In the archival field, computers were increasingly recognized for their utility in facilitating repeated manual tasks, including data compilation, planning, appraisal, descriptive inventory creation, records accessibility, computation, querying, and broad management functions. Notably, the use of computers to prepare archival descriptions, particularly those for modern records, was a key factor driving archivists' interest in the technology (Sobczak, 2016b, p. 22).

4.2.2.2. Among European archives

The development of electronic records archives in Europe is characterized by a collaborative and cooperative approach rather than a singular trend. This was officially recognized during the Netherlands' presidency of the European Union in the latter half of 1991, which marked the launch of an initiative to promote better collaboration among European archives. The Commission subsequently published the first report on Archives in the European Union in 1994, which the Council positively received. This report marked a significant milestone in the collaborative efforts of European libraries and archives, as it addressed the current situation and outlined future directions for archival work in the region. Through this collaboration, essential concepts related to the management and preservation of mixed archival heritage were developed at both the community and European levels.

The Council conclusions of 17 June 1994 led to several important outcomes, including the establishment of the European multidisciplinary *DLM Forums* on electronic documents and archives. These forums, held in Brussels in 1996 and 1999, as well as in Barcelona in 2002, aimed to explore, promote, and implement increased collaboration in electronic documents and archives among member states and at the community level. Additionally, the Commission collaborated with member states to publish INSAR, a periodical review of European archival developments spanning from 1995 to 2005. These initiatives represent a significant step toward improved cooperation and coordination on mixed archival heritage within Europe.

The publication of the proceedings and conclusions from the DLM-Forums I, II, and III, as recorded in the INSAR European Archives News Supplements II (1997), IV (2000), and VII (2002), respectively, is one of the tangible outcomes of the DLM-Forums (INSAR, Supplement III, 1997). These forums offer interdisciplinary recommendations on the management of machine-readable data, facilitating enhanced citizen access to electronic information. They have enabled greater interaction between public administration and archives services in terms of electronic documents and archives management, as recorded in INSAR Supplement V (2001). Furthermore, the European Model Requirements (*MoReq*) for Electronic Records Management, as documented in INSAR Supplement VI (2002), have contributed to the improvement of the archiving process. Additionally, a significant milestone in the field of archives management was the launch of the online portal Archives Portal Europe (*APE*) in 2009. APE provides access to archive materials from various European nations and information on archival organizations across the continent.

4.2.2.3. In Germany

The digital era has transformed the management, preservation, and accessibility of archives, and Germany is no exception. German authorities have shown a strong commitment to creating a harmonized electronic environment that seamlessly integrates traditional and modern archival resources. This

environment functions as a repository for information and digitized copies of original archival records, as well as for born-digital records. This initiative aims to enable national access to all archival holdings. Digitization plays a crucial role in achieving this goal, as it facilitates the unification of various records in the archives from physical/analog to digital form. The German archival sector is undergoing a significant transformation as it adapts to the digital age. These efforts have considerably enhanced the accessibility of German history and culture to researchers and the public worldwide.

During the 1970s, in the German Democratic Republic (*DDR*), in line with the concept of a centralized state, efforts were made to standardize archive methods and streamline archivists' work processes to increase productivity. To this end, a standardized information research system, known as the Information Retrieval System (*IRS*), was established for all state archives. The IRS aimed to incorporate data gathering, archive description, and audience-specific queries. A dedicated IRS State Archives research group was formed to address these challenges and develop archive description rules, processes, and descriptors. Using an algorithmic approach to information processing, comprehensive descriptions of procedures, known as programs, were created but were only available in paper form.

In the mid-1970s, electronic data processing systems were introduced to save archivists from time-consuming tasks such as comparing, sorting, and querying, particularly for extensive archive fonds. While punched cards were sufficient for smaller fonds, subject-oriented automated information and documentation systems (Sachorientiertes Programmsystem automatisiertes Informations- und Dokumentationssystem) were used to insert archive descriptions into computers after they were initially written on separate cards. However, this approach proved to be less reliable, as the data input procedure had a significant error rate, sometimes as high as one-third.

As a result, several archives attempted to acquire computers and MIDOS software in the late 1980s, which proved to be a superior alternative. Until this time, archives followed the rules in processing newly accessioned documents

and updating older ones. However, the introduction of subject-oriented automated information and documentation systems, coupled with the adoption of computer technology, revolutionized the way archives in the DDR operated, improving productivity and accuracy in the archiving process.

During the 1970s, archives in West Germany began to develop specialized software to assist archivists in describing archival materials. These software programs were either developed independently or in collaboration with private IT firms. By the end of the decade, several software programs were created, including AIDA (*Automatisiertes Informations-Dokumentationssystem für Archive*) by the state archives of Lower Saxony, AKABDA (*Aktenabgabedatei*) for records administration and description in the Bundesarchiv, MIDOSA (*Microcomputer gestütztes Informations-und Dokumentationssystem für Archive*) by the State Directorate of the Archives in Baden-Württemberg, and HADIS (*Documentation and Information System of Hessian Archives*) by the Hessisches Landesarchiv.

In the early 1990s, the Archivreferentenkonferenz (ARK) created a bibliography on topics related to archives and provided software instructions for use in archives. During this time, archives began to merge information management systems to enable more sophisticated management of archival assets and the publication of electronic inventories on the Internet. One example of this is the BundesArchiv IT-System, also known as the BASYS IT system. In the late 20th century, international standards for archive description, such as ISAD (G) and EAD, started gaining popularity. (Sobczak, 2016b, p. 27). Archives began receiving electronic documents more than 20 years ago, such as the Bundesarchiv's collection of electronic historical documents produced by East German entities between 1970 and 1990. As a result, acquiring the necessary equipment to manage electronic records became a significant concern for archives.

Nowadays, all state and federal archives come equipped with basic computer features, office programs, and software designed to facilitate archival descriptions. Moreover, many archives have updated their software to simplify

the handling of hybrid records, as well as repositories, reading rooms, and other areas. Two examples of such software are MIDOSA 21 at the Landesarchiv Baden-Württemberg and BASYS in the Bundesarchiv. Both analog and digital holdings management solutions have been developed, enabling the gathering of widely scattered information, such as computer databases, paper inventories, card catalogs, and other finding aids. This has increased work efficiency, enhanced citizen service, and expanded the accessibility of records at any time of the day or night. Advancements in computer applications have made the transfer of analog information into a digital form more straightforward and faster. There has also been a significant interest in innovative working tools. Today, all state archives have websites where they provide information about themselves and their collections. Furthermore, most state archives have either initiated or assisted in establishing websites where archival organizations can publish their research materials. The collaboration between public administration and archives to preserve electronic documents is also on the rise.

4.2.2.4. In Vietnam

The computerization of archival work in Vietnam has undergone more than three decades of continuous research, legal development, and practical implementation, with the State Records and Archives Department of Vietnam (*SRAD*) playing the primary leading role. The earliest recorded initiative dates back to 1989 with the State-level project *"Fundamental Issues in Building an Automated Archival Information System"* (Code 48A.02.04), which laid the theoretical foundation for applying information technology (IT) to archival description, classification, and retrieval. (State Records and Archives Department of Vietnam, 2022). From the 1990s to the 2010s, SRAD implemented numerous ministerial- and institutional-level research projects, ranging from digitizing rare collections, such as Châu bản (imperial administrative documents), to applying CD-ROM technology in preservation, developing software for electronic document management, archival statistics, and establishing standards for digital preservation.

In parallel with research, SRAD actively developed and issued a system of legal instruments and operational procedures to promote the application of IT in archives. These include professional guidance documents (such as Official Dispatch No. 608/LTNN-TTNC, 1999; Decision No. 53 QĐ/LTNN-NVTW, 2000) and national regulatory instruments such as Decree No. 01/2013/NĐ-CP, Decree No. 30/2020/NĐ-CP, along with Circulars No. 01/2019/TT-BNV and 02/2019/TT-BNV. These documents stipulate requirements for creating, managing, and preserving electronic archival records, as well as technical standards for metadata, data integrity, and long-term storage. The culmination of these efforts was the Prime Minister's Decision No. 458/QĐ-TTg (2020) approving the *"Scheme on Archiving Electronic Records of State Agencies for the 2020–2025 Period"*, demonstrating a clear policy commitment to digital transformation in the archival field.

In terms of infrastructure, SRAD has established a centralized data center equipped with upgraded firewalls, virtualized servers, SAN storage systems, and magnetic tape backup, meeting the requirements for large-scale and long-term storage. The four National Archives Centers, including the dedicated National Archives Center for Digital and Preventive Records, are equipped with independent database and application servers, LAN networks, and multi-terabyte storage systems.

Current application software covers a wide range of functions, from document and workflow management, archival cataloging, and statistics, to collection management and online public services. Since its launch in 2016, the electronic portal has provided Level 3 online public services for the issuance of archival copies and certifications, as well as hosting virtual exhibitions and thematic databases. Significant digital collections, such as *Châu bản* (309,384 images), *Mộc bản* (woodblocks, 55,324 images), cadastral maps (300,000 images), audio records (2,500 hours), and *Hồ sơ đi B* (Southern support mission records, 70,000 files), are now accessible via the agency's online platforms. (State Records and Archives Department of Vietnam, 2022)

However, alongside these achievements, notable challenges remain. The rate of electronic record creation remains low; some specialized databases and management applications are underutilized; and infrastructure, particularly in information security, has yet to be fully standardized. IT human resources are insufficient due to recruitment and retention constraints; awareness of cybersecurity and data safety in specific units remains incomplete. (Le Van Nang, 2022; State Records and Archives Department of Vietnam, 2022).

4.3. Situation before computerization in archives

Before the computerization of archives, archives faced several significant problems. *First*, access to the archives was limited. Archival materials were often stored in extensive physical collections, making access difficult for researchers, students, and the public. Access was frequently limited to a few hours a week, and researchers had to travel to the archives to view the collections physically. Physical archives were typically housed in a specific location, and users had to travel to the area to access the records. It was time-consuming and particularly challenging for researchers who lived far from the archives or who had limited time and resources for travel. Physical archives were often open for only limited hours, making it difficult for users to schedule time to access the records. This also meant that users had to carefully plan their trips to the archives to maximize their time there. Therefore, the archives encourage you to contact them or place an order in advance by phone or email before visiting. Additionally, physical archives often employ manual systems for managing their collections, which can be inefficient and hinder the search and retrieval of specific records. *Secondly*, before computerization, physical archives were subject to damage from light, humidity, moisture, and other environmental factors. They are also at risk of theft, fire, and other forms of destruction. Preserving physical records was a significant challenge for archives, and many valuable historical documents were lost over time, making them unavailable to future generations. *Ultimately*, many archives struggled to keep pace with the increasing volume of historical documents due to their limited resources and funding. Archival activities were

happening slowly, preventing the archives from fulfilling their tasks and responsibilities.

The archives have faced increased challenges during the pandemic, primarily due to the impact of the coronavirus outbreak. This global phenomenon has significantly impacted physical archives worldwide, including those in Germany, and has presented unprecedented challenges. The pandemic's initial stages caused the archives to close their doors to the public in compliance with health and safety regulations, resulting in an increased demand for remote access to archival materials. This development subsequently pressured archives to improve their digital infrastructure and expand their online services. The pandemic also led to the cancellation or postponement of public events, such as lectures, workshops, and exhibitions, which affected the archives' ability to engage with the public and generate revenue. Furthermore, the pandemic presented preservation challenges for archives related to pandemic-related records, as well as archives of remote work and online communication, and the management of newly generated records and collections. For example, due to the coronavirus pandemic, the state archives of Hessen implemented measures to prevent the spread of the virus. In 2020, the reading rooms were closed for five weeks (from March 16th to April 20th). Once the reading rooms reopened, the available spaces were reduced to comply with social distancing guidelines. To access the archives, users must adhere to the *'Measures and regulations against Coronavirus'* to ensure the safety of all visitors.

When archival materials are physically collated in one place, it limits the number of people who can read them. When archives are placed online, the number of people able to access and search them increases dramatically. Furthermore, thanks to the advances and sophistication of search engines, it is much more thorough. An added dimension that these technological advances have delivered is the ability to take information from one digital archive and use it to search for another within minutes. Additionally, archives are increasing their digitization efforts, making more materials available online, and

developing new online exhibitions and events to engage with the public remotely.

Dimension	Challenges before Computerization	Implications
Access	- Limited opening hours. - Requirement for in-person visits. - Travel barriers for distant users.- Manual request and retrieval systems.	Restricted user engagement and reduced inclusivity; difficulty for researchers with time or resource constraints.
Search and Retrieval	- Handwritten or typewritten catalogs. - Card index systems. - Slow, labor-intensive record location.	Inefficient workflows, high staff workload, and potential for errors in locating materials.
Preservation	- Vulnerability to environmental damage (light, humidity, pests). - Risks from theft, fire, and natural disasters. - No digital backup.	Permanent loss of unique historical materials; reduced long-term cultural heritage preservation.
Resources and Capacity	- Limited budgets and staff. - Inability to process growing record volumes promptly.	Backlogs in processing and preservation; inability to keep pace with record production.
Pandemic Impact (COVID-19)	- Prolonged closures of reading rooms.	Accelerated awareness of digital access needs, operational disruption,

	- Reduced capacity due to distancing measures. - Cancellation of public events. - Increased demand for remote access. - New recordkeeping needs (pandemic-related records, remote work documentation).	and pressure to adopt online service delivery.
Future Implications	- Recognition of online platforms' potential to expand access. - Technological tools enabling faster, more comprehensive research.	There is a need for robust digitization strategies and long-term investment in digital infrastructure.

Table 6. Challenges before Computerization in Archives

4.4. Opportunities

Computerization offers unprecedented opportunities for the archival sector, enhancing service capacity, expanding access, and increasing the social value of archival materials.

First, expanding access and enabling remote services. Digital technology allows users to search, retrieve, and utilize archival materials from anywhere via online systems, unrestricted by geographical distance or time. This is particularly valuable for researchers, scholars, students, and overseas communities. Providing 24/7 online services not only improves the user experience but also significantly increases the frequency and scale of archival use.

Second, integrating emerging technologies such as artificial intelligence (AI), machine learning, optical character recognition (OCR), and big data analytics. AI can automatically classify records, assign metadata tags, and recognize text, images, and audio content, saving considerable time and resources compared to manual methods. At the same time, machine learning enables systems to continuously improve accuracy based on input data, laying the groundwork for building intelligent archival repositories that can make content recommendations and link related records.

Third, international cooperation and digital resource sharing. The development of global connectivity infrastructure and open data standards facilitates collaboration between archival institutions across countries, enabling the sharing of data and joint digitization projects. This not only reduces costs but also contributes to the preservation of humanity's shared documentary heritage. Initiatives such as *Europeana* and UNESCO's *Memory of the World* program vividly illustrate the value of cross-border cooperation.

Fourth, enhancing the image and social value of archives. When archival materials become more accessible and are presented through user-friendly digital platforms, the public gains a clearer understanding of the role archives play in preserving collective memory and supporting societal transparency. Digital exhibitions, data storytelling projects, and interactive online activities bring archives beyond the narrow confines of professional circles, making them a vibrant part of cultural and social life.

4.5. Key Challenges

Computerization is a pervasive social and cultural phenomenon that impacts nearly all aspects of modern life. The computerization of archives presents both technological opportunities and challenges for archivists. In the digital age, where the creation and dissemination of digital information have surpassed the production and distribution of physical documents, the computerization of archives has become increasingly crucial. (Nicholas Negroponte, 1996).

The rapid and remarkable advancement of new information technologies, along with their broad application across various domains of society, has presented significant challenges to archives and archivists. The use of information technologies has had a dual effect on German archives and archives worldwide, as highlighted by Margarita Váyquez de Parga and Pedro González (De Parga & González, 1992, p. 156-157).*Firstly*, the integration of information technologies in the management of public and private organizations has led to the creation of new media records, thereby necessitating novel strategies and approaches to traditional archival principles and practices. These media's inherent and extrinsic characteristics demand innovative archival legislation to guarantee their preservation and access to information. New strategies must also be developed to define the criteria for archival management of records created in new media. *Secondly*, new information technologies have facilitated the management of archives, record descriptions, and arrangements, thereby enhancing efficiency in archives management, preservation, and dissemination of information about archival records. The double-edged impact of new information technologies poses a significant challenge to the traditional German and Vietnamese archival system, which focuses on preserving a valuable and age-old documentary heritage.

The pervasiveness of digital documents and media has revolutionized how textual, visual, and auditory information is stored and accessed in administrative, business, and personal settings. However, unlike traditional analog media, digital media present unique challenges for long-term archiving. In the past, preserving texts, images, films, or music required proper storage conditions to ensure the continued functionality of the medium itself. With the advent of the digital age, storage has become more complex. Digital media consists solely of a sequence of binary digits, ones and zeros, which become recognizable content when interpreted by a computer. The content is not tied to a specific data carrier, and the binary code remains identical across all digital media types. However, machine interpretation is required to access digital media, posing two fundamental challenges for long-term archiving. Firstly, the

binary data stream must be accurately preserved, and secondly, a machine capable of interpreting the binary data stream is required. This requires specialized hardware and software that may quickly become obsolete, making it impossible to interpret binary data streams from previous computer systems, operating systems, and file formats.

4.5.1. Technological Challenges

Despite the numerous advantages offered by digital technologies, it is imperative not to overlook the problematic aspects associated with them. Despite rapid advancements in digital technologies, attaining permanent and legally secure archiving of electronic documents remains challenging. Unlike traditional paper documents, most digital materials are intrinsically tied to the digital environment, and printing them on paper is not a feasible option for most content. Consequently, preserving digital materials necessitates a multifaceted technological approach that addresses several factors simultaneously, including protecting the content, functionality, metadata, and context. Furthermore, technological developments and changes to software and hardware necessitate ongoing migration and updates to ensure the continued accessibility and readability of digital materials over time.

Digital materials can become inaccessible in three main ways: *(1) the degradation of the physical media on which they are stored, (2) the obsolescence of software used to read digital files, and (3) the introduction of new computer systems and peripherals that cannot handle older materials*. Unlike preservation-standard microfilm or acid-free paper, tapes and disks are vulnerable to physical decay and have limited lifespans. Therefore, they must be stored under controlled conditions and regularly copied onto new media to prevent loss through carrier deterioration. Refreshing the materials, or transferring them to new media, often becomes necessary when a specific type of disk or tape can no longer be used in current computer systems. The disk and its accompanying disk drives have become obsolete, necessitating the transfer of materials stored on these media to new formats. Refreshment is a standard activity in any digital preservation program, helping to ensure the continued accessibility and

usability of digital materials over time. By regularly refreshing digital materials, organizations can mitigate the risk of data loss and ensure the long-term preservation of valuable digital assets. The obsolescence of software and hardware can result in the loss of information or functionality of files in their original format. Although successive versions of programs may be compatible, software producers only support compatibility for a short period. Consequently, programs may disappear from the market or cease to function on new platforms. Dependence on old versions of programs and outdated computer systems can lead to digital death. While it may be possible to keep the original hardware and software functioning in the short term, it is not a sustainable solution in the long run. Different approaches have been suggested to combat software and hardware obsolescence, including converting files to new platforms or various programs. However, conversion may result in an unacceptable loss of functionality, especially with complex databases or multimedia materials, and the cumulative effect of successive conversions over time is hard to predict. A standard, non-proprietary format can facilitate maintenance over time.

Closely related to infrastructure is the challenge of authenticity and integrity in the digital environment. Unlike physical records, which can be preserved in their original form, digital records exist as sequences of binary code that require machine interpretation. Over time, hardware obsolescence, file format incompatibility, and the degradation of storage media can compromise the authenticity of these records. Migration or conversion processes, often necessary to maintain accessibility, may alter the original bitstream, raising questions about whether the preserved object remains identical to the original. To address this, archives must implement robust technical and organizational frameworks, including the adoption of Public Key Infrastructures (*PKI*), digital signatures, and trusted timestamping, to verify provenance and ensure the integrity of records throughout their lifecycle.

Other approaches aim to recreate superseded versions of operating systems and programs in new environments, allowing the files to be maintained in their original format and read with the software for which they were created.

This is undoubtedly a way to bridge one or two generations of platforms, but over time, as new systems are introduced, one may face a Chinese box effect that becomes complex to handle. Another disadvantage may be that functionality is kept at the level of outdated systems, which may not be satisfactory for future users. It is still being determined what will prove feasible and successful, and many institutions are researching and creating test beds and pilots to gain more experience with potential solutions. In the meantime, a better understanding of the risks and complexities associated with digital material producers could make all the difference for institutions developing preservation systems. Producers can facilitate preservation efforts by using (official or de facto) standards like XML, TIFF, or PDF. The use of proprietary software complicates matters because it is protected and often requires more thorough documentation, making it impossible to predict the conversion outcome in every detail. Creators of digital materials and the ICT industry must be involved in the preservation process, as their cooperation can reduce the burden on heritage institutions. Creators will need to be encouraged to use open standards and provide sufficient documentation of their files. The ICT industry should be convinced of the value of open-source software and the need to publish detailed and complete documentation to ensure their products can continue to be used in a preservation setting. The technology for preserving digital materials requires substantial investments in research and development. However, such investments are negligible compared to the resources invested in creating the materials in the first place and the cost to society if no adequate systems are developed, resulting in the loss of materials.

The emergence of digital media has led to a proliferation of new electronic records, which are stored on electronic carrier media, including servers, hard drives, CD-ROMs, and the internet. These digital resources are increasing in number and social relevance, but the question of reliable archiving remains unanswered. Securing data storage, ensuring future access to information, and maintaining permanent usability are critical challenges that need to be addressed. However, various obstacles impede a straightforward solution to

these tasks, including the degradation of data carriers and the rapid technological changes that make accessing older data carriers and formats challenging. To tackle these challenges, binding technical and organizational standards are necessary for archiving digital resources. Leading archival information and memory institutions are collaborating to establish a framework for the secure, long-term archiving of digital documents.

During the archiving process, the authenticity and integrity of archived documents are particularly susceptible to risks, especially when the original bit sequence needs to be altered due to technical reasons, such as migration. To ensure the authenticity and integrity of the documents, it is imperative to establish effective organizational and technical structures through the cooperation of all stakeholders involved in the "record life cycle process." These structures should guarantee maximum security within the process. One promising solution is the implementation of public key infrastructures (PKI) in archives. The use of digital signatures and time stamps also plays a crucial role in ensuring the trustworthiness of digital archives. Additionally, the unique challenges presented by dynamic publications must be addressed to manage this issue effectively.

4.5.2. Organizational and Institutional Challenges

In addition to technological barriers, the computerization of archives faces significant organizational and institutional challenges. Many archival institutions, both in Vietnam and internationally, have yet to develop long-term digitization strategies and policies with a comprehensive vision closely aligned with the dual mission of preservation and access. Digital transformation is often carried out through short-term projects, lacking alignment in objectives, standards, and operational procedures.

Change management is a notable weakness. Many institutions have no structured plan for managing organizational change when adopting new systems, resulting in staff reluctance, slow adaptation, or the continued coexistence of outdated and modern workflows, which wastes resources.

Furthermore, coordination mechanisms between entities within the archival system, such as those between central and local archives, are often ineffective, leading to the duplication or omission of data, particularly in standardizing descriptions, metadata, and information exchange processes.

From a staffing perspective, many institutions have not yet restructured their organizational frameworks to meet the demands of a digital environment. Key roles, such as digital preservation specialists, AI experts for archives, or cybersecurity officers, are either absent or severely underrepresented. This has made the operation of digital systems heavily dependent on external technology vendors, creating potential risks to security and sustainability.

The adoption of digital technologies in archival practices has generated a host of legal issues that must be navigated to ensure compliance with applicable laws and regulations. Two key areas of concern are copyright and data protection. Concerning copyright, archives must carefully consider issues of ownership, licensing, and fair use when digitizing and making copyrighted materials available. In some cases, archival institutions may need to seek permission from rights holders before making digital copies of copyrighted works available to the public. Additionally, archives must be vigilant in protecting against unauthorized use or reproduction of copyrighted materials by third parties. On the data protection front, archival institutions must comply with a range of laws and regulations governing the collection, processing, storage, and dissemination of personal data. This may include obtaining consent from individuals for the use of their data in archival records, implementing robust security measures to safeguard against data breaches, and ensuring that personal data is not used in ways that violate individual privacy rights. Failure to comply with these and other legal requirements can result in significant legal and financial liabilities for archives, underscoring the importance of carefully navigating these legal issues when undertaking digital archival projects.

These challenges suggest that, beyond technological investment, the computerization of archives must be supported by a robust institutional and

organizational framework, characterized by effective coordination, system-wide standardization, and a strengthened capacity for change management.

4.5.3. Financial and Resource Constraints

The adoption of digital technologies in archives has been accompanied by several challenges, including the significant costs associated with the construction and operation of long-term digital archives. The need for long-term preservation of digital data in federal, state, and local government agencies has become increasingly urgent due to the rapid expansion of digital records. However, the financial implications of establishing and maintaining digital archives must be carefully assessed and taken into account in archival policy decision-making, particularly for smaller institutions. Thus, it is crucial to conduct a comprehensive cost analysis to determine the feasibility of constructing a digital archive, which involves not only the initial capital expenditures but also the ongoing operational expenses associated with ensuring the preservation, security, and accessibility of digital records over time. By doing so, archives can make informed decisions regarding the allocation of financial resources and the development of sustainable strategies for digital preservation.

One can see that digital native and digitized archiving involve costs related to establishing and maintaining an archive, which may increase over time. The idea of digitizing entire archival holdings is an appealing one, as it would enable unprecedented levels of access and discovery while also mitigating risks associated with physical deterioration and loss. However, the practical challenges and costs associated with such an endeavor are considerable. One of the primary obstacles is the sheer scale of the task. For instance, in the case of the German state archives alone, digitizing the approximately 1,700 kilometers of archival material would require an investment of approximately €900 million per year, spread out over a hundred years. (Mario Glauert, 2019, p. 14). Moreover, this figure does not even account for the stocks held by municipal archives, church archives, university archives, and other archival institutions.

4.5.4. User-related Challenges

As mentioned in this project, obstacles also exist for online users, who require specific skills and knowledge to use online platforms effectively. Of course, these problems also apply to users who visit the archive on-site, but they can be solved immediately by seeking advice from the archives' staff. That is why the Archive 2.0 and Archive on Web 2.0 concepts are increasingly discussed and expected by online users. The high quality of the service already provided is also reflected in the very positive assessment of quality and Speed of response to queries. (Mundt, 2018). In this case, satisfaction with 'off-site users' often lags 'on-site users', because online users have to find the solutions themselves or do not know whom to turn to for advice when problems occur. Even when off-site users know whom to ask for advice, they may have to wait for the archive staff to process their request. The Hessian State Archives are not the only ones facing this problem. It is rather the case for all archives that digitize their finding aids and holdings. In the rush to digitize everything, archivists are overlooking the one thing users value most: *themselves.* (Christian van der Ven, 2015).

Despite the challenges posed by digital transformation, computerization in archives has the potential to revolutionize the management, accessibility, and preservation of information, offering various benefits and opportunities for researchers, historians, and the general public. The introduction of computer technology and its impact on the management of digital information have enabled archives to become more open and to make their stored material more accessible. Archives are increasingly digitizing their holdings, making selected documents available online or in reading rooms equipped with the necessary facilities. The deployment of new technical solutions makes these digitized documents more discoverable online. Consequently, archives are becoming more widely accessible and open to the public, transforming how they are perceived and utilized.

4.5.5. Human Resource and Professional Skills

One of the core challenges in the computerization of archives is the digital capacity and skills of archival staff. Although many archival institutions have begun adopting digital technologies, a significant disparity in technical proficiency remains between individuals and across units. Many staff members are still accustomed to manual workflows, making it challenging to transition to processes that involve digitization, electronic data management, and the use of integrated archival management systems.

First, the digital skills of archival personnel are uneven. While some younger staff members are relatively adept at using document management software, database systems, and data analysis tools, the majority still face limitations in operating complex systems, handling metadata, or executing long-term digital preservation processes.

Second, there is a severe shortage of specialized human resources in emerging areas such as digital preservation, artificial intelligence (AI) for archives, and cybersecurity. These are critical technological domains that ensure the security, integrity, and long-term accessibility of electronic records.

Third, current training and professional development mechanisms do not meet the demands of continuous technological change. Training is often short-term, focusing on the operation of existing software rather than fostering digital thinking, data analysis skills, and the capacity to adapt to new technologies.

As a result, internal capacity is often insufficient to operate, maintain, and upgrade systems without the assistance of technology vendors. This creates a high level of dependency on external partners, posing risks of operational disruption and loss of control over data.

4.6. Digitization, archival descriptions, digital presentation, and digital preservation

4.6.1. Digitization in archives

The emergence and rapid advancement of digital technology at the turn of the twenty-first century have ushered in a new era of human progress, known

as the digital age, which has impacted almost every aspect of social life. Digitization has gained widespread popularity globally due to its exceptional advantages, and many countries are undertaking various-scale projects to digitize documents, including libraries, museums, and archives. The primary objective of these initiatives is to preserve original documents, books, films, photos, recordings, and other historical artefacts from damage. The Federal Republic of Germany has taken a pioneering role in the large-scale digitization of archives. As most archives recognize the benefits of digital technology, they are increasingly establishing digital archives alongside traditional ones. Digitization of archival materials is a crucial element in transforming conventional archives into digital archives.

4.6.1.1. Definition and process

In the archival field, digitization refers to the process of converting analog records into digital format through electronic signal conversion, such as scanning or photography. The primary objective of digitization is to facilitate the preservation and access to archival materials, which are susceptible to deterioration over time due to physical wear and tear, environmental factors, or mishandling. By creating digital copies of physical records, archives can reduce the need for handling and exposure of the original materials, thereby prolonging their lifespan. The digitization process of paper documents begins with selecting the records for digitization based on their relevance, condition, and copyright status. The records are then prepared by removing any physical obstructions, such as staples, paperclips, or binding, that could impede the scanning process. Next, the records are scanned using high-quality scanners that capture images of the records at a high resolution and in full color (the process of converting archival materials). The resulting digital images are then enhanced to improve their readability and quality, such as adjusting brightness and contrast, removing noise and dust, and correcting color distortion. Finally, the digital images are stored in a digital repository or archival database, where they are indexed and made available for online access or retrieval. Digital records can be searched, browsed, and downloaded by researchers and the public, thereby

enhancing the accessibility and usability of archival materials. The digitization process also enables archives to create backups of their records, which can be stored off-site, ensuring the safety and security of the records in the event of natural disasters, theft, or other emergencies.

Figure 9. The process of digitization

The definition of digitization of archival materials as simply the conversion of information from analog to digital format through electronic signal conversion is too narrow. A broader understanding of the digitization process of archival documents encompasses a range of phases, including project planning, document preparation, scanning standard selection, contractor selection, digitization phase (scanning, processing, quality control, long-term preservation), and handling and use of digital data (information management system creation, secure and reliable database use, system maintenance and improvement, user access). The digitization process is not limited to saving archival documents in digital form on electronic media. Still, it involves a comprehensive and integrated approach to the entire process of digitization, preservation, and access to digital archives. (Vu Dinh Phong, 2011).

Digitization of archival materials aligns with preserving originals and augmenting the value of archival materials by enhancing accessibility to digital archival collections, thereby replacing physical documents. Therefore, the digitization process involves implementing a digital chain or series of actions, from preparation to management and usage, in line with the intended objective.

The goal is to ensure the precision, dependability, and authenticity of the digital copies in relation to the originals.

4.6.1.2. Objectives of digitization

The growing need for efficient management and utilization of information in various fields of society demands fast, accurate, reliable, and high-quality search, processing, and storage of data. Traditional methods of information organization have proven insufficient in addressing the practical issues arising from these new requirements. This also holds for conventional forms of archival management. However, with the emergence of new scientific and technological developments, opportunities and challenges arise for industries involved in managing information resources, particularly in the context of archives management, preservation, and use. The digitization of documents, therefore, presents a viable solution to these challenges. For archival records, the goal of applying digitization is essentially focused on the following three main objectives:

Objective 1. Consolidate various types of archival documents into a uniform digital format, regardless of their original analog form.

Archival materials encompass a diverse range of information carriers, including paper, photographs, tapes, films, and wood, each with unique characteristics and attributes that pose distinct challenges for their management, preservation, and use. Traditional methods for preserving and organizing these materials involve specialized storage facilities, equipment, and conservation techniques for each type of material, which can be time-consuming and cumbersome. The digitization of archival materials presents an opportunity to unify these diverse materials into a single digital form, which can significantly reduce the gap between the separate processes of preservation, management, and use. By converting analog information carriers into digital signals and storing them in a computer database, archival activities can be streamlined and more efficient. This convergence into a single digital form has the potential to

enhance the preservation, organization, and accessibility of archival materials, thereby extending their information value.

This is depicted in the diagram below:

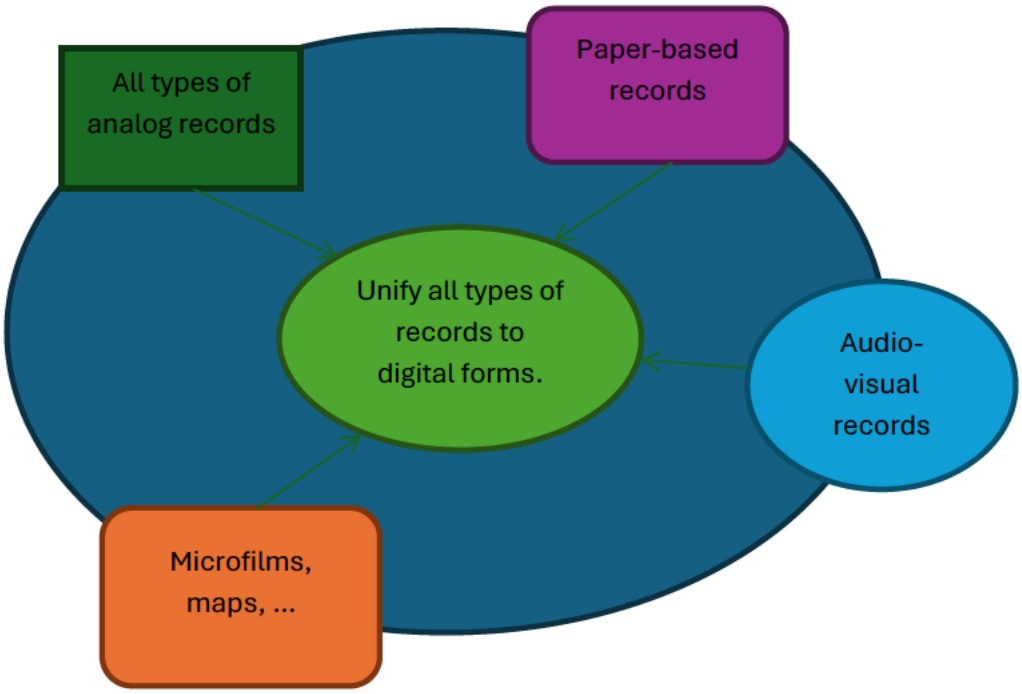


Figure 10. The different archival materials are identified and digitized together in digital format using the digitization method.

Digitizing various types of archival materials and unifying them in a digital database system offers unparalleled benefits for preservation, management, and accessibility. It enables easier and faster access to archived data, bridging the gap between archives and users and enhancing the overall user experience. The specific objectives that illustrate these advantages will be discussed in the following sections.

Objective 2: Prolong the durability of archival materials

Drawing upon the initial objective, archives will encompass two forms of archival materials following the transition from analog to digital: analog (a conventional form of documents) and digital. Suppose the conversion process guarantees the fulfillment of requirements such as authenticity and integrity of the originals. In that case, the information content between these two forms will be virtually identical, differing only in the way information is represented.

Requests for the utilization of archival materials typically center around the information content, rather than the data carrier. In legal contexts, the originals are utilized to establish a foundation and substantiate evidence. Hence, if we ensure the authenticity and integrity of the original's information content by authenticating with the digital version, we can utilize this digital copy, instead of predominantly relying on the originals as done in the past. This approach creates favorable conditions for preserving the original copies of the archival material, which have been subject to varying degrees of deterioration. Consequently, they are preserved in specialized archives, where exposure to factors that can harm the records, such as human activity, environmental conditions, and microorganisms, is limited during the handling and use of these materials. Additionally, this method facilitates the implementation of procedures to enhance the quality of archival materials in poor condition and prolong the life of documents, such as restoration, repair, microfilming, and treatment of documents that are presented in a blurred format. As a result, the longevity of the originals can be extended, thereby achieving one of the two primary tasks of archival work: the preservation and prolongation of the original materials' life.

Objective 3 aims to establish a centralized approach to managing and exploiting digitized documents, which can be implemented at two distinct levels. The first level pertains to a singular historical archive, where the management and exploitation of digitized documents can be optimized through the adoption of various strategies. These strategies include the utilization of efficient storage and retrieval mechanisms, standardized metadata schemas, and access controls to ensure document security and integrity. Additionally, the implementation of advanced analytical tools can enable researchers and other stakeholders to extract valuable insights and knowledge from the digitized documents.

At the second level, centralized management and exploitation of digitized documents can be achieved through the development of a network of various archives, spanning from central to local levels. This involves the adoption of a common framework that establishes standards for interoperability and data

exchange among the archives, thereby enabling seamless document sharing and collaboration. Furthermore, the development of shared access policies and collaborative tools can foster cooperation and knowledge sharing among the different stakeholders involved in the archive network.

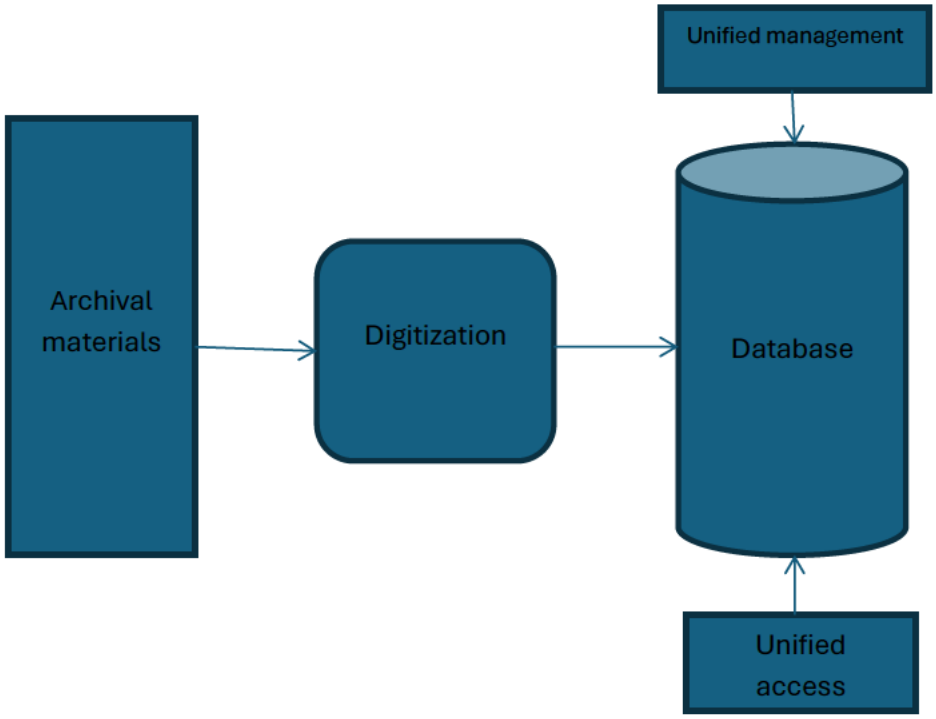


Figure 11. Model of management and access to the digital database in one archive

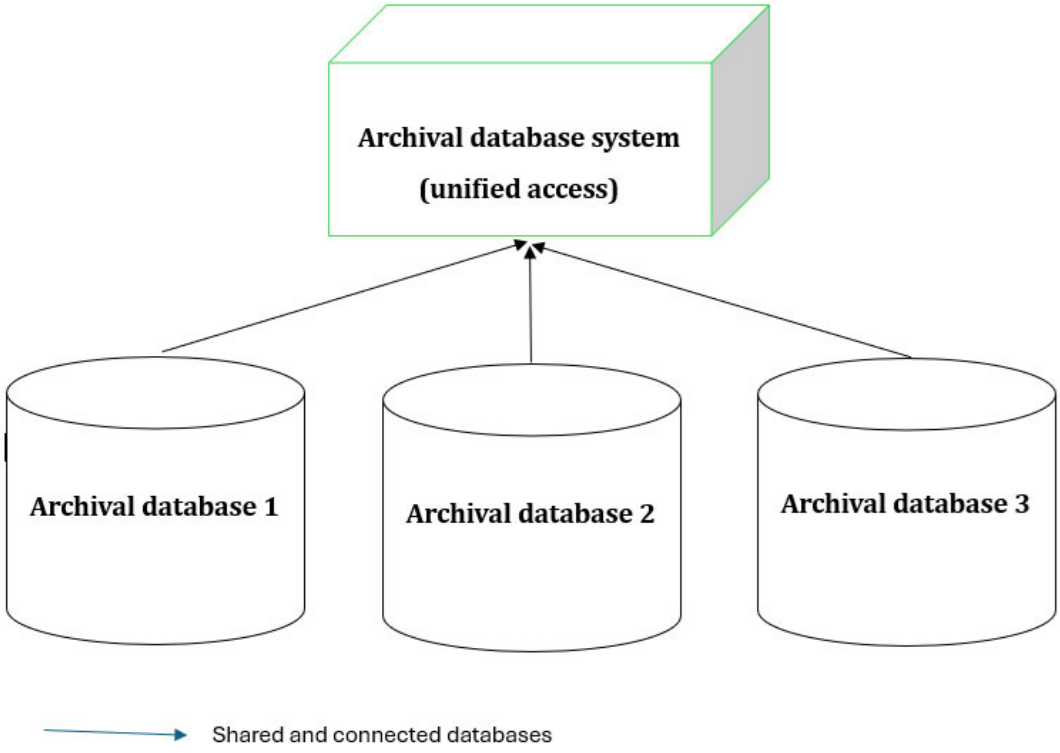


Figure 12. Model of unified access between archival institutions

As previously mentioned, archival documents maintained by archives are digitized and stored in a centralized database system for efficient management and use by the institution. In contrast to their traditional counterparts, digital archival documents can be stored in specialized warehouses, storerooms, and distributed across different geographical locations, posing challenges for their organization, management, and accessibility for both archives and users. However, digitization offers several benefits to archives, such as: *Firstly*, expanding the availability of information to a broader audience by providing rapid access to a diverse range of archival documents related to the same or similar topics. *Secondly*, a range of specialized hardware and software management systems, such as finding aids, auto-search, online portals, and more, facilitate efficient management, statistical analysis, database searches, and document provision to users, thereby reducing time and effort. *Lastly*, organizations can leverage digital information resources in various forms, which transcend the limitations of space and time - for instance, introducing, publishing, exchanging, and providing information sources, as well as

showcasing archival materials on intranets or the internet. This enhances the management, organization, and utilization of archival materials. As a broader objective, archives aim to assemble highly valued digitized databases at all levels, which the organization can widely utilize.

On digitization of archival resources in Germany, noticeably, is a research project as the coordination of seven different institutions, Landesarchive Nordrhein-Westfalen und Baden-Württemberg, the General Directorate of staatlichen Archive Bayerns, Sächsische Staatsarchiv, archives office of Westphalia, Institut für Stadtgeschichte (Stadtarchiv Mannheim), and Archivschule Marburg. Several guidelines have been released following the project, focusing on various digitization-related issues, including digitization workflow, digitization norms and standards, damage avoidance during scanning, digitization work instructions, preservation scan environments, privacy protection, and copyright. Additionally, the guidelines address the digitization of analog materials in microforms.

4.6.2. Archival descriptions

When information technology solutions were first introduced to documentation management, archivists encountered the challenge of handling an enormous volume of records with inadequate tools and techniques. The exponential growth of archival records coincided with the advancement of computerized information management techniques, presenting opportunities to enhance the accessibility of archival records. However, the adoption of electronic data processing necessitated the development of novel archival description methods. Archival description involves the generation of access tools, such as finding aids, that enable individuals to explore a surrogate of the collection, thereby improving accessibility and reducing the need for direct handling of original materials, which in turn enhances security. (Richard Pearce-Moses, 2005, pp. 25–26). According to the archival terminology dictionary published by the International Council on Archives (ICA), archival description refers to the process of collecting, examining, arranging, and documenting information to identify, administer, locate, and elucidate the contents of archives

and manuscript repositories, including the record systems and settings that gave rise to them. Furthermore, archival description also encompasses the outcome of this process. According to the Society of American Archivists, an archival description is a technique for scrutinizing, systematizing, and accumulating data concerning the formal attributes of a record or an accumulation of records, encompassing elements such as author, title, dates, extent, and contents. The primary purpose of this method is to facilitate the identification, administration, and understanding of the work. Additionally, archival description includes the outcome of this process. (Richard Pearce-Moses, 2005, p. 25). Archival descriptions produce finding aids, inventories, registers, indexes, and guides that users utilize to access the information they seek. As a result, archival description is one of the most critical tasks of an archivist.

Generating finding aids, inventories, registers, indexes, and guides is the tangible products of archival description that facilitate users' access to the information they require. Consequently, archival description is considered one of the most vital responsibilities of an archivist. Contemporary archivists distribute these access tools in standardized formats, both print and electronic. With the increasing prevalence of electronic formats, various standards have been devised to address this trend. Among these standards, the General International Standard Archival Description (ISAD (G)) (International Council on Archives, Committee on Descriptive Standards., 2000a), and metadata schemas such as Encoded Archival Descriptions (EAD) (Society of American Archivists & Library of Congress, 2002), have been developed to enable interoperability and exchange of archival descriptions via the internet. These standards consider all contextual elements surrounding the archival description, such as the archival material itself, its creator, the functions that led to its creation, and the repository where it is housed.

Standards are crucial in promoting understanding and consistency in human and technological descriptions. Common ground is established by adopting a standardized approach, such as those developed for archival

description, leading to improved comprehension and interoperability. Archivists recognize the importance of adhering to specific standards for archival description to encourage uniformity and facilitate interoperability.

The following are some of the prominent archival standards for descriptions:

- The General International Standard Archival Description (ISAD (G)), published by the International Council on Archives in 2000 (Committee on Descriptive Standards (ICA), 2000).

- The International Standard Archival Authority Record for Corporate Bodies, Persons, and Families (ISAAR (CPF)) (ICA, 2004).

- The International Standard for Describing Functions (ISDF) (ICA, 2007).

- The International Standard for Describing Institutions with Archival Holdings (ISDIAH) (ICA, 2008).

ISAD (G) is commonly used to generate finding aids. A finding aid is a tool that streamlines the process of locating specific information within a collection of records. Additionally, it can refer to a descriptive record that provides the repository with physical and intellectual control over the resources, while also assisting users in gaining access to and understanding the items. (Richard Pearce-Moses, 2005, p. 168). Researchers use these tools in printed and electronic formats to aid in their search for, locate, and access archival material. Finding aids typically include access tools such as inventories, indexes, guides, and registers.

It is crucial to analyze the entities that need to be described by archival standards to provide a more comprehensive and precise view of the related archival material. In addition to finding aids, archivists must provide contextual information to archival users to help them exclude irrelevant archival items from their searches. Archivists can accomplish this task by implementing standards such as ISAAR (CPF), which describes the creators of archives, and ISDF, which explains their functions, activities, and transactions. Contextual information refers to the circumstances surrounding the creation, use, and maintenance of a record or collection of records, such as its purpose, origin, and

relationship to other records. It is essential to document contextual information alongside the content and structure of the record, as this enables users to better understand the significance and value of the archival material. Therefore, documenting contextual information is crucial to ensure the authenticity, reliability, and accuracy of the archival record. (Richard Pearce-Moses, 2005, p. 90,91). Adding contextual information to archival descriptions is crucial, as it helps users understand the archive's significance and its relationship to its surroundings. It provides insight into the historical, social, economic, and cultural factors that influenced the creation of the archive. The context may also include information about the creators' background, their relationships with other individuals or organizations, and the intended audience or purpose of the archive. All these elements contribute to understanding the archive's content and significance, as well as identifying potential areas for research. As a result, documenting contextual information is critical to creating accurate and meaningful archival descriptions.

The elements of ISAD (G) provide contextual information, typically related to the creator's administrative history or biographical details. Nevertheless, archivists have suggested that giving archival contextual information in separate records would be more suitable than finding aids. This alternative approach would enable archivists to offer more detailed, explanatory contextual descriptions, which multiple archival institutions could share in case of identical provenance. Moreover, the ISDIAH standard provides comprehensive information on archival repositories, although its practicality still needs to be determined. Despite this, archival institutions have implemented ISDIAH to establish what information to include in archival description records and how to utilize it in archival descriptive systems.

4.6.3. Archival digital presentation

Archival presentation is a crucial aspect of archival work, as it enables archival materials to be shared and appreciated by a broader audience, thereby contributing to a deeper understanding and interpretation of the past. Archival presentation refers to the process of presenting archival materials to an

audience, whether in an exhibition, publication, or on a digital platform. The goal of archival presentation is to showcase the significance and value of the archival materials and to make them accessible and engaging for the intended audience.

Archival presentation can take many forms, depending on the nature of the materials and the goals of the presentation. For example, an exhibition might showcase original documents, photographs, and artifacts, along with interpretive text, multimedia displays, and interactive elements, to tell a story or convey a particular theme. A publication may include reproductions of archival materials, accompanied by commentary and analysis, to provide historical context and interpretation. A digital platform might provide access to digitized archival materials, along with search and discovery tools, to facilitate research and exploration.

Archival presentation requires careful planning and execution to ensure that the materials are presented in a clear, accurate, and engaging way. This may involve working with curators, designers, and other experts to develop a compelling narrative or visual presentation. It may also include ensuring that the materials are correctly preserved and protected to maintain their long-term availability and accessibility.

The advent of the digital era has dramatically transformed the way archival materials are exhibited to audiences. In particular, the digital format has significantly increased the accessibility of archival materials beyond the confines of physical repositories, such as museums, libraries, and archives, which have traditionally been the sole domain of such materials. The introduction of digital platforms has enabled users to access archival materials remotely and on a 24/7 basis, significantly expanding the audience for these materials and thereby rendering them more accessible to researchers, students, and the public alike.

Unlike traditional presentation methods, which are often limited to physical artifacts, digital archival presentations can encompass a broad range of formats, including interactive exhibits, multimedia displays, digital images,

audio, and video. These new formats offer greater opportunities for audience engagement, immersion, and interactivity. With digital platforms, users can zoom in on high-resolution images, search, filter data, and collaborate with others through commenting and sharing. This enhanced interactivity has created new opportunities for user engagement and collaboration, making archival materials more accessible and user-friendly than ever before.

Furthermore, digital archival presentation offers greater opportunities for interactivity, new formats, and increased accessibility, enabling a much wider audience, including students, educators, and the public, to engage with archival materials. In contrast, traditional archival presentation is often limited to researchers, scholars, and other experts. Moreover, digital archival presentation can be more cost-effective than conventional methods, particularly for distribution and accessibility, whereas traditional archival presentation can be expensive to produce and maintain.

In summary, the digital era has significantly expanded the opportunities to exhibit archival materials to diverse audiences, while also introducing new challenges and opportunities for archivists and scholars. This revolutionized the perception of how archival materials are showcased and accessed, introducing new opportunities for collaboration, engagement, and understanding.

4.6.4. Archival digital preservation

Preservation is an essential professional discipline that entails mitigating chemical and physical deterioration and damage to cultural property, thereby minimizing information loss and prolonging the lifespan of materials. (Richard Pearce-Moses, 2005, p. 305). In the context of archival materials, preservation encompasses a collection of activities and processes designed to safeguard and sustain archival materials over time, guaranteeing their physical and intellectual integrity for present and future use. These activities include environmental controls, such as temperature and humidity monitoring, as well as preventative measures like storage materials and protective enclosures. Additionally, disaster planning and response strategies are also implemented. Preservation

also involves addressing issues associated with the natural aging and degradation of materials, such as conservation treatments and restoration techniques. The ultimate objective of preservation is to ensure the long-term availability and accessibility of archival materials for research, education, and the conservation of cultural heritage. (Richard Pearce-Moses, 2005, pp. 305–306).

The preservation of digital resources for an indefinite period, commonly referred to as long-term preservation, presents considerable challenges due to the unpredictable and rapid nature of technological and socio-cultural changes that can transform both the form and use of digital resources.(Heike Neuroth et al., 2012, p. 16). Consequently, digital collections require specific preservation strategies that address their unique needs and anticipated future usage scenarios to ensure the long-term accessibility and availability of digital objects for research, education, and cultural heritage purposes. Long-term preservation involves implementing measures to protect digital objects while emphasizing their long-term usability permanently. (Wetzenstein, 2010, p. 8). Common strategies employed for long-term preservation include emulation and migration.

Digital preservation of archival objects is a complex and multifaceted process that encompasses a combination of technical, legal, financial, and organizational strategies. Technological obsolescence is a significant challenge in digital preservation, as it can render digital formats and storage systems unusable over time. A comprehensive preservation plan that considers the entire lifecycle of digital objects, from creation to long-term preservation and access, is necessary to address this issue. Financial sustainability is also a crucial factor in digital preservation. It requires ongoing investment in infrastructure, equipment, and skilled staff to ensure that the digital objects remain accessible and usable. Therefore, it is crucial to develop funding models that are sustainable in the long term. Organizational strategies also play a vital role in digital preservation. It involves developing clear policies and procedures for creating, managing, and preserving digital objects. Establishing standards for

metadata, file formats, and preservation methods is essential for ensuring that the digital objects remain accessible and usable over time. Moreover, it is crucial to provide training and support to staff and stakeholders on best practices for digital preservation. In addition to technological challenges, digital preservation also raises legal and ethical issues such as intellectual property rights, privacy, and data protection. Collaborating with archives, legal experts, and other stakeholders to develop policies and guidelines that comply with legal and ethical frameworks is essential for addressing these issues.

4.7. Summary

In the last two centuries, Europe and Germany have undergone significant changes in their recordkeeping and management practices. One of the most notable transformations occurred during the French Revolution, which took place between May 5, 1789, and November 9, 1799. The Revolution had a profound impact on various aspects of society, including the economy, politics, and management. It led to the establishment of independent archival institutions and the appointment of archivists as government officials. This shift marked a significant departure from the earlier practice of maintaining archives within individual institutions, such as churches or noble houses.

Along with these changes, Europe and Germany also faced significant challenges to their recordkeeping and management practices during the twentieth century. The two world wars that occurred during the first half of the century had a devastating impact on archives, resulting in the loss or destruction of numerous historical documents and cultural infrastructure. The devastation caused by the wars was especially severe in Germany. A comparable scale of damage and documentary loss was likewise experienced in Vietnam. Many of the historical records that were once housed in these archives were lost forever, leading to significant gaps in our understanding of the past. Despite these challenges, archivists and other professionals have worked tirelessly to preserve and restore the remaining archives.

Until now, German and Vietnamese archives have made significant strides in adopting and integrating modern IT technologies. This transformation has revolutionized the way archives store, manage, and provide access to their collections. One of the most important changes has been the digitization of archival materials. With the introduction of digital imaging technologies, archives can now create high-quality digital copies of their documents, making it easier for researchers to access and study them remotely. In addition to digitization, archives have also implemented various IT systems to manage their collections more efficiently. These systems enable archivists to organize and retrieve information quickly, allowing them to respond more efficiently to requests from researchers. For example, many archives have implemented sophisticated search algorithms that enable users to quickly locate specific documents, even if they are stored in different locations or collections.

The use of modern IT technologies has also facilitated international collaboration between archives. With the increasing digitization of archival materials, it has become easier for researchers and archivists from different countries to collaborate on projects and share information. This has led to the creation of various digital platforms and networks that enable archives to collaborate on large-scale projects, such as digitizing entire collections or creating comprehensive online databases of historical materials.

In conclusion, the adoption of modern IT technologies has transformed the way archives operate, enabling them to provide better access to their collections and collaborate more effectively with other institutions. These advancements have made it easier for researchers to access and study historical materials, ensuring that rich cultural heritage is preserved and shared with future generations.

CHAPTER V. ARCHIVAL DEVELOPMENT IN VIETNAM UNDER THE IMPACT OF COMPUTERIZATION

5.1. Introduction

In the quest for modernization, Vietnam stands to gain invaluable insights by studying the experiences and triumphs of nations boasting advanced archival systems, particularly in electronic records management. This strategic learning process enables Vietnam to expedite its overarching modernization agenda, enhancing the organization and management of electronic records. By adopting this approach, not only is the acceleration of progress ensured, but valuable time is also conserved throughout the modernization journey. Leveraging the wisdom distilled from established practices in electronic records archiving is pivotal, empowering Vietnam to execute its archival responsibilities with heightened efficiency and effectiveness. Moreover, the pervasive growth and application of scientific and technological advancements have undeniably woven a profound tapestry across the fabric of social existence, casting its transformative influence over the archival landscape. The increasing ubiquity of electronic records has resulted in an urgent and indispensable summons for the Vietnamese archive industry and the global community. A proactive pursuit of solutions is mandated to effectively manage this burgeoning and intricate documentation, thereby aligning archival practices with the dynamic demands of contemporary information landscapes.

Undertaking a transformation revolution since the early 1990s, Vietnam has proactively engaged in administrative reform, reshaping its existing administrative framework to harmonize with the country's dynamic development needs. Within this recalibration, the critical role of archival records in state administration comes sharply into focus, emphasizing an ongoing and imperative need for innovation and enhancement within this crucial domain. This persistent commitment is essential to ensure that archival practices remain abreast of the evolving demands of modern administration, aligning seamlessly with the dynamic requirements of the current phase of national development. As the narrative of administrative reform unfolds, the

underlying imperative persists to refine and modernize archival processes meticulously. This strategic evolution serves as the foundation for fostering a more effective and responsive framework, significantly contributing to the efficacy of state governance in Vietnam.

Given that the world is currently navigating the developmental landscape of the Fourth Industrial Revolution, commonly referred to as the digital revolution, Vietnam's archival landscape presents numerous opportunities and challenges. The rapid expansion of information technology (IT) has significantly enhanced the ability to efficiently manage, collect, and process information. Applying IT in archives has become an inevitable necessity, thereby contributing to the innovation of the archival field in Vietnam. Consequently, this integration addresses the challenges of the digital revolution and makes a substantive contribution to the overall innovation of Vietnam's archival sector. This commitment to technological advancement is explicitly outlined in the "Planning for the Archives Industry to 2020, Vision to 2030," articulated in Decision No. 579/QD-BNV dated June 27, 2012, by the Ministry of Home Affairs, the Socialist Republic of Vietnam. Within this strategic framework, a specific objective is identified, emphasizing the importance of the research and application of science and technology, particularly in IT, to align with the demands of modernizing records and archival practices. This forward-looking approach underscores the acknowledgment of the transformative power of technology in shaping the future trajectory of Vietnam's archival landscape. (Ministry of Home Affairs, 2012).

This narrative of the computerization of the Vietnamese archival system spans a duration of more than twenty-five years. It encompasses an intricate interplay among technological innovation, legislative change, institutional reform, and professional development. With the lens on computerization, Chapter V systematically evaluates the transformation of Vietnam's archives using the analytical dimensions from Chapter II: *technological readiness, legal and policy frameworks, institutional capacity, professional development, user access, and engagement*. This should be viewed as more than a mere historical

inventory, with the potential to illustrate both achievements and persistent challenges in digital transformation for archivists' work.

This chapter builds on that foundation using an integrated approach, drawing from a variety of sources to create a comprehensive, evidence-based examination. Documents range from official reports from the State Records and Archives Department of Vietnam (SRAD) to legislative files, such as the 2011 and 2024 Archive Laws, national and ministerial strategic plans, and published research. This framework guides the analysis of statistical data and case studies drawn from central and provincial archives to evaluate outcomes at different implementation levels.

This chapter is empirically grounded in semi-structured interviews conducted with digital transformation stakeholders between 2018 and 2025, focusing on archival digital transformation. These interviews include policymakers from the SRAD and other state bodies responsible for state regulation in the field of archiving; directors and managers of central and provincial archival institutions; archivists; and IT specialists.

This allowed for consistency of themes (challenges, strategies, and innovations) while providing the ability to explore site-specific experiences. Selected interviewees received follow-up questions about their initial responses during the data analysis. The data we gained through the interviews was particularly helpful in filling in gaps not covered by official documents (e.g., technical issues with OCR processing of Vietnamese language documents, budget-related issues for digital infrastructure preservation, or usage insights on online archival access).

This chapter compiles documentary evidence and personal experiences from a range of stakeholders to illustrate how computerization has been instrumental in the archival development process in Vietnam, both in theory and in practice. It establishes the empirical foundations for Chapter VII, which quantifies, in a comparative perspective, best practices and tailor-made solutions from the German experience itself. This chapter argues that Vietnam

has achieved legal maturity in digital archiving but continues to face operational fragmentation and uneven implementation capacity.

5.2. An introduction to the archival system in Vietnam

According to Article 9 of the Archives Law of Vietnam 2024: "*The National Archives Fond of Vietnam consists of all archival materials of the country, regardless of their date of creation, storage location, political and social regime, recording technology, and physical format. The National Archives Fond of Vietnam includes the Archives Fond of the Communist Party of Vietnam,*[18] *And the State Archives Fond of Vietnam*". (National Assembly, 2024, p. 7)

The archival fond of the Communist Party of Vietnam comprises all archival materials formed during the activities of the Communist Party of Vietnam, its predecessor organizations, political and social organizations, and prominent historical figures associated with the Party, its predecessor organizations, and political and social organizations. Separate agencies manage the archival materials of the Fond of the Communist Party of Vietnam and have a system of guiding documents and instructions specific to the Communist Party of Vietnam. However, they are also organized and implemented uniformly from the central to the local level. According to Decision No. 19-QĐ/VPTW in 1992, which outlines the functions, tasks, and organization of the archives Department of the Party's Central Office, issued by the Party's Central Office, the Archives Department of the Party's Central Office has the following responsibilities: directly managing the Party Central Committee's archives repository and assisting the Office of the Party Central Committee in drafting documents related to archival work and record-keeping for the Party and the Central Committee of the Ho Chi Minh Communist Youth Union and overseeing the implementation of decisions related to archival work. Managing the entire inventory of permanently archived documents in the provincial-level Party Committee

[18] Archival materials belonging to the archival fond of the communist party of Vietnam are not the subject of this research.

archives, city-level archives directly under the Central Committee, and the Central Archives of the Ho Chi Minh Communist Youth Union.

The state archival fond of Vietnam comprises all archival materials formed during the activities of state agencies, political and social organizations, professional organizations, socioeconomic organizations, public service units, armed units of the people, historical figures, exemplary individuals, and other documents formed throughout the country's historical periods. (National Assembly, 2024, p. 7)

According to the 2024 Law on Archives of Vietnam, the Government exercises unified state management over archival affairs, with the Ministry of Home Affairs serving as the principal body responsible for assisting the Government in this function and for leading, in coordination with other ministries and ministerial-level agencies, the implementation of state management in the archival domain. (National Assembly, 2024, p. 35). To centrally and uniformly manage archival materials, a system of archival agencies must be established from the central to the local level, including archival management authorities and a network of repositories and storage centers.

5.2.1. Central level

The Decision No. 1199/QĐ-BNV dated December 16, 2022, issued by the Minister of the Ministry of Home Affairs, stipulates the functions, tasks, powers, and organizational structure of the State Records and Archives Department of Vietnam that "*the State Records and Archives Department of Vietnam is an administrative agency under the Ministry of Internal/Home Affairs. It serves as an advisory body, assisting the Ministry of Home Affairs and its Minister in managing state affairs related to archives and records nationwide. Additionally, it manages national archival materials within the State Archives Fond of Vietnam. It provides public services related to archives and records as stipulated by the law.*" (the Minister of the Ministry of Internal Affairs of Vietnam, 2022, p. 1).

The organizational structure (the Minister of the Ministry of Internal Affairs of Vietnam, 2022, pp. 2–3) of the State Records and Archives Department of Vietnam includes the following:

Functional units under the Department: Department of Records and Archives Management I; Department of Archives and Records Management II; Financial Planning Division; Department of International Cooperation and Scientific Management; Organization and Staff; Office.

The Department has the following public service units: National Archives Center I, National Archives Center II, National Archives Center III, National Archives Center IV, and National Archives Center for Digital and Preventive Records.

The National Archives Centers in Vietnam are organizational units under the State Records and Archives Department. They preserve and organize the use of archival documents belonging to the National Archives Center of Vietnam. Currently, several National Archives Centers are numbered in the order of their establishment. They are entrusted with managing documents generated during different historical periods of the nation.

+ *National Archives Center I:* Decree No. 102-CP formally established documents from the Central Archives Repository in Hanoi on September 4, 1962. The center's function includes collecting, editing, preserving, and organizing the use of materials and archival documents that originated during the activities of central agencies, organizations, and individuals during the feudal and French colonial periods, dating back to before 1954, in the region from Quang Binh northwards in Vietnam. National Archives Center I is preserving approximately 6 kilometers of Han-Nom documents, French-language documents, and a collection of books and magazines. Moreover, the center is also responsible for protecting the Nguyen Dynasty's administrative documents - a collection recognized by UNESCO as part of the Documentary Heritage of Asia and the Pacific Region. (Ministry of Home Affairs, 2023a).

+ *National Archives Center II:* National Archives Center II was established in 1976 and is responsible for collecting, gathering, editing, preserving, and organizing archival materials and documents from significant central agencies, organizations, and notable individuals during the feudal, French colonial, and the periods of the United States - Nguy and the Socialist Republic of Vietnam in the southern region, from Dong Nai Province southwards. Currently, the center manages over 14 kilometers of documents, including administrative records from central agencies in the region's south spanning various historical periods, as well as films, photographs, audio recordings, scientific and technical documents, and materials collected from individuals, families, and lineages. Notably, the center also manages a comprehensive collection of documents from the Republic of Vietnam, encompassing a wide range of content and genres. (Ministry of Home Affairs, 2023b).

+ National Archives Center III: National Archives Center III was established in 1995 and is responsible for collecting, gathering, editing, preserving, and organizing archival materials and documents that have been generated during the activities of central agencies, organizations, individuals, families, and lineages that represent the democratic republic of Vietnam and the Socialist Republic of Vietnam in the northern region, from Quang Binh Province northwards. Currently, the center is preserving approximately 15 kilometers of documents from central agencies, audio-visual materials, scientific and technical documents, and materials collected from individuals, families, and lineages. (Ministry of Home Affairs, 2023c).

+ National Archives Center IV: The National Archives Center IV was established in 2006 and is responsible for collecting, gathering, editing, preserving, and organizing documents from the Nguyen Dynasty, as well as documents and materials from central agencies, organizations, and individuals during the feudal, French colonial, and the Socialist Republic of Vietnam periods in the region from Quang Tri to Binh Thuan and the Central Highlands. The center is preserving more than 2 kilometers of documents from central agencies across different historical periods. Notably, the center manages the Woodblocks

of the Nguyen Dynasty, a collection recognized by UNESCO as a World Documentary Heritage. (Ministry of Home Affairs, 2023d).

+ National Archives Center for Digital and Preventive Records: The National Archives Center for Digital and Preventive Records was established under Decision No. 176/QĐ-BNV dated 12 March 2025 of the Minister of Home Affairs, through the merger of three units: the National Archival Insurance Center, the National Archives Center for Electronic Documents, and the Archival Science and Technology Center. Its functions include performing professional activities in the preservation of digital archival records; directly managing preventive archival materials and the archival databases of the State Archival Fonds of Vietnam; providing information from digital archival records and archival databases; ensuring cybersecurity and carrying out specialized information technology operations; conducting research, application, and transfer of science and technology in archival and records management; and delivering public archival services. (Decision No. 176/QĐ-BNV Dated 12 March 2025 of the Ministry of Home Affairs, the Functions and Duties of the National Archives Center for Digital and Preventive Records, 2025)

5.2.2. Local level

In Vietnam, local historical archives are maintained only at the provincial and centrally administered city levels. The Provincial Historical Archives Center operates as a public service entity under the Department of Home Affairs, responsible for directly managing historical archives. Its functions include organizing the collection and acquisition of archival documents generated by the activities of provincial and district-level agencies and organizations. The center is tasked with collecting, preserving, utilizing, and promoting the value of these archival documents, as well as providing public storage services in accordance with legal regulations. The Center operates under the direct supervision and management of the Department of Home Affairs regarding its organizational structure, staffing, and professional activities, while also adhering to the professional guidance of the Department of State Records and Archives under the Ministry of Home Affairs. (National Assembly, 2024)

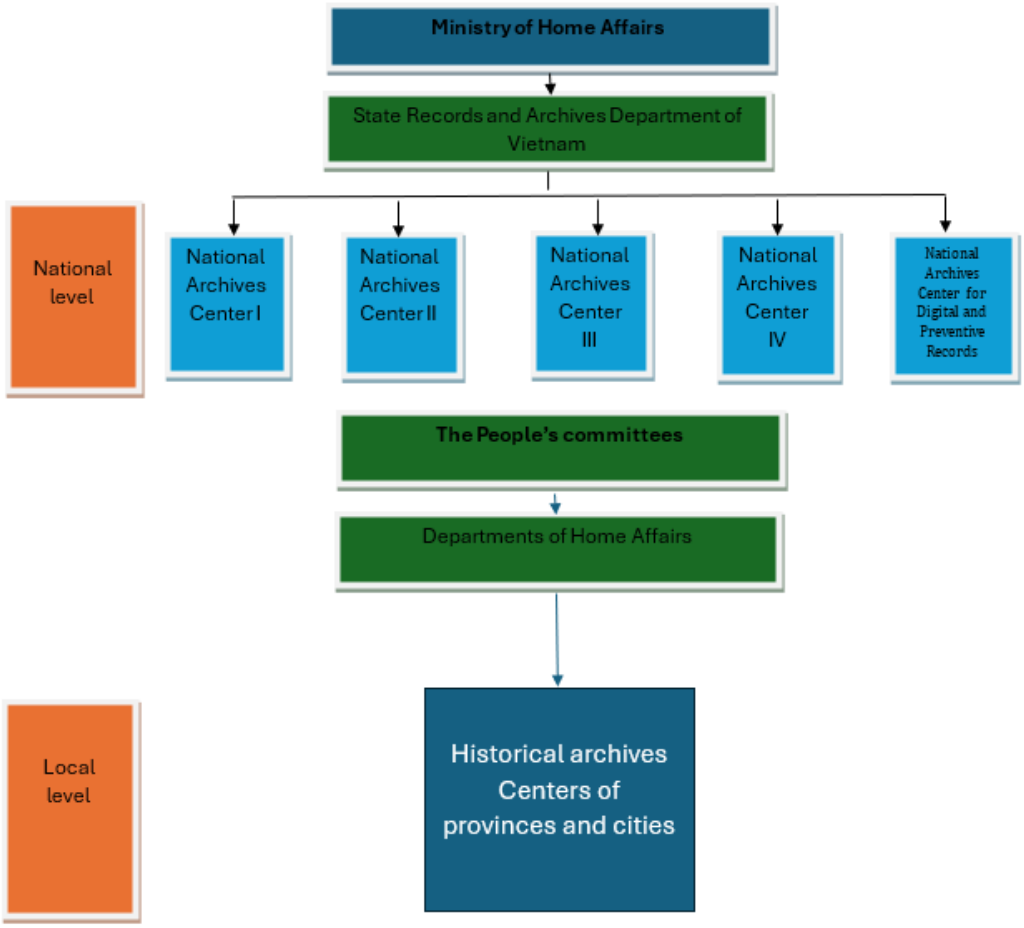


Figure 13. The Vietnamese State Archives organization

5.2.3 Institutional Characteristics of the Vietnamese Archival System

Vietnam's archival system is defined by several institutional features that have a direct bearing on its trajectory of digital transformation. *First*, the system operates within a dual institutional structure that encompasses both Party and State archival fonds. This arrangement reflects the broader political and administrative configuration of the country. However, in the context of digital governance, where interoperability, standardized metadata, and system integration are essential, such structural duality may generate coordination challenges. Differences in authority, appraisal mechanisms, and administrative oversight can complicate efforts to build a unified digital archival infrastructure. *Second*, Vietnam's archival governance is characterized by a high degree of

centralization. The Ministry of Home Affairs, through the State Records and Archives Department, exercises nationwide regulatory authority, issuing standards and professional guidance applicable across all provinces. This centralized structure contributes to normative consistency and policy coherence. At the same time, digital transformation requires not only legal uniformity but also robust technical capacity and operational flexibility at the local level. The tension between centralized regulation and decentralized implementation becomes particularly visible in digital archival practice. *Third*, archival institutions at the provincial level remain largely dependent on central directives and funding allocations. While legal and policy frameworks are promulgated uniformly, implementation capacity varies considerably due to differences in infrastructure, technical expertise, and financial resources. As a result, digital readiness is uneven across local archival institutions.

Taken together, these characteristics produce a mixed institutional effect. On the one hand, centralization facilitates the rapid introduction of new legal instruments, such as the 2024 Archives Law and its implementing regulations. On the other hand, structural duality and uneven provincial capacity present obstacles to achieving full interoperability and operational consolidation within a national digital archival system. In this respect, Vietnam's archival system can be described as normatively coherent but operationally heterogeneous, an institutional configuration that significantly shapes its current phase of digital archival development.

5.3. Archival legal framework in Vietnam

In the context of globalization and rapid digital transformation, the modernization of archival administration has become a strategic imperative for many countries, including Vietnam. Examining the experiences of nations with advanced archival systems, particularly in the field of electronic records management, provides valuable lessons that enable Vietnam to shorten its modernization trajectory and enhance its capacity to organize, manage, and exploit electronic records effectively. Such an approach not only optimizes

available resources but also minimizes potential shortcomings in the process of reforming and developing the national archival system. The rapid advancement of science and technology, especially information technology (IT), has profoundly transformed the information environment and the operational mechanisms of state agencies. The exponential growth of electronic records has generated an urgent need to establish appropriate management frameworks to ensure the integrity, authenticity, and long-term accessibility of records. These challenges extend beyond technical considerations to encompass legal frameworks, institutional capacity, and the professional competence of archival personnel. Since the initiation of the Đổi mới reforms in the early 1990s, Vietnam has undertaken comprehensive administrative reforms and gradually restructured its governance system to meet evolving socio-economic development demands. Within this transformation, archival records have increasingly been recognized as a foundational pillar of state governance, transparency, and accountability. Consequently, there is a continuous and pressing need to modernize archival practices to align with the requirements of contemporary public administration. As the world enters the era of the Fourth Industrial Revolution, commonly referred to as the digital revolution, Vietnam's archival sector faces both significant opportunities and complex challenges. The application of information technology in the collection, management, and dissemination of records has become an inevitable trend, driving comprehensive innovation within the archival domain. This orientation was formally articulated in the "Planning for the Archives Industry to 2020, Vision to 2030" (Ministry of Home Affairs, 2012), which emphasizes the importance of scientific and technological research and application, particularly in IT, to support the modernization of records and archival activities. Nevertheless, electronic records, as a relatively new subject of management, present numerous complexities related to long-term preservation, data standardization, information security, and accessibility. In response, the Vietnamese State has progressively developed and refined its legal framework to establish a solid foundation for the management and use of electronic records. Despite these

efforts, the transition from traditional archival models to digital environments remains an ongoing process, accompanied by substantial challenges in terms of resources, technological infrastructure, and institutional capacity.

5.3.1. Macro-Level Digital Governance Context

Vietnam's archival transformation cannot be isolated from the national digital reform agenda. Several foundational policy documents shape the regulatory environment within which digital archiving operates: *Resolution No. 52-NQ/TW (2019) on the Fourth Industrial Revolution; Resolution No. 17/NQ-CP (2019) on e-Government development; Decision No. 749/QĐ-TTg (2020) approving the National Digital Transformation Program; Decision No. 942/QĐ-TTg (2021) on Digital Government Strategy*. These documents establish digital data as a strategic national resource and define public administration as a digitalized ecosystem. Consequently, archives are repositioned from passive repositories to components of public data infrastructure. The significance of this macro-layer lies in its redefinition of archival governance as part of digital state-building. Archival regulation is no longer limited to preservation but extends to interoperability, data sharing, and digital trust.

5.3.2. Cross-Sector Digital Legal Infrastructure

The second layer of the framework consists of cross-sector digital legislation that directly affects archival operations: *Law on Electronic Transactions (2023 revision); Law on Cybersecurity (2018); Decree No. 13/2023/NĐ-CP on Personal Data Protection; Decree No. 47/2020/NĐ-CP on Digital Data Management and Sharing; Decree No. 42/2022/NĐ-CP on online public service provision.* These legal instruments provide rules for electronic authentication, data protection, cybersecurity compliance, and interoperability standards. They are not archival laws per se, but they determine the technological and legal environment within which digital records must be preserved. Particularly significant is the 2023 Law on Electronic Transactions, which expands the legal validity of electronic data across sectors. This strengthens the evidential status of digital records and reinforces the need for

long-term digital preservation mechanisms. The personal data protection framework (Decree 13/2023) introduces compliance requirements that affect archival access policies, especially concerning sensitive or classified records. Thus, the cross-sector layer creates both enabling conditions and regulatory constraints for digital archiving.

5.3.3. Archival-Specific Regulatory Framework

The core transformation of archival governance is reflected in the transition from the 2011 Archives Law to the 2024 Archives Law:

- The 2011 Law represented the first formal recognition of electronic records within the archival system. However, the structure of the law remained largely analog-oriented. Electronic records were incorporated without a distinct digital governance architecture. The regulatory emphasis remained on physical preservation, classification, and appraisal procedures designed for paper-based systems (National Assembly, 2011);

- Circular No. 01/2019/TT-BNV dated January 24, 2019, of the Ministry of Home Affairs regulating the process of exchanging, storing, and processing electronic documents in clerical work and essential functions of the electronic document management system in processing the work of agencies and organizations. (Ministry of Home Affairs, 2019);

- Circular No. 02/2019/TT-BNV, dated January 24, 2019, issued by the Ministry of Home Affairs, serves as a comprehensive directive governing the standards and prerequisites for inputting information data and the preservation of electronic archives. This circular explicitly outlines the criteria and requirements for maintaining the integrity and quality of electronic archives, including metadata, generated during the operational activities of various agencies and organizations. The overarching goal of Circular No. 02/2019/TT-BNV is to establish a standardized framework for input information data, ensuring consistency and quality in electronic archives. By doing so, the circular approach aims to facilitate a systematic and unified approach to creating,

storing, and managing electronic archival materials. Compliance with these standards is vital to guarantee the authenticity, accuracy, and accessibility of electronic archives, aligning with contemporary best practices in archival management within the regulatory framework set by the Ministry of Home Affairs (Ministry of Home Affairs, 2019).

- Decree No. 30/2020/NĐ-CP on clerical work;

- On April 3, 2020, the Prime Minister of the Socialist Republic of Vietnam issued Decision No. 458/QD-TTg, approving the "Electronic Document Archiving Project for State Agencies in the 2020 - 2025 Period." This project aims to establish a comprehensive framework for the uniform management, secure preservation, and efficient organization of electronic records generated by state agencies to enhance operational effectiveness and facilitate public and business access to state agency records (Prime Minister, 2020). The key stakeholders responsible for project implementation include ministries, ministerial-level agencies, government bodies, and People's Committees at all administrative levels. Other agencies and organizations may participate as needed, aligning their efforts with the project's objectives and relevant legal provisions to ensure effective electronic archives management.

The project outlines tasks and solutions in several areas:

+ Refinement of Legal and Professional Documentation: Enhancing the legal framework and professional guidance documents related to electronic archiving;

+ Establishment and Deployment of Electronic Records at Agency Archives: Setting up and operating electronic archiving systems within agency archives;

+ Implementation of Electronic Archives at Historical and Specialized Archives: This involves extending the application of electronic archiving to historical and specialized archives.

+ Integration of Electronic Archives Databases: Integrating databases into the State Archives Electronic Archives Database Management System;

+ Publication of Descriptive Data and Digitization: Providing descriptive data for non-restricted archived documents online and digitizing at least 30% of non-electronic documents with significant usage frequency;

+ Organizational Structure, Technology, and Training: Implementing solutions for organizational structure, technology adoption, and human resource training to meet centralized management requirements for electronic archives within state agencies.

This project represents a crucial step toward modernizing and streamlining electronic records management within the state sector, promoting transparency, efficiency, and accessibility for all stakeholders.

- Decision No. 416/QD-BNV, issued by the Minister of Home Affairs on June 13, 2023, outlining the criteria for determining archival documents with a high frequency of use to be preserved at National Archives Centers and participating in digitization for the project "Storing Electronic Documents of the Vietnam State Archives-Phase 2." (The Criteria for Determining Archival Documents with a High Frequency of Use to Be Preserved at National Archives Centers and Participating in Digitization for the Project “Storing Electronic Documents of the Vietnam State Archives - Phase 2.”, 2023)

Decision 416/QĐ-BNV specifies the following criteria:

+ Readers have accessed archival documents multiple times for exploration and use in the Reading Room of the National Archives Centers.

+ Archival documents have been released numerous times to support the publication and promotion of archival materials by the National Archives Centers through various channels, including publications, exhibitions, newspapers, magazines, websites, social networks, television, and radio.

+ Archives are expected to be disclosed and introduced as part of the program “Disclosure of national archives to serve construction, socioeconomic development, and protect the country's sovereignty.”

According to the criteria set out in this decision, the Director General of the State Records and Archives Department instructed the National Archives Centers to review, survey, and compile statistical data in order to establish a prioritized list of fonds/collections/archival holdings with high usage frequency that require digitization;

- Archives Law 2024 The 2024 Law constitutes a structural shift. It introduces:

+ Legal definitions of digital archives and digital archival repositories.

+ Regulations on digital archival databases.

+ Backup repositories and disaster recovery mechanisms.

+ Legal recognition of digital archival services.

Unlike the 2011 Law, the 2024 Law conceptualizes archives as data systems rather than physical repositories. It formalizes the integration of archives within digital governance infrastructure.

- The Government's Decree No. 113/2025/NĐ-CP of June 3, 2025, detailing several articles of the Archive Law.

- Circular No. 05/2025/TT-BNV (May 14, 2025) of the Minister of Home Affairs on professional standards for managing digital archival materials.

- Circular No. 06/2025/TT-BNV (May 15, 2025), guiding implementation of several articles of the Archives Law.

These included several policy innovations, such full legal validity of electronic archival records and guidelines for their management, preservation, and access; Citizen rights to access archives were broadened, procedures greatly simplified, and public archival services bolstered; Standards for when and how to declare archival materials of exceptional value and recognize them; Incorporation of private archives into national archival heritage with support from state policies on preservation and rights of private owners; Includes modernization of standards and norms, as well as promotion of adoption of international standards including ISO 15489, ISO 30300, and OAIS, coordinating

digitization initiatives with cross-border data interoperability; Strengthened measure of responsibility, characterizes the rights and duties suitable for an extraordinary system from existing ranges, structure accountability at all levels.

This is particularly evident in the global legal framework governing archive cooperation. These include signing and realizing cooperation agreements, becoming a member of international archival organizations, carrying out joint projects, and deploying research and technology transfer; Organizing exhibitions; and protecting archival materials abroad. All cooperation must abide by the principles of respect for sovereignty, equality, and mutual benefits, and full compliance with Vietnamese law and international agreements.

In connection with the Vietnamese government's current administrative restructuring process to a two-tier local government system (province and commune levels), the regulation leads to a demand for unified and functional electronic archival systems across governance levels. Electronic recordkeeping not only reduces reliance on traditional human resources and enables more real-time access but also eliminates access restrictions related to location, resulting in cost savings. Additionally, it decreases paper storage space, enhances transparency, facilitates smooth public service delivery, and supports timely decision-making. Provincial historical archives are expected to take a leading role in managing both the technical requirements and preservation of local data and infrastructure.

5.4. Analytical Assessment by Dimensions

5.4.1. Technological Readiness

Over the past decade, Vietnam has made significant efforts to enhance its technical readiness for the archival system through digitization programs and the development of electronic infrastructure, as outlined in the Strategy for Archival Sector Development until 2030. Central and provincial archival institutions have issued server systems, software for managing the archival database, and purchased modern digitization devices (large-format scanners; specialized appliances for photographing, duplicating maps, as well as scanning films). Additionally, under the direction of Politburo's Resolution No. 57-NQ/TW promulgated on December 22, 2024, the construction of digital repositories and links with the national digital platform is one of the most important goals. (The National Digital Archives Portal). Nevertheless, the regional uneven development and different paces of evolution between administrative levels continue to represent a significant challenge.

> *Technical infrastructure remains inconsistent. Many provinces lack software systems and technical environments capable of meeting new regulatory requirements for packaging, validating, and ingesting digital records.*

(Policymaker, P2, Interview, 2025)

Most provincial archives have outdated and non-standard infrastructure with isolated storage capacity, and lack coordination among various government sectors to access record management information systems, which results in duplication of records, while information sharing among National Archives Centers is still limited. This signals a disconnect between strategic goals and actual localizing capacity.

In an interview conducted with a national archives director:

> *The problems of "information monopolization and fragmentation," together with an excessively restrictive security mindset among certain organizations or individuals, hinder connectivity and the broad sharing of records.*

(Director of the archival institution, D2, Interview, 2025)

The digitization process has achieved standardization at the most basic level, with many agencies enforcing a set of uniform specifications for resolution, file formats (preferably TIFF or PDF/A), and even how files should be named (The Standards and Prerequisites for Input Information Data and the Preservation of Electronic Archives, 2019b). However, the number of historical records to be digitized is still huge, and resources available in terms of human power, equipment, and budget are not unlimited. For audiovisual records, the pace of physical decomposition is a key factor in determining digitization schedules, along with the equipment required for playing back tapes. A digitizing specialist at National Archives Center III said:

> *Equipment for film and magnetic tapes is costly and requires special support; without relevant investment projects, we are not able to meet the long-term preservation requirements.*

(Archivist, A2, Interview, 2025)

Some of these backup systems, redundant servers, and firewalls are automated to ensure that data is secure and protected, but end users often overlook the security level. While older data can be more difficult to recover or misplace, newer electronic records, especially those that are confidential or high-value, may warrant additional secure storage options with features such as encryption, multi-factor authentication, and access monitoring. The Archives Law 2024 and Circular No. 05/2025/TT-BNV provide further clarity on the technical requirements; however, consistency in compliance remains a concern.

As a whole, Vietnam has made significant progress in infrastructure, software solutions, and data digitization, laying the groundwork for

comprehensive digitalization in the archival domain. The latter also requires synchronized infrastructure, standardization of software, investments in necessary specialized equipment, and standardized deployment of security measures to protect the entire system. These are essential to robust operations in the national digital archival repository and the long-term usefulness of these collections.

5.4.2. Legal and Policy Frameworks

Over the past decade, Vietnam's archival institution has undergone a profound transformation from a traditional model based on physical carriers of information to a model centered on data governance and digital archiving. This shift is not merely technical in nature but reflects a broader institutional restructuring within the context of national digital transformation and e-government development. From the 2011 Law on Archives to the 2024 Law on Archives, Vietnam's archival legal system has evolved from formally recognizing electronic records to comprehensively institutionalizing digital archiving.

> *Previously, the 2011 Law on Archives and its implementing decrees addressed electronic records only in relatively general terms and did not fully keep pace with the rapid development of technology. The 2024 Law on Archives and its accompanying legal instruments represent a significant advancement: they formally recognize the legal validity of electronic archival records, expand access to information, and place greater emphasis on standards and technical regulations. From a legal framework perspective, I would argue that the system is now relatively comprehensive; the primary weaknesses lie in the implementation phase and in the operational capacity at the local level.*

(Policymaker, P1, Interview, 2025)

The 2011 Law on Archives marked the first time that electronic records were officially recognized as objects regulated under archival law. However, the structure of the law remained grounded in a traditional archival paradigm; electronic records were not designed as an autonomous operational system but

were instead incorporated into the general logic governing archival materials. The period from 2019 to 2023 witnessed a significant increase in subordinate legal instruments aimed at standardizing electronic processes and data, including circulars regulating the creation of electronic files, input data standards, and electronic document management. Notably, the Project on Electronic Records Archiving for the period 2020–2025 established a strategic orientation toward building a unified electronic archival system across state agencies. This represented a transition from a "*principle-based framework*" to a "*system-design approach*."

The 2024 Law on Archives marks a qualitative institutional shift. Concepts such as archival databases, digital repositories, backup repositories, digital archival services, and digital archival records are explicitly defined. Accordingly, the law no longer merely regulates "*records*" but rather governs the "*archival data infrastructure*." It may therefore be argued that Vietnam's archival institution has moved from a model based on physical information carriers to one grounded in data and the information lifecycle.

In the context of digital transformation, archives are no longer positioned as the final stage of the administrative process but are increasingly becoming an integral component of public data governance. The 2024 Law on Archives and its implementing decrees clearly emphasize lifecycle management of records and the requirement for synchronization between electronic document management systems and archival systems. Nevertheless, in practice, archival operations in Vietnam remain influenced by the traditional administrative model, whereby records are transferred to historical archives only after the completion of their active lifecycle. Early involvement of archival institutions in the creation and management of electronic records remains limited.

Although the current legal framework is relatively comprehensive, Vietnam's archival institution continues to face several structural challenges. *First*, there remains a gap between legal provisions and implementation capacity. Information technology infrastructure, particularly at the local level,

remains uneven. The lack of uniform technical standards and data interoperability may hinder the objective of establishing a unified national archival database. *Second*, human resources in digital archiving remain limited. The transition from traditional to digital archiving requires interdisciplinary expertise in information technology, data governance, and information security. However, existing training and professional development programs in digital preservation and metadata management have not yet fully met practical demands. *Third*, there is the issue of integrating archives into the national data strategy. In the context of Digital Government and the digital economy, archives need to be repositioned as a component of public data infrastructure, rather than being viewed solely as custodians of historical records.

In the context of digital transformation, Vietnam's archival institution may be characterized as having achieved a relatively high level of legal maturity while still undergoing a transition toward effective operational capacity. From 2011 to 2024, the legal system evolved through three stages: recognition, standardization, and comprehensive institutionalization. The next phase, however, requires a shift in focus from legislative development to strengthening infrastructure, enhancing human resources, and integrating archives into the broader national data governance strategy. Only by narrowing the gap between legal norms and implementation capacity can Vietnam's archival system truly become a sustainable component of the national digital ecosystem.

5.4.3. Institutional Capacity

Maintaining the digital archival infrastructure and ensuring its sustainability, from the central to the local level, is a critical issue that hinges on the capacity of Vietnam's institutional system. Over the recent years, due to comprehensive organizational restructuring, enhanced coordination mechanisms, and focused resource allocation in line with the strategic directions of the Government, as well as the Ministry of Home Affairs (MHA), the sector has been assisted.

Applying Decision No. 176/QĐ-BNV dated March 12, 2025, by the Minister of Home Affairs, which consolidates three previous specialized units and establishes the National Archives Center for Digital and Preventive Records, this body has unified digital archives management through preservation, State Archival Fonds database administration, and cybersecurity. This marks a significant step in preventing scatter and enhancing national management capacity.

In the context of implementing the 2024 Law on Archives and its guiding instruments (particularly Circulars No. 05 and 06/2025/TT-BNV), the Department of Records and Archives of Vietnam surveyed the status of digital records transfer to 34 provincial-level historical archives. (State records and archive Department of Vietnam, 2025). The survey results provide a relatively clear picture of the level of readiness and implementation capacity for digital archiving at the local level. The findings indicate that the proportion of localities transferring digital archival records in accordance with prescribed procedures remains low. Only approximately 17% of the surveyed provinces have carried out the transfer of electronic records to historical archives as required by regulations. Around 40% have developed implementation plans but have not yet conducted actual transfers. Notably, about 43% have never undertaken the transfer of digital archival records. These results suggest that although the legal framework has been relatively comprehensively established, implementation at the local level is still in its initial stage and lacks nationwide consistency, illustrating the implementation gap between regulatory ambition and local capacity.

In the provinces where transfers have been conducted, the majority of submitted materials consist of digitized records converted from paper originals. There have been no recorded cases of transferring records that were created entirely in digital form (born-digital records) from electronic document and administrative management systems. This situation reflects an important reality: electronic records management systems and digital archival systems at the local level are not yet fully interoperable, and standardized digital packaging

procedures (for example, Submission Information Packages – SIPs) have not been comprehensively implemented. (State records and archive Department of Vietnam, 2025).

Besides technical infrastructure remains inconsistent, and human resource limitations persist; professional procedures remain new and complex. Requirements relating to digital signature verification, data structure compliance, format validation, and information security demand close coordination between archival authorities and information technology units; however, such coordination mechanisms have not yet been standardized. Overall, the survey indicates that the transfer of digital archival records at the local level is currently in a transitional phase from awareness to implementation. Although the legal framework is clearly defined, effective implementation depends heavily on infrastructure conditions, available resources, and organizational capacity within each locality. This situation underscores the urgent need to further refine technical guidelines, strengthen investment in digital infrastructure, standardize digital packaging procedures, and enhance professional training in digital archiving. At the same time, it is necessary to establish periodic monitoring and evaluation mechanisms to ensure consistent and effective enforcement of digital archival regulations nationwide.

At the interdepartmental level, software/hardware projects are primarily funded from the budgets of executive authorities and the funds of target programs. Socialized receipts, due to legislative limitations, remain blocked, including for use by state archival establishments outside of earnings. As a result, some institutions have been compelled to postpone or scale back the scope of their digitization projects. Similarly, inter-agency coordination had also improved. The inclusion of IT departments, cybersecurity units, and cooperation with research and training institutions has helped improve the quality of implementation. However, this coordination is frequently “project-based” and does not have the sustained continuity and stability that are vital components of

successful collaboration. A pillar from the State Records and Archives Department of Vietnam observed:

> *When there is a particular project, coordination works relatively well, but after that, somehow, the activities together fall away.*

(Policymaker, P1, Interview, 2025)

In general, it can be said that at the center (in terms of institutional capacity), we have more organization and resources, making coordinating things a lot easier. However, the sustainability of the system would continue to rely on reducing disparities among localities, increasing streams of revenue, and fostering stable, long-term inter-agency partnerships to maintain a functional national digital archival repository.

5.4.4. Professional Development

Human resource development is a decisive factor in determining the success of digital transformation in the archival sector. Vietnam's archival workforce currently consists of a combination of professionals trained in traditional archival science and a newer generation equipped with knowledge in information technology, data management, and digital preservation. With the *Archives Law 2024* formally recognizing the legal validity of electronic archival records and mandating their management, conservation, and access in accordance with international standards, the need to strengthen staff competencies has become more urgent than ever.

In recent years, the Ministry of Home Affairs and the State Records and Archives Department of Vietnam have organized numerous training courses on digitization workflows, electronic records management, metadata standards, data security, and the application of emerging technologies such as artificial intelligence (AI) and optical character recognition (OCR). However, practical implementation reveals a clear gap between job requirements and the actual competencies of some staff, especially at the local level.

An interview at a national archives center revealed:

> *Most of our staff are familiar with traditional preservation methods, while digital data processing requires technical expertise and foreign language skills, but opportunities for in-depth training are still limited.*

(Director of the archival institution, D3, Interview, 2025)

This has led to slow progress in digitization, underutilization of available archival management software, and a heavy reliance on external IT specialists. In terms of career pathways, there is currently no clearly defined professional development framework for digital archivists, including standardized job titles, digital skill requirements, and competency assessment systems. The absence of a specialized competency framework for electronic archiving has led to recruitment, appointment, and training processes that lack strategic orientation.

In sum, despite notable progress in training and international cooperation, Vietnam's archival workforce still requires comprehensive capacity building to meet the demands of the digital era. A unified professional development strategy is needed, linking digital skills training with national professional standards, expanding international collaboration, and integrating new technologies, to build a workforce fully capable of managing and preserving archival materials in a digital environment.

5.4.5. User Access and Engagement

In this part, we will provide a summary of a characteristic of the operation that demonstrates whether Vietnam is efficient in transforming its digital technology into heritage management, user accessibility, and the utilization of unique historical materials. Recent initiatives have focused on expanding remote access services and enhancing user experience through online search systems, digital databases, and the provision of electronic copies. The Archives Law 2024 and its ancillary bylaws have legally expanded the public's right to archival information, simplified retrieval procedures, and promoted online public access through appropriate technology.

As mentioned, the State Records and Archives Department of Vietnam (SRAD) has been working with FPT IS[19] to create a National Digital Archives Portal[20] that features search functionalities for fonds, files, and record types in the archives centers nationwide. The National Digital Archives Portal (also referred to as the National Digital Archiving Platform) is an information technology system established to preserve, manage, share, and exploit digital records at the national level, in alignment with the digital transformation requirements of Vietnam's archival sector. The development of this portal has been implemented in accordance with Resolution No. 57-NQ/TW on the modernization of the archival sector and the development of Digital Government, in a context where digital archiving has become an indispensable component of national data governance and state digital transformation.

The portal was established in response to several pressing needs: ensuring lifecycle management of digital records; meeting requirements for long-term preservation and broad access; complying with technical standards based on ISO 14721 – OAIS (Open Archival Information System), the international standard for digital preservation; and supporting the development of Digital Government, Digital Society, and Digital Economy in Vietnam.

The National Digital Archives Portal is designed to fulfill several core functions. *First*, it serves as a system for the preservation and management of digital records, guided by the following principles: centralization of data from multiple systems across domestic agencies and organizations; standardization of metadata and data structures to ensure logical organization and efficient retrieval; and safeguarding the security, integrity, and authenticity of digital records in accordance with international standards. In particular, the adoption of the OAIS model (ISO 14721) enables the system to meet long-term preservation requirements and ensure data interoperability over time, one of

[19] FPT IS (short for *FPT Information System*) is a technology company and a member of the FPT Corporation, positioned as a leading provider of digital transformation products, solutions, and services in Vietnam and the region. (https://fpt-is.com/ve-fpt-is/) (Accessed 25.10.2025)

[20] https://luutru.gov.vn/luu-tru-tai-lieu-dien-tu-co-quan-nha-nuoc-gd-2021-2025/tim-kiem-va-doc-tai-lieu-tren-nen-tang-luu-tru-so-quoc-gia.htm (Accessed 25.10.2025)

the most significant challenges in global digital archiving. *Second*, the portal facilitates connectivity and data sharing with national systems. Beyond its storage function, it connects with source data systems of various agencies, thereby enabling: integration with archival databases of ministries, sectors, and local authorities; periodic and automated synchronization of data to the national digital archiving platform; and unified access and exploitation of digital records from multiple sources through a single platform. This approach aligns with Vietnam's national data-sharing policy orientation, as reflected in open data initiatives and Digital Government strategies, including regulations concerning the National Data Portal (data.gov.vn), which aggregates open data from state agencies. *Third*, the portal supports public access and utilization. It is designed not only for professional users (such as researchers and archivists) but also for the broader public by: providing online search and retrieval of digital records; supporting digital data exploration tools (such as aggregation and thematic filtering); and promoting research, educational, and cultural applications within the digital environment. Although this function was not fully developed at the initial stage of implementation, it reflects a forward-looking vision oriented toward serving the information society, in which digital archives function not merely as repositories but as an "open data infrastructure" for broad societal use.

Although the National Digital Archives Portal is fundamentally a technical platform, it operates within a broader legal and strategic framework, including: the 2024 Law on Archives and its implementing decrees and circulars; the National Data Strategy (in which archival data constitutes an essential component); and regulations on state data governance and sharing, such as Decree No. 47/2020/NĐ-CP on data management and digital data sharing. In this context, the Digital Archives Portal serves as a key instrument for implementing policies on the management, protection, and sharing of archival data within the broader framework of Government Data Governance and the concept of Government as a Platform. It may be argued that the National Digital Archiving Platform represents a pivotal solution to addressing the country's "*digital archiving challenge*," contributing to: the preservation of legal evidence

and historical documentation of national activities; the advancement of comprehensive digital transformation in archival and records management; compatibility with international standards, particularly in sustainable digital preservation; and the development of an open data ecosystem aligned with Vietnam's long-term Digital Government and national data development goals toward 2030.

Despite its breakthrough nature, the implementation of the digital archiving platform faces several challenges. The synchronization and standardization of distributed data across agencies require further strengthening; specialized human resources in digital archiving and data preservation remain limited; and the technical and financial requirements for maintaining long-term digital preservation systems raise sustainability concerns. Addressing these challenges will require continued policy refinement, infrastructure upgrades, and institutional and human capacity-building in the next phase of Vietnam's digital archiving strategy.

In summary, the National Digital Archives Portal of Vietnam constitutes a strategic platform within the national digital archiving framework, implemented under Resolution No. 57-NQ/TW. It establishes both the legal and technical foundations for the nationwide preservation, management, sharing, and exploitation of digital records. The development and continued enhancement of this platform represent a significant step in advancing Digital Government and building a sustainable national data infrastructure.

In Vietnam, several provinces have developed Internet-based search systems linked to online, digitized databases that receive and deliver record information over the internet. One archivist remarked:

> *In the past, you had to travel hundreds of kilometers looking for a file. Now they can lodge a request on the net and determine that outcome by using email or publish.*

(Archivist, A6, Interview, 2025)

Nonetheless, surveys and interviews illuminate differences in engagement with digital records among some user groups. The network infrastructure and internet speed at specific locations also play a crucial role in influencing the user experience. Furthermore, digital data transparency and completeness are also a function of the speed of digitization and prevailing information disclosure policies. In addition, due to the sensitive or unprocessed nature of the online materials of specific fonds and files themselves, these user experiences may not be perfect. Still, a gap exists between the actual needs of users and the available service capacity.

For the sake of access and engaged use, a combination of developing digitization and online publishing, outreach on online archival services, and integrating linked data-tagged finding aids into integrated search engines. In the long term, this public will be the focus of a "user-centered" strategy that incorporates archival activities into society's information needs and reaffirms the role of archives as an open institution in cultural life and information management.

5.5. Summary

This chapter has examined the impact of computerization on archival development in Vietnam through five analytical dimensions: technological readiness, legal and policy frameworks, institutional capacity, professional development, and user access and engagement. The findings demonstrate that archival transformation in Vietnam is not solely a technological process but a broader institutional process shaped by legal reforms, administrative structures, organizational capacities, professional development, and evolving user expectations.

The analysis reveals that Vietnam has established an increasingly comprehensive legal and policy framework for digital archiving. The Law on Archives 2024, together with Decree No. 113/2025/ND-CP and related implementing regulations, has provided an important institutional foundation for managing electronic records, digital preservation, and archival access. These

reforms have strengthened the legal status of electronic records, clarified preservation responsibilities, expanded citizens' rights of access, and promoted greater alignment with international standards and practices. At the technological level, significant progress has been achieved in digitization, the development of digital repositories, and the establishment of national and provincial digital archival initiatives. Nevertheless, the findings suggest that technological development has advanced more rapidly than public access and service delivery. As several interviewees emphasized, digitization does not automatically translate into digital accessibility. Infrastructure limitations, security concerns, and regulatory restrictions continue to constrain the broader use of digital archival resources. The study also highlights substantial disparities in institutional capacity across the archival system. National archival institutions generally possess stronger financial resources, technical infrastructure, and specialized personnel than many provincial archives. These differences significantly influence the pace, scale, and sustainability of computerization initiatives and contribute to uneven patterns of archival development across regions. Similarly, while professional development has improved considerably in recent years, the growing complexity of digital archiving has generated new demands for professional competencies. The findings indicate an increasing need for specialized training in electronic records management, metadata standards, digital preservation, cybersecurity, and emerging technologies. The absence of a standardized national training framework for digital archiving remains a significant challenge. User access and engagement constitute one of the most visible limitations of the current stage of archival computerization. Although millions of archival records have been digitized, access to these resources remains largely restricted. Existing online services are often limited in scope and are primarily designed for information dissemination and public outreach rather than comprehensive scholarly or public use. As a result, the potential benefits of digitization have not yet been fully realized.

Viewed through the lens of Institutional Theory, the Vietnamese experience of archival computerization can be characterized as a predominantly law-driven, state-directed, and project-based pathway of transformation. Technological change has largely been initiated and guided through legislation, governmental strategies, ministerial regulations, and national modernization programs. This institutional environment has enabled relatively rapid policy implementation and the dissemination of common standards throughout the archival sector. At the same time, the findings suggest that technological modernization has frequently been implemented through individual projects and programs rather than through fully integrated institutional infrastructures, contributing to persistent differences in capacity and implementation outcomes across archival institutions.

Overall, the chapter demonstrates that Vietnam has made substantial progress in establishing the legal, technological, and organizational foundations for digital archiving. However, the long-term success of archival transformation will depend not only on continued technological investment but also on the ability of archival institutions to strengthen organizational capacity, reduce regional disparities, expand public access, and adapt to the evolving demands of the digital environment. These findings provide the basis for the comparative analysis in Chapter VII, where the Vietnamese experience will be examined alongside the German case in order to identify broader patterns and alternative pathways of archival transformation in the digital age.

CHAPTER VI. CASE STUDY: DIGITAL ARCHIVING PRACTICES AT THE HESSIAN STATE ARCHIVES, GERMANY (HLA)

6.1. Introduction

This chapter examines the Hessisches Landesarchiv (HLA) as a case study of digital archival transformation within a federal governance structure. HLA represents one of the most advanced state archival institutions in Germany in terms of digital preservation infrastructure, records management integration, and public digital access. It is pertinent to highlight that the rate of technology integration into archival practices is subject to fluctuations, which depend on the available resources and fiscal capabilities of individual archival institutions. Certain German archives may enjoy a more favorable position concerning technological and digitization investments, thereby enabling them to leverage the latest advances in preservation technologies. In contrast, others may be compelled to prioritize more conventional conservation methods due to financial constraints. However, admittedly, Germany has demonstrated a sustained commitment to establishing a comprehensive electronic system for its archives. This would entail creating a centralized platform that can accommodate a broad range of archival materials, including digitized copies of original documents and born-digital records from various archives. Such a system would enable national access to all archival holdings, thereby facilitating more efficient research (Sobczak, 2016a). Among the others, the State Archives of Hessen is recognized as a pioneer in this area.

> *"Wir denken genug an Richtlinien, aber noch zu wenig an Umsetzung"*
>
> Dr. Kai Naumann

At the 23rd session of the *"Archiving documents from digital systems (AUdS)"* working group, held on March 12 and 13, 2019, at the National Archive Prague, Dr. Kai Naumann of the State Archive of Baden-Württemberg highlighted the inadequacy of the German digital long-term archiving landscape. (Naumann, 2019). Specifically, he contended that while adequate attention has been paid to the development of guidelines, there is a lack of focus on actual

implementation. This observation provides a useful analytical lens: the German archival landscape is normatively rich but operationally uneven. The HLA case, therefore, allows us to examine how one state archive attempts to bridge this gap. We share Dr. Naumann's view that effective implementation is a crucial element in the preservation of digital records and maintaining their integrity and accessibility over time. The process of implementing digital long-term archiving strategies necessitates a coordinated effort from various stakeholders, including archivists, policymakers, and technology experts. Although guidelines for digital long-term archiving have been sufficiently addressed, the actual implementation of these strategies requires ongoing attention to ensure efficient and sustainable preservation of digital records. As such, it is imperative to acknowledge the significance of proper implementation and to prioritize this aspect of digital long-term archiving.

The purpose of this chapter is to provide a comprehensive overview of the archival system in the state of Hessen, Germany, with a particular focus on the challenges and opportunities presented by digital archiving. The Hessian State Archives have faced various challenges in its endeavor to modernize its archive system; nevertheless, it remains committed to expanding its digital offerings, which have seen a significant surge in demand. This commitment to digitization can be attributed to the growing need for information accessibility and the increasing importance of technology in contemporary society. An example of the efforts of the Hessian State Archives to enhance its digital capabilities is the development of Arcinsys. This platform serves as a virtual reading room and offers opportunities for networking and collaboration with other GLAM (digital heritage institutions: galleries, libraries, archives, and museums). The Archive Portal D, the German Digital Library, Europeana, and the Archive Portal Europe are among the platforms with which the Hessian State Archives collaborate. (Hessen Landesarchiv, 2014, p. 21). The development of Arcinsys enables users to access and interact with archival materials in a digital format, promoting greater ease of access and research opportunities.

Additionally, the Hessian State Archives engages in active collaboration with its partners, utilizing Arcinsys and DIMAG to foster innovation and enhance the overall archival experience. The annual DIMAG day provides a forum for DIMAG partners to convene and share ideas for future collaborations and advancements in the field of digital archiving. Furthermore, the Hessian State Archives recognizes the importance of IT security in safeguarding the integrity and privacy of its digital collections. To ensure the protection of archival materials and user data, the archive works closely with IT security professionals to implement robust security measures. The outcome of this chapter is based on the application of empirical research methods, which encompass various data collection techniques, such as data analysis procedures and semi-structured interviews.

6.2. A brief history of the German archives

The development of the German archive was closely tied to changes and the development of the country's history. The federal structure of Germany currently comprises 16 states, each of which is responsible for its archival system and is enriched by nearly 3000 municipal and county archives, university archives, business archives, and others. The Federal Archives (Bundesarchiv), with its different sections partially located at various locations, is at the top.

Federal Archive		
01.	Bundesarchiv	
State Archives		
01.	Baden-Württemberg	
02.	Bavaria	
03.	Berlin	
04.	Brandenburg	
05.	Bremen	

06.	Hamburg	
07.	Hesse	
08.	Mecklenburg-Vorpommern	
09.	Lower Saxony	
10.	North Rhine-Westphalia	
11.	Rhineland-Palatinate	
12.	Saara	
13.	Saxony	
14.	Saxony-Anhalt	
15.	Schleswig-Holstein	
16.	Thuringia	

Table 7. List of Federal and State Archives in Germany

6.3. An introduction to the Hessian State Archives

For centuries, the three state archives in Hessen have served as crucial repositories of the collective memory of society and administration. Since the early modern period, they have been amassing and safeguarding a vast corpus of documents that serve various functions, including the protection of legal claims and the promotion of transparency in administrative practices. These materials offer a wealth of information to scholars, researchers, and the general public, enabling them to explore the past, gain new insights, and deepen their understanding of the present. The archives welcome access to their collections for scientific, historical, genealogical, and private research purposes, thus boosting a culture of academic inquiry and expanding the scope of knowledge in numerous fields. The Hessian archives' dedication to openness and accessibility has nurtured a dynamic intellectual community, attracting scholars and researchers from around the globe to investigate the region's cultural heritage

and history. The impact of this commitment can be seen in the visitor statistics of Arcinsys, the online portal for accessing the Hessian State Archives. The number of visitors to the portal in the years 2019, 2020, 2021, and 2022, indicates a substantial interest in the archives' holdings. In addition, international users comprise more than 10% of the total number of users accessing Arcinsys, suggesting that the archives' reach extends beyond the local community to a global audience. These figures indicate not merely quantitative growth, but a structural transformation in user behavior, where digital access increasingly supplements, and in some areas replaces, traditional on-site consultation, underscoring the significance of the Hessian State Archives' role in the preservation and dissemination of historical information, and its importance in advancing scholarship and research in the field.

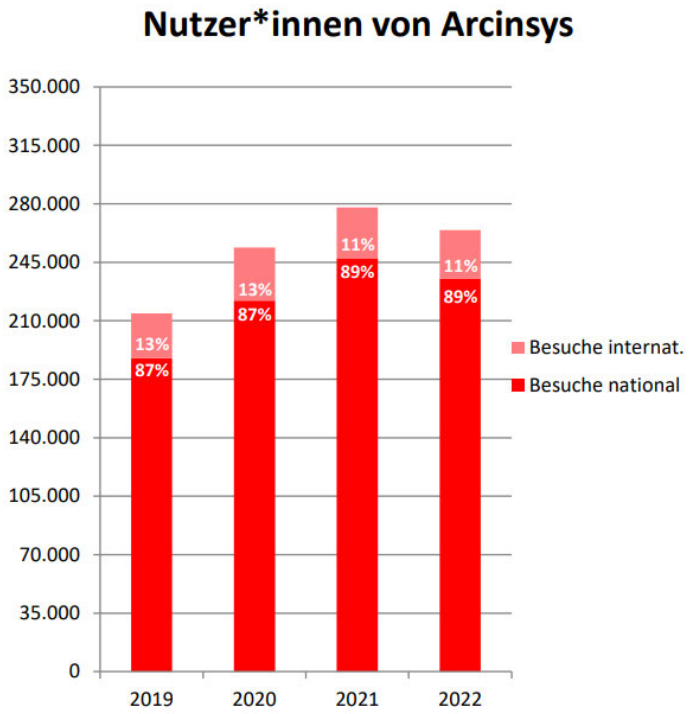


Figure 14. Users of Arcinsys[21]

Source: (Landesarchiv, 2023)

The historical material in the Hessian state archives is arranged according to the state borders that existed in the 19th century. These borders were created

[21] This document is compiled based on the target agreement between the Hessian Ministry of Science and the Arts (HMWK) and the HLA from 2017.

by the U.S. military administration, which established the state of Groß Hessen (Great Hessen) on September 19, 1945. A year later, the name of the State was changed to Land Hessen (State of Hessen) on December 1, 1946. This restructuring of the state in the aftermath of World War II was reflected in the division of Hesse into districts, or 'Regierungsbezirke,' specifically Darmstadt, Kassel, and Wiesbaden, which persisted until 1968. The state's archival records have been collected and maintained based on this division since 1945. The capital of Hesse is Wiesbaden, and the state is further subdivided into 21 districts, known as “Landkreise,” and five independent cities (kreisefreie Städte).

Figure 15. HLA regions

Source: (Landesarchiv, 2021a)

These geographical divisions play a crucial role in organizing and accessing the archival materials in the state archives, enabling researchers to navigate the collections and gain insights into the complex history and culture of the region.

6.3.1. Mission Statement of HLA[22]

Wir öffnen Dir die Türen zur Geschichte/

We open the doors to history for you!

The HLA's mission statement encapsulates their self-conception as an integral component of a knowledge-based and open society. (Hessisches Landesarchiv, n.d.). Functioning as the "House of History," the archives assume a central role as service institutions catering to all inquiries pertaining to Hessian history. In line with its overarching mission, the archives endeavor to stimulate historical and socio-political debates, thereby contributing to the formulation of collective identities among its citizenries. As part of this overarching mission, the archives engage in collaborative partnerships with research, educational, and cultural institutions, as well as with political and administrative entities at regional, national, and international levels. Through these collaborations, the archives play a vital role in facilitating knowledge exchange, enhancing public discourse, and generating new insights into the multifaceted history and culture of Hesse.

The HLA serves as an essential resource for addressing contemporary historical inquiries. With a wealth of original documents spanning more than 1,200 years of Hessian, German, and European history, the archives provide citizens with access to a diverse range of historical sources. Access to these documents is facilitated through both the archives' online platform and their reading rooms. As part of their ongoing efforts to expand digital offerings, the archives ensure that the cultural heritage is made accessible to interested individuals worldwide. To ensure the highest level of service, archivists provide expert guidance and ensure that all data protection measures are implemented. The archives are committed to meeting the unique demands of their clients and place a strong emphasis on ensuring that all their services are tailored to meet their needs.

[22] For more information about HLA, visit: https://landesarchiv.hessen.de/ueber-uns

The archives play a crucial role in preserving original and distinctive historical sources. They are responsible for safeguarding and maintaining the authenticity and integrity of their historical materials, which is vital for society's understanding and engagement with its past and future. The archives take their responsibility seriously and are dedicated to preserving these sources in their original form to guarantee their long-term availability. By doing so, they ensure that future generations have access to these unique and irreplaceable sources, enabling them to learn about and interpret the past in a meaningful and accurate way.

The HLA is charged with the crucial task of establishing a comprehensive and inclusive source base for posterity. To achieve this, they employ rigorous professional standards to selectively acquire both analog and digital documents from the state administration. By doing so, they help to encourage greater transparency and legal certainty, thus enabling citizens to gain a deeper understanding of the workings of government. In addition to these government records, the HLA supplements its collection with materials from all spheres of society, thereby providing diverse perspectives on both the past and the present.

The HLA plays a significant role in the digital modernization of the Hessian state administration, as digitization affects the handling and management of both analog and digital documents. The archives provide active and comprehensive guidance to the administration, ensuring that all data management practices are legally compliant, secure, and of the highest quality. With the continuous evolution of digital technologies and file formats, archivists offer up-to-date advice and guidance on proper data management and digital preservation strategies, ensuring the protection and accessibility of valuable and irreplaceable archival documents for future generations.

The archives play a vital role in shaping and advancing democratic and legal principles by providing new insights and perspectives on history. They serve as a cornerstone for preserving and promoting the cultural heritage of the Hessian society, allowing citizens to gain a comprehensive understanding of

their past and its evolution over time. By fostering open access to historical records and facilitating research, the archives encourage informed and critical reflection, which is essential for democracy and the rule of law. Through its role as a trusted institution dedicated to preserving the collective memory of society, the HLA enables the community to develop a greater appreciation for the values, traditions, and achievements that have shaped their shared history.

6.3.2. The structure of the HLA[23]

The HLA is composed of four distinct departments, including the Hessian State Archive in Darmstadt, the Hessian State Archive in Marburg (housing the land register archive and civil status archive), the Main State Archive in Wiesbaden, and the Central Services Department, which encompasses the Digital Archive Hessen and the municipal archive advisory service. An additional branch of the archive is the archive of the German youth movement, which collaborates with Jugendburg Ludwigstein. Furthermore, since 2014, the Marburg Archive School and the Hessian Institute for Regional History (formerly the Hessian State Office for Historical Regional Studies) have been cooperative partners of the HLA, aiming to enhance cooperation in the fields of specialized staff training, further education, and the communication of regional history. The organizational Degree provides information about the internal structure and the personal responsibilities of the HLA. (Kunst, 2022) .

The HLA is open to the public for academic and private research, offering access to over 150 kilometres of archived materials from the 8th century to the present day.

[23] For more information, visit: https://landesarchiv.hessen.de/ueber-uns

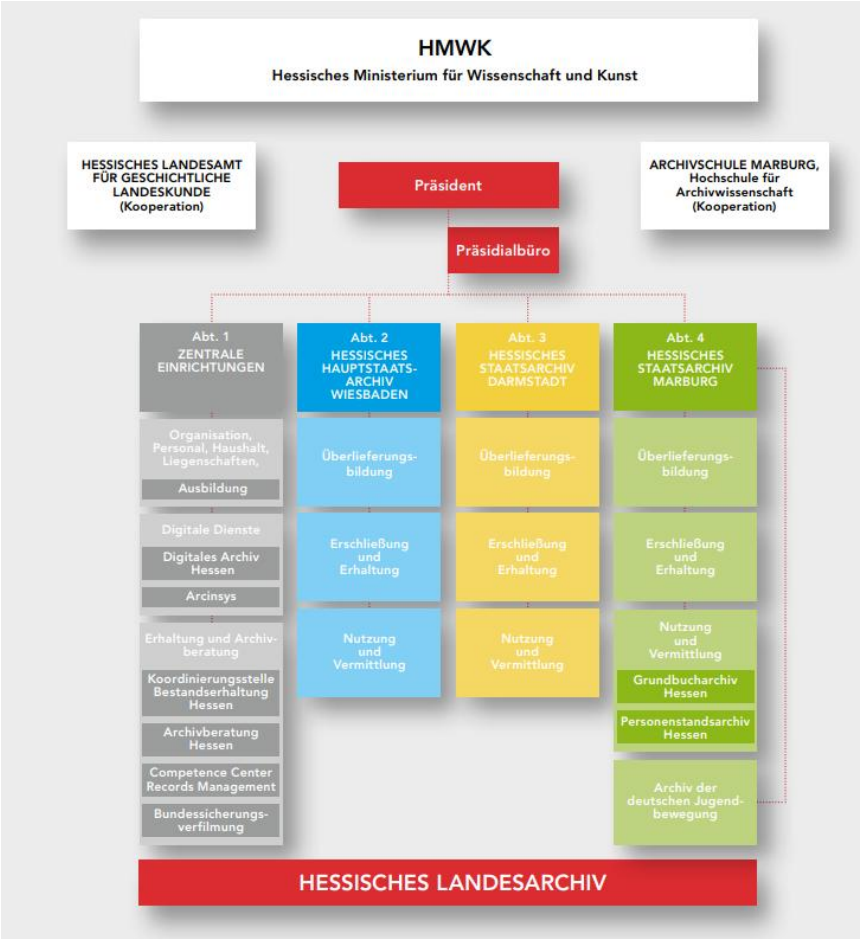


Figure 16. The structure of the HLA

Source: (Landesarchiv, 2021a)

6.4. Significant milestones in the development of computerization in HLA

Undoubtedly, numerous archives in Germany demonstrated an eagerness to integrate information technology into their archival practices during the 1960s. Several archives, including the Federal Archive in Koblenz, the State Archive of North Rhine-Westphalia in Düsseldorf, the State Archive of Baden-Württemberg in Stuttgart, and the State Archives of Hessen, are acknowledged as pioneers in this area. These archives established a precedent for many others in the country by embracing technological advancements to modernize their systems and enhance operational efficiency, thereby promoting greater access to their archival collections. Information technology has increasingly been employed in Hessen state administration since the 1970s, and this trend has

gained considerable momentum due to the Hessian State Government's e-government initiatives.

6.4.1. The introduction of HADIS

Following the trend of computerization in German archives in the 1960s, the HLA was among the pioneers to adopt this technological advancement. One of the first significant achievements in this regard was the development of specialized software for describing records in the 1970s. This software was called HADIS, which stands for "Hessisches Archiv-Dokumentations- und Informationssystem," meaning the Hessian archival documentation and information system. The introduction of HADIS marked a significant turning point in document management within the HLA, as it enabled archivists to create a more detailed and organized database of records.

It is evident that, before the implementation of HADIS, the HLA relied on a paper-based system to manage its materials. This approach was laborious and ineffective, making it challenging for archivists to consistently catalog and describe materials while also hindering researchers' ability to locate and access them. In recent times, the digitization of an ever-increasing volume of archival materials has underscored the imperative for a modern and effective system for digital asset management. In response to this exigency, HADIS was conceptualized and subsequently evolved into Arcinsys, which provides a comprehensive and cohesive platform for the management of both physical and digital materials and enhances the accessibility of archival materials for researchers and historians. By providing a centralized system for managing and accessing materials, HADIS has facilitated the location and retrieval of materials for researchers, regardless of their physical location. The development and protection of archival material are one of the products of the state archives. The sorting out of official documents worth archiving, accompanied by electronic lists, facilitated the transfer of the data to HADIS. At the end of 2013, *5,183,247 archival units* were recorded in HADIS.

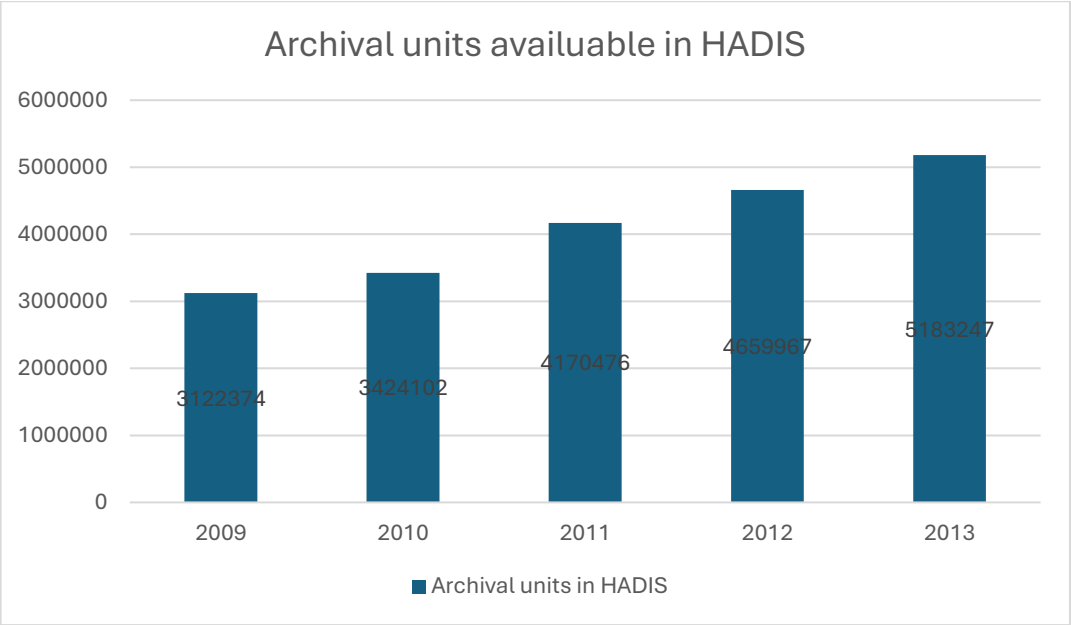


Figure 17. Archival units in HADIS

The archival indexing of the future is primarily focused on networked indexing, as contemporary archive users are generally also Internet users who expect the standards of large search portals and online presentations to be met by archives. HADIS has been adopted as a shared indexing system for the three Hessian state archives. The system facilitates decentralized input at the archive locations, while the Hessian Center for Data Processing (*Hessische Zentrale für Datenverarbeitung-HZD*) maintains the data centrally. (Hessen Landesarchiv, 2010, p. 28). More than three million development data records were published on the Internet from this database, allowing archive users to research indexing data from the state archives and other Hessian archives through a full-text search on the online portal http://www.hadis.hessen.de. The search results could be saved, and archival materials could be ordered directly to the reading room of the respective archive to prepare for an on-site visit.

Starting in 2010, the Hessian archives made significant progress in their networking efforts. Partner archives, such as municipal and university archives in Hessen, were allowed to participate in HADIS and input their indexing data directly into the HADIS database via the Internet. This was made possible through the establishment of the HADIS terminal server, which allowed for the networked development of all Hessian archives. As a result, HADIS has

increasingly become a portal for Hessian archives, fulfilling its function of providing a centralized location for archival materials. (Hessen Landesarchiv, 2010, p. 24,25).

6.4.2. The introduction and use of HeDok under the DOMEA concept

As a result of the administrative reform in Germany, the expectation in e-government for rapid and electronic processing, the requirement to exchange electronic records among public management authorities (federal, state, and local governments), and legal requirements for long-term storage and archiving of official documents resulted in the introduction of the DOMEA concept.

DOMEA stands for "Dokumentenmanagement und -archivierung in der öffentlichen Verwaltung/ Document Management and Archiving in Public Administration" and is a framework for the management of electronic records in German public administration. DOMEA is based on the principle of Functional Requirements for Electronic Records Management (FERM), which outlines the requirements for managing electronic records in an effective and legally compliant manner. The DOMEA concept is an organizational concept for document management and electronic transmission processing in public administration. In principle, the exact requirements apply to the electronic records as are laid down in laws, rules of procedure, and guidelines and regulations for paper records. Official documents must also meet the criteria of completeness, integrity and authenticity, traceability, and legality of administrative action in electronic form.[24]. Despite the focus on the federal administration, the DOMEA concept gained the status as the most important quasi-standard in the context of the German public sector. It formed the essential basis for the majority of introductory projects in federal, state, and local governments. (Schwalm, 2013).

Now, the new organizational concept of electronic administrative work/ Organizationskonzept elektronische Verwaltungsarbeit, developed by the Federal Ministry of the Interior, Germany, has replaced the previous DOMEA

[24] DOMEA concept: https://www.verwaltung-innovativ.de/ (29.10.2022)

concept. The organizational concept is based on a modular system. Its functions and supports include electronic document management (e-files/e-Akten) with electronic long-term storage and separation, as well as electronic process support, including electronic transaction processing, collaboration, and specialized procedures[25].

The introduction of HeDok was a specific implementation of an electronic records management system used in the state of Hessen. It was developed based on the principles and standards set by DOMEA. The HEDOK system has been introduced and used by a wide range of government agencies in Hessen since 2005 (Schieber, 2012, p. 85). HeDok, short for Hessische eDokumentenverwaltung, is a document management system (DMS) used by the state of Hessen in Germany. HeDok was developed in accordance with the functional requirements for electronic records management (FERM) defined by DOMEA, which outlines the minimum requirements that electronic records management systems must fulfill to ensure the authenticity, integrity, reliability, and accessibility of records. This document management system enabled electronic file management and transaction processing, and was implemented across all Hessian ministries, as well as some subordinate offices. One of the key benefits of HeDok is its ability to provide a central repository for digital documents, allowing government agencies to manage their documents more efficiently and securely. This has helped reduce the risk of data loss or duplication, a common problem in traditional paper-based archives. In addition, HeDok includes features such as version control, access control, and audit trails, which are important for ensuring the security and integrity of digital documents. These features help ensure that documents are properly managed throughout their lifecycle, from creation to disposal, and can be tracked and audited as needed. HeDok also provides powerful search and discovery tools, making it easier for archivists and researchers to quickly and easily find the documents they need. This includes full-text search, as well as advanced filtering and sorting

[25] Organisationskonzept elektronische Verwaltungsarbeit: https://www.verwaltung-innovativ.de/DE/Verwaltungsdigitalisierung/orgkonzept_everwaltung/orgkonzept_everwaltung_artikel.html (29.10.2022)

options, which can save researchers time and increase productivity. Another important benefit of HeDok is its ability to integrate with other systems used by government agencies, such as email and file servers. This integration enables the automatic import of documents into the system, simplifying archivists' document management and reducing the risk of data loss or duplication. With this system, the state administration could securely and efficiently manage its documents and files in electronic form, improving its workflow and ensuring better data protection. The implementation of HeDok was a significant milestone in the digital transformation of the Hessian state administration, enabling it to keep up with the fast-paced technological advancements of the 21st century (Schieber, 2011).

Until 2010, HeDok had not had a module that allowed the files created there to be evaluated by the responsible archives, and the files worthy of being archived were not sorted out and separated. (Hessen Landesarchiv, 2010, p. 27). That was also the reason for the introduction of xDOMEA in 2012, which served as the standard for exporting metadata of files, processes, and documents. (Schieber, 2012, p. 86). Since then, administrative authorities must hand over the records, which are deemed worthy of archiving according to the xDOMEA standard. In 2019, when advising the authorities on introducing electronic systems, the focus of HLA was still on introducing a new DMS product for the Hessian state administration, replacing the previous HeDok product. (Hessisches Landesarchiv, 2019, p. 28).

6.4.3. Establishment of the Central Digital Archive Hessen

Wiesbaden in the autumn of 2009 was a pivotal milestone in the HLA's pursuit of digital transformation. This progression allowed the HLA to satisfy its lawful obligation to gather digital records from the state administration, ensure their sustained preservation, and enhance their accessibility to prospective archive users. The establishment of the Digital Archive Hessen also stimulated greater collaboration between the HLA and other archival institutions, consequently promoting more efficient problem-solving through shared knowledge and cooperation.

After undergoing a conceptual and pilot phase, Minister of State for Science and Art, Eva Kühne-Hörmann officially established the Digital Archive Hessen in January 2011. The participation of various colleagues from archives throughout Germany during the opening event underscored the need for professional cooperation. It highlighted the Digital Archive Hessen's pioneering role for other federal states. Additionally, numerous representatives of Hessian authorities highlighted the close partnership between archives and the administration in digital archiving and the preparation for the disposal of digital documents. In his presentation, Andreas Kellerhals, Director of the Swiss Federal Archives (SFA), pointed out the importance of networking in solving the challenges of digital archiving. (Hessen Landesarchiv, 2011, p. 18). Hessen was also on this path, with more concrete projects taking shape in which the workload was distributed among several shoulders.

6.4.4. Joining the DIMAG project

To manage digital archive material comprehensively, a unique software solution was deemed necessary. This software would be responsible for controlling the various processes involved in acquiring, maintaining, and presenting the data to archive users. After careful consideration, the decision was made in Hessen to employ DIMAG, a software solution developed by the State Archive of Baden-Württemberg, for this purpose. In July 2010, an administrative agreement was reached between the archive administrations of both states to use and jointly develop DIMAG in the future. To facilitate the effective and automated processing of digital archive materials, the Hessian team made significant contributions to the development of software tools by programming specialized tools for this purpose. In an effort to further enhance the system's efficiency, DIMAG developers established a network at both the federal and state levels, aimed at promoting cooperation and collaboration. As observed by Irmgard Christa Becker, Karen Anderson, et al. (2018) and R. K. C. Keitel (2018), collaboration with other archives in the development of suitable software solutions has proved fruitful, and the partners continue to benefit significantly from intensive exchanges on conceptual issues relating to archiving

digital documents. (Irmgard Christa Becker, Karen Anderson, et al., 2018; R. K. C. Keitel, 2018).

Following its successful cooperation and collaboration, DIMAG underwent test operations in the Digital Archive Hessen, starting in August 2010, before going live in early 2011. To allow employees at the three locations to create, research, and view digital archives, an appropriate IT infrastructure was designed. A medium-term plan was developed to connect DIMAG with the Hessian archive software HADIS. This connection enabled archivists to access both analog and digital archive materials via HADIS, allowing archive users to search for and order digital archive materials through HADIS. This integration of the two systems facilitated the seamless search and retrieval of all types of materials, including medieval documents from the 8th century to digital photos from the 21st century, all from a single location.

DIMAG[26](Christian Keitel et al., 2020; Laux, 2019) is currently a program package that is collaboratively developed by its partners, comprising several modules, including the DIMAG core module (DIMAG-Kernmodul), IngestList, IngestTool, DIMAG access module (DIMAG-Accessmodul), and DIMAG inventory preservation module (DIMAG-Bestandserhaltungsmodul). These modules are only available as a complete package and cannot be obtained separately. Additionally, an open-source tool called IngestList is included with the package and is freely available on the internet.

The secure and permanent preservation of archive material in DIMAG is supported by several factors, including compliance with relevant standards for digital archiving, such as ISO 14721 (OAIS), PREMIS, DIN 31644, and DIN 31645. DIMAG manages digital archive material, while storage occurs outside the system in the file system. This ensures that, in the event of an unforeseeable failure of the DIMAG software, all metadata and primary documents of the digital archive can still be accessed and reconstructed. The browser-based nature of DIMAG enables access from any computer after activation, and its intuitive and

[26] For more information about DIMAG, visit: https://dimag-wiki.la-bw.de/xwiki/bin/view/Main/

straightforward operation further facilitates ease of use. Additionally, DIMAG can handle any format and structure, making it capable of accommodating future file formats and object structures that are currently unknown.

DIMAG has a well-defined identifier concept that is independent of the system and can be continued with future software, even after DIMAG has been replaced. The system also features version management, ensuring that existing files are not overwritten, even if a document or its metadata is updated. Therefore, the original information is not lost even if the document is saved again, intentionally or unintentionally. DIMAG also has a metadata concept that is customized to meet the requirements of archiving. The IngestTool allows the easy and graphical assignment of information from various sources, such as file attributes, directory names, CSV/TXT or XML files, to be transferred to freely definable XML output formats. These formats can then be imported into archival indexing systems. The output of an XML file for importing metadata into DIMAG is predefined and can be selected, and the user can define different XML output formats.

The DIMAG access module offers various options for generating a usage package. For example, users can create an access package for a specific group of users, including only certain documents or metadata. The module also supports the creation of access packages for long-term preservation, enabling the secure storage of documents while maintaining their authenticity and integrity. Additionally, the access module offers features such as watermarking and access control, which help ensure the security and confidentiality of the archived material. The DIMAG inventory preservation module offers functionalities for preserving digital archives, including the ability to migrate data to new file formats and monitor the authenticity and integrity of the archive material over time. Overall, DIMAG provides a comprehensive solution for the safe and permanent preservation of digital archival materials.

DIMAG's metadata concept is based on a few key principles and elements. Firstly, a distinction is made between several elements, including the primary data file, metadata file, representation, digital object, and structure entry. These

elements are organized in a mono-hierarchical structure, which can be freely designed according to the user's needs. Secondly, there is very little mandatory metadata, which makes the system more user-friendly and easier to use for archivists. Thirdly, the elements are permanently and uniquely linked using persistent identifiers, which helps ensure accurate tracking and retrieval of digital archive materials. Fourthly, DIMAG includes a representation element, which allows for precise mapping and integration of files resulting from future file format migrations. Finally, all relevant processes in DIMAG are written to logs, which are saved in XML format to ensure the traceability of the digital archive material's life cycle, even decades later.

DIMAG is a browser-based system that can be accessed from any computer with a standard internet browser and an active internet connection. Communication is encrypted using HTTPS and SFTP protocols to ensure security. Access to the system is linked to rights management, ensuring that only authorized personnel can access it. DIMAG stores all metadata and primary data in the file system, but it also saves metadata in a database for research purposes. The database fields used are freely configurable in a database table.

To ensure the integrity of the file system, several measures have been implemented in DIMAG. Firstly, the file system is based on an archive file system, which records all changes before they are written to a reserved memory area known as the archive. This helps to prevent data loss in the event of system failure. Secondly, a RAID (Redundant Array of Independent Disks) system is used to protect data against disk failure. This technology utilizes multiple disks to store data, providing redundancy and enabling data recovery in the event of a disk failure. Thirdly, all files are backed up with an additional MD5 (message digest algorithm 5) hash value file at the time of storage. This helps to verify the integrity of the data during storage and retrieval. Fourthly, the file system is stored in two other locations using two different backup methods, ensuring that multiple copies of the data are available in the event of loss or damage. Lastly, before each backup, the file system is checked for MD5 consistency to detect possible corruption, and the integrity of the primary data is checked before each

access. These measures help to ensure the safe and secure preservation of archival materials in DIMAG.

DIMAG is designed to ensure that digital archive materials are always available and accessible, even in the event of database or file system failure. The system employs a well-structured storage format and uses a technically unique identification system, known as aID, to maintain persistence and facilitate object movement within and external to the system. The State Archive of Baden-Württemberg developed DIMAG based on the LAMP stack, incorporating Linux, Apache, MySQL, and PHP, and utilizes RAID-5 technology to protect against data loss resulting from disk failure. Additionally, the system supports both SCP and SFTP protocols for secure data transfer.

DIMAG provides users with multiple interfaces for interacting with the system, including a web-based interface and standardized SOAP-based and REST-based interfaces for connecting to ingest systems and the archival specialist information system. The SOAP-based interface, originally known as the Simple Object Access Protocol, enables efficient exchange of data between systems and enables remote procedure calls. In contrast, the REST-based interface allows for coupling with the archival specialist information system. This flexible, multi-interface design ensures seamless integration with existing systems and facilitates the exchange of data between different applications.

In 2010, HLA officially joined the DIMAG project with the Baden-Württemberg archive. DIMAG (*Digital Magazine – Digital Archive/Storage*) supports archives in preserving digitally stored information for eternity. By joining the DIMAG project, the HLA demonstrated its commitment to keeping digital records and ensuring that future generations can access and understand the historical information they contain.

In 2015, a significant advancement was the development of a software tool that facilitated the automated transfer of vast quantities of data to the digital archive management system (DIMAG). This tool, known as the "*ingest tool*," represented Hessen's contribution to the DIMAG development network and has

been operational since the end of 2015, following a successful migration to the latest version of DIMAG. In 2017, a significant contribution to the more efficient design of the transfer process was the further development of the Hessian DIMAG module (IngestTool) and the implementation of the DIMAG-Arcinsys coupling, which avoided double work during indexing and enabled mass transfers with automatic indexing through the use of pre-archival metadata. After extensive conceptual preparatory work, the implementation concept for the further development of IngestTool in the DIMAG network was coordinated in the spring of 2017, and the programming work could begin. In parallel, electronic records were also acquired in 2017, involving 112 accessions with a total volume of over 68 million information units, totaling over *300,000 files*. (Hessen Landesarchiv, 2017, p. 27). The Digital Archive Hessen has acquired 123 accessions with a total volume of approximately 2.4 million information units (files and data sets) for the three state archives in 2018 (Hessen Landesarchiv, 2018, p. 27). In 2019, the DIMAG IngestTool, established at the Hessisches Landesarchiv, now makes it feasible to import massive amounts of digital archive records, including metadata, so that the archive records are formed within the DIMAG core module. That specific indexing data is automatically recorded in Arcinsys. A new release of the DIMAGIngestTool developed in-house was published in the fall of 2020.

In 2019, the Digital Archive Hessen processed 124 requests with a total volume of approximately 2.7 million information units for the three state archives. One hundred fourteen file collections were accessed, totaling around 440,000 files. Fifty-one acquisition projects were finally processed. (Hessisches Landesarchiv, 2019, p. 28). Despite the additional burden on all those involved, 84 accesses with a total volume of around 4,800,000 information units were accepted.

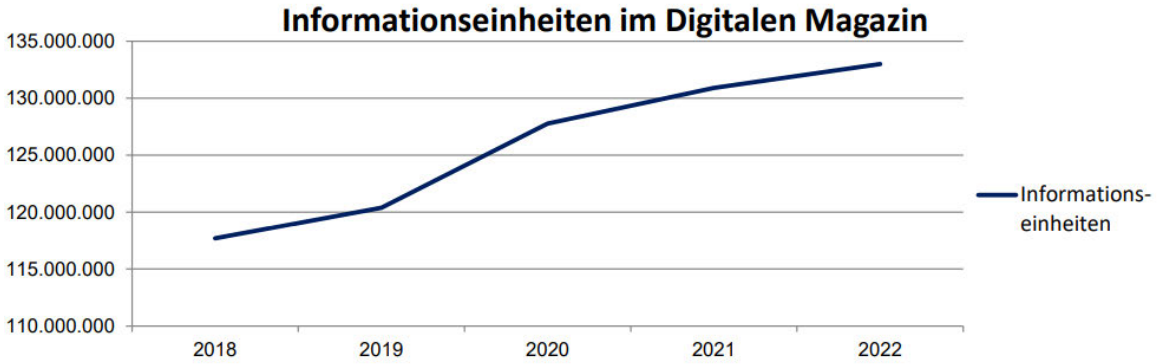


Figure 18. Information units in DIMAG

6.4.5. The replacement of HADIS by Arcinsys

In 2014, the HLA implemented the Hessen Archive Information System (Arcinsys) as the new archive information system and digital database, replacing the previous Hessian Archive Documentation and Information System (HADIS). The new system offers a more modern and user-friendly interface, providing enhanced search capabilities and increased accessibility to archive materials. This enables users to easily navigate a vast collection of documents spanning over 1,200 years of Hessian, German, and European history. Additionally, the Hessen Archive Information System is designed to support other Hessian archives, further enhancing the coordination and collaboration among different archival institutions in the region.

The provision of information on how to use Arcinsys was improved with the publication of manuals at the beginning of 2017 (the English version was published in 2018). Since then, external Arcinsys users have been able to access a detailed manual as a PDF file that describes all Arcinsys functions that users can access (Hessen Landesarchiv, 2017, p. 26).

The archival information system, Arcinsys, is a collaborative effort between the Hessisches Landesarchiv (Hessen) and the Niedersächsische Landesarchiv (Niedersachsen) Federal State Archives. The development of this system was carried out between 2011 and 2014, and it has been in use since the end of 2014 with ongoing improvements. In 2016, the Federal State Archives Schleswig-Holstein became the third partner to join the archives association. On

November 29, 2016, the management of the state archives signed a cooperation agreement running until 2025 for joint (further) development, user support, and maintenance of the system. The cooperation ranges from fulfilling archival tasks to exchanging technical questions about the system. The three archives aimed to utilize similar archival tasks together to support a system, thereby achieving added value for both the archive staff and users (Hessisches Landesarchiv, 2016, p. 26). In 2019, the Federal State Archives Bremen joined as a cooperation partner of the Niedersachsen Federal State Archives. The implementation of Arcinsys has led to greater efficiency and accessibility in the management and retrieval of archival records, not only for the HLA, but also for other Hessian and non-Hessian archives that utilize the system.

The Hessian Archive Documentation and Information System, Arcinsys, is the online research database for the HLA. (https://arcinsys.hessen.de). It is publicly accessible on the Internet. Arcinsys currently comprises datasets for more than 8 million units of description, and 650,000 archive items are already linked to freely accessible digital copies. (Landesarchiv, 2021b, p. 33). Moreover, the database continues to grow. New documentation from the participating archives is now available on the Internet and can be searched in seconds. In addition, Arcinsys contains short descriptions for approximately 270 archives in Hessen (including addresses and other data).

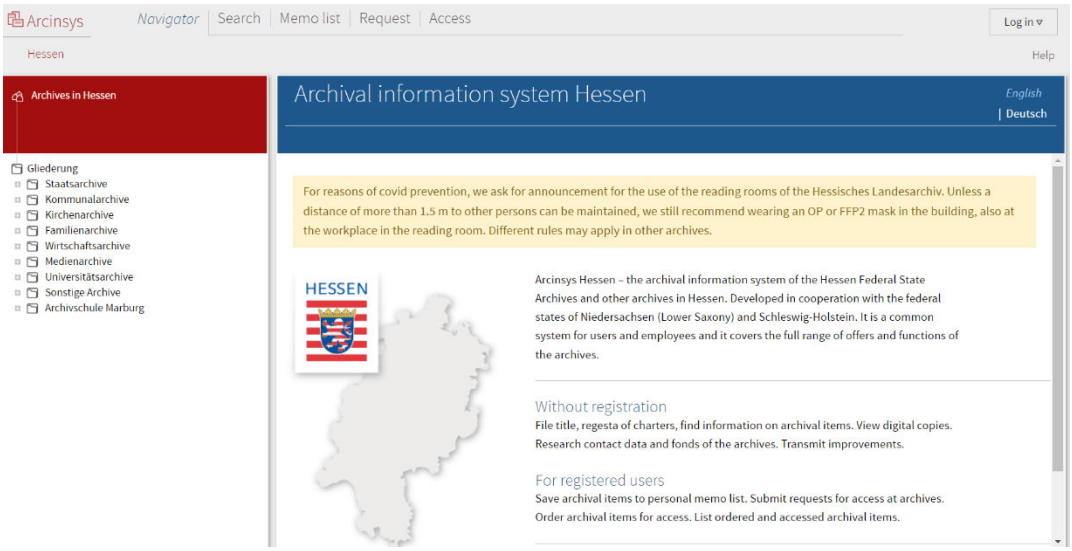


Figure 19. Screenshot of the start page of Arcinsys Hessen

Arcinsys is a standard system for users and employees, covering the full range of offers and functions within the archives.[27]. The Arcinsys archive information system is a web application. Users of the archive operate within the same system as the company's employees, allowing them to access it from any computer with an internet connection and a modern web browser, without the need to install any additional software. The view depends on the respective function. The earlier division between acquisition software and web presentation is superfluous. The web application facilitates the sharing of archive information systems among multiple archives in the network.

Arcinsys was developed as version 2 of the previous Hessian Archive documentation and information system, HADIS. The Arcinsys modules, Navigator (for Navigating research and Indexing) and Search (for full-text search and Signature search), are based on HADIS components. Arcinsys also contains the following modules: order (watch list, order function), request (use requests, authorization management), use (provision, use, reading room management), takeover (advice to the authorities, evaluation, access management), direction (development planning, maintenance planning), storage (preservation management), and administration.

Arcinsys implements a representation model for both analog and digital archive materials. Every archive record describes an information object as a logical, not a physical, unit. Several physical representations are assigned to this archive, including the paper original, its image on microfilm, and the digitized version. Several representations can represent different migration levels in the case of initially digital objects. The user orders an archival material for use; the archive provides a representation for use. Arcinsys uses only freely reusable software components. There are no third-party license restrictions to prevent the software from being used by other archive administrations.

Since the end of 2014, users and archive staff have had access to a more convenient and significantly faster search of 5.5 million Hessian data records.

[27] https://arcinsys.hessen.de/arcinsys/start.action?request_locale=en (30.01.2020)

This number has increased incredibly to 8.368.614 million in 2021, and 8.672.134 million in 2024. Additional service functions made the archives' offerings even more accessible than they had been before. In addition to research, the system could also be used to submit a request for use and to order archive materials. Arcinsys meets the requirements of the digital age with the proof of digital objects and the improved presentation of digital copies.

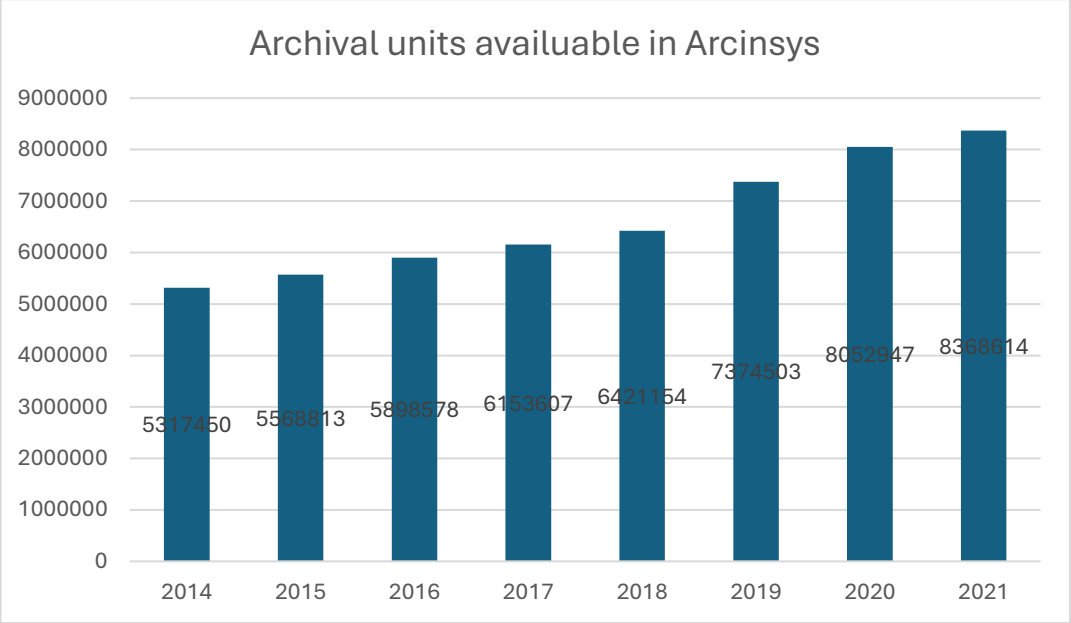


Figure 20. Archival units in Arcinsys

A willingness to integrate a link between DIMAG and Arcinsys has been in place in the HLA since 2014. As stated in the 2014 report of the State Archives of Hessen, Arcinsys and the digital archive will be linked in the future. An interface is created between the Arcinsys and DIMAG systems for this purpose. The redundancy of data in both systems is minimized. An automated metadata comparison will be set up between the two systems. Further expansion of Arcinsys will also be necessary to meet the changing requirements of archiving. The following steps will be the mechanical connection to comprehensive portals such as Archive Portal D, the German Digital Library, Europeana, and the Archive Portal Europe (Hessen Landesarchiv, 2014, p. 21). By December 2017, the Hessian archive data stocks had been delivered to two overarching portals: the Deutsche Digitale Bibliothek and Archivportal-D, to enhance their accessibility. As a result, since the turn of 2017/2018, researchers can access all of the

approximately 7,000 inventory descriptions of the State Archives, around 600,000 archival descriptions - of which roughly 100,000 have digital copies - in conjunction with materials from other institutions (Hessen Landesarchiv, 2017, p. 26).

A longer-term project was the expansion of Arcinsys into a fully comprehensive virtual reading room. Also, in 2017, the HLA made significant progress in providing digitized versions of its archive materials online. A total of over 19 million digital copies could be viewed online. (Hessen Landesarchiv, 2017, p. 26). In addition to the free provision of digitized material, it should be possible to make archive material available to individual users in digital form via the network. The corresponding requirements were discussed in June 2017 in two focus groups with academic and non-academic users. The "Virtual Reading Room" requirements concept was completed and coordinated with the Arcinsys development partners in Lower Saxony and Schleswig-Holstein. (Hessen Landesarchiv, 2017, p. 27) .

In 2018, more than 20,000 digitized items were attached to the 85,000 units of description in the inventory. This means that about a quarter of the documents and records can be viewed online. (Hessen Landesarchiv, 2018, p. 14). At the end of 2019, 18.804.067 digital copies were available in Arcinsys. (Hessisches Landesarchiv, 2019, p. 26). According to a 2020 report by the State Archives of Hessen, the HLA received a total of 5,266,716 accesses to archives in Arcinsys, provided 9,730 information services, and had 1,230,302 visits to its website. As of 2020, the archives have made 20,475,824 pages of digitized archival material available online, comprising 11,987 gigabytes of digital archival materials. (Landesarchiv, 2020, pp. 8–9). In response to the increasing demand for readily accessible digitized archive materials, the HLA made a concerted effort to expand its online offerings. In 2021 alone, 1.564.376 newly digitized items were made available in Arcinsys, bringing the total number of digital copies in the archive to 22.040.200. This significant increase in digitized material resulted in a total of 6,164,499 accesses to digital copies in Arcinsys over the course of the year.

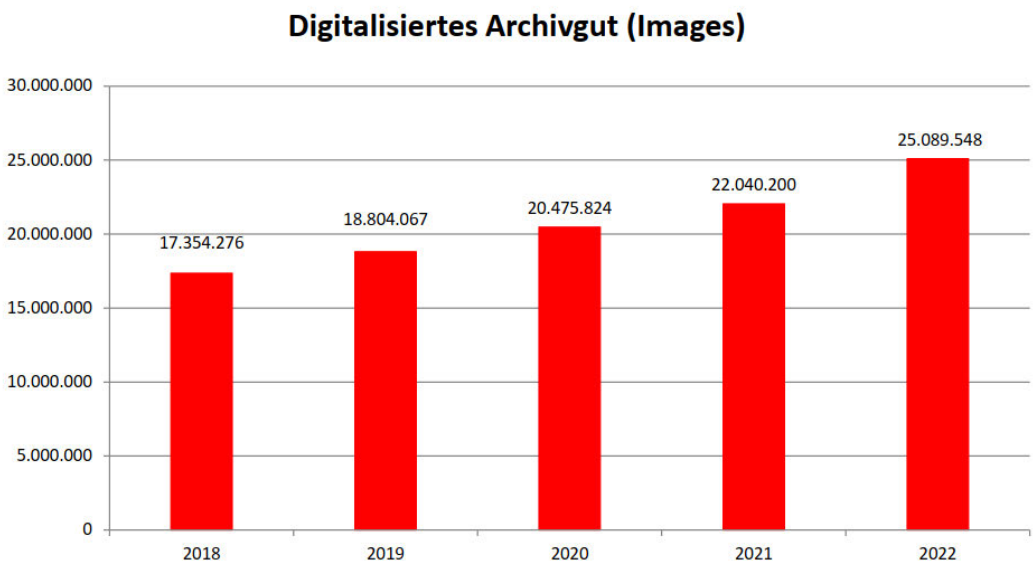


Figure 21. Digitized copies in Arcinsys

Source: (Landesarchiv, 2023)

In summary, the transition from HADIS to a more integrated digital archival environment marked a shift from database documentation toward structured digital preservation workflows. The introduction of the Arcinsys marked a significant milestone in archival management. The program replaced HADIS, which had been the indexing software in use for the past 20 years. The modern web application supported multiple fields of archival work beyond indexing, such as consulting with authorities, document evaluation and acquisition, and the management of archival materials, including their storage in the stacks, planning of preservation measures, and the use of both analog and digital archival materials. The adoption of Arcinsys marked a new era in archiving, with its modular design enhancing operational efficiency and providing greater convenience for users. Notably, the program provided users with an advanced level of comfort and usability, which was equally essential for meeting the expectations of the modern-day internet-savvy archive users.

6.5. Computerization in HLA – Legal framework

6.5.1. The Hessian Archives Act and the Decree on the Management of Files

The state administration has increasingly utilized information technology since the 1980s. With the introduction of a unified system for electronic record-keeping in 2004 and the use of database-based specialist applications in many parts of the administration, administrative action has become more transparent and effective. The development poses new challenges for archives: all electronic documents relating to a process and analog documents must be transferred to document all administrative activities. Many types of data can be stored, including specialized applications, records from the document management system (HeDok), files stored in folder systems, and digital photos. Similarly, to analog documents, the State Archives decides which records are appropriate for archiving. The digital repository stores selected data to make it accessible and usable for archive users. As with analog archival records, digital archival records are indexed in Arcinsys; they can be researched and ordered through Arcinsys after the expiration of the protection period.

The legal framework for the management and preservation of archival records is provided by the Hessian Archives Act (Hessisches Archivgesetz), which came into effect on October 10, 2022. This law establishes the legal framework for the creation, use, and preservation of records in Hessen, outlining the responsibilities of the HLA in this regard. The Erlass zur Aktenführung in den Dienststellen des Landes Hessen (Decree on File Management in State Agencies of Hesse) would provide further guidance for state agencies in Hesse on how to implement the requirements of the Hessian Archives Act in their day-to-day operations. According to the Hessian Archives Act and the Decree on the Management of Files of December 14, 2012, physical and digital records are considered public archives. As a result, the Hessian state authorities must transfer them to the appropriate state archives.

The legal framework governing the HLA was revised in response to several significant regulatory and institutional developments. These included the entry into force of the General Data Protection Regulation (GDPR) on 27 April 2016, the Information Reuse Act (IWG) of 13 December 2006, and the Online Access Act (OZG) of 14 August 2017, as well as the completion of the structural reform that consolidated the state archives into the unified authority of the Hessisches Landesarchiv (HLA). The introduction of the GDPR had a particularly tangible impact on archival practice. It required the reassessment of access procedures, the strengthening of anonymization measures, and the systematic evaluation of personal data risks, especially in relation to born-digital records. At the same time, the Information Reuse Act increased expectations regarding the reusability of public sector information, thereby placing additional pressure on archives to balance open access objectives with data protection obligations.

Furthermore, the Online Access Act (OZG) significantly expanded the digital service responsibilities of public authorities, including archival institutions. In this context, the shortening of protection periods was reconceptualized as a formal administrative service within the framework of federal information management (FIM). This process was analyzed and operationalized in cooperation with the Hessian Center for Data Processing (HZD), ensuring technical compatibility and standardized digital workflows. As part of these adjustments, the HLA also updated its online service descriptions and access information within the citizen portals “Hessen-Finder” and “Service Hessen,” thereby aligning archival services with the broader digital government infrastructure. Taken together, these legal and organizational changes did not merely result in formal amendments to regulations; they reshaped archival access policies, administrative procedures, and service delivery models within the HLA, reinforcing its integration into the digital governance architecture of the state of Hessen.

Moreover, in order to address the challenges of preserving digital records, the "Digital Archive Hessen" was established in 2009. This initiative has

developed permanent storage strategies and solutions that ensure the integrity (i.e., archival records cannot be altered), authenticity (i.e., archival records originate from the stated originator), completeness (i.e., archival records have not been removed), and readability (i.e., archival records can be viewed and interpreted) of digital records. Electronic documents are already legally recognized as authoritative and are subject to appropriate retention periods. To ensure that state archives can access and extract data from these records decades later, the Digital Archive Hessen provides guidance to state departments on proper preservation techniques.

6.5.2. Digital strategy (2020-2025)[28]

In 2018, the President of the HLA presented the HLA's new mission statement in the Archive News for Hessen (Archivnachrichten für Hessen) (Landesarchiv, 2018, pp. 9–13), in which digital use was highlighted. HLA had a Digital strategy 2020-2025 (Digitalstrategie) (Landesarchiv, 2021c) published, with which the HLA positions itself as an active player in the digital transformation. With 38 pages, the Digital Strategy presents and examines all aspects of the archival tasks. The State Archives' IT infrastructure is also appropriately focused. The first step is to determine the current position, establish the strategic orientation, and develop an action plan to achieve the strategic goals. It is already evident from the "Management Summary" that not all of these measures will necessarily be implemented by 2025: "The complete implementation of the measures will require considerable additional resources." Above all, the digital strategy outlines a plan for further development of the HLA.

The HLA is positioning itself as an active player in the digital transformation through its digital strategy, published at the beginning of the 2019/20 fiscal year. The design seeks a horizon of six years, i.e., up to 2025. The following three overarching strategic areas are outlined following a review of

[28] https://landesarchiv.hessen.de/sites/landesarchiv.hessen.de/files/digitalstrategie_hla.pdf (30.01.2020)

the achievements of the past two decades: First, the HLA is deeply rooted in the information society and oriented toward its needs. It adheres to fundamental principles, including customer orientation, participation, transparency, networking, and data protection. In addition, it maintains a digital perspective across all its archival services, which applies to all the tasks described in HLA's mission statement. Finally, the HLA emphasizes the importance of an excellent IT infrastructure in addressing the upcoming digital challenges.

The 2020–2025 Digital Strategy of the Hessisches Landesarchiv (HLA) was conceived as a comprehensive transformation program comprising a total of 71 measures. Its overarching objective is to integrate archival functions into the public data infrastructure while ensuring the long-term preservation of digital records (HLA, 2019). As of 2024, approximately 49% of the planned measures have been completed (HLA, 2023; Peter Sandner, 2024). This level of implementation is considered positive, particularly given that the strategy requires substantial human and financial resources. The most notable achievement to date is the consolidation of the technical infrastructure for digital archiving. Measures related to securing and expanding the technical infrastructure have reached an implementation rate of approximately 91% (HLA, 2023; Peter Sandner, 2024). These include the establishment and expansion of centralized digital storage systems, the strengthening of data center capacities, and the enforcement of information security and data protection standards. The prioritization of infrastructure reflects HLA's "infrastructure-first, services-second" approach, aimed at ensuring sustainability and the long-term preservation of digital records. Another core accomplishment is the establishment and operation of the Competence Center for Records Management. According to the official report, this initiative represents one of the key projects completed (HLA, 2023; Peter Sandner, 2024). The Center provides advisory support to public authorities in managing electronic records in compliance with legal requirements, preparing archival transfers of records with enduring value, and harmonizing workflows between administrative bodies and archival institutions. This development marks a

transition from a traditionally “passive recipient” model of archival practice to one characterized by early engagement in the records lifecycle. Progress in the area of original preservation and long-term information maintenance has reached approximately 71% (HLA, 2023; Peter Sandner, 2024). This indicates sustained efforts to balance the preservation of traditional analog records, the safeguarding of the integrity and authenticity of digital materials, and the mitigation of format- and system-related risks. The relatively high level of implementation in this area demonstrates that HLA regards long-term preservation as a strategic priority rather than focusing solely on surface-level digitization. The strategy also aims to intensify digitization efforts and further integrate data into the Arcinsys archival information system. Significant progress has been made in reducing digitization backlogs and expanding digital content available through the online research platform (HLA, 2023; Peter Sandner, 2024). Nevertheless, measures primarily directed toward public engagement and the expansion of user-oriented services have not progressed at the same pace as internally focused initiatives.

6.6. Digital archiving in HLA – Conceptual framework

DIMAG, or Digital Magazin (Digital Archive/Digital Storage/Digital Repository), is a software package designed for the long-term archiving of digital archival materials. Its development can be traced back to the year 2006, when the Landesarchiv Baden-Württemberg initiated a project called “Konzeption für ein digitales Landesarchiv/ Conception for a Digital State Archive.” The project team, comprising two archivists and a computer scientist, identified fundamental principles for long-term archiving of digital records, which included evaluation and acquisition, processing, archiving, and use as the four essential task areas (C. Keitel et al., 2007). DIMAG was conceptualized as more than just a repository for digital documents; it was intended to support a comprehensive range of programs for various archiving tasks. During development, the software specifications of the OAIS standard (ISO 14721), PREMIS standard, and Nestor criteria catalog “Trustworthy digital long-term archives” (DIN 31644) were all considered.

6.6.1. OAIS reference model

The OAIS (Open Archival Information System) Reference Model is a conceptual framework for digital archiving. It provides a common language and a standardized approach for describing, managing, and preserving digital content over the long term. The OAIS Reference Model was first published by the Consultative Committee for Space Data Systems (CCSDS) in 2002 and has since been widely adopted by organizations that manage digital archives, including national libraries, museums, and government agencies. (Allinson, 2006; Consultative Committee For Space Data Systems, 1997; B. Lavoie, 2014; B. F. Lavoie, 2008). In 2013, the OAIS reference model was available in a German translation. (Schrimpf, 2014)

6.6.1.1. Environment model of an OAIS

The OAIS Reference Model identifies three additional entities that interact with the OAIS archive. (Consultative Committee For Space Data Systems, 1997; B. F. Lavoie, 2008). *Producers*: Individuals or organizations that create or acquire digital content to be stored in the OAIS archive. Producers may include scientific research institutions, government agencies, publishers, and other entities that generate or collect digital content. Producers are responsible for providing digital content in a format suitable for long-term preservation and for supplying metadata that accurately describes the content. *Consumers*: Individuals or organizations that access or use the digital content stored in the OAIS archive. Consumers may include researchers, educators, government agencies, and members of the public. Consumers must comply with the OAIS archive's access policies and procedures and use the digital content in accordance with any applicable legal or ethical guidelines. *Management*: The entity responsible for overseeing the operations of the OAIS archive. Management may include the individuals or organizations that own or operate the archive, as well as regulatory bodies or oversight committees that monitor its performance. Management is responsible for establishing and enforcing policies and procedures for the preservation and management of digital content,

as well as for ensuring that the archive meets its performance and reliability targets.

Producers, Consumers, and Management interact with the OAIS archive in different ways, but all are critical to the long-term preservation of digital content. Producers are responsible for providing high-quality digital content suitable for conservation, while Consumers rely on the OAIS archive to access this content. Management is responsible for ensuring that the archive is operated in a manner that meets the needs of both Producers and Consumers, while also meeting any legal or regulatory requirements. Together, these entities form a complex ecosystem that is crucial to the long-term preservation and accessibility of digital content.

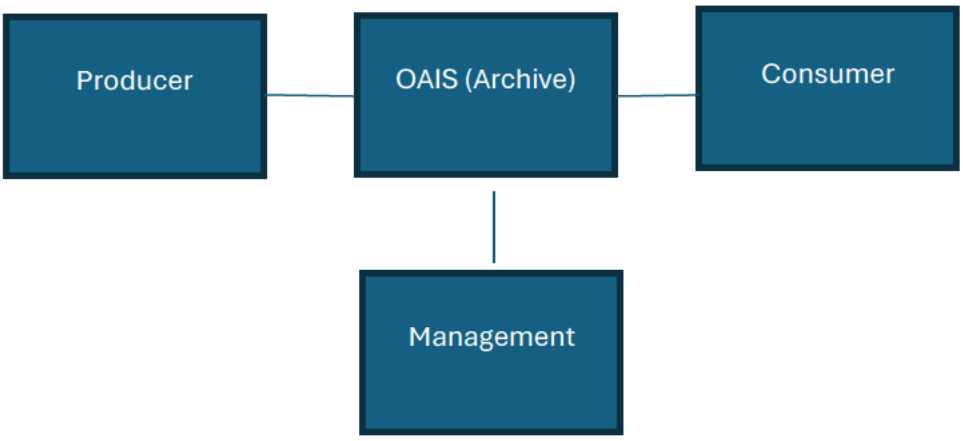


Figure 22. Environment Model

6.6.1.2. Functional model

The model defines six functional areas, each of which is necessary for the successful implementation of an OAIS-compliant archive. These functional areas are: *Ingest*: This functional area is responsible for accepting data from various sources and transforming it into a format that can be managed and preserved by the archive. *Archival Storage*: This functional area is responsible for storing and managing the data to ensure its long-term preservation. This includes creating metadata that describes the data and establishing appropriate access controls. *Data Management*: This functional area is responsible for managing data throughout its lifecycle, including migration, refresh, and replication. *Administration*: This functional area is responsible for managing the archive's

overall operations, including budgeting, staffing, and quality assurance. *Preservation Planning*: This functional area is responsible for developing and implementing strategies to ensure the long-term preservation of data. This includes activities such as format migration and emulation. *Access*: This functional area is responsible for providing access to data in a manner consistent with the archive's preservation objectives. This may include providing access to the original data or to surrogate copies created for specific purposes. (Consultative Committee For Space Data Systems, 1997).

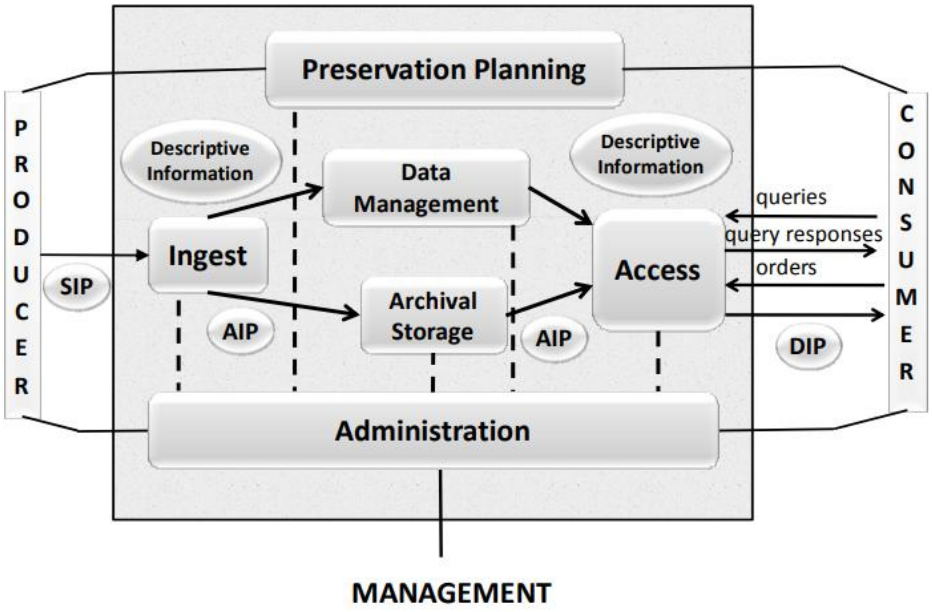


Figure 23. OAIS Functional Entities

(Consultative Committee For Space Data Systems, 1997)

The OAIS Reference Model also defines a set of information objects required for managing and preserving digital content. These information objects include the SIP (Submission Information Package), which contains the data and metadata that is ingested into the archive; the AIP (Archival Information Package), which includes the data and metadata that is preserved by the archive; and the DIP (Dissemination Information Package), which contains the data and metadata that is provided to users.

6.6.2. PREMIS standard

The acronym PREMIS stands for "PREservation Metadata: Implementation Strategies."(Katharina Ernst, 2021, p. 68). The initiative, established in 2003 by OCLC (Online Computer Library Center) and RLG (Research Libraries Group), is responsible for developing and maintaining the widely recognized PREMIS metadata standard for long-term archiving. (Olaf Brandt, 2010). In essence, long-term archiving metadata comprises structured information about digital objects, their relationships, and links that facilitate, document, and support digital long-term archiving processes, as well as their respective contexts. (Caplan, 2009; Olaf Brandt, 2010).

PREMIS provides a framework for capturing and preserving metadata about digital objects, including files, databases, and websites, throughout their lifecycle. The standard defines a set of data elements that can be used to characterize the diverse attributes of digital objects, such as their structure, technical characteristics, and preservation history. (Caplan, 2009). The metadata generated by PREMIS can support various preservation tasks, encompassing the identification, authentication, and sustained access to digital materials. The standard has been crafted to be adaptable and extendable, enabling institutions to tailor it to their specific requirements. PREMIS can be applied across a diverse range of applications, from single collections to massive digital repositories. Additionally, the standard has garnered widespread adoption and support from numerous organizations operating in the digital preservation realm. PREMIS version 3.0, the latest iteration of the standard, was launched in 2015, introducing novel features and enhancements. It includes support for linked data and the ability to capture granular provenance information for digital objects. (Caplan, 2009).

6.6.3. DIN 31644

Digital objects are susceptible to various risks, such as loss of integrity, authenticity, confidentiality, availability, and usability. Long-term archiving of digital objects presents distinct challenges, including the obscure association of

information with the data carrier, the physical aging of the data carrier, and the rapid technological changes required to interpret digital objects. (Bergmeyer Winfried et al., 2008). The primary objective of long-term digital archives is to protect and conserve information for extended periods.

How can an archive gain or represent trustworthiness? An archive can gain or represent trustworthiness by meeting specific standards and criteria for the preservation and management of its collections. One way to demonstrate this trustworthiness is through certification based on catalogs of criteria. DIN 31644 was presented for this purpose. Before the introduction of DIN 31644, there have been also various recognized standards for digital preservation, such as Trusted Digital Repositories, Attributes & Responsibilities (TDR) in 2002, The Reference Model for an Open Archival Information System (OAIS) in 2002, Trustworthy Repositories Audit & Certification: Criteria and Checklist (TRAC) in 2007, Audit and Certification of Trustworthy Digital Repositories (RAC) in 2009, ISO 16363 in 2012, Core Trust Seal in 2017 (C. Keitel, 2022).

DIN 31644 is a German standard that specifies requirements for trusted digital long-term archiving. The standard is known in German as "DIN 31644 Vertrauenswürdige Digitale Langzeitarchive. " (Katharina Ernst, 2021, p. 64). The standard, published in 2012 by the German Institute for Standardization (Deutsches Institut für Normung e.V., or DIN), provides guidelines for the long-term preservation of digital information in archives, libraries, and other cultural institutions. The standard is based on ISO 14721:2012, which provides an international framework for digital preservation. However, DIN 31644 is more detailed and specific in its requirements, guiding on implementing the ISO standard in a German context. The DIN 31644 standard provides a comprehensive framework for the long-term preservation of digital information in a trusted, reliable manner. It is designed to ensure that digital data can be preserved over the long term, even as technologies and formats change, and that it can be accessed and used by future generations. (C. Keitel & Schoger, 2013).

The digital archive of the HLA is an example of a trusted digital long-term archive based on the Nestor criteria catalog, which was a precursor to DIN

31644. The Nestor criteria catalog was a set of guidelines developed by the Nestor working group in Germany, comprising experts in digital preservation and archiving. The catalog was created in the early 2000s and later superseded by DIN 31644. The Nestor criteria catalog provided a framework for evaluating the trustworthiness of digital long-term archives, encompassing topics related to digital preservation, including organizational structure, preservation planning, technical infrastructure, and access and use. The catalog was widely adopted by archives and other cultural institutions in Germany and beyond, helping to establish best practices for the long-term preservation of digital information. (C. Keitel & Schoger, 2013).

The digital archive of the HLA is based on the Nestor criteria catalog, and it is designed to ensure the long-term preservation of digital records and documents related to the history of the state of Hesse in Germany. The digital archive is designed to meet the requirements of the Nestor criteria catalog and the DIN 31644 standard, which provides more detailed, specific guidance on the long-term preservation of digital information.

6.7. Case Study Insights

6.7.1. The strong trend toward digital offerings

Despite several difficulties, there is a consistent trend toward digital offerings, which the HLA will continue to expand. The Hessian State Archives have been actively incorporating digital technologies into their efforts to preserve historical records for long-term archiving. Some of the initiatives they have undertaken include digitizing their collections, utilizing digital preservation tools and techniques to ensure the longevity of the digital files (DIMAG), and providing online access to their resources (Arcinsys). In addition, the Hessen State archives have implemented digital archiving strategies (Digitalstrategie 2020-2025) to ensure the authenticity, reliability, and usability of their digital records over time. This includes implementing digital preservation workflows, regularly monitoring the condition of digital files, and migrating them to new formats as necessary to ensure long-term accessibility.

The creation of the Digital Archive Hessen has exemplified the HLA's steadfast commitment to digital initiatives. Furthermore, the HLA has developed partnerships and collaborations with other organizations to advance their efforts in electronic archiving. By working together, they aim to ensure that electronic records are preserved and made accessible to future generations, advancing the field of digital preservation more broadly.

6.7.2. The trend of the link between DIMAG and Arcinsys

Arcinsys is an archival information system that serves as a repository for metadata concerning both physical and digital archival materials. It facilitates research by providing users with comprehensive access to this information. The system is continually evolving, with ongoing efforts to transform it into a virtual reading room. To achieve this objective, the system is being upgraded and optimized with state-of-the-art technologies and innovative features that will enhance its usability and accessibility. The trend of integrating DIMAG and Arcinsys was stated in the 2014 manual report of the HLA, demonstrating a commitment to developing a unified digital archival system. As reported, the integration process will establish an interface between the Arcinsys and DIMAG systems, minimizing data redundancy and enabling automated metadata comparison. As stated by the archivists at HLA in the interview on December 02, 2022, about this matter,

"*Digitized and genuinely digital archival records are currently stored and managed in different repositories in the HLA. Traditionally, archives in Germany have regarded digitized and born-digital records as separate areas. Nevertheless, a different view is now gaining ground. In the future, it is therefore also conceivable (and probably sensible) for the HLA to link the two systems more closely, especially concerning a uniform user interface. However, there are no concrete plans for this at the HLA (yet)*".

(Head of Department/ Archivist/Officer, H2,H3, H4, H5, H6, Interview, 2022)

Furthermore, Arcinsys's ongoing expansion is necessary to address the ever-changing requirements of archiving. The next step toward this goal involves connecting Arcinsys to comprehensive portals such as Archive Portal D, the German Digital Library, Europeana, and the Archive Portal Europe through a mechanical process. (Hessen Landesarchiv, 2014, p. 21).

To facilitate the efficient transfer of metadata for digital archive materials, the DIMAG IngestTool is used during data ingest. This tool enables automatic metadata transfer to Arcinsys, streamlining the workflow. The continuous development of Arcinsys, coupled with the integration of modern digital tools, allows users to access a vast array of archival material, both physical and digital, in a user-friendly, intuitive manner. This technological advancement ultimately enhances the research experience by enabling users to navigate archives more easily and efficiently.

As archives continue to move their content online, users increasingly move into the digital space. With the digitization of inventory overviews and finding aids, users are arriving later and later in the archive. With the ongoing digitization of inventory, physical presence in the reading room will become increasingly unnecessary for users. More than eight million units of description can already be searched online in the Arcinsys archival information system in the three HLA. (Landesarchiv, 2021b). At the end of 2021, more than 22 million digital copies were available to users on the Internet. (Landesarchiv, 2021b).

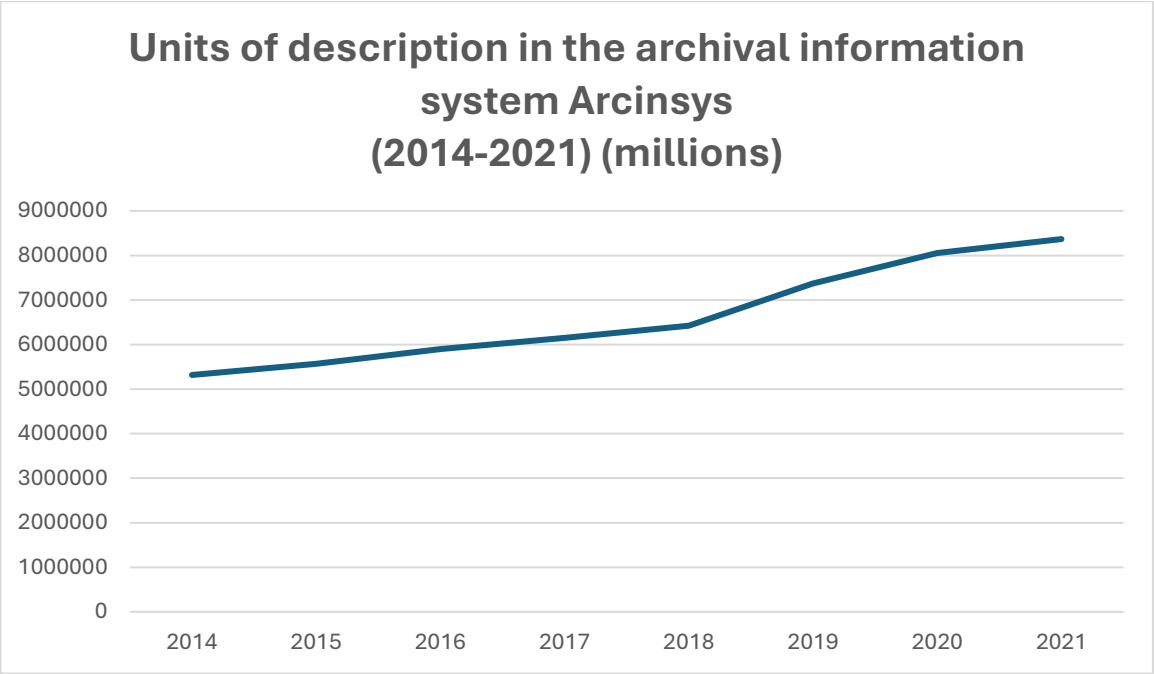


Figure 24. Units of description in the archival information system Arcinsys

This development appears to be a great advantage for users: they can inform themselves extensively about the stocks in advance of their visit to the archive and also order individual files in the reading room. With a bit of luck, the desired archival material will already be available as a scan and can be viewed comfortably from your desk at home. Users would like these options to be expanded. In the user study of the HLA, the two most common suggestions for improvement relate to expanding the digital offerings: enhancing the online finding aid and further digitizing and making archive materials more accessible online. (Tripp, 2019).

6.7.3. The trends related to users

The advent of computerization in archives has given rise to numerous trends that are closely linked to their user base:

Trend 1: *Increasing diversity of users: Digital archives have attracted a more diverse user base, including younger individuals*, non-academics, and international users. Digital archives have also attracted a new type of user. Thanks to technological advancements, archival materials can be presented in various ways, for example, a 3D online exhibition. That draws more attention and interest from users, thereby increasing the role of archives in society. Users

of the archives will be more diverse, with backgrounds, professions, groups, ages, and interests from various sources. They can be historians, academics, students, genealogists, journalists, or artists, etc.

Trend 2: *The Transformation of Research Methods: Digital access has led to changes in research methods, with many researchers now conducting their research entirely online, using archival materials* rather than physically visiting archives.

Trend 3: *Exponential increase in the number of users accessing the archives online*: An inevitable trend in the future will be the increasing number of users accessing storage, mainly online. This can be understood: online access does not limit the number of people who can reach it or the time of access. Meanwhile, direct access to the reading room is available to a limited number of individuals and only within a specific time frame.

The notion that online approaches will completely replace traditional methods of accessing archives, including paper-based archives, has been a topic of much debate among scholars and practitioners in archival studies. While some observers believe that electronic media, including digital and born-digital records, have the potential to supplant traditional archives entirely, I would argue that this is not necessarily the case. Evidence from the State Archives of Hessen suggests that although the number of users accessing archives online via Arcinsys has increased, the number accessing archives through reading rooms has remained unchanged or even increased. This finding suggests that traditional methods of accessing archives continue to play a vital role in archival studies.

Furthermore, it is worth noting that the COVID-19 pandemic has had a significant impact on how archives are accessed, with many reading rooms and physical archives closed due to health and safety concerns. However, even during this time, the number of users accessing archives through reading rooms remained relatively stable, with only a slight decrease. This suggests that while online access has become increasingly popular, it is unlikely to completely

replace traditional methods of accessing archives, at least in the short to medium term.

Indeed, several reasons explain the coexistence of traditional archives and reading rooms alongside online access. One reason is the limited availability of online archives. While there has been a significant increase in the digitization of archival materials, not all archives have been digitized yet. As a result, researchers may still need to physically visit the reading room to access certain materials that are not available online. In addition, some researchers may prefer to work with physical materials rather than digital ones. This may be because they find it easier to read physical documents or because they want to examine the materials more closely. Furthermore, some archival materials may require specialized equipment to view, such as microfilm or microfiche. Researchers may not have access to this equipment at home, so they need to visit the reading room to use it. Another factor supporting the continued existence of reading rooms is the need for archivists' assistance. Researchers may require assistance in locating the necessary materials or interpreting them. It may be easier for them to receive this assistance in person rather than online. Collaboration and networking are also the reasons. The reading room may provide a space for such collaboration and networking opportunities.

Ivan Szekely has also given five reasons for the existence of traditional archive institutions in the digital age. (Szekely, 2017), include: Their profound cultural and societal importance, Persistent functions of documents and data, Preservation of physical copies, Migration of document formats, and Institutional responsibility (Szekely, 2017, pp. 11–13).

Despite the growing trend toward the digital use of archival materials, the 'traditional' visit to the HLA's reading rooms remained significant (illustrated in Figure 4.6). Many users required access to archived records or preferred viewing the original documents rather than digital copies. Except for the closure from December 18, 2020, to February 12, 2021, during the second year of the COVID-19 pandemic, the State Archives of Hessen provided a reduced but consistent number of reading room spaces, which were in high demand. In total,

1,833 users visited the reading rooms in 2021 (compared to 2,330 in the previous year) and consulted 29,332 archival units (compared to 31,846 in the previous year).

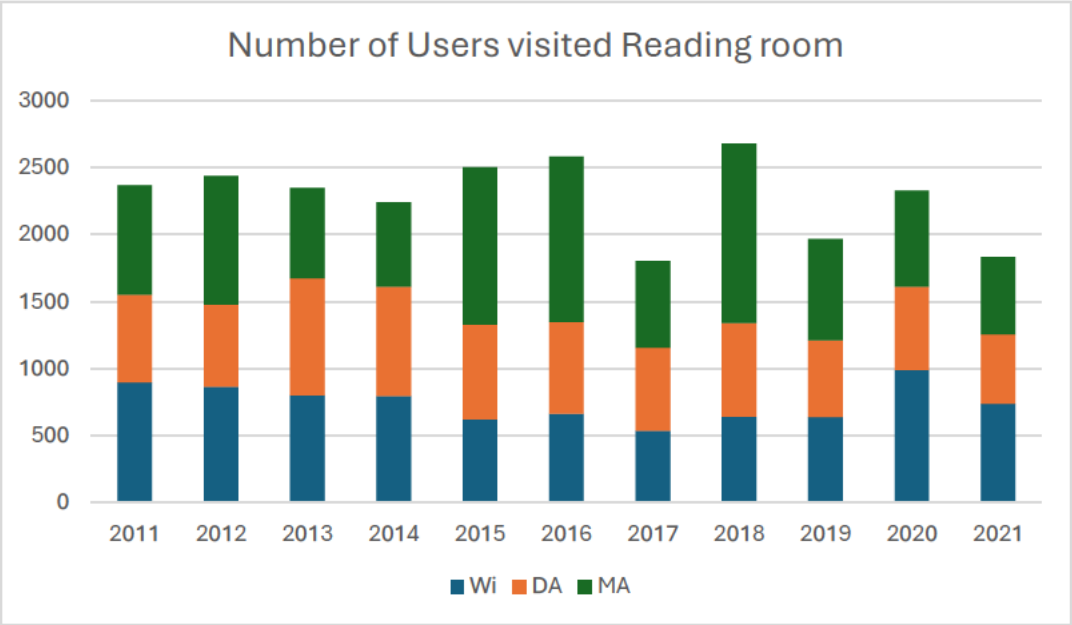


Figure 25. Number of users visited the Reading room (2011-2021)

6.7.4. Further developing Arcinsys

The continual evolution of Arcinsys, an archival information system, is driven by the need to enhance its capacity as a repository of metadata for both physical and digital archival materials. In its current form, Arcinsys plays a pivotal role as a valuable resource for research purposes. However, ongoing efforts are underway to upgrade the system into a virtual reading room, enabling remote users to access archival materials without visiting the physical repository. This transformation is expected to provide greater convenience and accessibility to the vast array of archival materials while ensuring the preservation of the cultural and historical heritage they embody. (Hessen Landesarchiv, 2014, p. 21). The advancement of Arcinsys is being undertaken through collaborative efforts with various partners, including the Niedersachsen State Archives, the State Archive of Bremen, and the Schleswig-Holstein State Archives. These partners have expressed a shared objective of transforming Arcinsys into a virtual reading room. (Haberer, 2022, p. 14). In 2021, the web page 'www.arcinsys.de' was redesigned to be barrier-free and

responsive, serving as a prototype for the holistic Arcinsys application. This metamorphosis facilitated seamless operation across various end devices, including smartphones and tablets, extending beyond its conventional PC or laptop compatibility. (Landesarchiv, 2021a, p. 34) .

6.7.5. Collaboration among partners

The HLA actively commits to collaborative efforts with its partners to promote innovation and enrich the overall archival experience. This is achieved through the use of Arcinsys and DIMAG, which serve as vital tools that facilitate these partnerships. An annual DIMAG day has been held, providing a forum for DIMAG partners to convene and exchange ideas for future collaborations and advancements in digital archiving. Additionally, the State Archives of Hessen collaborate with prominent organizations, including the Archive Portal D, the German Digital Library, Europeana, and other GLAM entities, to promote the further development of digital archiving.

The HLA recognizes the critical importance of IT partners in safeguarding the integrity and privacy of its digital collections. To ensure the optimal safeguarding of archival materials and user data, the archive collaborates closely with IT security professionals to implement robust security measures. This proactive approach underscores the HLA's unwavering commitment to protecting sensitive information and preserving historical materials for future generations. By strengthening partnerships and implementing advanced security protocols, the HLA is well-positioned to remain at the forefront of digital archiving, shaping the future of this critical field.

In 2021, the HLA dedicated significant efforts to advancing its digital infrastructure, with a particular focus on digitization and expanding its storage solutions. To this end, comprehensive measures were undertaken to ensure the central infrastructure could effectively process, secure, and make the digitized archive material accessible. The archive's digital copies, which now exceed 400 TB, are stored in a sustainable repository hosted by the university computer center (HRZ) at Philipps University of Marburg. (Landesarchiv, 2021a, p. 31).

The development of the repository has been supported by a technical market analysis conducted by a service provider, which identified a suitable software solution. The repository is designed to support long-term archiving, emphasizing automated ingest and efficient data management. Dedicated interfaces have been established to ensure simplified, rapid delivery of digital copies. In addition to the repository's setup and operation, the HLA and the University of Marburg have partnered to facilitate the further use of digitized archive material for scientific research and teaching. The integration of data stocks into the HRZ's infrastructure has made this material more accessible and streamlined its integration into ongoing research projects. (Landesarchiv, 2021a, p. 31,32).

Furthermore, the HLA has actively engaged with the Marburg Center for Digital Culture and Infrastructure (MCDCI), participating in the newly launched master's program, Cultural Data Studies, which began in the winter semester of 2021/22. (Landesarchiv, 2021a, p. 31). This initiative underscores the archive's ongoing commitment to advancing the use of digitized archive material for research and educational purposes, further solidifying its position as a leading institution in digital archiving.

6.8. Summary

This chapter has examined the impact of computerization on archival development in Germany through the case of the Hessian State Archives (Hessisches Landesarchiv – HLA). Using the five analytical dimensions developed in the research framework, technological readiness, legal and policy frameworks, institutional capacity, professional development, and user access and engagement, the analysis demonstrates that archival transformation in Germany extends far beyond technological modernization and reflects broader processes of institutional adaptation within a mature archival system.

The findings indicate that Germany has developed a highly integrated framework for digital archiving that combines legal regulation, technological infrastructure, professional coordination, and long-term preservation

strategies. Computerization has not been approached as a series of isolated digitization projects but as part of a comprehensive effort to integrate records management, digital preservation, archival description, access services, and governance mechanisms across the entire records lifecycle. Within this framework, electronic records, digital repositories, and online access systems are treated as components of a broader archival ecosystem rather than independent technological solutions. Technological development has played a central role in this transformation. The implementation of Arcinsys as a comprehensive archival information system, the continued development of DIMAG and its associated ingest tools, and the integration of archival workflows have significantly enhanced the management, preservation, and accessibility of digital records. These initiatives demonstrate how technological infrastructures can be embedded within archival operations in ways that improve efficiency, support large-scale transfers of digital records, and facilitate long-term digital preservation. The chapter also highlights the importance of institutional capacity and professional collaboration. The HLA benefits from stable organizational structures, sustained financial investment, specialized expertise, and participation in national and regional professional networks. Collaborative initiatives such as DIMAG and professional platforms such as Nestor illustrate how knowledge-sharing, coordination, and collective problem-solving contribute to the development of digital archiving capacities across the German archival sector. Professional development remains an essential component of this transformation. The increasing complexity of digital preservation, metadata management, electronic records appraisal, and digital access requires continuous adaptation of archival competencies. Rather than replacing traditional archival principles, computerization has expanded the range of professional skills required of archivists and reinforced the importance of interdisciplinary cooperation between archivists, information specialists, and IT professionals. User access and engagement have likewise undergone significant transformation. The findings suggest that contemporary German archives increasingly prioritize remote access, digital service delivery, and user-centered

access models. While physical reading rooms remain important, the strategic objective is no longer simply to bring users to archives but to make archival resources accessible regardless of time and location. In this sense, computerization has fundamentally reshaped the relationship between archives and their users, creating new opportunities for research, public engagement, and cultural participation.

Viewed through the lens of Institutional Theory, the German experience represents a federal, lifecycle-integrated, and professionally coordinated pathway of archival transformation. Technological innovation has been embedded within broader governance arrangements that distribute responsibilities across different archival levels while maintaining extensive coordination through professional associations, collaborative projects, and common standards. The findings, therefore, suggest that the success of digital archiving in Germany cannot be explained solely by technological advancement. Rather, it reflects the capacity of archival institutions to integrate technological innovation into established legal frameworks, organizational structures, professional practices, and long-term preservation strategies. The chapter demonstrates that the German archival system has responded to computerization through a process of institutional adaptation rather than technological replacement. Computerization has transformed archival functions, workflows, and access models while preserving the core institutional roles of archives as custodians of memory, accountability, and cultural heritage. These findings provide an important comparative perspective for Chapter VII, where the German and Vietnamese experiences will be analyzed as distinct institutional pathways of archival transformation in the digital age.

CHAPTER VII. COMPARATIVE ANALYSIS: VIETNAM AND GERMANY

7.1. Introduction

This chapter presents a structured comparative analysis of digital archival development in Vietnam and Germany. Building on the country-specific examinations in Chapters V and VI, it aims to identify convergences, divergences, and structural patterns that shape the trajectory of digital transformation in both archival systems. Rather than providing a descriptive juxtaposition, the chapter applies a systematic comparative framework to generate analytically grounded findings relevant to digital archival governance. The comparison is conducted using a structured, focused case study approach (George & Bennett, 2005). Five analytical dimensions: Technological readiness, legal and policy framework, institutional and organizational capacity, professional development, and user access and engagement, serve as the organizing lens. These dimensions were previously developed in Chapter II and applied consistently in Chapters V and VI. Their use here ensures analytical coherence and allows for a dimension-by-dimension evaluation across both national contexts.

Structurally, the chapter proceeds as follows. Section 7.2 compares technological readiness and infrastructure development. Section 7.3 examines legal and regulatory environments. Section 7.4 evaluates institutional and organizational capacity. Section 7.5 analyzes professional development and human resource preparedness. Section 7.6 assesses public access models and user engagement strategies. Section 7.7 synthesizes these findings into broader comparative insights, followed by a summary in Section 7.8.

At the analytical core of this chapter lies the argument that the divergence between Vietnam and Germany cannot be explained primarily by differences in technological availability or access to digital tools. Both countries have invested substantially in digitization, electronic records management, digital repositories, and online archival services. Rather, the findings suggest that the most significant differences arise from distinct governance logics, institutional

arrangements, and patterns of organizational development through which technological innovations are implemented and sustained.

The Vietnamese experience of archival computerization can be characterized as a predominantly law-driven, state-directed, and project-based pathway of transformation. Digital development has been strongly supported by legislative reforms, national strategies, and governmental programs, resulting in rapid normative expansion and increasing technological adoption. However, implementation outcomes remain uneven across administrative levels, reflecting differences in institutional capacity, resource allocation, and professional expertise. In contrast, the German experience, illustrated through the case of the Hessian State Archives (Hessisches Landesarchiv), reflects a more lifecycle-integrated and professionally coordinated pathway of transformation. Technological innovation has gradually been embedded within broader governance structures, professional networks, and institutional arrangements that connect records management, digital preservation, archival access, and long-term stewardship. As a result, digital transformation appears less as a series of individual projects and more as an ongoing process of institutional adaptation. Building upon the theoretical framework developed in Chapter II, this chapter adopts Institutional Theory as its principal interpretative lens. While both Vietnam and Germany are experiencing the broader global process of archival computerization, the chapter argues that technological developments alone cannot account for the observed similarities and differences. Particular attention is therefore given to the ways in which institutional environments shape the adoption, implementation, coordination, and long-term consequences of technological change. Through the five analytical dimensions of technological readiness, legal and policy frameworks, institutional capacity, professional development, and user access and engagement, the chapter seeks to explain how different institutional contexts generate distinct trajectories of archival transformation in the digital age.

Accordingly, the comparison reveals not a simple dichotomy of "advanced" versus "developing" systems, but two distinct developmental logics

shaped by political-administrative structure, resource distribution, and governance culture. Understanding these logics is essential for assessing transferability, identifying structural constraints, and formulating context-sensitive policy recommendations in Chapter VIII.

7.2. Technological Readiness

Technological readiness in digital archival transformation is not merely a question of hardware availability or digitization volume. It encompasses the degree of system integration across the records lifecycle, the sustainability of infrastructure investment, and the standardization of technical and metadata frameworks. When examined through these criteria, Vietnam and Germany demonstrate distinct developmental patterns shaped by different governance logics and institutional capacities.

7.2.1 Infrastructure Integration and System Architecture

In Germany, particularly in the case of the Hessisches Landesarchiv (HLA), digital archival infrastructure is characterized by lifecycle integration. Systems such as DIMAG (for long-term digital preservation) and Arcinsys (for archival information management and public access) are designed to operate within a coordinated ecosystem. This reflects a strategic emphasis on interoperability, metadata standardization, and preservation planning embedded within institutional routines. The architecture is not project-based but structurally consolidated within the operational framework of the archive.

By contrast, Vietnam's technological readiness remains uneven and transitional. At the central level and in some major provinces, relatively advanced systems for electronic records management and digitization have been established. However, interview data consistently indicate significant disparities between administrative levels.

> *As one central-level policymaker noted, "in some ministries and large provinces, digital archives and electronic document management systems are relatively well developed; but at district and commune levels, infrastructure remains weak, with limited equipment and no centralized data repositories.*

(Policymaker, P1, Interview, 2025)

The case of Hà Tĩnh province further illustrates this structural unevenness. While the provincial archival center has operated a digital portal since 2017 and manages approximately 1.7 million digitized pages, the system still depends on external service providers for maintenance and backup. (IT professional, I3, Interview; State Records and Archives Department of Vietnam, 2023). Such reliance raises concerns regarding data sovereignty and long-term sustainability.

Comparatively, Germany's model emphasizes institutionalized integration, whereas Vietnam's model is characterized by localized initiatives and differentiated readiness levels. The challenge in Vietnam lies less in the absence of technology than in the lack of a unified national digital archival platform capable of ensuring interoperability across ministries and provinces. From an Institutional Theory perspective, these differences reflect more than contrasting technological architectures. They reveal distinct approaches to the governance of archival computerization. In Vietnam, infrastructure development has largely been driven by national strategies, governmental programs, and administrative directives, resulting in a relatively centralized but uneven process of digital modernization. While this model facilitates the rapid dissemination of policies and technical standards, the degree of infrastructure integration often remains dependent upon the capacities of individual institutions and the availability of project-based funding. By contrast, the German experience demonstrates a more coordinated and institutionally embedded approach to infrastructure development. Systems such as Arcinsys and DIMAG function not merely as technological solutions but as components of a broader archival governance framework that integrates records management,

digital preservation, archival access, and long-term stewardship. Consequently, infrastructure integration in Germany appears less as a discrete technological undertaking and more as a process of institutional consolidation in which technological systems are gradually incorporated into established administrative, legal, and professional structures. These findings suggest that differences in technological infrastructure cannot be understood solely in terms of technological sophistication or investment levels; rather, they reflect distinct institutional environments that shape how technological innovations are organized, coordinated, and sustained over time.

7.2.2 Digitization as Strategy versus Project-based

Both countries recognize digitization as a foundational component of digital transformation. However, the strategic logic underlying digitization differs significantly. In Germany, digitization is typically embedded within structured preservation and access planning, aligned with archival appraisal and metadata standards. Digitization serves clearly defined preservation and user-service objectives and is integrated into a broader infrastructure of digital repositories and cataloging systems. (HLA, 2019). In Vietnam, digitization has expanded rapidly in recent years. National Archives Centers have digitized millions of pages of archival material, and several provinces have initiated large-scale scanning projects. However, interviews suggest that digitization often operates as a "campaign-based" activity rather than as part of a fully integrated preservation architecture.

National Archives Centers: The digitization output ranges from approximately 1.65 to 10 million pages per unit. The digitization output at the National Archives Centers (NAC) in Vietnam is as follows:

- NAC I: approximately 10 million pages ;
- NAC II: approximately 8 million pages;
- NAC III: approximately 7 million pages;
- NAC IV: approximately 1.65 million pages.

(Source: Statistical data by the author)

Provincial archives: output ranges from 1 to 6 million pages, with quality heavily dependent on local resources. Some have implemented OCR, but hardware limitations persist (IT professional, I3, interview, 2025). As one archivist explained,

> *While digitization is widely implemented, "technical standards and data formats are not yet unified, and many systems operate independently without seamless integration.*

(Archivist, A5, Interview, 2025)

The fact that the Circular No. 02/2019/TT-BNV provides clear technical standards (TIFF/PDF formats, 300 dpi resolution, standardized metadata, digital signatures) (Circular 02/2019/TT-BNV, pp. 9–10). However, records digitized before 2019 fail to meet these standards and require conversion. (State Records and Archives Department of Vietnam, 2023). There is no uniform criterion for selecting materials for digitization, leading to the inclusion of unprocessed (unarranged) records, a practice that wastes resources and undermines the usability of digital repositories. Moreover, there is evidence that some digitization initiatives prioritize quantity over systematic integration into long-term preservation workflows. This creates potential risks related to metadata inconsistency, duplication, and migration challenges in the future. Thus, while both countries have achieved substantial digitization outputs, Germany's approach reflects lifecycle embedding, whereas Vietnam's approach remains partially *project-driven* and in need of deeper architectural consolidation.

The comparison further suggests that digitization performs different institutional functions within the two archival systems. In Vietnam, digitization has frequently been implemented through discrete projects and government programs designed to accelerate modernization and increase the availability of digital resources. As a result, digitization itself often becomes a visible indicator of progress and institutional achievement. However, the sustainability and long-term integration of digitized resources remain dependent upon the capacities of

individual institutions and the continuity of policy support and funding. In Germany, by contrast, digitization appears less as an isolated objective and more as one component of a broader lifecycle-oriented approach to records governance. Digitization initiatives are generally embedded within long-term strategies that connect records creation, preservation, description, access, and digital stewardship. Consequently, the emphasis is placed not only on the quantity of digitized materials but also on their integration into archival workflows, preservation infrastructures, and user services.

From an Institutional Theory perspective, these differences reflect distinct governance logics rather than different levels of technological commitment. The Vietnamese model can be characterized as a project-based pathway of digital modernization, whereas the German model reflects a more institutionally consolidated approach in which digitization is embedded within broader organizational and governance structures. This distinction helps explain why similar digitization technologies may generate different outcomes in terms of sustainability, interoperability, and long-term archival development.

7.2.3 Emerging Technologies: Experimentation versus Institutionalization

A key difference in technological readiness between Germany and Vietnam lies in the degree to which emerging technologies are institutionally embedded within archival workflows. While both countries acknowledge the transformative potential of artificial intelligence (AI), optical character recognition (OCR), and semantic search tools, their levels of integration and governance differ substantially.

In Germany, experimentation with advanced technologies has been incorporated into coordinated national and inter-institutional initiatives rather than remaining isolated pilot projects. For instance, the Archivportal-D initiative integrates cataloging information and digitized holdings from multiple archival institutions into a unified search environment, including automated authority data linking and standardized metadata frameworks. This reflects a structured

approach to interoperability and data harmonization. Similarly, the OCR-D project represents a nationally coordinated effort to enhance OCR techniques for historical documents through modular open-source workflows, thereby embedding text recognition within broader digital preservation strategies. (German Research Foundation, 2014). Professional archival conferences and collaborative research initiatives further demonstrate ongoing experimentation with AI-assisted indexing, machine learning-based text recognition, and semantic enrichment tools, indicating that technological innovation is discussed and tested within established professional networks rather than pursued in isolation. (Frank Linnenbach, 2023)

In Vietnam, the use of AI and OCR is still predominantly experimental. Policymakers and IT professionals confirm that such technologies are being piloted for text recognition, classification, and search enhancement, but "*most applications remain at the pilot or project level and have not yet become a unified national solution*" (Policymakers, P1, P2, and IT professionals, I1, I2, Interview, 2025). Cloud-based backup systems are also implemented in some local archives, yet concerns about cybersecurity and dependence on private vendors remain prominent. A provincial director explicitly warned that electronic archival data are "*partially under the control of technology enterprises*," raising issues of digital sovereignty and long-term control. (Director of the archival institution, D4, interview, 2024).

Therefore, while both countries are exploring advanced technologies, Germany's experimentation occurs within a more institutionalized governance environment, whereas Vietnam's experimentation remains decentralized, resource-dependent, and unevenly regulated. This suggests that the primary difference lies not in technological availability but in the institutional capacity to coordinate, standardize, and sustain innovation over time. Consequently, emerging technologies are more likely to become embedded within archival practice in Germany, whereas in Vietnam, they remain largely dependent on individual initiatives and project-based implementation.

7.2.4 Structural Constraints and Developmental Logic

The comparative analysis reveals that technological readiness is not determined solely by financial resources or political commitment. Vietnam has demonstrated strong political endorsement of digital transformation, particularly through national digital transformation strategies and the 2024 Archives Law. However, interviews consistently emphasize that "*the main obstacles are not political will or legal recognition, but rather the fragmentation of technical infrastructure, limited specialized personnel, and insufficient operational and system-level standardization across administrative tiers*." (Policymaker, P1, interview, 2025). From the perspective of digital transformation's three pillars, people, technology, and process, Vietnam has made notable progress in the regulatory dimension of process design. However, technological standardization and institutional capacity building have not yet reached a comparable level of consolidation. The gap, therefore, lies not in legal intent but in the alignment between human resources, system architecture, and interoperable technical standards.

In Germany, by contrast, technological development benefits from long-term institutional continuity, stable funding mechanisms, and established professional networks that facilitate shared infrastructure models (Take the DIMAG project as an example).

In summary, Vietnam's technological readiness can be characterized as normatively ambitious but operationally fragmented, reflecting a pattern in which technological modernization often advances faster than institutional integration. Germany's readiness, exemplified by the HLA, reflects a consolidated infrastructure-first and lifecycle-integrated model in which technological systems are embedded within broader governance and preservation frameworks. The core divergence, therefore, lies not in technological aspiration but in the degree of institutional embedding, coordination, and architectural coherence. From this perspective, technological readiness emerges as an outcome of broader institutional arrangements rather

than technological capacity alone. These differences provide an important foundation for the comparative analysis developed in the subsequent sections.

7.3. Legal and Policy Framework

Legal and policy frameworks constitute a foundational pillar of digital archival transformation. However, the comparison shows that Vietnam and Germany are not different in having legal tools, but in how well these tools are integrated into institutions, how consistent the regulations are, and how effectively those rules are put into practice.

7.3.1 Normative Expansion versus Institutional Consolidation

Vietnam has achieved significant normative expansion in its digital archival legal framework, whereas Germany demonstrates deeper institutional consolidation and policy continuity within a stable regulatory ecosystem.

Vietnam's Archives Law 2024, together with Decree No. 113/2025/NĐ-CP and Circulars 05 and 06/2025/TT-BNV, establishes a comprehensive legal foundation for digital archives, including definitions of digital repositories, submission information packages (SIP), metadata requirements, and digital preservation responsibilities. In addition, national digital transformation strategies and government-wide data governance policies provide macro-level support for archival digitization. Furthermore, interview data also confirm that policymakers perceive the current legal framework as substantially more advanced than in previous periods. As one policymaker noted, "*The new law provides a clear legal basis for electronic archives and digital transfer procedures; the issue now is implementation capacity rather than regulatory absence*" (Interview, P1, Interview, 2025).

In Germany, digital archival governance operates within a multilayered legal structure combining federal data protection law (GDPR), state archival acts (e.g., Hessian Archives Act), the Online Access Act (OZG), and the Information Reuse Act (IWG). Rather than undergoing rapid normative expansion, the German framework reflects incremental adaptation within an established

institutional order. The Hessisches Landesarchiv (HLA) aligns digital preservation practices with long-standing archival legislation, implementing reforms through revisions rather than comprehensive structural overhauls.

Vietnam's trajectory is characterized by rapid normative expansion, in which legal reforms and policy initiatives serve as primary drivers of archival modernization. Through the Law on Archives 2024 and related implementing regulations, the country has accelerated the formal recognition of electronic records and digital archiving practices. Germany's trajectory, by contrast, reflects a higher degree of institutional consolidation, where legal frameworks evolve gradually within established governance structures, professional practices, and administrative traditions. From a comparative perspective, the key challenge for Vietnam lies not in the absence of legal recognition but in the institutionalization of newly introduced standards within everyday archival operations. Germany's advantage lies less in legislative innovation and more in institutional continuity, administrative maturity, and the capacity to translate legal requirements into stable organizational routines. These findings suggest that successful archival transformation depends not only on regulatory development but also on the extent to which legal norms become embedded within institutional practice.

7.3.2 Implementation Gap and Interoperability Governance

Even with detailed laws, Vietnam struggles to put them into practice effectively, while Germany shows better consistency between its legal requirements and how they are carried out in practice. The 2024 Archives Law and its implementing regulations define digital submission procedures and technical standards. Interviews reveal persistent disparities in the operationalization of these regulations across administrative levels. A provincial director emphasized that "*although regulations exist, infrastructure and software systems differ widely between provinces, and interoperability remains limited*" (Director of the archival institution, D4, Interview, 2025).

In Germany, while implementation challenges also exist, the federal–state coordination model enables the development of shared infrastructure platforms and cooperative networks (e.g., DIMAG). Legal obligations related to data protection and online administrative services (OZG) are translated into standardized workflows for access management, anonymization, and digital service provision.

The contrast does not suggest that Germany is free from implementation challenges. Rather, it indicates that its governance architecture provides more developed mechanisms for coordination, harmonization, and standard-setting across archival institutions. In Vietnam, by comparison, regulatory centralization coexists with uneven implementation capacity, resulting in varying levels of technical compliance and interoperability across administrative tiers. From an Institutional Theory perspective, the findings suggest that the principal challenge has shifted from normative development to institutional implementation. While the legal foundations for digital archiving have largely been established, the effectiveness of these regulations depends upon the capacity of institutions to translate formal requirements into operational practice. This requires not only implementation guidance and technical support but also sustained monitoring mechanisms, professional coordination, and capacity-building initiatives capable of promoting consistent application across the archival system. Consequently, the implementation gap observed in Vietnam reflects less a deficiency of regulation than a challenge of institutionalization.

7.3.3 Data Protection, Access Regulation, and Openness

Both countries must balance digital access expansion with data protection obligations. Yet, the governance emphasis differs: Germany prioritizes regulated openness within established privacy frameworks, whereas Vietnam adopts a more cautious, risk-management-oriented approach.

In Germany, the GDPR significantly shapes archival access procedures, requiring anonymization measures and privacy assessments before digital

release. At the same time, initiatives such as Archivportal-D and open data policies encourage broad public access within legally defined protection periods. In Vietnam, the legal framework increasingly supports online access and digital dissemination; however, interviews reveal heightened sensitivity regarding data security and state information control. One respondent noted that "*concerns about data security and confidentiality often limit the scope of online publication, especially for sensitive records*" (Archivist, A6, Interview, 2025). Furthermore, emerging personal data protection regulations add additional layers of caution.

Germany's regulatory culture is based on a long-standing practice of using procedural safeguards to find a balance between privacy and openness. Vietnam's regulatory culture places a stronger emphasis on risk avoidance and centralized control, particularly in the context of national security and administrative hierarchy. The divergence suggests that technological readiness in access provision is closely tied to legal culture and administrative trust. Expanding online archival access in Vietnam will require not only technical infrastructure but also clearer guidelines reconciling transparency with data protection.

Overall, the comparison demonstrates that both Vietnam and Germany possess increasingly robust legal frameworks for governing digital archives. The principal difference lies not in the existence of legal provisions but in the governance logics through which these provisions are implemented and sustained. Vietnam has undergone a period of rapid normative modernization, positioning digital archives within broader national agendas for digital transformation and administrative reform. However, the translation of legal requirements into standardized operational practices remains uneven across institutions and administrative levels. Germany, by contrast, exhibits a higher degree of institutional consolidation, where legal frameworks, professional standards, and technical infrastructures have gradually evolved within a stable administrative and governance environment. As a result, legal norms are more deeply embedded in organizational routines, professional practices, and inter-

institutional coordination mechanisms. From an Institutional Theory perspective, the findings suggest that legal completeness alone does not guarantee technological standardization or operational coherence. The effectiveness of digital archival governance depends upon the extent to which legal norms become institutionalized through organizational capacities, professional coordination, and implementation mechanisms. Consequently, the comparative analysis highlights that archival transformation is shaped not only by regulatory design but also by the institutional environments within which regulations are interpreted, implemented, and sustained. These observations provide an important foundation for the broader comparative discussion developed in Section 7.7.

7.4. Institutional and Organizational Capacity

Institutional and organizational capacity constitutes a decisive factor in determining whether digital archival transformation moves beyond policy design toward sustained operational practice. The comparative analysis reveals that the core divergence between Vietnam and Germany does not lie primarily in political commitment or formal structures, but in the degree of institutional consolidation, coordination mechanisms, and administrative continuity. These differences become particularly visible in governance arrangements, lifecycle integration, resource allocation patterns, and organizational cultures, all of which influence the ability of archival institutions to translate technological innovation into long-term institutional change.

7.4.1 Centralization versus Coordinated Federalism

Vietnam operates within a highly centralized regulatory framework. Still, it faces uneven implementation capacity across administrative tiers, whereas Germany's federal structure, despite its decentralization, enables stronger horizontal coordination and shared infrastructure development. In Vietnam, the Ministry of Home Affairs and the State Records and Archives Department exercise strong normative authority over archival governance nationwide. Central authorities issue legal standards, technical regulations, and professional

guidance that apply uniformly to provinces. However, interview data reveal substantial disparities in institutional capacity between central and local levels. As one central-level policymaker observed, "*while legal standards are unified, implementation depends heavily on the financial and technical conditions of each province*" (Policymaker, P1, Interview, 2025). By contrast, Germany's archival governance operates within a federal structure where state archives (Landesarchive) retain significant autonomy. However, cooperative frameworks such as inter-state digital preservation networks (e.g., DIMAG cooperation) enable resource sharing and standardized workflows across states. At the Hessisches Landesarchiv (HLA), digital preservation infrastructure is not an isolated provincial initiative but embedded within broader collaborative arrangements that enhance technical consistency.

Vietnam's centralized governance model promotes normative coherence and facilitates the dissemination of policies and standards across the archival system. However, centralization does not automatically ensure operational harmonization. Germany's decentralized governance structure, by contrast, demonstrates how coordination can emerge through institutionalized collaboration, professional networks, and negotiated mechanisms of inter-organizational cooperation. The comparison suggests that effective coordination depends not only on administrative authority but also on the existence of governance arrangements capable of linking multiple actors within a shared institutional framework. From this perspective, reducing implementation disparities in Vietnam may require greater emphasis on interoperable technical platforms, coordinated procurement practices, and system-wide monitoring mechanisms in addition to regulatory guidance. These findings indicate that institutional coordination, rather than centralization alone, plays a critical role in sustaining archival transformation.

7.4.2 Lifecycle Integration and Early Archival Involvement

Germany demonstrates a more advanced integration of archives into the early stages of records management, whereas in Vietnam, archival institutions often remain positioned at the endpoint of the administrative lifecycle. In the HLA context, records management advisory services and coordination with administrative agencies support early intervention in electronic records creation and appraisal processes. Digital preservation is not treated solely as a downstream archival function but as part of an integrated lifecycle governance model. In Vietnam, recent legal changes have put more emphasis on lifecycle management and electronic transfer procedures. However, interviews show that archival units are often only involved after documents are finished or ready to be transferred. One archivist stated that "*archives are often considered as the receiving authority rather than a partner in the creation and management phase*" (Archivist, A5, Interview, 2025). Policymakers acknowledged that while regulations now require early coordination, practical collaboration between IT units and archival professionals remains limited (Policymaker, P1, Interview, 2025).

The structural positioning of archival institutions within administrative workflows has significant implications for technological readiness and long-term digital preservation. Early archival involvement contributes to more consistent metadata creation, improved preservation planning, and greater interoperability across information systems. By contrast, archival participation concentrated in the later stages of the records lifecycle increases the risks of incompatible formats, incomplete metadata, and delayed transfer of digital records. The comparison suggests that these differences are rooted less in technological capability than in institutional design. In Germany, the integration of archival authorities into records governance facilitates earlier intervention and stronger lifecycle management. In Vietnam, archival institutions continue to play a more limited role during the creation and active management of records. From an Institutional Theory perspective, strengthening formal coordination mechanisms between record creators and archival authorities may contribute

more substantially to the sustainability of digital archiving than technological upgrades alone. These findings highlight the importance of lifecycle integration as an institutional condition for successful archival transformation.

7.4.3 Resource Allocation and Sustainability

Institutional sustainability in digital archiving depends on stable funding models and long-term technical planning. At the HLA, digital infrastructure development is integrated into multi-year strategic planning cycles and supported by recurring public funding allocations. System maintenance, updates, and staff training are institutionalized within the archive's organizational structure. As previously mentioned, short-term projects or digitization campaigns fund many digital archival systems in Vietnam. A provincial director noted that "after the initial project funding ends, maintenance and system upgrades become difficult due to limited local budgets" (Director of the archival institution, D4, Interview, 2025). Additionally, reliance on private technology providers for system development and maintenance was repeatedly identified as a structural vulnerability (IT professional, I4, interview, 2025).

The comparison indicates that differences in sustainability are influenced not only by the availability of financial resources but also by the institutional mechanisms through which resources are allocated, maintained, and coordinated over time. Project-based funding can accelerate technological modernization and generate visible short-term achievements; however, it may also create challenges for long-term sustainability once external support or dedicated project funding expires. By contrast, institutionalized budgeting mechanisms, stable financial planning, and the development of in-house technical expertise contribute to greater continuity in digital preservation and infrastructure management. From an Institutional Theory perspective, organizational resilience depends not only on resource availability but also on the extent to which financial and technical capacities are embedded within routine organizational structures. The findings suggest that long-term

sustainability is more likely to be achieved when digital archiving is supported through stable institutional arrangements rather than temporary project-based initiatives alone.

7.4.4 Governance Culture and Administrative Logic

Differences in governance culture influence how institutional capacity is exercised in digital archival transformation. Germany's archival governance culture emphasizes procedural transparency, professional autonomy, and inter-institutional collaboration. Decisions regarding digital strategy are typically embedded within consultative processes involving archivists, IT specialists, and administrative partners. Vietnam's governance culture, while increasingly reform-oriented, remains strongly hierarchical. Hierarchical governance can accelerate reform when political will is strong, but may also create implementation bottlenecks if leadership priorities shift. Collaborative governance structures, by contrast, distribute responsibility and technical expertise more evenly. Building durable institutional capacity in Vietnam will require not only regulatory clarity but also strengthened professional autonomy, cross-sector collaboration, and institutionalized technical consultation mechanisms.

To sum up, the comparative analysis demonstrates that institutional and organizational capacity constitutes one of the most significant factors differentiating Vietnam and Germany in the process of digital archival transformation. While Vietnam exhibits strong legislative commitment and centralized regulatory authority, implementation outcomes remain uneven across administrative levels due to variations in organizational capacity, technical resources, and institutional coordination. Germany, although operating within a decentralized federal system, achieves greater operational coherence through collaborative governance arrangements, lifecycle integration, professional networks, and stable resource allocation mechanisms.

From an Institutional Theory perspective, these findings suggest that the effectiveness of digital transformation depends not only on formal authority or

technological investment but also on the capacity of institutions to coordinate actors, integrate archival functions into administrative processes, and sustain long-term organizational adaptation. The comparison further indicates that institutional coordination, early archival involvement, stable funding structures, and professional collaboration function as critical mechanisms through which technological innovation is translated into sustainable archival practice. Consequently, the effectiveness of technological modernization and legal reform remains closely conditioned by the institutional environments within which they are implemented and maintained.

7.5. Professional Development

Professional development represents the human dimension of digital transformation and constitutes a critical mechanism through which technological and institutional change is translated into archival practice. The comparative analysis indicates that the principal difference between Vietnam and Germany lies less in the formal existence of training programs than in the degree to which digital competencies have been institutionalized within professional standards, career structures, organizational routines, and leadership practices. Consequently, the effectiveness of digital transformation depends not only on technological investment but also on the capacity of archival systems to develop, retain, and continuously renew professional expertise in response to evolving technological environments.

7.5.1 Digital Competency Integration

Germany demonstrates a higher degree of institutional integration of digital competencies within archival professional roles, whereas Vietnam continues to face a structural skills gap in digital preservation and data governance. In Germany, digital preservation, metadata management, and IT collaboration have progressively become embedded in archival job profiles. At institutions such as the HLA, digital archivists work alongside IT specialists within structured workflows, and continuing professional development programs reinforce interdisciplinary competence. In Vietnam, however,

interview data reveal a persistent paradox. Professionally trained archivists often lack advanced IT knowledge related to digital preservation systems, interoperability standards, and database architecture. On the other hand, IT staff who work at archival institutions often have technical skills but often lack sufficient knowledge of archival principles like appraisal, provenance, and long-term preservation logic (Director of the archival institution, D2, Interview, 2025). This dual gap creates coordination challenges in system design and implementation. Moreover, remuneration and career incentives within the archival sector remain relatively modest compared to opportunities in private technology enterprises. As a result, highly qualified IT professionals are often reluctant to pursue long-term careers in public archival institutions (Director of the archival institution, D2, Interview, 2025). The limited attractiveness of archival employment constrains the development of hybrid professionals capable of bridging archival science and information technology.

The challenge in Vietnam, therefore, extends beyond a simple shortage of digital skills. Rather, it reflects a structural misalignment between professional training systems, labor market incentives, and the evolving competency requirements of digital archival governance. The comparison suggests that sustainable capacity-building depends not only on expanding training opportunities but also on embedding digital competencies within professional standards, career development pathways, and organizational expectations. In this context, the development of interdisciplinary expertise combining archival knowledge, information management, and digital technologies appears increasingly important for supporting long-term archival transformation. These findings indicate that professional development is most effective when it becomes institutionalized within the broader professional ecosystem rather than remaining confined to individual training initiatives.

7.5.2 Leadership Literacy and Decision-Making Capacity

Leadership-level digital literacy significantly influences the sustainability of digital archival initiatives. Interview responses in Vietnam highlight that

digital transformation initiatives often depend on the awareness and commitment of institutional leaders. As one respondent observed, “without strong understanding and support from leadership, digital projects cannot be prioritized” (Archivists, A3 and A4, Interview, 2025). This indicates that leadership-level digital governance capacity remains uneven. In Germany, although not all archival leaders possess advanced technical expertise, digital strategy is typically supported by advisory structures, specialized technical units, and professional networks that reduce dependence on individual leadership capacity. As a result, digital governance is embedded within broader organizational and professional frameworks rather than relying solely on the competencies of individual managers. The comparison suggests that successful digital archival governance requires both technical specialists and digitally informed administrators capable of making strategic decisions regarding technology, preservation, and information governance. Limited leadership literacy may increase institutional dependence on external vendors, project-based solutions, and short-term technological initiatives. From an Institutional Theory perspective, leadership capacity functions as an important mechanism through which organizations interpret, coordinate, and sustain technological change. The findings, therefore, indicate that the institutionalization of digital governance competencies at the leadership level represents a critical component of long-term archival transformation.

7.5.3 Vendor Dependency and Knowledge Sovereignty

Professional capacity directly affects technological autonomy. Several Vietnamese interviewees expressed concern that digital archival systems are frequently designed and maintained by external technology companies, with limited internal technical oversight (IT professional, I1, I2, and I3, Interview, 2025). This dependence creates vulnerabilities in system continuity and data control. In Germany, although private vendors are also involved, archives typically maintain stronger internal expertise for evaluating, configuring, and supervising digital systems. Where internal technical knowledge is insufficient, institutional control over digital preservation environments may weaken.

Developing in-house technical expertise and establishing cross-functional teams combining archivists and IT specialists are essential for long-term digital sovereignty.

In summary, the comparison demonstrates that professional development constitutes a decisive factor shaping the implementation and sustainability of digital archival transformation. Vietnam has made significant progress in incorporating digital topics into archival education, training programs, and broader reform agendas. Nevertheless, structural challenges remain in the areas of advanced technical competencies, leadership literacy, and the development of institutionalized career pathways for digital archival specialists. Germany's relative advantage lies not primarily in superior technology but in the gradual integration of digital competencies into professional identities, organizational routines, and institutional practices.

From an Institutional Theory perspective, the findings suggest that technological transformation becomes sustainable only when professional competencies are embedded within broader professional and organizational structures. Digital skills, leadership capacities, and technical expertise, therefore, function not merely as individual attributes but as institutional resources that shape the ability of archival organizations to adapt to technological change. Consequently, the long-term effectiveness of digital transformation depends on the extent to which professional development is institutionalized within educational systems, career structures, professional networks, and organizational cultures.

7.6. Online Access and User Engagement

The provision of online access to archival materials and the facilitation of meaningful user engagement have become defining indicators of digital transformation in archives worldwide. In the digital age, archives are expected not only to preserve materials but also to democratize access, reduce barriers to information, and foster active participation from diverse user communities. This section presents a comparative analysis of how archives in Germany and

Vietnam have approached the development of online access and user services, examining both the technological and socio-cultural dimensions of this transformation.

Germany's archival sector has shown a strong commitment to making online access a key part of its digital strategy (HLA, 2019). The German model goes beyond simply digitizing collections; it reflects a paradigm shift toward archives as public-facing, participatory institutions. Archives in Germany provide users with access to materials through highly integrated digital platforms. For instance, the Archivportal-D, a nationwide archival portal, consolidates metadata and digital surrogates from federal, state, and municipal archives, enabling seamless cross-institutional searches. Germany has adopted progressive open-access policies that align with the broader Open Data and Open Government movements. Many digitized collections are freely available without registration, reflecting a philosophical commitment to public ownership of archival knowledge. Germany's success in online access stems from a dual foundation of robust technological infrastructure and a cultural commitment to transparency, public service, and civic participation. It reflects a vision of archives not merely as custodians but as facilitators of democratic knowledge.

Vietnam's progress in developing online access to archival materials remains relatively limited and fragmented, shaped by technical, institutional, and cultural barriers. Unlike Germany's Archivportal-D, Vietnam lacks a unified national portal for archival access. The National Digital Archives Portal of Vietnam has not been working yet. Each National Archives Center maintains its own basic website, with limited digital finding aids and few digitized collections accessible online. Cross-institutional search functionality is virtually nonexistent. Users must frequently rely on physical visits or direct contact with archivists to access holdings. Legal and policy constraints significantly limit online accessibility. Through my fieldwork at the Vietnam National Archives Center III, I found that there is significant latent demand for online archival access. However, this demand is stifled by systemic barriers, most notably the

lack of a national digital access strategy and the fear of releasing sensitive information.

The gap between Germany and Vietnam is not merely technological; it is fundamentally policy-driven and culturally embedded. Germany's open-access ethos is inseparable from its commitment to democratic governance and transparency, while Vietnam's restrictive access reflects broader institutional and political risk-management strategies. Vietnamese archives continue to be viewed primarily as custodial institutions rather than public-serving knowledge hubs. Vietnam runs the risk of continuing a "digital strategy" in which digitization efforts are made but are not really available or useful to the public. Without strategic changes to user-centered design and open-access policies, investments in digitization will not have much of an impact on society and culture.

In my professional judgment, the single most impactful reform Vietnam could undertake in this dimension is modeled on Archivportal-D to create and develop the National Archival Portal, but adapted to local legal and cultural constraints. Coupled with policy reforms that strike a balance between transparency and national security considerations, this shift would unlock enormous value for researchers, educators, policymakers, and the general public.

7.7. Discussion

Although Vietnam's archival legal framework, particularly with the 2024 Law on Archives, has made significant progress in institutionalizing digital archiving, a comparison with the model of the Hessisches Landesarchiv (HLA) in Germany reveals notable differences in development philosophy, operational mechanisms, and the level of system integration.

First, the fundamental difference lies in the development logic. Vietnam has adopted a law-driven digital transformation model, in which the legal framework is established first to provide a unified foundation for nationwide implementation. In contrast, HLA operates under an infrastructure- and capacity-driven model. In its Digital Strategy 2020–2025, HLA prioritized

strengthening technical infrastructure, data security, and records management capacity before expanding public-facing services. This approach is reflected in the fact that more than 90% of infrastructure-related measures were completed before achieving comparable progress in user-oriented services.

Second, regarding the role of archives within the public data ecosystem, the HLA model positions archives as an integrated component of the state-level data infrastructure, participating early in the records lifecycle through its Competence Center for Records Management. In Vietnam, although the 2024 Law on Archives emphasizes lifecycle management and the development of archival databases, archives are still often perceived in practice as the "end point" of the administrative process. While the shift from a "passive receiving" model to an "early engagement" model has been formally institutionalized, it has not yet been fully internalized in operational practice.

Third, in terms of technological integration and adherence to international standards, HLA has implemented centralized digital preservation systems that ensure integrity and authenticity at the operational level. By contrast, Vietnam has established a relatively comprehensive legal framework, but the capacity to deploy infrastructure and ensure synchronization across administrative levels remains uneven. This indicates that the gap between "policy design" and "technical implementation capacity" continues to be a structural challenge.

It should be noted, however, that the institutional and public governance contexts of the two countries differ fundamentally. The HLA operates within a highly decentralized administrative system, supported by stable financial and human resources. In contrast, Vietnam is implementing reforms on a nationwide scale with varying levels of development across provinces. From this perspective, Vietnam's decision to prioritize legal framework development may be seen as a rational choice within a centralized governance context.

From a critical standpoint, it may be argued that Vietnam's archival legislation has now reached a stage of normative completeness. Yet, it is still in

the process of transforming into an operational system capacity. Compared with HLA, Vietnam appears to be in a transitional phase, from institutional design to the consolidation of implementation infrastructure. Consequently, the core challenge no longer lies in drafting new laws, but in ensuring feasibility, technical interoperability, and professional capacity to realize an integrated digital archiving model in practice.

7.8. Summary

This chapter has compared digital archival development in Vietnam and Germany across five dimensions: technological readiness, legal and policy frameworks, institutional and organizational capacity, professional development, and user access and engagement. The analysis demonstrates that the principal divergence between the two archival systems lies not in technological ambition, regulatory recognition, or access to digital tools, but in the degree of institutional consolidation, governance coordination, and operational coherence through which technological change is implemented and sustained. Vietnam has made significant progress in establishing a comprehensive legal and policy foundation for digital archives, particularly through the Law on Archives 2024 and related implementing regulations. Nevertheless, implementation remains uneven across administrative levels. Infrastructure fragmentation, limited interoperability, organizational capacity constraints, and continued reliance on project-based initiatives affect the consistency and sustainability of digital archival development. Germany, as illustrated through the case of the Hessian State Archives, demonstrates a more integrated and institutionally embedded model in which digital preservation, records management, access services, and governance mechanisms are progressively aligned within coordinated technical and organizational frameworks. Legal adaptation supports this transformation, but long-term sustainability is achieved primarily through institutional integration, professional coordination, and lifecycle-oriented governance.

Three key insights emerge from the comparison. *First*, normative reform does not automatically ensure operational standardization. *Second*, early archival involvement throughout the records lifecycle strengthens long-term digital sustainability. *Third*, professional capacity, organizational coordination, and institutional incentives are decisive factors shaping the effectiveness of technological transformation. These findings suggest that successful digital archiving depends not only on technological innovation but also on the institutional environments within which technology is adopted, governed, and maintained. From an Institutional Theory perspective, the comparison indicates that Vietnam and Germany represent distinct institutional pathways of archival transformation. Vietnam's development can be characterized as a predominantly law-driven, state-directed, and project-based pathway of modernization, whereas Germany reflects a more lifecycle-integrated, professionally coordinated, and institutionally consolidated pathway. These differences should not be interpreted as different stages of development but rather as alternative institutional responses to the opportunities and challenges of computerization.

Overall, the chapter demonstrates that archival transformation in the digital age is fundamentally a process of institutional adaptation as much as a process of technological change. The findings, therefore, provide an important foundation for the policy implications and future-oriented discussion developed in the following chapter.

CHAPTER VIII: PROPOSING A FUTURE ARCHIVAL MODEL FOR VIETNAM

8.1. Introduction

The digital transformation has become an integral part of archives, much as it has in other aspects of our world. It is undeniable that archives have been significantly impacted by digitization, necessitating a digitally inclusive reimagining. The virtual reading room, which has been conceptualized for some time, is no longer a mere possibility but a reality. Additionally, there is a growing public expectation for quick, easy access to a wide range of information on the Internet. (Regina Rößner, 2017, p. 9).

The process of computerization has brought five significant aspects to the archives. *Firstly*, digitization is the process of converting analog or physical records into digital form, which is now widely accepted. *Secondly*, the online posting of retro-converted indexing information, including descriptions and retro-conversion of finding aids, has greatly facilitated the process of locating and accessing archival materials. *Thirdly*, the presentation of digital copies of analog archival materials on archive websites or portals has enabled users to browse and access materials remotely. *Fourthly*, archiving born-digital materials (originally digital) poses a significant challenge for archives, requiring professionalization and expertise to manage effectively. *Finally*, the application of emerging technologies such as AI and digital platforms in archives. (Regina Rößner, 2017, pp. 9–14; Wolfgang Krauth, 2018, pp. 219–228) .

The emergence of digital technologies in archives has ushered in new possibilities and challenges. While computerization has increased access to archival materials, it has also created new challenges, such as the preservation of digital materials. These challenges necessitate a multidisciplinary approach and a new set of skills and expertise in the archives sector. Undoubtedly, the digital transformation of archives is an ongoing process that requires continuous adaptation to keep pace with technological developments and meet the evolving needs of users.

The archive's future is uncertain, especially as it enters the digital world. No one can say for sure about the future of archives. Still, under the historical and archival approaches and perspectives, the future of archives and archival work is somewhat predictable in certain respects. Thus far, it is evident that the archival field, influenced by information and communication technologies, has undergone various transformations. We not only see archives with physical-carrier records (most commonly paper-based, analog film, microfilm, wooden carriers, and animal skin), but also digital archives of born-digital and digitized records. Although the number of physical records currently outweighs that of digital ones in the archives, with the rapid increase of electronic records, an electronic focus will become increasingly important and required by the archives. Furthermore, driven by user-oriented trends, digitizing analog records is happening quickly and has become one of the most critical tasks in archives today. To summarize, the basic model of an archive encompasses traditional archives that handle physical documents of all types, digitized archives resulting from the digitization of physical records, and born-digital archives. Although digitized and born-digital archives have been managed separately (such as the DIMAG and Arcynsys systems of the Hessen State Archives), in our opinion, almost every archive will soon develop an integration system for both digitized and born-digital records.

The concept of creating an integrated electronic system remains a key approach in German archives. Software for archival processing and digital holding management systems formed the basis of digital archiving. It results from an increasing tendency for archives to integrate their IT systems. Not only archives in Germany, but archives worldwide are increasingly constructing digital archives and a unified electronic environment. The ongoing shift toward IT applications in the archival field is bolstered by several factors shaping the archives landscape. First and foremost, the rapid pace of technological advancement, coupled with falling equipment prices, has paved the way for the emergence of innovative IT tools transforming how archives are managed and preserved. In addition, changing social structures have played a pivotal role in

driving the adoption of IT applications in archival processes. Specifically, the transition from industrial to information and digital societies has led to a growing demand for digital archives that can accommodate the increasingly digitized nature of modern records. Furthermore, the democratization of information and changing attitudes toward online accessibility have had a significant impact on the archival landscape. This has led to a shift from traditional, paper-based archives toward digital archives, which offer enhanced accessibility and flexibility for users. Viewed as a whole, these factors have created a dynamic environment that is shaping the future of archival practices, leading to an ongoing transformation of the archival field.

The Chapter describes strategies and techniques for the long-term preservation of digital information from the perspective of available standards and their application contexts in Germany. The future need for action is identified and explained against the backdrop of existing experience.[29]. Furthermore, proposals are made to explain how the long-term archiving of digital documents should be designed in light of current archival performance in Germany.

8.2. Foundational Conditions for Future Archival Development

The future development of archives should not be understood solely as a technological transformation. While digital technologies create new opportunities for preservation, access, and records management, the long-term evolution of archives is equally shaped by governance structures, professional practices, legal frameworks, and institutional adaptation. Consequently, the conditions discussed in this section are interpreted not only as technological drivers but also as institutional foundations for the future development of archives.

[29] Which have been clearly presented in Chapter VI

8.2.1. Administrative Reform and Digital Governance Context[30]

Advancements in science and technology, particularly in information technology, have enabled the implementation of more efficient and interactive government systems, facilitating better management and engagement with stakeholders and the broader public. This has given rise to several new models of government, including E-Government, Government 2.0, Digital Government, Mobile Government, and Open Government. The overarching objective of these models is to enhance information sharing and management between the government and its stakeholders, while also maximizing stakeholder participation and contribution to governmental activities. By promoting openness, transparency, and democracy through information exchange, these models aim to improve government operations.

In Germany, the public administration has undergone numerous reforms over the past several decades to achieve greater efficiency, service orientation, cost-effectiveness, and innovation. Evidence of this process can be seen in government programs such as the "*Zukunftsorientierte Verwaltung durch Innovationen/ Future-oriented administration through innovations*" initiative, launched during the 16th legislative period. This program focuses on enhancing personnel, control, and organizational practices, while also promoting the development of e-government capabilities. These efforts reflect a broader trend toward modernizing public administration in Germany, to improve governance and meet the needs of citizens and stakeholders in an ever-changing landscape (Bundesministerium des Innern, 2006b, 2006a); the Government program "*Network-based and transparent administration/ Vernetzte und transparent Verwaltung*" in the 17th legislative period (The Federal Government, 2010). Additionally, the Federal E-Government Act (EGovG) took effect on August 1, 2013, providing a regulatory framework for digitization within the federal administration. The EGovG also established timelines for implementing

[30] For more information on public administration reform in Germany, visit: https://www.verwaltung-innovativ.de/DE.

electronic access to government services for individuals, businesses, and other public entities. This act marked a significant milestone in Germany's e-government development, underscoring the government's commitment to modernizing public services and promoting digital innovation. By providing a legal basis for the digitization of government services and mandating specific implementation deadlines, the EGovG aimed to enhance the accessibility, transparency, and efficiency of public administration, while also improving citizen engagement and participation in the policymaking process (Government, 2014). In September 2014, the German Federal Cabinet approved the Digital Administration 2020 (Digitale Verwaltung, 2020) program, which aims to modernize administrative practices during the 18th legislative term. This program aimed to establish a framework for the future federal administration, leveraging digitization to create a more effective, transparent, efficient, accessible, and responsive government that is better equipped to meet the needs of citizens and businesses alike.

In today's digital era, customers expect public services to be more accessible, efficient, and convenient. They demand access to information and services online, 24/7, from any location and on any device. As a result, public service providers are under pressure to transform their service delivery models to meet these expectations. By harnessing digital tools and technologies, the program aimed to foster greater public engagement and improve the overall quality of government services. The Digitale Verwaltung 2020 program underscores the government's commitment to innovation and progress, positioning Germany as a leader in the field of e-government and administrative modernization. (Government, 2014; The Federal Government, 2014).

In Vietnam, digital archival development is embedded within a rapidly evolving digital governance environment. The ongoing public administration reform program emphasizes simplification, transparency, and digital service provision. Electronic document management and online public services are increasingly mandatory across ministries and provinces. The national digital transformation program places data infrastructure, interoperability, and e-

government services as the strategic priorities. The establishment of national data platforms and sectoral databases creates systemic pressure for archival systems to integrate into broader data governance ecosystems. The updated legal framework formally recognizes electronic records and digital repositories, creating normative conditions for lifecycle management and electronic transfer procedures.

In the ongoing modernization and digitization of public administration, electronic records are assuming a central role. The use of such records confers numerous benefits, including rapid retrieval of relevant information for case work and processing, location-independent and uninterrupted access to information, elimination of media breaks, accelerated processing of procedures, enhanced transparency, automated verification, and support for flexible working methods. Electronic records are transforming public administration, promoting greater efficiency, accountability, and accessibility. As governments seek to improve their information management capabilities and optimize services through digital innovation, the use of electronic records is likely to become even more widespread, further driving the shift toward a more modern, digitized public sector. (Bundesministerium des Inneren (BMI), 2014).

8.2.2. Technological development

As noted, the accelerated pace of technological progress, coupled with reduced equipment costs, has facilitated the emergence of innovative IT tools that are revolutionizing the management and preservation of archives. With the advent of the Fourth Industrial Revolution (IR 4.0), which is predicated on digital technology and the integration of intelligent systems, all aspects of social life are undergoing a significant transformation. Super-automation, a hallmark of Industry 4.0, is poised to introduce game-changing improvements to archival management methods and processes. By leveraging the convergence of physical and artificial intelligence, super-automation technology has the potential to transform the record management process by enabling the creation of 'intelligent storage' systems. These systems are designed to replace traditional archival fixed shelves and boxes, which are bulky, heavy, and occupy significant storage space, with an automated system that optimizes storage capacity. This

shift toward intelligent storage is expected to significantly improve the efficiency and accuracy of archival management while reducing the cost and space requirements of traditional archival storage solutions.

In addition, the advent of digital technology has heralded a significant breakthrough in the exploitation and use of documents by enabling the conversion of traditional archives into digital formats. This transformation has been facilitated by the combination of metadata (Big Data) with connectivity technology, allowing the creation of a storage system in cyberspace and the Internet of Things (IoT). This environment facilitates interconnections and interactions between cyberspace hosting systems and real-time systems, enabling seamless communication and data access across platforms. The use of metadata and IoT technology has enabled the creation of an interconnected and intelligent archival network, thereby enhancing the accessibility and availability of archival records for researchers, scholars, and the general public.

Recent changes have altered how users connect with the Internet and, more significantly, how they engage with it. These include the development of more advanced Web browser search engines, the widespread adoption of digitization, the exponential expansion of Web 2.0, and the dawn of Web 3.0. The first two make dependable searches and make Internet use a reality within reach. One screen can serve as the venue for both the archivist's description and the raw material, enabling the user to engage with historical material in an immersive way that blurs the boundary between metadata and core content. The responsibilities traditionally provided by the paper catalog, reading room desk, and user's notebook may be combined with the Web-based experience, including Web 2.0 capabilities that allow users to contribute notes or comments. Web 3.0, characterized by the Semantic Web or linked data, is now being tested in isolated systems and envisions a global database in which all data is connected via semantic applications.

8.2.3. Emerging Paradigms in Archival Development

The archive sector faces complex challenges in today's rapidly changing information world. What are the trends in future archives, and where have unique and valuable information resources been preserved? Traditionally, archivists have seen themselves as trusted custodians of proprietary records; hence, provenance, authenticity, and integrity are central to their mission. Therefore, they have been more reluctant to take advantage of new digital technology than other memory and information institutions. Archives are specialized, so often little of interest to the average citizen in the performance of their functions. (Dobreva, 2018, pp. XIX–XX).

Today, archives have long sought to become information brokers on par with libraries and similar institutions (Sobczak, 2016a, p. 6). In addition, the archives must demonstrate their role and significance in society by making themselves more accessible to users. In line with the archives' public-interest missions – such as preservation and providing cultural and educational access to the records in their collections – archivists at archival institutions have a vested interest in digitizing holdings and making them available online (Dobreva, 2018, p. XX). In the European Union, archives are considered Janus-faced, and public archive services are integral to modern public administration in all countries. As such, they contribute to the development of document management within administrations and a more comprehensive information society (European Union, 2006, p. 29). As part of public administration, archives ensure the preservation of records of permanent value for government and administrative use, as well as for evidence of rights. On the other hand, archives also provide citizens with the means to check the effectiveness of administration and display its achievements (European Union, 2006, p. 9). In this case, we can see the relationships among archives, public administrations, and users. Archives are considered necessary to ensure transparency and accountability, which are essential in a modern democracy. As users' information demands increase, archives are responsible for meeting their information needs. To fulfill this task, archives have no choice but to be more **open, transparent, and user-**

oriented. This is also the perspective on a modern archive, which establishes no borders or distance with users. There is a growing expectation in society that all information resources should be available online, 24 hours a day (National Archives & MLA, 2010, p. 6). Archive services, alongside their duty to preserve past and present records, also aim to make the information in their collections discoverable, accessible, and relevant to all (National Archives & MLA, 2010, p. 7).

The rapid development of new information technology, particularly in digitization, web browsing, and internet access, has led to significant changes in the nature and function of archives. The traditional view of archives as a physical repository of records is being challenged by the emergence of virtual and dematerialized archives. Many observers believe that electronic media, including digital and born-digital records, have the potential to supplant traditional paper-based archives. The World Wide Web is considered an archive of archives, providing unprecedented access to an ever-expanding array of digital resources. As a result, archives have become mixed, integrated, or hybrid entities, incorporating both physical and digital records. (Sobczak, 2016a, p. 7). The management of such records presents significant challenges for archivists, who must develop new strategies and tools to address the preservation, arrangement, and access to electronic records. Digital archives require specialized equipment and software, as well as effective metadata and database management systems to ensure their long-term preservation and accessibility. Archivists must also be proficient in advanced technologies, such as digitization, optical character recognition, and web archiving, to capture, preserve, and provide access to digital records. Ultimately, the evolution of archives in response to new information technology underscores the critical importance of adapting traditional archival practices to meet the challenges of the digital age.

The use of archives is expected to change rapidly in the coming years. It could become an indicator of the extent to which archives can adapt to the challenges of digital transformation. The tremendous technical possibilities open new perspectives for the archives far away from the stacks and reading room. However, the pace of this transformation is fast, and their expectations

are demanding. The archives will only be able to digitize some of the stored sources, and the indexing of the digitized items will meet the users' expectations. Increasingly, only what is available digitally and online will be used. In the medium term, this will facilitate the digitization of sources, their development, and preservation. Thus, usage could serve as a second evaluation for future archival materials and for inventory selection. What is revolutionary about this new form of traditional creation, however, is that it is no longer controlled by the archivist but by the user.

These developments suggest that the future of archives is not merely characterized by the adoption of new technologies. Rather, emerging technologies challenge traditional archival functions, professional roles, governance arrangements, and relationships with external actors. The central question, therefore, becomes not whether archives will become digital but how archival institutions will redefine their place within increasingly data-driven societies.

8.2.4. Open archives and open access to archival materials

The adoption of open archives and user-centered approaches has become increasingly prominent in German archival practices over the last few decades, as Christian Keitel (Hering, 2021, pp. 223–239) has noted. The acknowledgment of the user's needs, which was overlooked in classical German archives, has become a fundamental principle for contemporary German archivists. The ubiquitous influence of social media has also affected the archival domain, as networking opportunities and digital communication channels have become increasingly popular among archives. In addition to providing direct customer interaction, social media can enhance public perception of archives and help revitalize the perception of archival institutions and their profession as antiquated. The 'Open Archives' conference series has been held in Germany since 2012, and it features a broad range of topics, including online services, social media platforms such as Facebook, Twitter, blogs, and Instagram, and critical reflections on their technical and communicative values. However, the practical considerations of cost-benefit ratios and the limited resources of most

archives, particularly in terms of staffing and finances, must be carefully weighed when implementing social media strategies. The scholarly discourse on the relationship between archives and social media has been stimulating. It is poised to remain a compelling area of research, as social media continues to shape various aspects of contemporary social life.

In principle, archives strive to make online finding aids and digitized archive material available on the Internet for unrestricted use in line with the "Open Access" strategy. Archives wanted to become brokers of information on par with libraries and similar institutions. (Sobczak, 2016c).

What does the phrase "open access" mean? According to SAA, "open access" is the principle that access to archival resources should not be restricted unnecessarily; A model of access to create works and data that seeks to eliminate barriers for readers, such as subscription fees and physical media, and barriers to reuse, such as copyright restrictions and licensing fees. (Richard Pearce-Moses, 2005). Effie Kapsalis defined "open access as " making public domain materials open for use without any restrictions, and making copyrighted materials available under the provisions of fair use (non-commercial, educational)." (Kapsalis, 2016).

8.3. Transferable Insights from the German Archival Model

The integration of information technology (IT) to safeguard and ensure the availability of historical records in German archives has gained recognition as a significant pursuit in recent years. The German archival system has undergone a digital transformation aimed at leveraging technology to bolster the preservation and diffusion of its repositories. However, the pace of adoption of these technological innovations is contingent on various factors, such as the resources available to individual archives, their specific mandates and priorities, and the state of technology at the time. It is worth noting that funding and resource allocation can significantly affect the pace of technology integration across German archives. Some archives may possess the financial capability to invest in technology and digitization, while others may prioritize more

conventional preservation methods due to financial constraints. Despite these hurdles, some archives, such as the Hessian State Archives, have adopted a proactive approach to technology, utilizing it to digitize their repositories, preserve records, and provide online access to their holdings. This underscores the crucial role that IT plays in safeguarding and making historical records accessible, and is a testament to the continuous efforts of German archives to modernize and upgrade their systems to better meet the needs of scholars and the general public.

It is noteworthy that many archival institutions in Germany simultaneously manage traditional, digitized, and born-digital collections. These categories should therefore not be understood as mutually exclusive stages of development, but rather as coexisting components of a broader archival ecosystem. As technology continues to evolve and increasing volumes of records are created in digital environments, the proportion of digitized and born-digital holdings is expected to expand further within German archives. In the Federal Republic of Germany, archival collections are commonly differentiated into three categories: traditional archives, digitized archives, and born-digital archives. However, the significance of this classification extends beyond technological characteristics alone. The German experience demonstrates that successful archival transformation depends not only on technological innovation but also on the capacity of institutions to adapt governance structures, professional competencies, preservation strategies, and organizational arrangements to changing technological environments. From this perspective, the transition from traditional to digitized and born-digital archives reflects not merely a technological evolution but a broader process of institutional adaptation. Consequently, the German model suggests that the future development of archives should be understood not simply as a progression toward increasingly digital collections, but as the continuous reconfiguration of archival institutions in response to new technological, organizational, and societal conditions. This insight is particularly relevant for Vietnam, where the challenge extends beyond digitization itself to the

development of institutional capacities capable of supporting long-term digital governance and preservation.

8.3.1. Traditional archives

Preserving historical records in their original format is a crucial function of traditional archives. These archives serve as custodians of a diverse range of materials, including paper documents, photographs, maps, and audiovisual materials, which are essential sources of information for scholarly research and other purposes. The archives maintain their collections in secure, environmentally controlled facilities, using appropriate storage systems and preventive measures to preserve these materials for future generations. The objective is to prevent any degradation or damage caused by climatic conditions, natural disasters, or other factors that could compromise the integrity and authenticity of the materials. Access to these archives is typically facilitated through physical visits, where researchers and other interested parties can examine and scrutinize the original records in person. The archives provide facilities such as reading rooms, research desks, and other amenities that create a conducive environment for scholarly inquiry. Scholars and researchers must meticulously examine these materials to extract pertinent information, analyze historical trends, or trace the provenance of particular artifacts. The physicality of these archives creates an unparalleled experience for scholars to encounter the materials in their original form and appreciate their significance in a more profound and nuanced way. Moreover, traditional archives often play an instrumental role in preserving cultural heritage and maintaining a collective memory of the past. The materials in these archives can offer insights into various aspects of society, politics, economics, and culture, providing a window into the evolution of human history. The archives are essential for transmitting cultural knowledge and serve as a repository of cultural memory, ensuring the continuity of artistic practices, values, and traditions over time. In this sense, archives are vital for cultural preservation and heritage management.

8.3.2. Digitized archives

The advent of digitization has revolutionized traditional archives by enabling the conversion of their collections into digital format, thereby facilitating more efficient storage, management, and accessibility of archival materials. Digitized archives use cutting-edge technologies and digital tools to ensure the secure and reliable preservation of these collections, mitigating the risks of damage or loss that can occur to physical records. Moreover, digitization has enabled the online dissemination of archival materials, thus increasing access to these collections for researchers and the general public, regardless of their geographic location. A digitized archive comprises materials that have been computerized from their original paper-based format over the past few decades. This archive type offers a virtual collection of digital resources for online presentations, scanning, and access. As such, digitized archives, like the Digitales Bildarchiv in Germany, launched by the Federal Archive, have been designed primarily to facilitate access to archival materials, especially photographs. The primary objective of digitized archives is to make collections accessible to a broader audience while providing enhanced functionality and flexibility in their use. Despite the perceived advantages of digitization, concerns persist about the long-term preservation of digital records. The original records may not be retained, leading to the loss of valuable historical information. Therefore, some experts argue that the long-term preservation of digital records should be given more significant consideration in the development of digitized archives. While digitization offers immense benefits in accessing and disseminating archival materials, preserving their authenticity, integrity, and accuracy over time remains a pressing concern that must be addressed through appropriate measures and strategies.

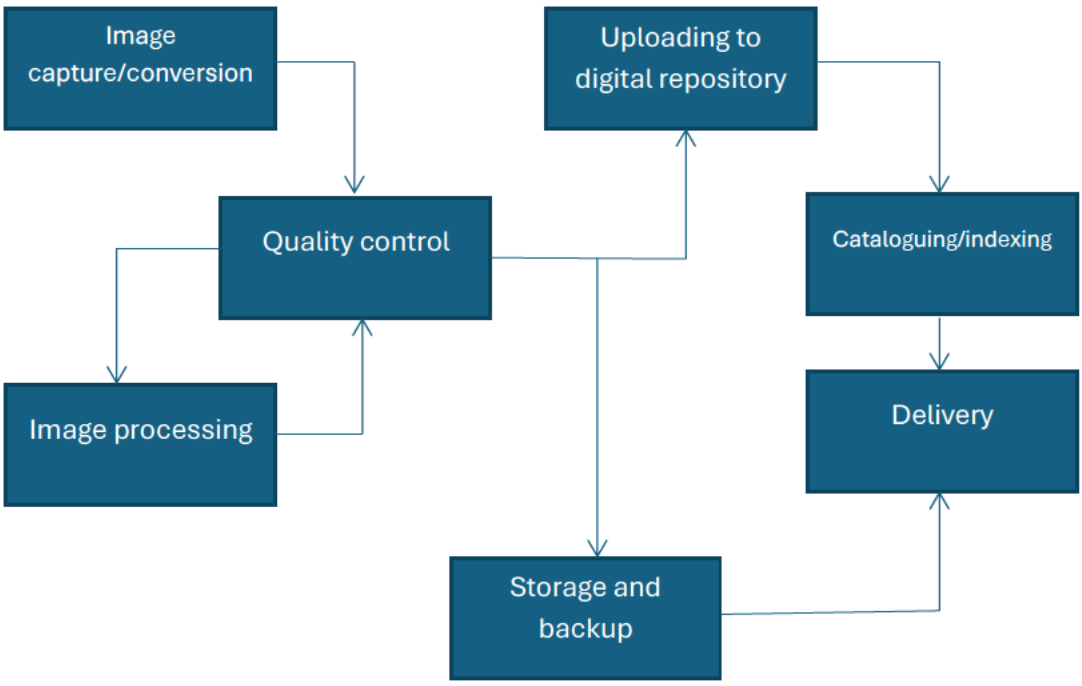


Figure 26. Sample workflow of digitization

8.3.3. Born-digital archives

Born-digital archives are repositories containing records created and stored in digital format from their inception, including electronic records, digital images, and email. This area of archives is rapidly expanding in Germany, presenting significant challenges and opportunities for archives in managing and conserving these records for future generations. The advent of born-digital records has fundamentally transformed how archives operate, from the creation of digital records to their management, preservation, and access. The sheer volume of born-digital records created daily poses significant challenges for archives, including storage, access, and retrieval, while ensuring their authenticity, reliability, and security. To address these challenges, archives formulate strategies and adopt new technologies to manage and conserve born-digital records. Archives increasingly invest in digital tools and platforms to enhance access to born-digital archives. These tools and platforms enable users to search, browse, and view digital archives in innovative ways, thereby improving their usability and accessibility. These tools have also enabled

archives to collaborate with other institutions and researchers to develop new research methods and interdisciplinary approaches to studying digital archives.

The classification of archives is a crucial topic in archival studies, both in Germany and globally, especially in light of the exponential growth and development of information technology and digitization. Archivists are facing new challenges in preserving born-digital and digitized records, which have altered their responsibilities from solely preserving paper-based archives. To address these challenges, several German archives are working toward developing an integrated digital archive that incorporates both types of records. However, achieving a fully automated, integrated system remains a time-consuming process that relies on software programs supporting archival processing and digital holding management systems. The success of creating a comprehensive digital archive depends on integrating these systems, which is crucial for efficient management and preservation.

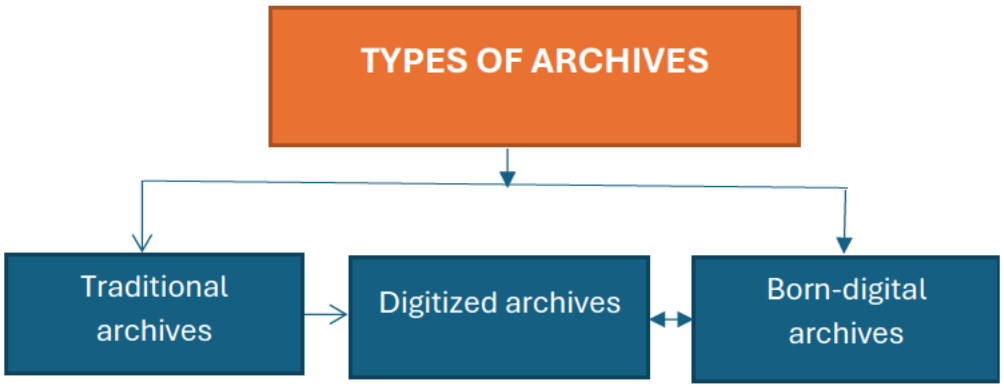


Figure 27. Current development of German digital archiving

8.4. "Hybrid" as a model of future archives

The dissertation distinguishes between Future of Archives as an open conceptual discourse and Hybrid Archives as an empirically derived model of archival development. While the "future" of archives cannot be universally defined, it can be interpreted through local practices that embody technological integration and institutional adaptation. The Hybrid Archives represent such a form, where analog and digital logics coexist, reflecting both infrastructural modernization and cultural continuity. Again, while the future of archives cannot be predicted with certainty, comparative evidence suggests that digital

sustainability depends less on rapid technological adoption and more on institutional embedding. The experience of the Hessisches Landesarchiv illustrates how infrastructure integration, lifecycle coordination, and cooperative development models can gradually stabilize digital transformation within a complex administrative environment. Any strategic orientation for Vietnam must be context-sensitive, acknowledging differences in governance structure, resource allocation, and administrative culture. Against this background, this chapter proposes a future-oriented Hybrid Archival Model for Vietnam. There is a willingness on the part of the German archives to integrate a system for both physical and digital materials. (Sobczak, 2016b, p. 7). This work is no longer an assumption; in fact, it is already happening in many archives around the world. As technology continues to evolve, archives are seeking ways to manage and preserve their collections across various formats, including traditional, digitized, and born-digital records.

Having a combination of all three types of archives offers several advantages. For example, traditional archives can provide access to original records, while digitized and born-digital archives can offer access to records in more flexible, accessible ways. This allows archives to reach a wider audience and make their collections more relevant and accessible to the public. However, managing and preserving a combination of archives can also pose challenges, particularly when safeguarding born-digital records. Archives need to have the proper infrastructure and systems in place to ensure that born-digital records can be securely stored, managed, and accessed in the future. This requires significant investment in technology and expertise, as well as ongoing efforts to manage and preserve the records over time.

There is no specific name for this type of archive at the moment; however, this type of archive is often referred to as “hybrid archives” or “integrated archives”, in which the term “hybrid archives” refers to archives that contain a mixture of physical and digital records. The term “integrated archives” refers to archives that bring together different types of collections, including traditional and digital collections, into a single repository. The goal of these archives is to

provide a comprehensive and integrated approach to preserving and making accessible historical records, regardless of the format in which they were created or stored. By combining traditional, digitized, and born-digital collections, these archives can offer a more comprehensive view of history and make their collections more accessible and relevant to the public.

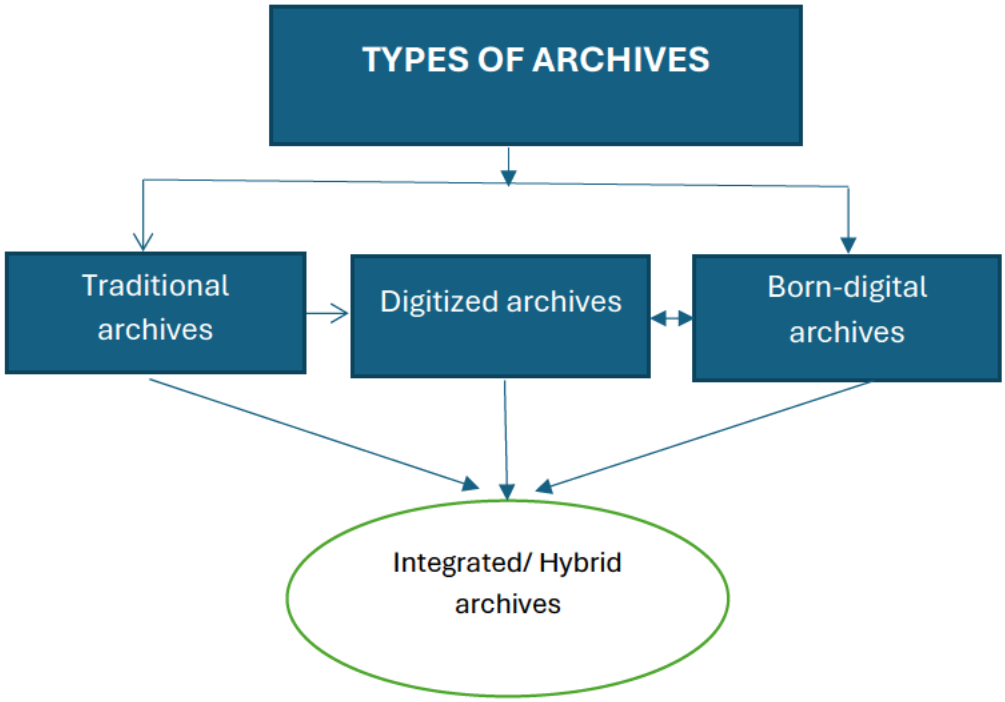


Figure 28. The future of the archives will be integrated or hybrid

The future of archives is expected to take the form of integrated or hybrid repositories, often referred to by various names, such as virtual archives, digital archives, or archives 2.0, among others. The approach adopted by archives in achieving integration or hybridization is mainly dependent on the specific requirements of the archives and their collections. One of the most common techniques employed to achieve integration is digitization. The digitization process involves converting physical records, such as paper documents and photographs, into digital format. Once digitized, the records can be electronically stored, managed, and accessed alongside born-digital records. Metadata management is another critical task for archives seeking to integrate physical and digital records effectively. A robust metadata management system is required to provide a clear and consistent way of describing the collections,

including information on the format, location, and context of the records. Such a system is vital for achieving effective search and retrieval of records in the digital environment. In addition to digitization and metadata management, linked data is an emerging approach that holds great potential for achieving integration or hybridization of archives. Linked data enables the connection of disparate pieces of information from various sources, including physical and digital records, through the use of unique and persistent identifiers. This enables archives to create rich and interconnected networks of information that can be used to discover new relationships and insights about the collections. Another approach to achieving integration is through the use of virtual presentation. By bringing together physical and digital records in a single online platform, archives can provide access to their collections in a more flexible and accessible manner while preserving the original records in their physical form. To ensure that physical and digital records can be effectively integrated, archives need to ensure that their systems and technologies are interoperable. Interoperability refers to the ability of different systems and technologies to work together seamlessly, allowing archives to share data and information easily and effectively. Achieving interoperability is crucial for enabling archives to provide comprehensive and integrated access to their collections across different platforms and systems.

To sum up, the term “hybrid” does not merely refer to the coexistence of physical and digital records. Rather, it represents an integrated institutional and governance architecture that connects records management, digital preservation, access platforms, professional development, and inter-institutional coordination within a coherent system of archival governance. The objective is to formulate a plausible and operationally grounded framework that builds upon Vietnam’s existing legal and technological achievements while addressing the structural constraints identified throughout this study. From this perspective, hybrid archives should not be understood as a temporary transitional stage between traditional and fully digital archives. Instead, they may represent a sustainable institutional form through which archival

organizations balance historical continuity with technological innovation, legal accountability, public access, and digital stewardship. The future of archives, therefore, lies not in the replacement of traditional archival principles but in their adaptation to new technological, organizational, and societal environments. More fundamentally, the findings of this dissertation suggest that the future of archives should be understood not merely as a technological future, but as a process of institutional evolution. Emerging technologies such as artificial intelligence, cloud computing, and automation will undoubtedly reshape archival practices. However, their long-term significance will depend on how archival institutions adapt their governance arrangements, professional identities, organizational structures, and societal roles in response to these transformations. In this sense, the hybrid archive represents not only a technological model but also a future institutional form for archival development in Vietnam.

8.5. Strategic Implications

8.5.1. Inter-Institutional Cooperation and Network Governance

The Digital Archive Hessen decided in 2010 to cooperate with the State Archive Baden-Württemberg. The DIMAG software, developed in 2006, proved to be a suitable solution for meeting the requirements for archiving digital documents in a state archive. The development partnership, which was concluded in July 2010, aims to distribute the particular software development and maintenance efforts among several shoulders. In addition to the undeniable efficiency gains and cost savings, joint development also helps increase the software's quality. The software, which has now been jointly developed, can be used more abstractly to meet requirements in various areas.

Other archives are also interested in using DIMAG and the additional modules. Initial business models have been developed for such "support partnerships", in which an archive uses the software for a fee but does not actively participate in further development. They are to be welcomed in

principle, as they promote the spread and thus the viability of the software, while also standardizing archival work processes in the field of digital archiving.

Currently, DIMAG has evolved into a comprehensive software family comprising various modules. Since 2010, a transnational association of development partners has been promoting its further development. Alongside the Baden-Württemberg State Archive, current development partners include the HLA, in association with the Lower Saxony State Archive, the General Directorate of the Bavarian State Archives, and the Association for Digital Archiving North (DAN), which represents the states of Bremen, Hamburg, Mecklenburg-Western Pomerania, Saxony-Anhalt, and Schleswig-Holstein.(Robert Kretzschmar & Christian Keitel, 2018). The partners are engaged in advancing the functionalities of DIMAG by leveraging their collective expertise and resources to address the evolving needs of digital long-term preservation.

With Arcinsys, the HLA, in cooperation with the Lower Saxony State Archive, has developed a modern archive information system that encompasses the entire archival workflow, from acquisition to provision of archive material. Since the 1980s, the state archives of Hesse and Lower Saxony have been utilizing databases to record their finding aids and make them available on the Internet shortly after the turn of the millennium. Following this tradition, they took a consistent and innovative step into the future with Arcinsys to further open their digital archives to historical research and the interested public. In 2016, Schleswig-Holstein became the third partner to join the Arcinsys alliance, which was founded in 2014 by the states of Hessen and Lower Saxony. Financial contributions from Lower Saxony and Schleswig-Holstein make it possible to maintain the Arcinsys support and maintenance center in Wiesbaden.

Each development partner has assumed responsibility for further developing specific modules within the DIMAG software. The Landesarchiv Baden-Württemberg maintains the DIMAG core module, IngestList, and the DIMAG Web Ingest Tool (DIWI). The HLA is responsible for the IngestTool and the ingest process module. The General Directorate of the Bavarian State Archives is currently developing the AccessTool, while DAN is responsible for

the inventory preservation module and a module for electronic files (E-Akten). These modules are, or will be, integrated into the overall DIMAG package, and each development partner is authorized to use all modules. Furthermore, they can enable public archives within their federal states to use DIMAG and determine the associated provisions. However, DIMAG is only provided as a complete package, and archives that use DIMAG become application partners in the DIMAG network. This extensive cooperation among the development partners and application partners is actively encouraged to promote a stable and robust community and enhance knowledge exchange. It is noteworthy that DIMAG cannot be purchased as a standalone software without actively participating in the cooperation community. (Laux, 2019).

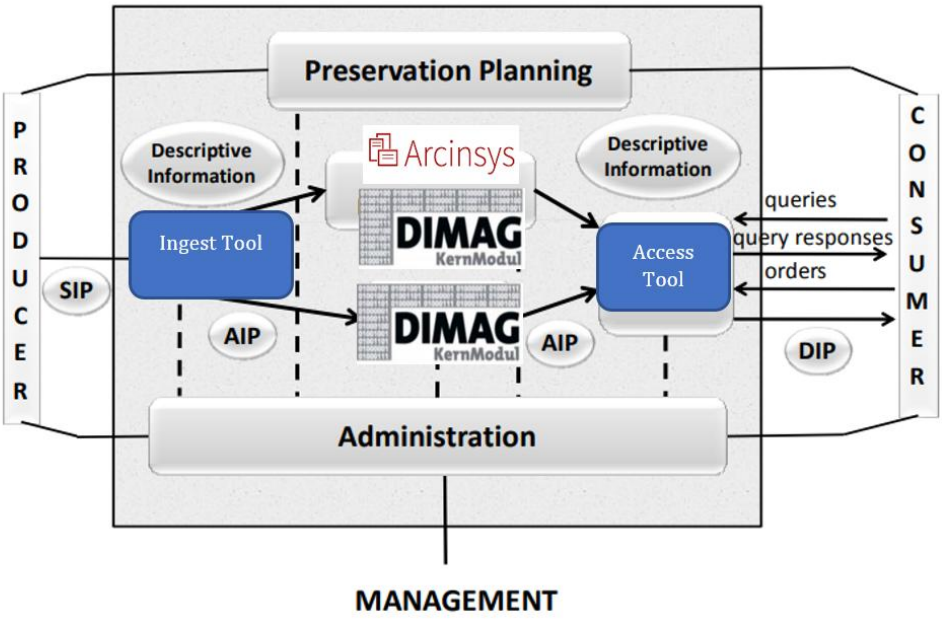


Figure 29. The DIMAG modules

There is an urgency to integrate the modules developed by partners in the DIMAG network for the Digital Archive Hessen (DAH).

(Archivists, H2,H3,H4,H5 and H6, Interview, 2022)

Specifically, the usage module developed by the Bavarian State Archives and the preservation module by the Digital Archiving North cooperation network (DAN) need to be integrated into the system. It is important to note that access to files in DIMAG is limited to archives due to legal protection periods. To

provide access to digital archive materials from the archive package (AIP), the General Directorate of the Bavarian State Archives is developing the AccessTool. This tool generates a use package called DIP for the reading room in the core module, which includes all the necessary information for accessing the material.

We can see that cooperation has been instrumental in advancing long-term digital preservation solutions by facilitating resource pooling, knowledge sharing, and collaboration among institutions and organizations. The complexity and dynamic nature of the digital preservation field necessitate that experts from diverse fields collaborate to create comprehensive, robust solutions. For instance, archives may bring their expertise in archival practices and standards, while computer scientists may contribute their skills in software development and data management. By collaborating, these disparate areas of expertise can be combined to achieve shared goals, resulting in solutions that meet the needs of all stakeholders. Cooperation is also beneficial for overcoming resource constraints, which are a significant challenge in long-term digital preservation. The preservation process requires substantial resources, including hardware, software, and staff time. By pooling resources and leveraging economies of scale, organizations can reduce costs and optimize resource utilization. Additionally, cooperation enables organizations to build a stronger community of practice, encourages knowledge sharing, and allows them to learn from each other's experiences. This process can enhance confidence and trust in digital preservation efforts, ensuring that digital archives remain accessible over the long term. (Christian Keitel, 2013, pp. 147–156; Peter Sandner, 2013, pp. 57–70).

Cooperation among institutions can also facilitate the standardization of processes and procedures, thereby simplifying information sharing and collaboration. When organizations collaborate to establish a standard approach to long-term digital preservation, they can build a shared understanding of the most effective methods for managing and preserving digital information. Standardization can reduce inconsistencies and confusion across institutions and archives, making it easier to share and exchange information. Moreover,

standardization can enhance interoperability among systems and tools used by various organizations, simplifying data sharing and reducing the need for customized integration solutions. This can help to save resources and time while making it easier to compare and analyze data from different sources. Furthermore, cooperation can lead to the development of best practices and guidelines for digital long-term preservation. These guidelines can be shared among institutions, enabling them to adopt the most effective methods for managing and preserving their digital collections. This can lead to more consistent and reliable approaches to digital preservation, enhancing the long-term accessibility and usability of digital information for future generations. (Christian Keitel, 2013, pp. 147–156).

Cooperation is crucial to ensuring that digital preservation solutions are interoperable, meaning they can work seamlessly together regardless of the specific hardware or software used. Achieving interoperability is a significant challenge in digital preservation, and it is not easy to reach without cooperation. When different organizations collaborate to develop digital preservation solutions, they can design them to be interoperable. This means that data and information can be shared across various systems, hardware, and software without risk of loss or corruption. By ensuring interoperability, institutions can avoid vendor lock-in and remain flexible in choosing the tools and solutions best suited to their needs. Cooperation plays a vital role in achieving interoperability and ensuring the long-term preservation of digital materials. Collaborating on digital preservation solutions can help ensure that institutions work together seamlessly and have access to the best possible tools and solutions to manage and preserve digital information.

Cooperation among organizations in digital preservation facilitates the sharing of best practices and lessons learned, thereby enhancing effectiveness and efficiency. Through collaboration, organizations can exchange their experiences and knowledge about successful and unsuccessful approaches to digital preservation. This helps other organizations to avoid common pitfalls and implement best practices more rapidly. Additionally, cooperation promotes

innovation in digital preservation by enabling organizations to build on one another's accomplishments and learn from one another's setbacks. Together, organizations can advance the field of digital preservation and ensure that critical digital assets are preserved for future generations.

8.5.2. User-Centered Access and Public Value

The emergence of online finding aids and digitized surrogates of original records since the 1990s has fundamentally transformed the landscape of archival research. The availability of archives online, including digitized versions of analog originals, has had a profound impact on how users access archival records. However, several issues have arisen, including users' expectations for instant, seamless online searching, the challenges they face in locating and using online archival records, and the uneven progress of digitization programs toward a predominantly online world of archives. These issues have changed the role of archivists, who traditionally mediate between users and materials.

Nowadays, users are increasingly accessing materials without making physical visits to archives; however, in addition to working on digital and digitized physical documents, archivists must remain focused on the “physical documents”. This tension is compounded by the reality that we cannot fully trust the digital world due to its high potential risk of loss. Moreover, the digitization process will take time, and not all physical materials can be digitized. The cost of digitizing archival materials has long been recognized as a significant issue. Not to mention that physical materials are the root of the discipline. There is a fact that, although many people expect to access archival materials online, several still want to view the original physical documents because they seek not just the information or content, but also the meaning and value of the document itself, as a memory. In Germany, archival institutions are generally concerned with their physical holdings. However, increasingly, they are focusing on and developing born-digital archiving while balancing this with the management of digital surrogates produced by projects to digitize analog records. DIMAG is an example of the development of managing born-digital records.

Although historians have not been the only users of the archives, they are the primary and dominant group. In the past, historians have had to engage in an interactive process to access original archival materials, involving both remote and face-to-face contact with archivists. Making archival materials accessible is the primary task of archivists. For a long time, to provide archival services to users, archivists have interacted with them in various ways, including written (such as paper and email) and telephone inquiry services. The advent of online databases and finding aids has helped archivists reduce the workload of providing information about archival materials, as users can find answers themselves without archivists' assistance. What does it mean by online access? Online access involves accessing online information about archival materials (through websites, finding aids, and catalogs), as well as accessing digitized surrogates of physical and born-digital materials. (Duff, 2010).

Archivists' work is to satisfy researchers' and users' needs and requests. In providing services, archivists face various challenges related to the nature of the materials and their management, as well as the interaction between users and archivists. (McCausland, 2011). The reference work of an archivist to provide archival services includes conducting reference interviews, negotiating questions, defining and refining search strategies, interpreting finding aids, and offering advice on tools and services. (Duckett, 1998).

The interaction between archivists and users is less frequent as users now independently find information and records online. The Internet, with its promise of instantaneous access wherever you are and whenever you like, requires archivists to better understand users' information needs and research methods. To meet users' needs and requests, archivists must become more user-oriented and adapt to new technologies. (Cox et al., 2007). Over the last two decades, some larger archival institutions have made significant progress in the transition toward online access, from initial efforts to put finding aids online to providing access to the results of substantial projects to digitize high-use, high-demand physical records.

The HLA has pursued the goal of further aligning its current and future offerings with users' needs. User studies have been presented at every annual conference. The received results served as a point of reference for improving the service. HLA has offered training courses and consultation hours on Arcinsys for interested users since 2017. As a result, users were prepared to work in the archives and with authentic sources.

8.5.3. Technical Standardization and System Integration

Based on the analysis provided earlier, two fundamental challenges emerge in digital long-term archiving. The first problem concerns the precise preservation of the binary data stream, which is a sequence of zeros and ones. Preserving the data medium alone is insufficient, since the data itself must remain unchanged. The second challenge is the requirement for machines to interpret the binary data stream, which necessitates the use of specialized hardware and software. However, given the rapid pace of technological advancements, computer systems, operating systems, and file formats undergo frequent replacement, thereby rendering earlier binary data streams incompatible with newer ones.

To address the challenges of digital long-term archiving, several solutions must be implemented. First and foremost, it is crucial to preserve the integrity and authenticity of digital documents over an unlimited period of time. This can be achieved by using file formats such as PDF, TIFF, TXT, CSV, and XML, which ensure digital records remain permanently readable. When one of these formats becomes unstable, the affected data can be migrated to a new format, ensuring that the archived information is preserved even if the original file is no longer available. A controlled data storage and management software program should also be implemented to regularly check the archived digital documents for changes and verify their integrity. Additionally, the management software for the digital archive should log all "lawful" changes to the archive materials, including migrations. A controlled and documented process should also be in place to ensure authenticity by transferring data from the issuing departments to the archive storage. By implementing these solutions, digital archives can

ensure the longevity and accessibility of their collections, preserving them for future generations to access and study.

Achieving long-term digital document preservation requires an optimal technical concept, which can be developed through market observation and continuous technology advancement (“technology watch”). Automated migration of large datasets and consideration of metadata's role in controlling conversion processes can help identify reusable technical procedures. Additionally, quality criteria and certification procedures must be established for archiving systems, especially if they are to be operated with shared responsibility, to ensure compliance with technical standards.

When the data carrier and the data are not fixedly connected, the data can be transferred to another data carrier. Unlike analog media, the efforts of digital preservation do not prioritize the conservation of the physical data carrier through measures such as cooled storage rooms or acid-free paper. Instead, the focus is on copying the data to new carriers before any signs of deterioration emerge that could alter the binary data stream. While the durability of the data carrier must still be considered for reliable planning of regular copying, this approach prioritizes the preservation of the data itself. However, for digital files in outdated formats that are no longer compatible with current systems, preservation efforts may be rendered futile. Despite the binary stream being perfectly preserved through regular recopying, the file may become unusable without appropriate measures to address format obsolescence.

Two approaches have been developed to address the issue of handling digital files in obsolete formats: *migration* and *emulation*. Migration involves converting the file to a new format using auxiliary programs, but this process requires constant risk assessment and timely action to ensure the content remains equal. Emulation, on the other hand, involves simulating an obsolete system on a current system using specialized software known as an emulator. This approach offers the advantage of requiring only one emulator per old system, after which any number of old files can be interpreted with it without further effort. However, developing a new emulator for each new system can be

complex and challenging, particularly if it is expected to replicate all the original system's functions with accuracy.

The methods described require considerable ongoing effort and often fail to ensure the problem is solved. However, there are suitable measures to mitigate the problem, allowing it to be introduced gradually across many applications.

8.6. Summary

This chapter has proposed a future archival model for Vietnam based on the findings of the comparative analysis and the broader transformations associated with computerization, digital governance, and emerging technologies. The discussion demonstrates that the future development of archives cannot be understood solely as a process of technological modernization. While digitization, born-digital records, artificial intelligence, cloud computing, and online access are important drivers of change, their long-term impact depends on the institutional environments within which they are implemented and sustained.

The analysis identified several foundational conditions shaping future archival development, including administrative reform, digital governance, technological innovation, open access, and evolving user expectations. Drawing upon transferable insights from the German experience, the chapter argues that successful archival transformation requires more than technological investment. It depends equally on governance coordination, lifecycle integration, professional development, institutional capacity, and sustainable organizational arrangements. Building upon these findings, the chapter proposed the concept of the hybrid archive as a future model for Vietnam. In this dissertation, hybrid archives are understood not simply as the coexistence of analog and digital records but as an integrated institutional and governance framework that combines records management, digital preservation, public access, professional expertise, and inter-institutional cooperation within a coherent archival system. From this perspective, hybrid archives represent a

long-term institutional form capable of balancing historical continuity with technological innovation.

The chapter further emphasizes that the future of archives lies not in replacing traditional archival principles but in adapting them to new technological and societal environments. Consequently, the long-term success of archival transformation in Vietnam will depend not only on technological progress but also on the capacity of archival institutions to strengthen governance structures, professional competencies, organizational resilience, and collaborative networks. The proposed hybrid model, therefore, provides a strategic framework through which Vietnam can pursue sustainable archival development while responding to the challenges and opportunities of the digital age.

CHAPTER IX. CURRENT AND EMERGING TRENDS IN ARCHIVAL SCIENCE

9.1. Introduction

The field of archival science is undergoing a profound transformation, driven by an unprecedented confluence of technological innovation, evolving societal expectations, legal reforms, and the accelerating digitalization of information. Archives are no longer viewed merely as custodians of static historical materials. Still, they are increasingly conceptualized as dynamic information infrastructures that underpin governance, democracy, cultural memory, and public accountability in the digital age. This chapter examines current and emerging trends reshaping archival science globally. These trends are not isolated phenomena, but rather part of a systemic shift that affects how archives are conceptualized, managed, accessed, and preserved. The chapter synthesizes technological developments, such as artificial intelligence, blockchain, big data analytics, and cloud computing, alongside broader shifts in archival theory, professional competencies, and governance models.

From my own research experience, both during my time working within the Vietnamese archival system and observing the German model, it has become increasingly clear that the future of archives is no longer simply a matter of digitizing collections. It is a matter of fundamentally redefining the identity and function of archives in a networked, data-driven society. This shift is not optional, but existential: archives must evolve or risk becoming obsolete.

Technological innovation stands at the forefront of the transformation currently reshaping archival science. The traditional functions of archives, namely acquisition, appraisal, preservation, description, and access, are being redefined by the rapid adoption of digital tools, infrastructures, and emerging technologies. These technologies do not merely automate existing processes; they fundamentally alter how records are created, managed, preserved, and made accessible.

This chapter examines the key technological trends driving the global evolution of archival science, with a specific focus on their implications for both Germany and Vietnam.

9.2. From computerization to digital transformation in archives

According to the Ministry of Information and Communications of Vietnam, *"Computerization, also known as the application of information technology, is the digitization of existing business processes. Computerization does not change processes or operational models. When computerization reaches a high level that leads to changes in processes or operational models, it is called digital transformation"* (Ministry of Information and Communications, 2021, p. 21). From a technological perspective, digital transformation is the next stage of computerization, made possible by groundbreaking advancements in emerging technologies, particularly digital technology (Ministry of Information and Communications, 2021, p. 21).

It can be affirmed that the emergence of digital transformation in archiving, in technological terms, did not occur instantaneously but rather resulted from a process of technological accumulation and breakthrough. This process can be divided into three main stages: Computerization of archival work, Digitization, and Digital Transformation.

From a societal perspective, the rapidly growing demand from individuals and organizations for fast, flexible, and unrestricted access to information, both in terms of space and time, has become a significant driver of governments' efforts to reform public services, including the archival sector. In the process of building e-government and digital government, digital transformation in archiving has become an indispensable requirement to enhance transparency, improve management efficiency, and improve service quality.

In response to internal needs, digital transformation is both a solution and an imperative in today's turbulent context. For instance, when the COVID-19 pandemic broke out, the need to maintain operations under remote working conditions compelled archival agencies to accelerate the adoption of technology

to digitize workflows and deliver archival services flexibly. Currently, digital records are gradually replacing paper records in the operations and activities of government agencies, organizations, and enterprises. This poses a significant challenge for traditional archival systems, which have primarily handled paper-based records. In this context, digital transformation has become a mandatory requirement for archival institutions to sustain and enhance their role and position in society.

In summary, digital transformation in archiving did not emerge suddenly but is the cumulative result of long-term practical needs, technological innovation, and reforms in information management. It represents an irreversible trend in the modernization journey of the national archival system.

On June 3, 2020, the Prime Minister issued Decision No. 749/QĐ-TTg approving the *National Digital Transformation Program to 2025, with Orientation to 2030*, affirming the vision that by 2030 Vietnam will become a stable and prosperous digital nation, pioneering the trial of new technologies and models; fundamentally and comprehensively renewing the Government's management and administration, business operations of enterprises, and the way people live and work; and developing a safe, humane, and widespread digital environment (Government, 2020).

According to the *Digital Transformation Handbook 2021* published by the Ministry of Information and Communications, *"Digital transformation is the transformation of an operational model based on digital technology and digital data"; "it is the digitization of an entire organization, creating new processes, new organizational models, new methods of delivering services, or providing entirely new services"; "it is a comprehensive and fundamental change for individuals and organizations in the way they live, work, and produce, based on digital technologies"* (Ministry of Information and Communications, 2021, pp. 21, 23).

In the archival sector, digital transformation extends beyond the digitization of physical records to encompass the restructuring of workflows, reorganization of archival service delivery methods, and the creation of a user-

centered digital information ecosystem. Digital transformation has become an inseparable part of archival operations, as it has in many other aspects of modern life. Its far-reaching impact requires not only technical adaptation but also a comprehensive redefinition of the archival function toward full digital integration. Concepts such as the "virtual reading room," once purely hypothetical, have become a reality, reflecting the public's growing expectation of fast, convenient access to diverse information through the Internet (Regina Rößner, 2017, p. 9).

These developments underscore the growing intersection of digital technology and archival science, underscoring the need for comprehensive, long-term strategies, specialized human resource training, and a user-centered approach to digital archival transformation. It is essential to note, however, that the scope of digital transformation in archives extends beyond the technical dimension to encompass organizational, legal, human resource, and digital culture aspects. Among these, ensuring the integrity, authenticity, and long-term accessibility of digital records remains a core principle.

9.3. Drivers of Digital Transformation in Archiving

Digital transformation in archiving is not merely a reaction to technological change; it is the result of a combination of multiple internal and external drivers within the archival sector. From the analysis of its origins and scope, several key factors can be identified:

First, the advancement of digital technology is the most direct and consequential driver of change in the archival field. Digital technology (Ministry of Information and Communications, 2021, p. 24) is one of the core technological areas of the Fourth Industrial Revolution, encompassing cloud computing, big data, artificial intelligence (AI), blockchain, virtual reality (VR), and machine learning. These technologies are being applied to improve the processes of collecting, classifying, preserving, and providing access to archival records. The development of new data formats and electronic document management

systems (EDMS) has also enabled archives to digitize and manage large volumes of complex records more efficiently.

Second, changes in public governance models have become a significant driver of digital transformation in archiving. Advances in science and technology have prompted governments to adopt information technology to enhance efficiency in management, administration, and interactions with stakeholders and the general public. This has led to the emergence of new government models, including E-Government, Government 2.0, Digital Government, Mobile Government, and Open Government.

The core objective of these modern governance models is to manage and share information effectively between the government and stakeholders, while maximizing their participation and contributions to governmental activities. This, in turn, enhances governance effectiveness and ensures the principles of openness, transparency, and democracy through the exchange and sharing of information.

As a result, governments increasingly recognize that information management is a central task in building e-government and digital government. Within this framework, electronic records management strategies form an integral and foundational component in the design and implementation of e-government and digital government initiatives. Consequently, digital transformation in archiving has become an inseparable part of administrative reform and state modernization programs in many countries.

Third, the growing demand for information from society is a strong driver of digital transformation in archiving. In modern society, people expect to access archival information at any time and from anywhere. This creates pressure on archival institutions to provide online archival services, including web-based search systems, digital record access via online platforms, and integrated archival portals.

Fourth, supportive policies, regulations, and increasingly complete standards and legal frameworks are crucial conditions for ensuring the

feasibility of digital transformation in the archival sector. Regulations on digital archives, electronic records management, data security, privacy, and technical standards have helped create a stable legal environment for the long-term development of this field.

Finally, the internal needs of archival institutions themselves are a key driver for implementing and accelerating digital transformation in the archival sector. Digital transformation in archives plays a critical role in protecting and enhancing the value of archival materials. When records are digitized and converted into digital data, it not only minimizes physical deterioration caused by environmental factors such as temperature, humidity, and light but also makes storage and recovery of materials safer and more efficient.

Physical archival records are vulnerable to damage or loss over time, whereas digitization can safeguard them within digital storage systems with robust backup and recovery capabilities. Digitization also greatly facilitates the sharing and access of archival materials. As digitized archives become increasingly accessible, they underscore the crucial role and position of archival institutions in supporting interdisciplinary research and advancing education, especially amid rapid development in information and communication technology.

While numerous positive factors are driving the digital transformation of the archival sector, it is essential to acknowledge that, alongside opportunities, significant barriers and challenges remain. These include a shortage of human resources with the necessary professional expertise, incomplete or lagging legal frameworks, data security and safety issues, and, in particular, organizational mindsets and cultures that have yet to adapt to technological innovation. Identifying and accurately assessing these obstacles is a prerequisite for developing an effective, sustainable, and contextually appropriate digital transformation strategy for the archival sector.

9.4. Key Development Trends in Digital Transformation in Archiving

In today's rapidly changing information landscape, the archival sector faces numerous complex challenges. One of the core questions is: *How will archives institutions entrusted with preserving unique and highly valuable information resources evolve in the future?* To answer this, it is necessary to examine the relationship between archives and other stakeholders (such as state administrative agencies and users), while also reassessing the role and social significance of the archival profession.

Traditionally, archivists have viewed themselves as trusted custodians of records with well-established provenance; as such, values such as provenance, authenticity, and integrity have always been central to their mission. Consequently, compared to other information institutions such as libraries or museums, archives have tended to be more cautious in adopting new digital technologies. Furthermore, due to their specialized nature, archival activities have historically attracted limited public attention (Milena Dobreva, 2018, pp. 19–20). However, in the current context, archives increasingly aspire to become information hubs on par with libraries and other knowledge institutions. To strengthen their position in society, archives must gradually close the gap with users. Anchored in their mission to serve the public interest by preserving and ensuring access to cultural and intellectual heritage, archival institutions have a responsibility to digitize and publish their holdings online to enhance accessibility (Anna Sobczak, 2016, pp. 6–7).

In many countries, public archives are regarded as an integral part of a modern administrative system, serving both as a mechanism for managing administrative records and as a contributor to the development of the information society. Functionally, archives ensure the long-term preservation of valuable records to support state administration, provide legal and historical evidence, and act as a tool for citizens to monitor the effectiveness of government operations (European Union, 2006, p. 29). Within the triangular relationship between archives, government, and users, archives function as

institutions that guarantee transparency and accountability, values considered fundamental to a modern democracy.

Digital transformation in archiving is advancing rapidly in many countries and regions worldwide, driven by technological progress, societal needs, and modern information governance strategies. From the above analysis, we identify two prominent trends:

9.4.1. Application of AI and Disruptive Technologies in Archiving

The integration of artificial intelligence (AI), machine learning, blockchain, cloud computing, and big data analytics represents one of the most significant transformations in contemporary archival practice. However, these technologies should not be understood merely as tools for efficiency enhancement. Rather, they reshape core archival functions across appraisal, arrangement, description, preservation, and access.

Artificial intelligence (AI) and machine learning are becoming essential tools for managing and analyzing digital records. These technologies can assist in the rapid and accurate classification, search, and analysis of archival materials. Many advanced libraries and archival repositories have deployed machine learning systems to process large volumes of unstructured content, including videos, audio recordings, and images. AI also enhances semantic search and retrieval capabilities, enabling users to locate information based on meaning rather than simple keyword matching. The application of AI and machine learning (ML) is rapidly expanding in archival science, offering solutions to historically labor-intensive challenges. For example, automated metadata generation: AI models can analyze images, audio, and text to produce descriptive metadata at scale. Document recognition and classification: Natural Language Processing (NLP) enables the identification of entities, topics, and relationships within documents; Handwritten Text Recognition (HTR): AI now deciphers manuscripts, drastically accelerating digitization outputs; Semantic search and content discovery: ML models allow users to search based on meaning rather than exact keyword matches. Despite the potential of AI

applications in archives, in Vietnam, this technology remains unexplored, representing a significant missed opportunity to increase accessibility to historical records.

This shift introduces several structural risks. *First*, algorithmic bias may reinforce or distort representational patterns within archival collections. *Second*, automated classification processes may reduce transparency in appraisal and description decisions. *Third*, the opacity of machine learning models challenges archival principles of accountability and provenance.

Blockchain technology offers potential solutions to the perennial archival challenges of authenticity, integrity, and provenance: Immutable audit trails: Blockchain can provide tamper-proof records of document custody, transfer, and access; Smart contracts: These can automate aspects of archival permission, licensing, and digital rights management; Verification of authenticity: Particularly relevant for born-digital government records, ensuring they have not been altered. While such technologies can strengthen tamper-evidence mechanisms, they also raise questions regarding scalability, sustainability, and long-term compatibility with preservation environments. In Vietnam, blockchain is absent mainly from archival discourse, reflecting a lag in adopting frontier technologies.

Besides that, the shift toward cloud computing represents a paradigm shift in how archives manage storage, access, and scalability. Hybrid and multi-cloud architectures offer redundancy, disaster recovery, and flexible scalability. Archives are increasingly offering Archive-as-a-Service (AaaS) models, providing on-demand remote access and storage. However, without clear legal and governance frameworks, reliance on external service providers introduces dependency risks, data sovereignty concerns, and long-term contractual uncertainties.

Big Data Analytics in Archives: The growth of digitized and born-digital collections introduces big data dynamics into archival practice. Archives become sources not only of documents but of analyzable datasets, enabling historical

trend analysis, social pattern mapping, and computational research in the humanities and social sciences.

So, new technologies that could change the world need strong governance frameworks to go along with them. Three principles stand out to me as being especially important: Human-in-the-loop supervision to guarantee professional responsibility in automated decision-making; Making algorithmic processes that affect archival description and access clear; and keeping records of them and evaluating the adoption of technology based on risk, finding a balance between new ideas and long-term viability. In this situation, disruptive technologies should be judged not only on how well they work technically, but also on how well they fit with the archival principles of authenticity, reliability, integrity, and long-term accessibility.

9.4.2. The trend toward open data, open access, and open archives

Open archival policies are increasingly being developed to ensure that records of historical, cultural, and scholarly value are more widely accessible. This "open" trend in archiving reflects the growing demand for transparency in information, knowledge exploitation, and enhanced user access rights. Many archival institutions have launched online portals providing search tools, download options, and clearly defined policies on the use and reuse of archival data (for example, through Creative Commons licensing). Global collaboration in storing and sharing information resources is helping to create a worldwide archival network, narrowing the information access gap between countries and fostering cooperation among archives, libraries, museums, and research institutes to build open data ecosystems. Notable examples include the Archivportal-D in Germany and Europeana in Europe, which integrate resources from multiple cultural heritage institutions into unified, accessible platforms.

9.4.3 Trustworthy Digital Preservation and Standards

Beyond technological innovation, one of the most decisive global trends in archival development is the shift from digitization toward trustworthy digital preservation. While early phases of digital transformation focused primarily on

scanning and online access, contemporary archival governance increasingly emphasizes sustainability, authenticity, and auditability of digital repositories. Digitization, in itself, does not guarantee preservation. The long-term survival of digital records depends on structured ingest procedures, standardized metadata frameworks, format sustainability strategies, integrity verification mechanisms, and clearly defined preservation workflows. In this respect, digital archives must evolve from storage environments into governed preservation infrastructures.

International practice demonstrates that trusted digital preservation is grounded in several interrelated components: *First*, standardized ingest pipelines ensure that records entering archival repositories conform to defined Submission Information Packages (SIP), including metadata completeness, format validation, and integrity checks (e.g., checksums). Without such controls, long-term accessibility becomes uncertain. *Second*, metadata standardization plays a central role. Descriptive, structural, and preservation metadata must be systematically aligned to support authenticity verification and future migration processes. Metadata, therefore, is not merely descriptive but constitutive of digital preservation. *Third*, format sustainability strategies and migration planning are essential to mitigate technological obsolescence. Preservation environments must anticipate evolving software ecosystems rather than react to format decay after loss occurs; *Fourth*, auditability and documentation are critical. Digital repositories must be capable of demonstrating compliance with defined preservation standards through internal monitoring, logging, and periodic evaluation procedures. Trust in digital archives increasingly depends on demonstrable governance rather than implicit institutional authority.

This evolution reflects a broader conceptual shift: archives are becoming components of national information infrastructures. In such infrastructures, trust is constructed through standardization, transparency, and accountability mechanisms rather than solely through custodial tradition.

For Vietnam, this trend is particularly significant. While legislative reforms have established the legal basis for electronic records and digital repositories, operational standardization and audit mechanisms remain uneven across administrative levels. The transition from project-based digitization to trustworthy preservation infrastructure requires: Nationally harmonized metadata and ingest standards; Institutionalized quality assurance procedures; Periodic technical audits of preservation environments; Capacity building in digital preservation management.

Ultimately, trustworthy digital preservation is not a technological endpoint but a governance condition. It ensures that digital transformation enhances, rather than undermines, the archival mandate of preserving authentic and reliable records for future generations.

9.5. Ethical Frameworks

Develop ethical guidelines addressing the use of AI in archival description and access; the management of sensitive or marginalized histories in digital spaces; and the balancing of transparency with rights to privacy and cultural ownership. The implications for Vietnam are clear and profound. The global trends examined in this chapter are not distant developments but immediate signals of where archival science is heading. Vietnam stands at a critical juncture: Proactive engagement with these trends offers a path toward modernization, resilience, and global relevance. Neglecting them risks systemic obsolescence, data loss, and diminished societal value. Vietnam's archival future depends not merely on adopting digital tools but on a comprehensive transformation of law, governance, infrastructure, the workforce, and the public mission. The window for this transformation is open, but narrowing rapidly. This synthesis lays the intellectual and practical foundation for the concluding chapter, in which strategic recommendations for Vietnam's archival future are articulated in response to these challenges and opportunities.

9.6. Summary

This chapter has examined major contemporary and emerging trends shaping the future development of archives in the digital age. The analysis demonstrates that technological change extends far beyond digitization and should be understood as part of a broader transformation affecting archival governance, professional practice, institutional structures, and societal expectations. Emerging technologies such as artificial intelligence, blockchain, cloud computing, big data, and cybersecurity are reshaping archival processes, preservation infrastructures, access models, and information management practices. While these technologies create new opportunities for automation, accessibility, and long-term preservation, they also introduce new challenges related to authenticity, trust, sustainability, accountability, and digital governance.

At a broader level, the findings suggest that archives are undergoing a gradual transition from custodial repositories to complex information and data governance institutions. Archives are increasingly embedded within wider ecosystems of digital government, information infrastructures, open data initiatives, civic participation, and knowledge societies. Consequently, the future of archives cannot be understood solely in technological terms. It also involves the reconfiguration of archival functions, professional identities, governance arrangements, and relationships with external actors, including technology providers, public administrations, and users.

The implications for Vietnam are therefore both technological and institutional. While continued investment in digital infrastructure remains important, long-term success will depend equally on the capacity of archival institutions to adapt their governance structures, strengthen professional competencies, support inter-institutional coordination, and develop sustainable frameworks for digital preservation and access. The findings further suggest that the future relevance of archives will increasingly depend on their ability to balance technological innovation with legal accountability, public trust, cultural memory, and information governance responsibilities. Ultimately, the chapter

indicates that the future of archives is not simply a question of technological modernization. Rather, it represents a process of institutional evolution in which archival organizations continuously adapt to changing technological, organizational, and societal environments. This perspective provides an important foundation for the concluding discussion presented in the next chapter.

CHAPTER X. CONCLUSION AND RECOMMENDATIONS

10.1. Introduction

The computerization of archives in Germany has a long history, dating back to the 1960s and 1970s, when early computer systems were first introduced to manage archival records. Over time, advances in technology have led to increasingly sophisticated systems for digitizing and preserving historical documents, as well as improving access to them for researchers and the general public. Today, many archives in Germany are working to digitize their collections and provide online access to their holdings, making it easier for people to access and study historical records from the comfort of their own homes. However, the process of digitization and computerization is ongoing and requires significant investment, as well as careful consideration of issues such as data privacy, preservation, and access. (Andreas Berger, 2015a, p. 23). The spread of digital media and the increasing volume of digital records have led to a new problem area: digital long-term archiving, which involves the preservation and accessibility of digital content. This issue has received increasing attention in recent years.

This dissertation set out to examine the impact of computerization on archival development in Vietnam and to draw lessons from the German experience, particularly within the context of digital transformation and long-term digital preservation. The central research problem was not merely technological adaptation, but institutional transformation: how computerization reshapes archival governance, professional practice, and public access. The findings demonstrate that computerization extends far beyond digitization. In both countries, it has redefined archives from custodial institutions managing physical records to complex information infrastructures embedded within digital government ecosystems.

Chapter X synthesizes the main findings of the dissertation, acknowledges its limitations, and outlines directions for future research. By revisiting the research questions and consolidating comparative insights, the chapter clarifies

how this study advances the understanding of digital archival transformation in transitional governance contexts.

10.2. Presentation of main research findings

With a focus on the Vietnamese National and Provincial Archives and the State Archives of Hessen, this dissertation provides a comprehensive picture of Vietnamese and German archival practice in the context of digital technologies.

Computerization has brought both opportunities and challenges to the archives. The advantages can be improved accessibility, enhanced organization, increased efficiency, better preservation, and remote access. Computerization makes it easier for researchers and the public to access archival records, as they can be made available online or through a computer system. It allows remote access to archival records so that researchers and the public can access them without being present at the archives. Computer systems can store and organize large amounts of data, making it easier to locate specific documents and information. Moreover, computerization can automate many manual processes, such as cataloging, indexing, and preservation, saving time and reducing errors. Digital formats are more durable and less susceptible to physical decay than analog materials, leading to longer preservation. Besides the opportunities that computerization can bring to the archives and archival work, the challenges are also considered in terms of cost, technical complexity, digital preservation, format obsolescence, security, legal and policy issues, and user adoption. It is realizable that computerization is expensive, requiring significant investments in hardware, software, and personnel. Managing and preserving digital records can be technically complex, requiring specialized knowledge and expertise. Ensuring the longevity of digital records is a significant challenge; therefore, ongoing investment in technology and resources is necessary. Furthermore, digital formats can become obsolete over time, making it difficult to access and preserve older records. Digital records are vulnerable to security breaches and loss, requiring robust security measures to protect sensitive information. Computerization raises significant legal and policy issues, including privacy, intellectual property rights, and access to information. Lastly, to ensure that

users effectively utilize digital archives, they must also possess the necessary skills and knowledge in the digital world. Although both opportunities and challenges were examined in the context of computerization in Vietnamese and German archives, it is worth noting that the former refers to how the archives fulfill their roles and missions. The latter involves new tasks the archives must undertake, specifically dealing with new types of records, namely electronic records (digitized and born-digital). We concluded that digitization and digital archiving have been ongoing efforts to help archives achieve their goals, though they face obstacles. It is indisputable that managing electronic records is the biggest challenge that records managers and archivists face, regardless of whether they work in the private or public sector, or in large or small organizations. Given this field's dependence on technology, we can see that the challenge also confronts IT and technical managers, as well as developers. Indeed, everyone in this sector faces this challenge, as the norm today is for each employee to have a PC at their desk to work with electronic records. Managing electronic documents is a complex undertaking because it involves creating, capturing, organizing, and providing ongoing access to them.

The digital age has brought about significant changes to the nature and management of archives. It requires a re-evaluation of traditional archival theories and principles to ensure the practical preservation and accessibility of digital records for future generations. The rise of computerization has had a profound impact on archival theory, leading to a shift from traditional, paper-based archives to digital archives. This shift presents both challenges and opportunities for managing, preserving, and accessing archival materials. Digital records are more vulnerable to alteration, corruption, and loss compared to their physical counterparts, which are generally considered more authentic and reliable. However, digital archives offer enhanced access, with metadata and artificial intelligence enabling sophisticated management and description. The proliferation of born-digital records has prompted a reconsideration of the archive's role in society and raised privacy concerns. New authenticity standards and preservation strategies are needed to ensure the reliability of

digital records and preserve cultural and historical information for future generations. The ongoing challenge of maintaining the authenticity of digital records requires continuing investment and attention.

Information and memory institutions, in general, and archives, in particular, are in the public interest. Archival work determines the visibility of history and how history is written and experienced. The project focuses on the impact of computerization on archives and archival work. Archives in the digital age have shown that the future of archives is open, transparent, and participatory. (Benoit, 2019). Archives and the processes of collecting, indexing, and categorizing materials are closely interrelated with political, economic, cultural, social, scientific, and technological developments. The collection, selection, classification, accessibility, and use of historical sources are determined by many decisions and contexts. In the digital age, participatory and transparent forms of collecting, generating data, and presenting historical sources can initiate radically new ways of writing history and stories. This also means opening up archives to the general public and involving the public in collecting and describing historical sources through new forms of communication. In the wake of computerization, we found that cooperation among archives, researchers, the public, and users has become more critical and closer. The key terms to discuss archives in the digital age are participation, transparency, and cooperation.

Digital transformation in archives is fundamentally a governance transformation, not merely a technological shift. Computerization alters archival workflows, metadata practices, and access systems; however, its deeper impact lies in restructuring institutional authority, accountability mechanisms, and lifecycle management responsibilities. Sustainable digital archives require coherent alignment between legal frameworks, technical standards, and organizational coordination. In Germany, digital archival development evolved within established governance structures emphasizing procedural standardization and cooperative infrastructure. In Vietnam, rapid normative reform has established a legal basis for digital records, yet operational

consolidation remains uneven. The comparison demonstrates that technological capability alone does not ensure institutional sustainability; governance architecture is the decisive variable.

Digital long-term preservation is the practice of preserving digital information beyond the lifespan of current hardware and software, as outlined in the Open Archival Information System (OAIS) standard. To address this issue, the DIMAG cooperation group aims to develop technical solutions that enable the practical preservation of digital data. The DIMAG software package can perform all essential tasks for digital long-term preservation, including preparing digital data for transfer and migration. (Laux, 2019). Long-term digital preservation is a complex and multifaceted endeavor that requires ongoing investment in hardware, software, expertise, and infrastructure. While collaboration among institutions can help to distribute costs and mitigate risks, several challenges must be overcome to make such cooperation effective. One of the most significant challenges is the lack of common standards for digital preservation. Institutions may use different file formats, software, and storage systems for their digital collections, making it difficult to exchange data and ensure long-term preservation. The lack of common standards can also create challenges when collaborating on shared projects or initiatives, making it difficult to develop consistent workflows and best practices. Another challenge is resource constraints. Many institutions may lack the financial, technical, or human resources needed to invest in digital preservation, or may prioritize other areas of their operations over preservation. This can create disparities among institutions and limit opportunities for collaboration. Legal and ethical issues also pose challenges to cooperation. Digital collections may contain sensitive or copyrighted materials, and institutions may have different policies or legal frameworks for managing these materials. This can create challenges when collaborating on shared collections or initiatives, and may require careful negotiation and coordination among participating institutions. Organizational culture and practices can also create barriers to collaboration. Institutions may have different approaches to digital preservation and may not always prioritize

collaboration or information sharing. This can create challenges in developing shared strategies and best practices, and may require cultural and organizational change within participating institutions. Finally, communication and coordination pose significant challenges to collaboration. Effective collaboration in digital preservation requires clear communication, coordination, and trust among participating institutions. This can be challenging when institutions are geographically dispersed or when there are differences in language, culture, or organizational structure. However, by acknowledging and addressing these challenges, participating institutions can work together to develop effective and sustainable approaches to long-term digital preservation.

Trust is also a critical factor in collaboration for long-term digital preservation among institutions. Institutions must be able to trust each other to fulfill their commitments and follow best practices for digital preservation. Trust is built over time through communication, transparency, and collaboration. A critical aspect of trust in digital preservation is the development of shared standards and best practices. These standards provide a common framework for institutions to follow, ensuring that digital materials are consistently and sustainably preserved. Institutions that adhere to these standards are more likely to be trusted by other institutions, as they demonstrate a commitment to the long-term preservation of digital materials. Another critical aspect of trust is the ability to share resources and expertise. Institutions may have different levels of expertise in digital preservation and may be able to contribute other resources or capabilities to shared preservation initiatives. By working together and sharing resources, institutions can build trust and develop more effective preservation strategies. Finally, trust is built through ongoing communication and collaboration. Institutions must be willing to share information, coordinate their efforts, and collaborate to address common challenges. By fostering a culture of cooperation and trust, institutions can ensure their digital collections are preserved and accessible to future generations.

Lifecycle integration is the decisive condition for long-term digital preservation sustainability. The comparative evidence indicates that archives

functioning solely as downstream receiving institutions face increased risks of format incompatibility, metadata loss, and preservation inefficiency. Sustainable digital archiving requires early archival involvement in records creation, system design, and metadata configuration. Germany's experience demonstrates structured integration of archival expertise into administrative workflows. In Vietnam, while lifecycle principles are formally recognized, practical coordination between record-creating agencies and archival authorities varies significantly across administrative levels. The finding confirms that preservation sustainability depends less on storage volume and more on lifecycle governance integration.

Normative modernization does not automatically guarantee operational coherence. Vietnam has achieved significant legislative advancement, particularly through updated archival regulations recognizing electronic records and digital repositories. However, discrepancies between formal regulation and technical implementation reveal a structural gap between normative ambition and institutional capacity. Germany illustrates a contrasting trajectory: incremental legal adaptation accompanied by continuous operational standardization and cooperative system development. The key lesson is that legal reform must be complemented by enforceable technical standards, interoperability protocols, and implementation oversight mechanisms. This finding highlights the importance of governance consolidation in the next phase of Vietnam's digital archival development.

Furthermore, archives are increasingly adopting the principles of openness, particularly in the context of electronic devices and holdings. Open access, open software, and open standards are becoming more prevalent, enabling unrestricted access to archival materials (within the constraints of relevant licenses and agreements) while reducing reliance on proprietary software and standards. Notably, German archives have demonstrated their capacity to develop their IT solutions, such as DIMAG, in partnership with public computing centers. This approach enables archives to take on a more proactive role as guardians of information freedom and transparency, overseeing the

processes of creation, processing, and management. Historically, archives have not fully assumed this role, underscoring the importance of this shift toward openness. This trend highlights the increasing importance of democratizing access to archival materials and ensuring their preservation for future generations.

It is generally agreed that before computerization, archives were primarily focused on their relationships with public agencies, rather than with users. At that time, archives were viewed as passive repositories of records, with their primary role being to acquire and preserve records from public agencies for future use by historians, researchers, and other scholars. Users were not viewed as active partners in the archival process, and their needs and interests were not always prioritized. However, since the mid-1980s, there has been a gradual shift in how archives view their relationships with users. Archives have become more aware of the importance of user engagement and have placed greater emphasis on outreach, education, and public programming. Archives have also become more responsive to users' needs and interests, developing new strategies to make archival materials more accessible and usable. One key driver of this shift has been the rise of digital technologies, which have made it easier for archives to share their collections with a broader audience. Digitization has enabled archives to make their collections available online, thereby expanding access to archival materials and making them more easily searchable and discoverable. Archives have also utilized digital technologies to develop new tools and platforms for engaging with users, including online exhibits, educational resources, and social media. Overall, while there is still much work to be done to make archives more user-centered, it is clear that a significant shift has occurred in how archives view their relationships with users since the mid-1980s. Archives are increasingly recognizing the importance of user engagement. They are taking steps to develop new strategies and tools to engage users and make their collections more accessible and usable.

It is widely recognized that archives in Vietnam should design an integrated website or portal to serve as a professional repository of databases

and digitized and born-digital items that can be made available to users on the internet. Such a website or portal can provide a central location for users to access archival materials and help archives better manage and organize their collections. By creating a central repository of archival materials, archives can facilitate easier discovery and access to their collections. The website or portal can be designed to provide a user-friendly interface that makes it easy to search and browse archival materials, and can include tools and resources to help users understand how to use the materials they find. In addition to providing access to digitized and born-digital items, the website or portal can also serve as a platform for collaboration and communication among archives. Archives can utilize the platform to share information, best practices, and resources, as well as to collaborate on joint projects or initiatives. This can help to foster a sense of community among archivists and can lead to more effective and sustainable preservation and access strategies. Of course, there are many challenges to designing and implementing a website or portal for archival materials. Archivists must consider issues such as copyright, privacy, and data security, and must ensure that the website or portal is accessible to all users, including those with disabilities. However, with careful planning and investment, archives in Germany can create a website or portal that serves as a valuable resource for users and helps to promote the long-term preservation and accessibility of archival materials. The availability of digital archives has dramatically expanded the range of materials that researchers can access from the comfort of their own homes or offices. Digitized archives can often be searched using keywords, which can save researchers time and effort in locating relevant materials. Furthermore, the ability to access archival materials online has facilitated the development of new research methods and approaches, such as text mining and distant reading. Researchers can use software tools to analyze extensive collections of digitized materials, identifying patterns and trends that might not be apparent from reading individual documents. That being said, there are still limitations to using archival materials exclusively online. Some archives may not have been digitized or may have limited digital access, which can restrict

researchers' ability to explore specific topics fully. Additionally, online archives may not always provide high-quality reproductions of original documents, which could limit the accuracy and completeness of research findings. Finally, some researchers may prefer to work with physical materials for various reasons, such as the tactile experience of handling historical documents or the ability to view multiple documents side by side.

Providing users with 100% online-access to archival materials is currently an unattainable goal. Digitization processes require decades or even a century to complete. While online access is the future of archives, traditional services continue to be an essential aspect of any archive. So, "*hybrid*" will be a model of the current and years to come archives.

The expansion of electronic services has expanded the user base beyond those in traditional reading rooms, as evidenced by past experiences with German archives. Users can search archive records using essential tools like databases before visiting them, and examine the contents of such documents using samples from digitized fonds. Sometimes, casual users who would never have considered visiting archives end up there because relevant search results from the Internet have appeared. Additionally, they are more inclined to utilize them online, reducing the number of trips to archives and providing them more freedom to research at convenient times and locations. In the distant future, electronic access could replace the conventional way of accessing records in a research room. Understandably, before implementing models, Germans often examine developments in other countries, engage in discussions about pressing issues, and develop models and criteria for the models' growth. This trend is demonstrated historically by the way German archives have adopted new technology.

Managing electronic records is a global phenomenon. However, countries on different continents are at varying stages of development in responding to the challenge, which continues to evolve as technologies develop and organizations change. Managing electronic records involves multiple roles, an extensive range of aspects that cover organizational, technical, and legal issues, and ongoing exploration and investigation to achieve and share greater

effectiveness and efficiency. To be successful, these elements must come together in holistic solutions at both the strategic and operational levels.

Theoretically, beyond its empirical comparison of Vietnam and Germany, this dissertation contributes to the theoretical understanding of digital transformation in archival science in three principal ways. *First*, this study advances the conceptual understanding of computerization by reframing it as an institutional governance transformation rather than a purely technological process. *Second*, the dissertation contributes a structured comparative analytical framework for examining digital archival systems across national contexts. The five-dimensional framework: Technological readiness, legal and policy framework, institutional and organizational capacity, professional development, and online access and user engagement, provides a systematic model for assessing digital archival maturity. *Third*, this dissertation introduces the concept of a Hybrid Archival Model tailored to transitional digital contexts (Chapter VIII).

10.3. Limitations of the Study

While this dissertation provides a structured comparative analysis of digital archival transformation in Vietnam and Germany, several limitations should be acknowledged. *First*, the comparative scope of the study is institutionally selective. The German case analysis focuses primarily on selected state-level archival institutions and cooperative digital preservation models, rather than encompassing the full diversity of archival systems across all federal states. Although these cases are representative of broader governance patterns, regional variations within Germany may exhibit additional nuances not fully captured in this study. *Second*, the Vietnamese context presents inherent structural asymmetries across administrative levels. While national legal reforms and strategic frameworks have been analyzed comprehensively, implementation conditions vary significantly among provinces. The empirical data, particularly interviews and document analysis, reflect these disparities but cannot exhaustively represent the operational realities of all local archival

institutions. *Third*, the study relies primarily on qualitative methods, including semi-structured interviews, policy analysis, and institutional documentation. Although this approach enables in-depth institutional insight, it does not provide large-scale quantitative measurement of digital archival maturity, cost efficiency, or performance indicators. Future research employing mixed-method or quantitative evaluation frameworks could further validate and expand upon the findings presented here. *Fourth*, technological development in the field of digital preservation evolves rapidly. Emerging tools in artificial intelligence may significantly alter archival practice within a short time horizon. As such, certain technological assessments presented in this dissertation may require periodic reassessment as digital infrastructures continue to evolve. *Fifth*, the comparative dimension is shaped by structural differences between Germany's federal administrative system and Vietnam's centralized governance model. While the study carefully avoids direct institutional transplantation, the transferability of governance mechanisms must always be interpreted within contextual constraints.

Despite these limitations, the comparative framework, empirical evidence, and governance-oriented analysis developed in this dissertation provide a coherent foundation for understanding digital archival transformation in transitional contexts.

10.4. Suggestions for further research

Collaboration is widely acknowledged as an essential component of digital transformation in the archival sector, as it enables institutions to share resources, knowledge, and expertise, and to develop effective and sustainable approaches to long-term digital preservation. However, as the number of partners involved in collaborative projects grows, new challenges and complexities arise that need to be addressed. One example of this is the DIMAG collaboration, a network of German state archives, municipal archives, and other archival institutions that use the DIMAG system for digital preservation. With the participation of numerous institutions both in Germany and abroad,

coordinating and implementing the diverse needs and requirements of the network is a difficult organizational task. To address this challenge, the DIMAG network has adapted its organizational structures to facilitate communication, collaboration, and information-sharing among participating institutions. However, further research and development are needed to ensure that the network can continue to meet the evolving needs and expectations of its partners. Specifically, the division of labor in a significant association remains a tough challenge for DIMAG, as it requires balancing the diverse and sometimes conflicting priorities and interests of participating institutions while ensuring the overall effectiveness and sustainability of the collaboration. Therefore, ongoing research and adaptation will be critical for DIMAG to continue to serve as a model for effective and sustainable collaboration in the digital transformation of archival practices.

The advent of computerization and digital information management has profoundly impacted archives, transforming how they store, manage, and make their data accessible to the public. With the digitization of selected holdings, archives have become increasingly engaged in the process of digitization and are now making their stored data more accessible than ever before. This has been made possible through the application of new technological solutions, which have made archives more visible online, thereby changing their perception and image in society. As a result of this increased visibility, archives are evolving into increasingly user-friendly and open institutions, attracting not only regular visitors, such as active record creators, academics, and civil servants, but also new users who have never had contact with such institutions. These new users are often drawn to archives through search results when browsing the Internet, yet, despite their growing numbers, they have received little consideration in the past. It has been assumed that these new users are competent in accessing and using archives. Still, the reality is that they are often inexperienced and lack knowledge of the rules for using archival holdings. Given this, a suggestion for future research is to adopt different approaches to serving and educating these new users. This requires the development of finding aids and electronic services

that are user-friendly and accessible to those with little or no experience. By doing so, archives can ensure that their holdings are accessible to a broader audience and that their historical and cultural heritage is preserved for future generations (Sobczak, 2016b, pp. 22–23).

10.5. Summary

The digital transformation of archives is often framed primarily as a question of technological modernization. This dissertation has argued that such a perspective is incomplete. Computerization does not merely digitize records or automate archival processes; it reshapes the institutional foundations upon which archives operate. Through a comparative analysis of Vietnam and Germany, the study has demonstrated that technological change produces different outcomes depending on governance arrangements, organizational structures, professional capacities, and institutional environments.

The findings suggest that archives are undergoing a profound transformation in their functions, responsibilities, and societal roles. In the digital age, archives increasingly operate as components of broader information and data governance infrastructures. They remain institutions of memory, authenticity, accountability, and cultural heritage, but they also assume new responsibilities related to digital preservation, information governance, cybersecurity, data stewardship, and public access. Consequently, the future development of archives cannot be understood solely through the lens of technological innovation.

For Vietnam, the path forward is shaped by a distinctive combination of rapid normative modernization and uneven institutional capacity. The comparative insights derived from Germany do not imply institutional imitation. Rather, they highlight a number of transferable principles, including lifecycle integration, cooperative governance, professional coordination, organizational resilience, and long-term institutional consolidation. These principles informed the development of the Hybrid Archival Model proposed in this dissertation. The study further argues that hybrid archives should not be understood simply as a

combination of analog and digital records. Instead, they represent a future institutional form through which archival organizations integrate traditional archival functions with emerging responsibilities associated with digital governance and information stewardship. In this sense, hybrid archives provide a framework for balancing continuity and change, preserving established archival principles while adapting to evolving technological and societal environments.

Ultimately, the future of archives is not determined by technology alone. Emerging technologies such as artificial intelligence, cloud computing, blockchain, and automation will continue to influence archival practice, but their long-term significance will depend upon how archival institutions adapt their governance structures, professional cultures, organizational arrangements, and public missions. The future of archives is therefore not simply a technological future; it is a process of institutional evolution. Understanding this interaction between technological innovation and institutional adaptation constitutes the central contribution of this dissertation to contemporary archival scholarship.

REFERENCES

Allinson, J. (2006). OAIS as a reference model for repositories. *Education*, 1–17. http://eprints.whiterose.ac.uk/3464

Andrea Roenz. (2018). Social Media in deutschsprachigen Archiven – der momentane Stand der Dinge. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 41–43.

Andreas Berger. (2015a). Digitalisierung eines ganzen Archivs? Strategien zur Auswahl, Priorisierung und Durchführung von Massendigitalisierungen . In Irmgard Christa Becker & Stephanie Oertel (Eds.), *Digitalisierung im Archiv – Neue Wege der Bereitstellung des Archivguts. Beiträge zum 18. Archivwissenschaftlichen Kolloquium der Archivschule Marburg* (pp. 23–32). Archivschule Marburg.

Andreas Berger. (2015b). Planung und Aufbau einer Digitalisierungswerkstatt am Beispiel Köln. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 238–241.

Antje Diener-Staeckling. (2018). Wie entwickele ich eine Social-Media-Strategie für mein Archiv? – oder: Die optimale Kosten-NutzenRechnung. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 28–31.

Antje Diener-Staeckling, Dagmar Hovestädt, Joachim Kemper, & Patricia Lenz. (2022). Deutsche Archive im digitalen Zeitalter: Partizipation, Offenheit, Transparenz. In Antje Diener-Staeckling Dagmar Hovestädt Joachim Kemper Patricia Lenz (Ed.), *Budrich Academic Press*. Budrich Academic Press: Opladen • Berlin • Toronto . https://medium.com/@arifwicaksanaa/pengertian-use-case-a7e576e1b6bf

Appelbaum, S. H. (1997). Socio-technical systems theory: an intervention strategy for organizational development. In *Management Decision* (Vol. 35, Number 6). https://doi.org/10.1108/00251749710173823

Archivschule Marburg. (2015). *Terminologie der Archivwissenschaft https://www.archivschule.de/uploads/Forschung/ArchivwissenschaftlicheTerminologie/Terminologie.html (Accessed on 18.08.2019)*.

Arnold, K. (2015). Europas Kulturgut online – Die Europeana. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 24–27.

Ashworth, R., Boyne, G., & Delbridge, R. (2009). Escape from the iron cage? Organizational change and isomorphic pressures in the public sector.

Journal of Public Administration Research and Theory, *19*(1). https://doi.org/10.1093/jopart/mum038

Astrid B. Mueller. (2015). Die Deutsche Digitale Bibliothek – Kultur und Wissen online. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 20–21.

Atherton, J. (1985). *From Life Cycle to Continuum. Some Thoughts on the Records Management-Archives Relationship*. *18*(January 1971).

Bailey, C. A. (1988). *Archival theory and machine-readable records : Some problems and issues by Catherine Aileen Bailey b. a, the University of British Columbia, 1986, a thesis submitted in partial fulfillment of the requirements for the degree of Master of Archival Studies*. (August).

Bailey, S. (2008). *Managing the crowd rethinking records management for the Web 2.0 world*.

Bastian Gillner. (2018). Offene Archive: Archive, Nutzer und Technologie im Miteinander. *ARCHIVAR. Zeitschrift Für Archivwesen*, (13–21).

Basu, P., & De Jong, F. (2016). Utopian archives, decolonial affordances: Introduction to special issue. *Social Anthropology*, *24*(1), 5–19. https://doi.org/10.1111/1469-8676.12281

Baxter, P., & Jack, S. (2015). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*. https://doi.org/10.46743/2160-3715/2008.1573

Beck, E. (2015). Pilotprojekt „Digitalisierung von archivalischen Quellen“ im Endspurt. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 231–232.

Becker, I. C., Gerald Maier, U., K., & Wolf, C. (2016). *Netz werken. Das Archivportal-D und andere Portale als Chance für Archive und Nutzung* (Irmgard Christa Becker, Gerald Maier, Karsten Uhde, & Christina Wolf, Eds.). Archivschule Marburg.

Becker, I. C., Haffer, D., Meier, R., & Uhde, K. (2025). *Born digital – neue Archivaliengattungen und ihre Bearbeitung im Archiv* (I. C. Becker, R. Meier, D. Haffer, & K. Uhde, Eds.). Beiträge zum 28. Archivwissenschaftlichen Kolloquium der Archivschule Marburg.

Becker, I. C., & Koal, V. (2017). *Archivisches Handeln.Strategien und Perspektiven unter dem Einfluss neuer Technologien* (Irmgard Christa Becker & Valeska Koal, Eds.). Archivschule Marburg.

Benoit, I. E., & E. A. (2019). *Participatory Archives: Theory and Practice*. Facet. doi:10.29085/9781783303588.

Bergmeyer Winfried, Dobratz Susanne, Hänger Andrea, Huth Karsten, Keitel, C., Klump, J., Dr. Korb, N., Rödig, P., & Rohde-Enslin, H. (2008). *nestor-Kriterien, Kriterienkatalog vertrauenswürdige digitale Langzeitarchive*. urn:nbn:de:0008-2008021802

Bikson, T. (1994). Organizational trends and electronic media - work in progress. *AMERICAN ARCHIVIST*, *57*.

Blecher, J., & Happ, S. (2013). *Archive im Verbund: Netzwerke und Kooperationen* (Jens Blecher & Sabine Happ, Eds.). Leipziger Unversitätsverlag.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2). https://doi.org/10.1191/1478088706qp063oa

Brown, C. (2018). *Archival future* (C. Brown, Ed.). Facet. doi:10.29085/9781783302192.

Bundesministerium des Inneren (BMI). (2014). *Digitale Verwaltung 2020*. 1–104. https://www.bmi.bund.de/SharedDocs/downloads/DE/publikationen/themen/moderne-verwaltung/regierungsprogramm-digitale-verwaltung-2020.pdf?__blob=publicationFile&v=4

Bundesministerium des Innern. (2006a). *E-Government 2.0*. http://www.verwaltung-innovativ.de/cln_339/nn_684536/DE/Informations__Kommunikationstechnik/EGovernment20/egovernment20.html?__nnn=true

Bundesministerium des Innern. (2006b). *Zukunftsorientierte Verwaltung durch Innovationen. Regierungsprogramm.* 1–22.

Caplan, P. (2009). *PREMIS verstehen* (p. 28). http://www.loc.gov/standards/premis/understanding_premis_german.pdf

Chisita, C. T., Enakrire, R. T., Durodolu, O. O., Tsabedze, V. W., & Ngoaketsi, J. M. (2021). Handbook of research on records and information management strategies for enhanced knowledge coordination. In *Handbook of Research on Records and Information Management Strategies for Enhanced Knowledge Coordination: i*. https://doi.org/10.4018/978-1-7998-6618-3

Christian Keitel. (2013). DIMAG-Kooperationen. In Christian Keitel & Kai Naumann (Eds.), *Digitale Archivierung in der Praxis. 16. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen“ und nestor-Workshop „Koordinierungsstellen“*. Verlag W. Kohlhammer Stuttgart.

Christian Keitel, & Kai Naumann. (2013). *Digitale Archivierung in der Praxis* (Christian Keitel & Kai Naumann, Eds.). Verlag W. Kohlhammer Stuttgart.

Christian Keitel, Rolf Lang, & Elisabeth Klindworth. (2020). DIMAG: Kurzbeschreibung. *DIMAG-Entwicklerverbund*. https://doi.org/10.1016/j.ajodo.2020.06.013

Christian van der Ven. (2015). Getting personal: shifting from traditional to digital services without losing our human (inter)face. *Die Fachzeitschrift Für Archiv, Bibliothek Und Dokumentation (Arbido)*. https://arbido.ch/de/ausgaben-artikel/2015-1/kompetenzen/getting-personal-shifting-from-traditional-to-digital-services-without-losing-our-human-interface

Christoph Schmidt. (2016). Neue Wege der Bereitstellung: Die Nutzung genuin digitaler Archivalien im Landesarchiv NRW. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 273–274.

Columbia, B. (2012). UNESCO/UBC Vancouver Declaration. *The Memory of the World in the Digital Age : Digitization and Preservation*, (September), 1–5. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/mow/unesco_ubc_vancouver_declaration_en.pdf

Committee on Descriptive Standards (ICA). (2000). *ISAD(G) : general international standard archival description : adopted by the Committee on Descriptive Standards, Stockholm, Sweden, 19-22 September 1999.* International Council on Archives = Conseil international des archives.

Consultative Committee For Space Data Systems. (1997). Reference Model for an Open Archival Information System. *Journal of Archival Organization*, *7*(January), 48. https://doi.org/10.1081/E-ELIS3-120044377

Cook, M. (1986). Archives and the computer. In *Education for Information*. https://doi.org/10.3233/efi-1987-5421

Cox, R. J., Alderfer, L., Arden, B., Barry, T., Bence, A., Berdahl, S., Bleich, B., Boerger, M., Grlnnell, D., Jackson, D., Johnson, Y., Jones, L., Justham, K., Kjellman, S., Manella, A., Patton, C. D., Perrotta, D., Pike, R. C., Presutti, R., … Vannucci, A. (2007). Machines in the archives: Technology and the coming

transformation of archival reference. *First Monday*, *12*(11). https://doi.org/10.5210/fm.v12i11.2029

Cynthia J. Durance. (1990). Management of Recorded Information. In et al. Cynthia J. Durance (Ed.), *Management of Recorded Information*. De Gruyter, Inc. https://doi.org/10.1515/9783111514598

Dahlmanns, T., & Naumann, K. (2018). *Von der Theorie zur Praxis: Bestandserhaltung digitaler Unterlagen*.

Daniel Fähle, Gerald Maier, Tobias Schröter-Karin, C. W. (2015). Archivportal-D. Funktionalität, Entwicklungsperspektiven und Beteiligungsmöglichkeiten. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 10–19.

David Carlin & Laurene Vaughan. (2015). *Performing digital: Multiple perspectives on a living archive*. Ashgate. UK.

David Lake, Jeffery Hartley, Helen Morgan, & Debra Steidel Wall. (2002). *ARCHIVAL AUTOMATION : A BIBLIOGRAPHY* (Number December).

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3). https://doi.org/10.2307/249008

de Gruyter Saur. (1993). Information handling in offices and archives. In *Information handling in offices and archives*. DE GRUYTER SAUR. https://doi.org/10.1515/9783111503363

De Parga, M. V., & González, P. (1992). Changing technologies in European archives. *American Archivist*, *55*(1), 156–166. https://doi.org/10.17723/aarc.55.1.h1l4l10491x1jh65

Decision No. 176/QĐ-BNV Dated 12 March 2025 of the Ministry of Home Affairs, the Functions and Duties of the National Archives Center for Digital and Preventive Records (2025).

Decree No. 47/2020/NĐ-CP, dated April 9, 2020: Managing, Connecting, and Sharing Digital Data of State Agencies. Pub. L. Decree No. 47/2020/ND-CP dated April 9, 2020 (2020).

Deparga, M. V, & Gonzalez, P. (1992). Changing Technologies in European Archives. *The American Archivist*, *55*, 156–166. https://doi.org/10.17723/aarc.55.1.h1l4l10491x1jh65

Dictionary.com. (2018). *https://www.dictionary.com/browse/computerization (Accessed: 28.12.2018)*. Dictionary.Com.

DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2), 147–160.

Do Thu Hien. (2014). *Research on Building a Virtual Reading Room to Serve the Exploitation and Use of Archival Materials in Vietnam* [Master's thesis]. University of Social Sciences and Humanities, Vietnam National University, Hanoi.

Dobreva, M. (2018). *Digital archives Management, use, and access*.

Duckett, B. (1998). Reference services for archives and manuscripts. In *Library Review* (Vol. 47, Number 1, pp. 59–60). https://doi.org/10.1108/lr.1998.47.1.59.20

Duff, W. M. (2010). Archival mediation. In *Currents of archival thinking* (pp. 115–136).

Duong Van Kham. (1994). *Informatics and innovation in archives management*. National Political Publishing House.

Duong Van Kham. (2013a). Digitization of archival materials - Practical requirements for the Archival industry. *Vietnam Archives and Records Journal*, *2*(2013).

Duong Van Kham. (2013b). Setting up metadata - the most important task of an archival digitization project. *Spots of Time Journal*, *1*(2013).

Duranti, L. (2001). The impact of digital technology on archival science. *Archival Science*, *1*(1), 39–55. https://doi.org/10.1007/BF02435638

Duranti, L., & Blanchette, J.-F. (2004). *The authenticity of electronic records: the InterPARES approach*. https://www.researchgate.net/publication/228612249

Eastwood, T., & MacNeil, H. (2010). *Currents of Archival Thinking* (p. 254). https://www.google.com/books?id=o-VmPgAACAAJ

Emery, J. C. (1964). The Impact of Information Technology On Organization. *Academy of Management Proceedings, XIII International Congress on Archives*, *1964*(1), 69–78. https://doi.org/10.5465/ambpp.1964.5067822

Erlandsson, A., International Council on Archives. Committee on Electronic Records, & International Council on Archives. (1997). *Electronic records management : a literature review*. ICA.

European Union. (2006). *Report on archives in the enlarged European Union*. 1–254.

Feak, C., & Swales, J. (2016). Telling a Research Story: Writing a Literature Review. In *Telling a Research Story: Writing a Literature Review*. https://doi.org/10.3998/mpub.309338

Fèvres, J. (2022). Everett M. Rogers, Diffusion of innovations. *Essais*, *1*. https://doi.org/10.4000/essais.11135

Fischer, B. (2015). Thüringer Archive. Gemeinsam im Netz. www.archive-in-thueringen.de. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 32–35.

Fred van Kan. (2018). Vollständige OnlineDienste Möglichkeiten und Unmöglichkeit. *ARCHIVAR. Zeitschrift Für Archivwesen*, 25–27.

Generaldirektion der Staatlichen Archive Bayerns. (2010). *Neue Entwicklungen und Erfahrungen im Bereich der digitalen Archivierung : von der Behördenberatung zum Digitalen Archiv*. Generaldirektion d. Staatl. Archive Bayerns.

Gerald Maier & Clemens Rehm. (2018). *Archive heute - Vergangenheit für die Zukunft: Archivgut – Kulturerbe – Wissenschaft*.

Government. (1993). *Resolution No. 49/CP dated August 4, 1993, of the Government on IT development in our country in the 90s*.

Government, T. F. (2014). Digital Administration 2020 - Summary. *Digitale Verwaltung*, 10.

Guidelines for Managing Outgoing and Incoming Documents and Creating Records in the Network Environment, Pub. L. Instruction No. 822/HD-VTLTNN, Issued on August 26, 2015 (2015).

Haberer, S. (2022). *Digitale Archivierung mit DIMAG im Niedersächsischen Landesarchiv (NLA) und Weitergabe von DIMAG an andere Archive in Niedersachsen*.

Hartmut Weber, G. M. (2000). *Digitale Archive und Bibliotheken. Neue Zugansmöglichkeiten und Nutzungsqualitäten: Heft 15* (Hartmut Weber & Gerald Maier, Eds.). Verlag W. Kohlhammer Stuttgart .

Heike Neuroth, Stefan Strathmann, Achim Oßwald, Regine Scheffel, Jens Klump, & Jens Ludwig. (2012). *Langzeitarchivierung von Forschungsdaten. Eine Bestandsaufnahme*. Verlag Werner Hülsbusch, Boizenburg, 2012.

Hering, K. (2021). Zwölf Wege ins Archiv. Umrisse einer offenen und praktischen Archivwissenschaft. *The American Archivist*, *84*(1), 210–213. https://doi.org/10.17723/0360-9081-84.1.210

Hessen Landesarchiv. (2010). *Tätigkeitsbericht der hessischen staatsarchive 2010*.

Hessen Landesarchiv. (2011). *Tätigkeitsbericht der hessischen staatsarchive 2011*.

Hessen Landesarchiv. (2014). *Tätigkeitsbericht der hessischen staatsarchive 2014*.

Hessen Landesarchiv. (2017). *Tätigkeitsbericht der hessischen staatsarchive 2017*.

Hessen Landesarchiv. (2018). *Tätigkeitsbericht der hessischen staatsarchive 2018*.

Hessisches Landesarchiv. (n.d.). *Mission Statement des Hessischen Landesarchivs (Accessed 04.12.2019)*. Retrieved https://landesarchiv.hessen.de/ueber-uns

Hessisches Landesarchiv. (2019). *Tätigkeitsbericht der hessischen staatsarchive 2019*.

Higgins, S., Hilton, C., & Dafis, L. L. (2014). Archives context and discovery: rethinking arrangement and description for the digital age. *2nd Annual Conference of the International Council on Archives, 11-15 October 2014, Girona, Spain*. http://www.girona.cat/web/ica2014/ponents/textos/id174.pdf

Hilary Jenkinson. (1922). *A Manual of Archive Administration*. Oxford: Clarendon Press.

Hill, J. (2011). *The future of archives and recordkeeping: a reader*. facet Publishing.

Hirtle, P. B. (2014). Archival Authenticity in a Digital Age. In *Páginas a&b: arquivos e bibliotecas* (Vol. 0, Number 6, pp. 73–90). http://ojs.letras.up.pt/index.php/paginasaeb/article/view/136

HLA. (2023). *Zwischenevaluierung 2023 der Digitalstrategie des Hessischen Landesarchivs 2020–2025*.

HLA digital. (2019). *HLA digital Digitalstrategie des Hessischen Landesarchivs*.

H.Neuroth, A., R.Scheffel, S., & (Hrsg.), K. H. (2012). Eine kleine Enzyklopädie der Langzeitarchivierung. Version 2.3. In K. H. H. Neuroth, A. Oßwald, R. Scheffel, S. Strathmann (Ed.), *Uma ética para quantos? XXXIII* (Version 2, Number 2). Verlag Werner Hülsbusch. http://www.nestor.sub.uni-goettingen.de/handbuch/index.php

Hoang Quoc Tuan. (2013). Orientation for digitization and management of digital documents of the Archives Department of the Party Central Committee Office. *Spots of Time Journal*, *3*(2013).

Hugh, T. A., & Taylor, H. A. (1987). Transformation in the Archives: Technological Adjustment or Paradigm Shift? *Archivaria*, *25*(Winter), 12–28.

ICA. (1996). *Electronic records programs : report on the 1994/95 survey*. International Council on Archives.

ICA. (1997). *Guide for Managing Electronic Records From an Archival Perspective Committee on Electronic Records February 1997* (Number February).

ICA. (2000). *ISAD(G) : general international standard archival description : adopted by the Committee on Descriptive Standards, Stockholm, Sweden, 19-22 September 1999.* International Council on Archives = Conseil international des archives.

ICA. (2004). *ISAAR (CPF) : international standard archival authority record for corporate bodies, persons, and families* (Second Edition). International Council on Archives.

ICA. (2007). *ISDF: International Standard for Describing Functions*. www.ica.org.

ICA. (2008). *ISDIAH: International Standard for Describing Institutions with Archival Holdings*. www.ica.org.

ICA. (2011). *A Universal Declaration on Archives*.

Ingo Runde. (2015). : Lebendiges Erbe digital. Das Bildprogramm des historischen Studentenlokals „Zum Roten Ochsen“ in Heidelberg. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 246–248.

Irmgard Christa Becker, Dominik Haffer, & Karsten Uhde (Eds.). (2012). *Digitale Registraturen - digitale Archivierung. Pragmatische Lösungen für kleinere und mittlere Archive?* Contributions to the 16th Archival Colloquium of the Marburg Archive School.

Irmgard Christa Becker, Karen Anderson, & Luciana Duranti (Eds.). (2018). *Born Digital in the Cloud: Challenges and Solutions*. Archivschule Marburg.

Irmgard Christa Becker, & Stephanie Oertel. (2014). Digitalisierung im Archiv – Neue Wege der Bereitstellung des Archivguts. Beiträge zum 18. Archivwissenschaftlichen Kolloquium der Archivschule Marburg. *ABI-Technik : Zeitschrift Für Automation, Bau Und Technik Im Archiv-, Bibliotheks- Und Informationswesen*, *34*(1), 41–46.

Irmgard Christa Becker, Thomas Henne, Niklas Konzen, Robert Meler, Kai Naumann, & Karsten Uhde (Eds.). (2018). *E-Government and digitale Archivierung*. Archivschule Marburg.

Jaillant, L., & Caputo, A. (2022). Unlocking digital archives: cross-disciplinary perspectives on AI and born-digital data. *AI and Society*, *37*(3). https://doi.org/10.1007/s00146-021-01367-x

Jean-Pierre Wallot. (1992). National Archivist of Canada, Proceedings of the 12th International Congress on Archives. *Montreal, 6-11 September 1992*, *XXXIX*.

Joachim Kemper. (2016). „Anfragen“ über Soziale Medien, Blogposts, Chats, Twitter & Co.? Aspekte einer virtuellen Nut- zerberatung im Web 2.0. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 224–227.

Joachim Kemper. (2018). Vier Konferenzen und ein ArchivCamp Zum Stand der Dinge bei „Offene Archive“. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 22–24.

Julian Holzapfl. (2014). Lesesaal Internet. Erfahrungen, Ergebnisse und Wünsche auf dem Weg zu einer digitalen Forschungslandschaft archivischer Quellenbestände. *Workshop as Part of the ICARUS@work Series and the EU Project ENArC on March 11, 2014, in Munich*.

Julie McLeod, C. H. (2019). *Managing electronic records* (Julie McLeod & Catharine Hare, Eds.). Facet.

K. Uhde. (2010). *Archive and Internet*.

Kamatula, G., Mnkeni-Saurombe, N., & Mosweu, O. (2013). The role of archives in the promotion of documentary national heritage in Tanzania, South Africa, and Botswana. *Journal of the Eastern and Southern Africa Regional Branch of the International Council on Archives*, *32*(May 2014), 109–127.

Kapsalis, E. (2016). The Impact of Open Access on Galleries, Libraries, Museums, & Archives. *Angewandte Chemie International Edition*, *6*(11), 951–952.

Karnowski, V., & Kümpel, A. S. (2016). Diffusion of innovations von Everett M. Rogers (1962). *In M. Potthoff (Hrsg.), Schlüsselwerke Der Medienwirkungsforschung*.

Kate Theimer. (2018). Partizipation als Zukunft der Archive. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 6–12.

Katharina Ernst. (2021). Standards und Normen im Bereich der Langzeitarchivierung. *ARCHIVAR. Zeitschrift Für Archivwesen*, (2), 62–70.

Kathke, G. M. C. R. J. (2016). Nutzung digital konzepte, Angebote und Perspektiven eines „virtuellen Lesesaals“ im Landesarchiv Baden-Württemberg. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 237–248.

Keitel, C. (2022). *Umfrage zur Nutzung der DIN-Norm 31644*.

Keitel, C., Naumann, K., & Lang, R. (2007). Konzeption und Aufbau eines digitalen Archivs. In Katharina Ernst (Ed.), *Erfahrungen mit der Übernahme digitaler Daten. Bewertung, Übernahme, Aufbereitung, Speicherung, Datenmanagement.* (Vol. 99, pp. 36–41). Stuttgart: Hohenheim Verlag, 2007. http://www.stuttgart.de/sde/item/gen/237495.htm

Keitel, C., & Schoger, A. (2013). *Vertrauenswürdige digitale Langzeitarchivierung nach DIN 31644*. Berlin; Vienna; Zurich: Beuth Verlag GmbH, 2013.

Keitel, C. (2010). Digitale Archivierung beim Landesarchiv Baden-Württemberg. *ARCHIVAR. Zeitschrift Für Archivwesen*, 19–26.

Keitel, R. K. C. (2018). The Archiving System DIMAG and its Development through Cooperation and Collaboration: Policy, Professional and Technical Aspects. In K. A. I. C. B. L. Duranti (Ed.), *Born Digital in the Cloud: Challenges and Solutions* (pp. 83–97). Marburg Archive School.

Khuat Thi Kim Chi. (2015). *Research on Construction and Management of archival Database of the Hanoi Department of Architectural Planning* [Master’s thesis]. University of Social Sciences and Humanities, Vietnam National University, Hanoi.

KLA. (2015). *Empfehlungen zum Aufbau eines Digitalen Archivs, Ausschuss „Digitale Archive“ der Konferenz der Leiterinnen und Leiter der Archivverwaltungen des Bundes und der Länder (KLA)*.

KLA. (2022). *Think DIP – Access zu digitalem Archivgut*.

KONRAD ELMSHÄUSER. (2018). *Das UNESCO-Programm Memory of the World (MoW)-deutsche Archive und das Weltdokumentenerbe*.

Krause, D. (2015). Wirtschaftsarchivportal WAP. *ARCHIVAR. Zeitschrift Für Archivwesen*, *2*, 28–29.

Krauth, W. (2015). Archive und Online-Portale. Thesen für den weiteren Erfolg. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 6–9.

Kretzschmar, R. (2010). Aktuelle Entwicklungstendenzen des archivischen Berufsbilds. *ARCHIVAR. Zeitschrift Für Archivwesen*, 356–360.

Kunst, M. für W. und. (2022). *Organizationserlass für das Hessische Landesarchiv*. https://www.rv.hessenrecht.hessen.de/bshe/document/VVHE-VVHE000018759

Kurth-Bürgi, M. M. B. (2016). Die Online-Beratung des Schweizerischen Bundesarchivs Erste Schritte in Richtung „virtueller Lesesaal“. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 228–230.

Landesarchiv, H. (2018). *nachrichten aus hessen 18/2 · 2018*.

Landesarchiv, H. (2020). *Hessisches Landesarchiv Tätigkeitsbericht des Hessischen Landesarchivs 2020*.

Landesarchiv, H. (2021a). *Tätigkeitsbericht des Hessischen Landesarchivs*.

Landesarchiv, H. (2021b). *Tätigkeitsbericht des Hessischen Landesarchivs*.

Landesarchiv, H. (2021c). *Tätigkeitsbericht des Hessischen Landesarchivs*. https://landesarchiv.hessen.de/sites/landesarchiv.hessen.de/files/digitalstrategie_hla.pdf

Landesarchiv, H. (2023). *Das Hessische Landesarchiv in Zahlen: Quartalsbericht 4/2022 an das HMWK*.

Landesarchiv Nordrhein-Westfalen. (2018). Offene Archive – Archive im Web 2.0. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1). http://search.ebscohost.com/login.aspx?authtype=ip,cookie,cpid&custid=s6213251&groupid=main&profile=eds

Laux, S. (2019). DIMAG – Programmpaket zur digitalen Langzeitarchivierung im Verbund. *ABI Technik*, *39*(3), 202–212. https://doi.org/10.1515/abitech-2019-3004

Lavoie, B. (2014). Information System (OAIS) Reference Model : Introductory Guide. *Technology Watch Reports*, 37.

Lavoie, B. F. (2008). The Open Archival Information System Reference Model: Introductory Guide. *Microform & Imaging Review*, *33*(2). https://doi.org/10.1515/mfir.2004.68

Le Van Nang. (2022). *Strengthening the application of information technology in document and archive work*.

Le Van Nang, & Duong Van Kham. (1995). *Computerization of archives and library work*. National Political Publishing House.

Liu, Z. (n.d.). *Academic Journal of Management and Social Sciences: The Prospects and Challenges of Artificial Intelligence Technology in Archival Management*.

Lomas, E. (2011). The future of archives and recordkeeping. In *Records Management Journal* (Vol. 21, Number 1, pp. 76–78). facet Publishing. https://doi.org/10.1108/09565691111125125

Luu Van Van. (2009). Basic issues in digitalizing archival materials. *Vietnam Archives and Records Journal*, *10*(2009).

M. Hagedorn-Saupe, G. M. (2002). *In coordinating Europe's digitalization, Germany National Representatives group progress report: coordinating mechanisms for digital policies and digitalization process*.

Macneil, H. (2000). Providing grounds for trust: Developing conceptual requirements for the long- term preservation of authentic electronic records. *Archivaria*, *50*(1), 52–78.

Manoff, M. (2004). Theories of the Archive from Across the Disciplines. In *Portal* (Vol. 4, Number 1). https://doi.org/10.1353/pla.2004.0015

Mario Glauert. (2017). Brandenburgische Archive : Berichte und Mitteilungen aus den Archiven des Landes Brandenburg. *Archivbenutzung Im Digitalen Zeitalter*, 3–9.

Mario Glauert. (2019). Was ist ein erfolgreiches Archiv? : Archivbenutzung im Zeitalter der digitalen Transformation. In *Arbeiten für das Gedächtnis des Landes* (pp. 10–17). Brandenburgisches Landeshauptarchiv.

McCausland, S. (2011). A Future Without Mediation? Online Access, Archivists, and the Future of Archival Research. *Australian Academic and Research Libraries*, *42*(4), 309–319. https://doi.org/10.1080/00048623.2011.10722243.

Meyer, J. W., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology, 83*(2), 340–363.

Michael, P., & Stropp, S. (2013). *Altregistratur , Zwischenarchiv und Endarchiv - unterschiedliche Rechtskreise und Aufgaben*. 1–19.

Millar, L. A. (2017). Archives: Principles and practices. In *Archives: Principles and Practices*. Facet. https://doi.org/doi:10.29085/9781783302086

Millar, L. A. (2018). Archival Principles. In *Archives* (pp. 1–2). Facet. https://doi.org/10.29085/9781783302086.004

Ministerpräsident, D. H. (2022). *Hessisches Archivgesetz (HArchivG)*)*. (32), 493–498.

Ministry of Home Affairs. (2012). *Decision No. 579/QD-BNV dated June 27, 2012, Planning for the Archives Industry to 2020, Vision to 2030*.

Ministry of Home Affairs. (2023a). *Decision No. 1017/QD-BNV, issued by the Ministry of Home Affairs on December 18, 2023, delineates the functions, tasks, powers, and organizational structure of the National Archives Center I.*

Ministry of Home Affairs. (2023b). *Decision No. 1018/QD-BNV, issued by the Ministry of Home Affairs on December 18, 2023, regulates the functions, tasks, powers, and organizational structure of the National Archives Center II.*

Ministry of Home Affairs. (2023c). *Decision No. 1019/QD-BNV, issued by the Ministry of Home Affairs on December 18, 2023, regulates the functions, tasks, powers, and organizational structure of the National Archives Center III.*

Ministry of Home Affairs. (2023d). *Decision No. 1020/QD-BNV, issued by the Ministry of Home Affairs on December 18, 2023, regulates the functions, tasks, powers, and organizational structure of the National Archives Center IV.*

Miriam Eberlein, Detlev Heiden, Mathias Jehn, C. K., & Schieber, und S. (2021). Entwicklung und Betrieb von DIMAG. *ARCHIVAR. Zeitschrift Für Archivwesen*, (2), 76–83.

Morries Rieger. (1973). The 7th International Archives Congress, Moscow, 1972: A report. *The American Archivist*, *Vol. 36*, 491–512.

Müller-Baur, H. (2015). Archion – Ein Internetportal für Kirchenbücher und mehr. *ARCHIVAR. Zeitschrift Für Archivwesen*, *2*, 30–31.

Mundt, C. R. und S. (2018). Die Nutzerstudie 2016 des Hessischen Landesarchivs. Ziele Vorgehen und Ergebnisse. In *Kompetent! – Archive in der Wissensgesellschaft* (pp. 221–231).

National Archives Center No.1 of Vietnam. (2018). The Imperial Records of the Nguyễn Dynasty Vol. 3 - Gia Long "Report on Drifting." *Joint Project Celebrating the 45th Anniversary of Japan-Vietnam Diplomatic Relations: Japan and Vietnam – Archival Records on Our History.*

National Archives Center No.4 of Vietnam. (2018). *Woodblocks of the Nguyễn Dynasty (H28/3)*. Joint Project Celebrating the 45th Anniversary of Japan-Vietnam Diplomatic Relations: Japan and Vietnam – Archival Records on Our History.

National Archives, & MLA. (2010). *Archives for the 21st Century in action* (Number March).

National Assembly. (2024). *The Law on Archives No. 33/2024/QH15 of the Socialist Republic of Vietnam takes effect on July 1, 2025.*

Naumann, K. (2019). *Ein Überblick zur Archivierung digitaler Unterlagen in Deutschland* (Vortrag Am 12. März 2019 Im Rahmen Des AK AUdS).

Naumann, K., Puchta, M., & Bayern Generaldirektion der Staatlichen Archive Bayerns. (2016). *Kreative digitale Ablagen und die Archive Ergebnisse eines Workshops des KLA-Ausschusses Digitale Archive am 22./23. November 2016 in der Generaldirektion der Staatlichen Archive Bayerns*.

Nestor. (2020). *http://www.langzeitarchivierung.de*.

Nguyen Thi Chinh. (2018). Big Data and the Role of Electronic Document Management in the Context of the 4.0 Industrial Revolution. *Vietnam Archives and Records Journal*, *6*(2018), 11–15.

Nguyen Thi Ha. (2013). *Research on solutions to digitize precious and rare paper records with blurred letters to make insurance copies* (Ministerial-Level research project).

Nguyen Thi Kim Thu, & Nguyen Thi Chinh. (2022). *Scientific theoretical framework for determining some technical requirements of the Digital Archives*.

Nguyen Thi Thanh. (2014). *Research on Building a Digital Repository at the Office of the Ministry of Public Security* [Master's thesis]. University of Social Sciences and Humanities, Vietnam National University, Hanoi.

Nicholas Negroponte. (1996). Being Digital. In *The Library Quarterly* (Number 2). London : Hodder and Stoughton, 1996. https://doi.org/10.1086/602868

Niedersächsisches Landesarchiv, & Verband Niedersächsischer Archivarinnen und Archivare e.V. (2017). *Archiv-Nachrichten Niedersachsen: Mitteilungen aus niedersächsischen Archiven*. www.startext.de

Nordrhein-Westfalen, L. (2009). Zugang zu Archivgut im digitalen Zeitalter. *ARCHIVAR. Zeitschrift Für Archivwesen*, 236–238.

Nordrhein-Westfalen, L. (2010). Digitale Archivierung. *ARCHIVAR. Zeitschrift Für Archivwesen*, *1*, 5–132.

Nordrhein-Westfalen, L. (2012). Chancen und Grenzen für die Archive in der virtuellen Welt. *ARCHIVAR. Zeitschrift Für Archivwesen*, 128–223.

Nordrhein-Westfalen, L. (2015a). DIGITALISIERUNG. *ARCHIVAR. Zeitschrift Für Archivwesen*, *3*(November), 212–291.

Nordrhein-Westfalen, L. (2015b). Portale. *ARCHIVAR. Zeitschrift Für Archivwesen*, *1*, 4–105.

Nordrhein-Westfalen, L. (2016). Virtueller Lesesaal. *ARCHIVAR. Zeitschrift Für Archivwesen*, *03*(69. Jahrgang), 208–295.

Nordrhein-Westfalen, L. (2021). Digitale Langzeitarchivierung. *ARCHIVAR. Zeitschrift Für Archivwesen*, *2*, 61–133.

North, D. C. (1990). Institutions, Institutional Change and Economic Performance. *Cambridge University Press*.

Noyes, J. M. (2015). *Archiving Ephemerality: Digitizing the Berlin Wall*.

Office of the Ministry of Home Affairs. (2022). *Electronic records management from the practice of the Ministry of Home Affairs* (Ministerial-Level scientific research project).

Olaf Brandt. (2010). PREMIS. In *Eine kleine Enzyklopädie der digitalen Langzeitarchivierung*. https://www.langzeitarchivierung.de/Webs/nestor/DE/Publikationen/nestor_Handbuecher/nestor_handbuecher_node.html

Paré, G., Trudel, M. C., Jaana, M., & Kitsiou, S. (2015). Synthesizing information systems knowledge: A typology of literature reviews. *Information and Management*, *52*(2). https://doi.org/10.1016/j.im.2014.08.008

Peel, K. L. (2020). Beginner's guide to applied educational research using thematic analysis. *Practical Assessment, Research and Evaluation*, *25*(1). https://doi.org/10.7275/ryr5-k983

Penn, E. S. M. (2014). *Exploring archival value: an axiological approach*. https://discovery.ucl.ac.uk/id/eprint/1455310/

Peter Sandner. (2013). 10 FAQs. Argumente zu Bedarf und Notwendigkeiten der digitalen Archivierung. In Christian Keitel & Kai Naumann (Eds.), *Digitale Archivierung in der Praxis. 16. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen" und nestor-Workshop „Koordinierungsstellen"*. Verlag W. Kohlhammer Stuttgart.

Peter Sandner. (2016a). Nutzeridentifizierung im virtuellen Lesesaal Werkstattbericht aus der Entwicklung von Arcinsys. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 233–236.

Peter Sandner. (2016b). „Virtueller Lesesaal". Originär archivspezifische Anforderungen an einen virtuellen Nutzungsbereich. In *Neue Wege ins Archiv – Nutzer, Nutzung, Nutzen* (pp. 37–45).

Peter Sandner. (2024). *Stand der HLA-Digitalstrategie 2020–2025 nach zwei Dritteln ihrer Laufzeit*.

Peterson, T. H. (1984). Archival principles and records of the new technology. *American Archivist*, *47*(4), 383–393. https://doi.org/10.17723/aarc.47.4.30u45640617n2184

Pilger, K. (2015). Das Archivportal „Archive in NRW" als Aggregator für das Archivportal-D. *ARCHIVAR. Zeitschrift Für Archivwesen*, *1*, 36–37.

Plassmann, M. (2016). Archiv 3.0? Langfristige Perspektiven digitaler Benutzung. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 219–223.

Radoff, M. L., & Schellenberg, T. R. (1957). Modern Archives: Principles and Techniques. In *The Mississippi Valley Historical Review* (Vol. 43, Number 4). https://doi.org/10.2307/1902318

Raulff, U., Lepper, M., & (Hg.). (2016). *Handbuch Archiv. Geschichte, Aufgaben, Perspektiven*. J.B.Metzler Verlag.

Regina Rößner. (2017). Grundlagen der digitalen Archivierung. *Archiv-Nachrichten Niedersachsen Mitteilungen Aus Niedersächsischen Archiven*, (3. Niedersächsischer Archivtag), 9–14.

Richard Pearce-Moses. (2005). A Glossary of Archival and Records Terminology. In *Collections: A Journal for Museum and Archives Professionals* (Vol. 8, Number 1). https://doi.org/10.1177/155019061200800106

Robert Henri Bautier. (1971). *Archives and automation* (Record of the 13th International Conference of the Archival Round Table).

Robert Kretzschmar, & Christian Keitel. (2018). The Archiving System DIMAG and its Development by Cooperation and Collaboration. Political, Professional, and Technical Aspects. In Irmgard Christa Becker, Karen Anderson, & Luciana Duranti (Eds.), *Born Digital in the Cloud: Challenges and Solutions.* Contributions to the 21st Archival Colloquium of the Marburg Archive School.

Robinson, L. (2009). A summary of Diffusion of Innovations. *Changeology*.

Rogers, E. M. (2002). Diffusion of preventive innovations. *Addictive Behaviors*, *27*(6). https://doi.org/10.1016/S0306-4603(02)00300–3.

Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). Free Press.

Rolan, G., Humphries, G., Jeffrey, L., Samaras, E., Antsoupova, T., & Stuart, K. (2019). More human than human? Artificial intelligence in the archive. *Archives and Manuscripts*, *47*(2). https://doi.org/10.1080/01576895.2018.1502088

Rolf Källman. (2015). Digisam - Toward a Coordinated Digital Cultural Heritage. In *Digitalisierung im Archiv - Neue Wege der Bereitstellung des Archivguts* (pp. 33–48).

Schenk, D. (2018). How to distinguish between manuscripts and archival records: A study in archival theory. In *Manuscripts and Archives: Comparative Views on Record-Keeping* (Vol. 11, pp. 3–17). https://doi.org/10.1515/9783110541397-002

Schieber, S. (2011). Das Digitale Archiv der hessischen Staat sarchive: Ein Werkstatt bericht. *ARCHIVAR. Zeitschrift Für Archivwesen*, *64*(01), 73–78. http://www.archive.nrw.de/archivar/hefte/2011/ausgabe1/ARCHIVAR_01-11_internet.pdf

Schieber, S. (2012). Entwicklung einer Aussonderungsschnittstelle für das DMS DOMEA. *16. Tagung 2012 Des Arbeitskreises "Archivierung von Unterlagen Aus Digitalen Systemen (AUdS)."* https://www.sg.ch/content/dam/sgch/kultur/staatsarchiv/auds-

2012/übernahme/02-Schieber_Entwicklung_einer_Aussonderungsschnittstelle_DMS_DOMEA.pdf

Schöggl-Ernst, E., Stockinger, T., & Wührer, J. (2019). Die Zukunft der Vergangenheit in der Gegenwart. In *Die Zukunft der Vergangenheit in der Gegenwart* (pp. 9–30). https://doi.org/10.7767/9783205232346.9

Schrimpf, S. (2014). *Das OAIS-Modell für die Langzeitarchivierung: Anwendung der ISO 14721 in Bibliotheken und Archiven*.

Schwalm, S. (2013). Der Nachfolger des DOMEA® -Konzepts Das Organisationskonzept elektronische Verwaltungsarbeit und seine Auswirkungen auf die elektronische Archivierung. In *Digitale Archivierung in der Praxis /Digital archiving in practice, 16th conference of the working group "Archiving of documents from digital systems" and Nestor workshop "Coordination offices". Serie A Heft 24. Verlag W. Kohlhammer Stuttgart.* (pp. 232–252).

Schwarz, R. D. K. (2010). Archivierung und dauerhafte Nutzung von Datenbankinhalten aus Fachverfahren. *ARCHIVAR. Zeitschrift Für Archivwesen*, *1*, 6–18.

Scott, W. R. (2014). Institutions and Organizations: Ideas, Interests, and Identities (4th ed.). *SAGE*.

Seidu, N. (2016). Mittendrin statt nur dabei Twitter als Social Media Marketinginstrument für das Archivportal-D. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 231–232.

Shinde, G., Kirstein, T., Ghosh, S., & Franks, P. C. (n.d.). *AI in Archival Science: A Systematic Review*.

Sobczak, A. (2016a). 0 | Page. *National Digital Archives*, 241.

Sobczak, A. (2016b). *Traditional versus Virtual Archives: the Evolving Digital Identity of Archives in Germany*. https://depot.ceon.pl/bitstream/handle/123456789/11109/Virtual Archives - dr Anna Sobczak.pdf?sequence=1&isAllowed=y

Sobczak, A. (2016c). *Traditional versus Virtual Archives: the Evolving Digital Identity of Archives in Germany*. http://goo.gl/MI5gga.

Society of American Archivists, & Library of Congress. (2002). *Encoded Archival Description Tag Library*. www.archivists.org

Stake, R. E. (1995). The Art of Case Study Research: Perspectives on Practice. In *Thousand Oaks, CA, Sage*.

State Archives and Records Department of Vietnam. (2009). *Digitizing Archival Records - Sharing Experiences*.

State Department of Records and Archives of Vietnam. (1989). *Fundamental issues in building a national automatic intelligent information system* (State-Level scientific research project).

State Department of Records and Archives of Vietnam. (2010). *Develop requirements and solutions for managing electronic records* (Ministerial-Level scientific research project).

State Department of Records and Archives of Vietnam. (2014). *The authenticity of electronic records*.

State Department of Records and Archives of Vietnam. (2018). *Building a basic framework for managing records in the context of e-government* (Basic level scientific research project).

State Department of Records and Archives of Vietnam. (2020). *Archiving electronic documents of state agencies in the period 2020 – 2025.*

State Department of Records and Archives of Vietnam. (2021). *The potential applications of blockchain technology in the management of electronic archives maintained by state agencies* (Basic level scientific research project).

State Department of Records and Archives of Vietnam. (2022). *The scientific basis determines the technical requirements of digital archives* (Ministerial-Level scientific research project).

State Records and Archives Department of Vietnam. (2022). *The journey of implementing information technology applications and developing professional guidance documents and legal documents on electronic document management of the State Records and Archives Department*.

Strategic Push toward Enhancing the Integration of Electronic Documents in the Day-to-Day Operations of State Agencies (2012).

Szekely, I. (2017). Do Archives Have a Future in the Digital Age? *Journal of Contemporary Archival Studies*, *4*(2), 1. http://elischolar.library.yale.edu/jcasAvailableat:http://elischolar.library.yale.edu/jcas/vol4/iss2/1

Terry Eastwood. (2010). A contested Realm: The Nature of Archives and the Orientation of Archival Science. In Terry Eastwood & Heather MacNeil (Eds.), *Currents of Archival Thinking* (pp. 3–22). Libraries Unlimited.

The Criteria for Determining Archival Documents with a High Frequency of Use to Be Preserved at National Archives Centers and Participating in Digitization for the Project "Storing Electronic Documents of the Vietnam State Archives - Phase 2," Pub. L. Decision No. 416/QD-BNV, on June 13, 2023 (2023).

The Electronic Document Storage Project for State Agencies from 2020-2025, Pub. L. Decision No. 458/QD-TTg, Issued on April 3, 2020 (2020).

The Federal Government. (2010). *Network-Based and Transparent Administration*.

The Federal Government. (2014). *Key Elements of the Program "Digital Administration 2020."* 8–11. https://www.verwaltung-innovativ.de/DE/Startseite/startseite_node.html

The International Standard Organization. (2016). *ISO 15489-1: 2016 Information And Documentation - Records Management*. PART 1: CONCEPTS AND PRINCIPLES.

The Minister of the Ministry of Internal Affairs of Vietnam. (2022). *Decision No. 1199/QĐ-BNV stipulates the functions, tasks, powers, and organizational structure of the State Records and Archives Department of Vietnam*.

The Process of Exchanging, Storing and Processing Electronic Documents in Clerical Work and Essential Functions of the Electronic Document Management System in Processing Work of Agencies and Organizations, Pub. L. Circular No. 01/2019/TT-BNV dated January 24, 2019 (2019).

The Standards and Prerequisites for Input Information Data and the Preservation of Electronic Archives, Pub. L. Circular No. 02/2019/TT-BNV, Dated January 24, 2019 (2019).

The Transmission and Reception of Electronic Documents, Pub. L. Decision No. 28/2018/QD-TTg on 12.06.2018 (2018).

Thomas Krämer. (2021). Das Digitale Archiv NRW: Eine spartenübergreifende Verbundlösung zur digitalen Langzeitarchivierung. *ARCHIVAR. Zeitschrift Für Archivwesen*, (2).

Tim Odendahl. (2018). Archive im Quadrat Instagram für Archive. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 44–46.

Tripp, S. (2019). *Chats – Foren – FAQs Überlegungen zur Online-Nutzung im Hessischen Landesarchiv*.

Trist, E. L., & Bamforth, K. W. (1951). Some Social and Psychological Consequences of the Longwall Method of Coal-Getting: An Examination of the Psychological Situation and Defenses of a Work Group in Relation to the Social Structure and Technological Content of the Work System. *Human Relations*, 4(1), 3–38. https://doi.org/10.1177/001872675100400101.

Udo Schäfer & Nicole Bickhoff. (1999). *Archivierung elektronishcher Unterlagen: Heft 13* (Udo Schäfer & Nicole Bickhoff, Eds.). Verlag W. Kohlhammer Stuttgart .

Ulrich Niess & Harald Stockert. (2015). Auf dem Weg zum digitalen Allrounder: Digitalisierung im Stadtarchiv Mannheim. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 242–245.

UNESCO, & InterPARES, P. (2012). *The Memory of the World in the Digital Age: Digitization and Preservation: An international conference on permanent access to digital documentary heritage*. http://www.unesco.org/new/es/communication-and-information/events/calendar-of-events/events-websites/the-memory-of-the-world-in-the-digital-age-digitization-and-preservation/

Unger, T. (2018). Archivisches Bloggen jenseits des „Mainstream"? Die Blogs des Universitäts- archivs und des Histori- schen Vereins Osnabrück. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 32–36.

VdA. (2010a). *Archive im digitalen Zeitalter. Überlieferung – Erschließdung – Präsentation*. 79th German Archive Day in 2009.

VdA. (2010b). *Für die Zukunft sichern! Bestandserhaltung analoger und digitaler Unterlagen*. Conference publication 13. 78th German Archive Day 2008.

Venkatesh, V., & Davis, F. D. (2000). Theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science*, *46*(2). https://doi.org/10.1287/mnsc.46.2.186.11926

Vietnam, M. of I. and C. of. (2021). *Guidebook on digital transformation*. Information and Communication Publishing.

Vu, D. P. (2025). Digital transformation in the archival field: origins and emerging development trends. *Data and Archival Records Management in the Context of Digital Government Development in Vietnam*.

Vu Dinh Phong. (2011). *Digitization of film heritage in Vietnam: realities and trends*. University of Social Sciences and Humanities.

Vu Dinh Phong. (2013). Digitization of film materials - An urgent issue today. *Vietnam Archives and Records Journal*, *12*(2013).

Waidmann, S. (2015). Das Archivportal Europa. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 22–23.

Webster, P. F. (2002). Theories of the Information Society. In *Theories of the Information Society*. https://doi.org/10.4324/9780203426265

Wenz-Haubfleisch, W. K. S. R. A. (2011). Kommunale Findmittel ins Netz. Schwerpunkte DFG-geförderter Retrokonversion in Hessen. *ARCHIVAR. Zeitschrift Für Archivwesen*, 303–307.

Westhorp, G. (2014). Realist Impact Evaluation. *Research and Policy Development*, (September), 1–12. www.odi.org/twitter

Wetzenstein, T. (2010). *Digitale Langzeitarchivierung unter dem Aspekt des Access* [nestor edition 2]. http://www.langzeitarchivierung.de

Wolf, C. (2012). Digitalisierung von Kulturgut in Schweden. *ARCHIVAR. Zeitschrift Für Archivwesen*, (4), 387393.

Wolf, G. M. & C. (2015). Umsetzung der Digitalisierungsstrategie im Landesarchiv BadenWürttemberg. Aktuelle Fortschritte und Ausblick. *ARCHIVAR. Zeitschrift Für Archivwesen*, (3), 233–237.

Wolf, T. (2018). Blogs in deutschen Archiven Ein kommentierter Überblick. *ARCHIVAR. Zeitschrift Für Archivwesen*, (1), 37–40.

Wolfgang Krauth. (2018).). „… denn für die Zukunft der Archive ist es existentiell wichtig, hier nicht den Anschluss zu verpassen…“. Aufgaben, Chancen und Grenzen des Archivars in der archivischen Informationstechnologie. In Gerald Maier & Clemens Rehm (Eds.), *Archive heute - Vergangenheit für die Zukunft: Archivgut – Kulturerbe – Wissenschaft: Serie A Heft 26* (pp. 219–228). Verlag W. Kohlhammer Stuttgart.

Yeo, G. (2018). Records, Information and Data. In *Records, Information and Data*. Facet. https://doi.org/10.29085/9781783302284

Yeo, G. (2024). Artificial intelligence and the future(s) of archival theory and practice. *Archeion*, *125*, 10–32. https://doi.org/10.4467/26581264arc.24.008.20572

Yin, R. K. (2018). Case study research and applications: Design and methods. In *Journal of Hospitality & Tourism Research* (Vol. 53, Number 5). https://doi.org/10.1177/109634809702100108

APPENDIX

I. Glossary of related terms

The following selected terms are relevant to the discussion throughout this dissertation. Sources are cited when compiling those definitions. Chapter II will provide more detailed explanations for the core and central terms. Readers interested in more information about archival terminology will want to consult such sources as:

1. Terminologie der Archivwissenschaft:

https://forschung.archivschule.de/terminologie/index.html; As this work focuses on German archival examples, it is essential to use German archival terminology.

2. Richard Pearce-Moses, A Glossary of Archival and Records Terminology (Society of American Archivists, 2005), http://www2. archivists.org/glossary

It is one of the essential tools for archival practitioners to familiarise themselves with archival terms and definitions. In addition to the online version, the SAA website also provides a printed version of this glossary.

3. The ICA's resource Multilingual Archival Terminology, www.ciscra.org/mat/;

A specific tool that includes archival terms and their translations in twenty languages, supported by the International Council on Archives, has been translated by archival experts.

4. The Association of Records Managers and Administrators, Glossary of Records and Information Management Terms, www.arma.org/r1/publications;

5. International standards, such as ISO/IEC 2382-1:1993 and ISO 15489-1:2001

6. Glossaries related to digital long-term preservation:

- Digital preservation handbook compiled by the Digital Preservation Coalition (DPC), at: https://www.dpconline.org/handbook/glossary.

Terms and Concepts	Definitions
Digitization	The conversion of archival materials from analog to digital formats enhances accessibility and preservation.
Retro-conversion of finding aids	The transformation of existing analog finding aids (such as inventories and catalogs) into digital formats to improve searchability and usability.
Online access	The provision of digital access to archival materials via online platforms enables remote research and retrieval.
Long-term digital preservation	Ensuring the sustained availability and integrity of digital materials through preservation strategies such as format migration and integrity checks.
AI applications	Examining the significance and emerging trends in the application of artificial intelligence in archives to support and optimize professional workflows.
Computerization	Computerization refers to the process of applying computer technologies to archival operations and recordkeeping systems. It involves automating traditional manual processes, such as accessioning, classification, description, and retrieval, through the use of computer-based tools and databases. In archival science, computerization represents the initial stage of technological integration, marking the transition from paper-based to electronic workflows. Computerization thus laid the foundation for further digitization and digital transformation in archives by reshaping administrative and technical processes. While more recent literature has adopted broader terms such as *digital transformation* to capture the

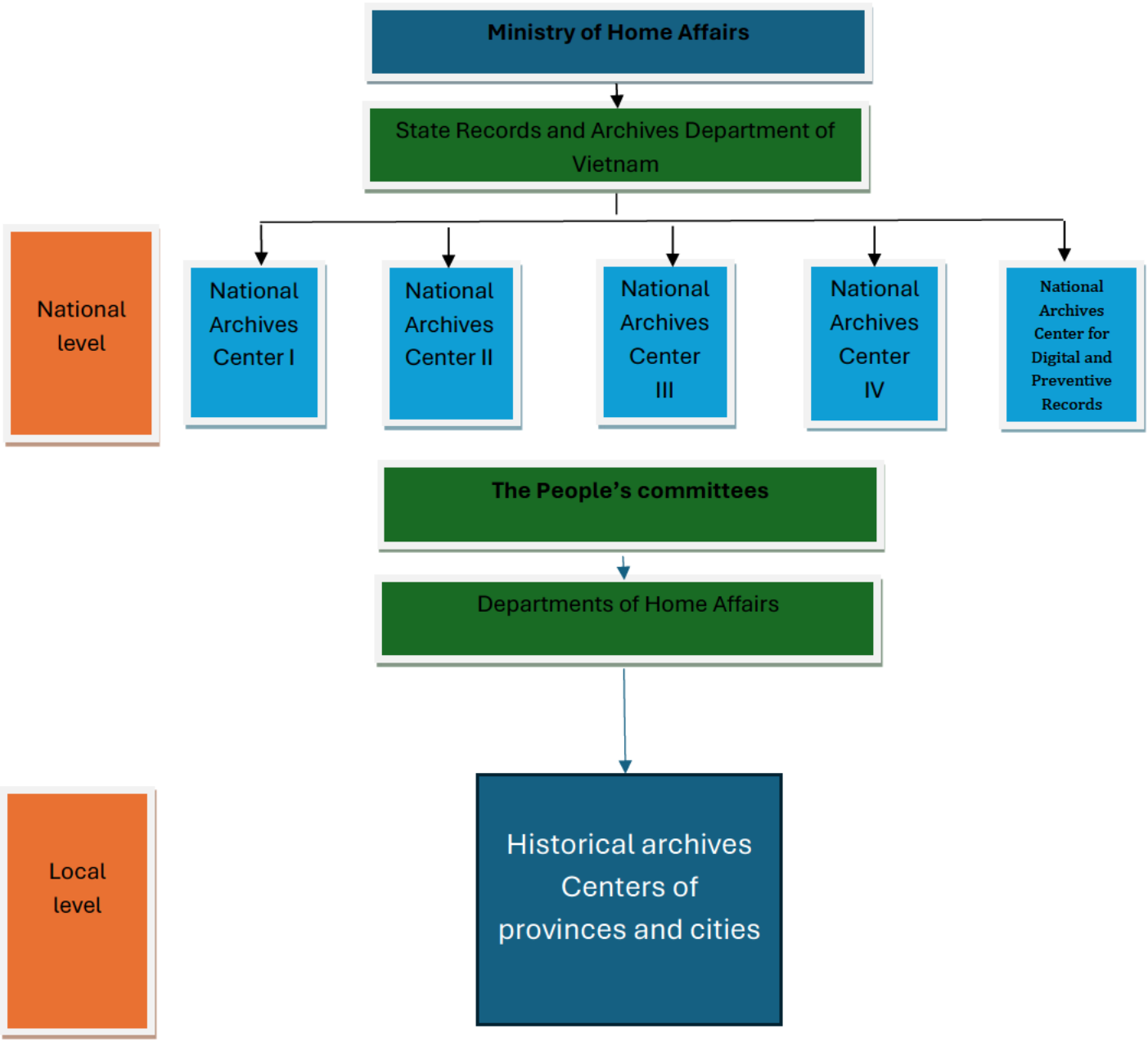
	systemic and disruptive nature of technological change, this research retains the term *computerization* to maintain consistency. However, it should be understood in an extended sense that encompasses digitization, digital archiving, AI applications, and other technological advancements relevant to archival development.
Digitization	Digitization is the process of converting analog or physical records, such as paper documents, photographs, films, or sound recordings, into digital formats. It is primarily a *technical* operation intended to ensure both preservation and accessibility of archival materials.
Digital transformation	Digital transformation encompasses a broader and more profound change than either computerization or digitization. It refers to the systemic integration of digital technologies into all aspects of archival work, management, preservation, access, and user interaction, thereby transforming organizational culture, workflows, and professional identities. In this study, digital transformation is understood as a socio-technical and institutional evolution that redefines the mission and functions of archives in the digital era.
Records	Records are documents, regardless of form or medium, created or received by an individual or organization in the course of official or personal activity and preserved as evidence of such activities. Records are characterized by their evidential and informational value, forming the primary sources upon which archival collections are later built.

Archives	The term *archives* is used in three related senses: (1) records of enduring value preserved as evidence of activities, decisions, and transactions; (2) the institution responsible for the acquisition, preservation, management, and provision of access to such records; and (3) the repository or facility in which archival materials are maintained.
Hybrid archives	A *Hybrid Archive* refers to an integrated governance model that manages analog, digitized, and born-digital records within a unified institutional and technical framework. It goes beyond the mere coexistence of physical and digital materials by aligning records management, digital preservation, metadata standards, and access systems under a coherent lifecycle strategy. The hybrid approach bridges traditional custodial practice and digital innovation, ensuring authenticity, interoperability, and long-term sustainability.

II. The Hessian State Archives division

III. The Hessian State archives organization

IV. The Vietnamese State Archives organization



V. Internship

The Vietnam National Archives Center No. III
34 Phan Ke Binh, Cong Vi,
Ba Dinh, Hanoi, Vietnam

Hanoi, 20 June 2024

Mr. Vu Dinh Phong
Date of birth: 28.07.1989
PhD candidate
Justus-Liebig-University Giessen (JLU), Germany)

Dear Mr. Vu Dinh Phong,

We are pleased to inform that your application for an internship at the National Archives Center III of Vietnam has been accepted. Your internship will commence on 01.09.2024 and conclude on 28.02.2025 (six months).

During your internship, your primary focus will be digitising historical documents and developing digital archives. Your responsibilities will include, but are not limited to:

- Assisting in the scanning and digitisation of historical documents;
- Cataloging and organizing digital files within our archival database;
- Participating in the enhancement of digital archives;
- Supporting the development of digital archival access tools and resources;
- Conducting research related to digital preservation techniques.

Please report to the National Archives Center III at 34 Phan Ke Binh, Cong Vi, Ba Dinh, Hanoi, by 8:30 AM on your first day. You will be introduced to your supervisor and given a brief orientation about our facility and procedures.

We believe that your skills and enthusiasm will significantly contribute to the work at the National Archives Center III, and we look forward to working with you. Should you have any questions or require further information, please do not hesitate to contact us at (+84) 24 3762 6620 or (+84) 43 832 62 91.

Yours Sincerely,

[redacted]

Tran Viet Hoa
Director of the Vietnam National Archives Center III

VI. Interview structure

At the beginning of each interview, the researcher introduces himself and provides a brief explanation of the study's purpose and objectives. The participant is informed that their contribution is voluntary and that they may withdraw at any time. The researcher assures the participant that all information provided will be used solely for academic purposes and treated with strict confidentiality. The data will be anonymized, and no personal or institutional identifiers will appear in the dissertation or related publications. Before starting the interview, verbal consent is obtained for recording the conversation, which will be securely stored and used only for transcription and analysis within this study.

I. Target group: Policymakers

Part A. General Information

Could you please provide your position and institutional affiliation?

Part B. Interview Content

1. Technological Readiness

How would you assess the current level of technological and infrastructural readiness for digital archiving in Vietnam (including software, hardware, networks, and security)?

Which new technologies (AI, OCR, blockchain, big data, cloud computing, etc.) have been adopted in archival work, and to what extent?

In your opinion, what are the main factors that facilitate or hinder the upgrading of infrastructure and the adoption of new technologies?

2. Legal and Policy Frameworks

To what extent do the existing laws and policies on digital archiving meet current practical needs? What are their main strengths and weaknesses?

Has the formulation of the Archives Law (2024) and its guiding documents sufficiently considered technological and international integration aspects?

Are there any national strategies or programs currently in place to support the digital transformation of the archival sector?

3. Institutional Capacity

How are resources (financial, human, and infrastructural) allocated to archival institutions under the management system?

Is there an inter-agency or central-local coordination mechanism in implementing digital archiving?

What are the main challenges in maintaining and operating digital archival systems?

4. Professional Development

Do you think the current archival workforce meets the requirements of working in a digital environment?

Are the current training and capacity-building programs for digital archival professionals effective?

Are there long-term plans to develop a specialized cadre of digital or IT-based archival experts?

5. User Access and Engagement

What is your view on expanding public access to archival materials through online platforms?

Do current policies adequately balance the right to access information with national security and confidentiality requirements?

Are there any strategies or initiatives to enhance user interaction, feedback, and online archival services?

Part C. Open-Ended and Concluding Questions

What recommendations would you make to archival institutions to speed up the digital transformation process over the next 5–10 years?

II. Target group: Leaders and staff of central and local archival institutions

Part A. General Information

Please state your current position and institutional affiliation.

Part B. Interview Content (Five Analytical Dimensions)

1. Technological Readiness

What technical infrastructure, software, or systems are currently in place to support digital archiving at your institution?

How would you describe the current status and process of digitization (priorities, rate of progress, and workflow)?

Has your institution or your own work applied new technologies such as AI, OCR, image recognition, or cloud computing? If yes, to what extent?

In your view, what technical factors most facilitate or hinder the effectiveness of digital archiving?

2. Legal and Policy Frameworks

Which legal documents, regulations, or guidelines currently govern digital archiving at your institution?

How suitable or practical are these regulations for your daily work or institutional conditions?

Have you encountered any challenges in implementing new laws or policies, such as the Archives Law (2024), in practice?

3. Institutional Capacity

Do you think your institution has sufficient resources (financial, human, and infrastructural) to sustain and expand digital archiving systems?

How does coordination take place between your institution and other bodies (central–local or inter-agency) in implementing digital initiatives?

From your perspective, what are the main operational or organizational challenges in maintaining digital archiving systems?

4. Professional Development

How would you assess the qualifications and digital skills of staff working in digital archiving (including your own, if applicable)?

What kinds of training or professional development programs on digital archiving or information technology have you or your institution participated in?

What difficulties exist in recruiting, retaining, or developing staff with adequate digital competencies?

5. User Access and Engagement

What forms of archival services are currently offered to users (on-site and online)?

How do users access and utilize digital archival materials at your institution?

Is there a mechanism for collecting and responding to user feedback? If so, how effective is it?

Part C. Open-Ended and Concluding Questions

Based on your experience, what have been the biggest challenges in implementing digital archiving?

III. Target group: Information Technology (IT) specialists at archival institutions

Part A. General Information

Please state your current position and institutional affiliation.

1. Technological Readiness

What key hardware and software systems are currently used to support digital archiving at your institution?

How would you assess the system's current performance and its capacity to adopt new technologies, such as AI, OCR, or cloud computing?

2. Legal and Policy Frameworks

What technical regulations, standards, or security policies guide your institution's digital archiving operations?

Have any legal or policy requirements (e.g., the Archives Law 2024, information security standards) created challenges or constraints in implementation?

3. Institutional Capacity

Do your institution's resources (budget, IT staff, infrastructure) adequately meet operational and maintenance needs?

How does collaboration between IT teams and archival professionals work in practice, particularly when addressing system issues?

4. Professional Development

How would you describe the current technical skills and training opportunities for IT staff involved in digital archiving?

What additional capacity-building or skill-development initiatives would improve system management and innovation?

5. User Access and Engagement

What features or tools are available to help users access and retrieve digital archival materials effectively?

How does your institution gather and respond to user feedback to improve the system's usability and reliability?

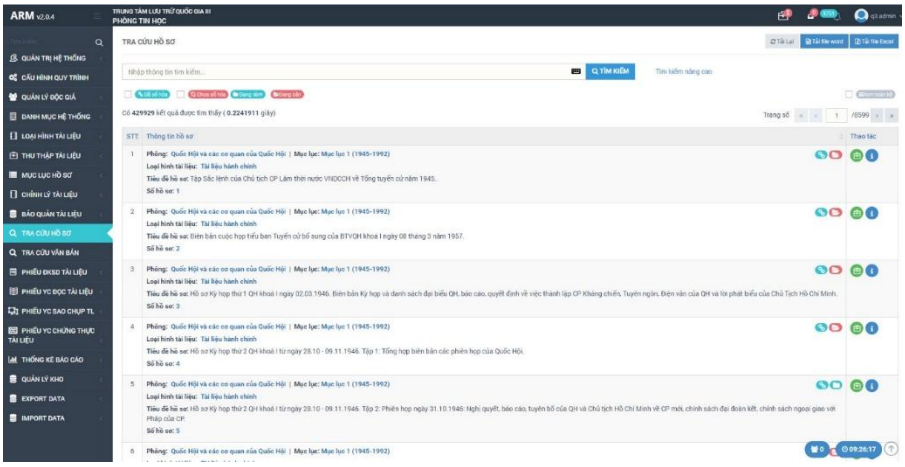
Part C. Open-Ended and Concluding Questions

From your experience, what is the most critical technical challenge in operating or maintaining the digital archiving system?

If you could improve one aspect of the system, what would be your top priority?

VII. Pictures

7.1. The screenshots of electronic document management software at historical archives centers in Vietnam




PHẦN MỀM QUẢN LÝ
TÀI LIỆU LƯU TRỮ - TÀI LIỆU ĐIỆN TỬ
(AIMS)
Tên đăng nhập
Mật khẩu
Login by Localhost
Quên mật khẩu?
Đăng nhập
Bạn chưa có tài khoản? Đăng ký
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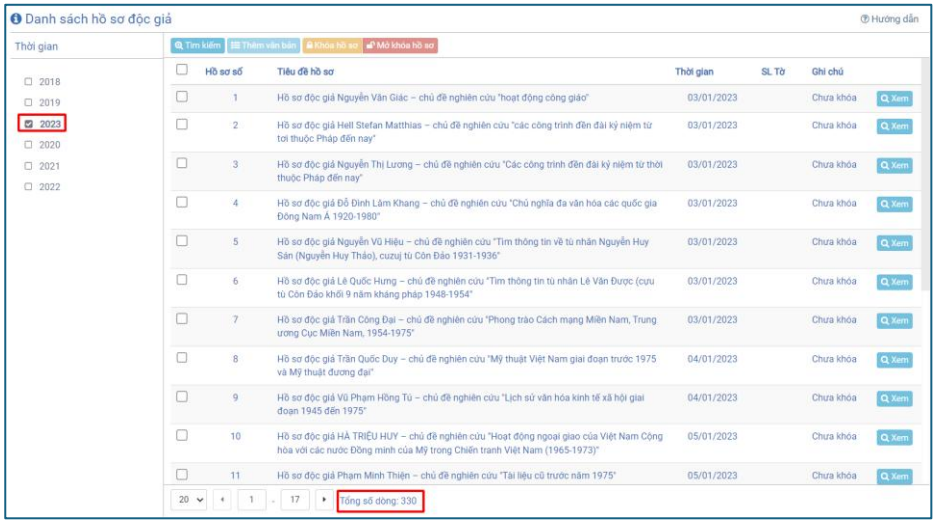
Cài đặt AIMS trên thiết bị di động (Android, IOS)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1 Hồ sơ độc giả Nguyễn Văn Giác – chủ đề nghiên cứu "hoạt động công giáo" 03/01/2023 Chưa khóa Xem
2 Hồ sơ độc giả Hell Stefan Matthias – chủ đề nghiên cứu "các công trình đền đài kỷ niệm từ tới thuộc Pháp đến nay" 03/01/2023 Chưa khóa Xem
3 Hồ sơ độc giả Nguyễn Thị Lương – chủ đề nghiên cứu "Các công trình đền đài kỷ niệm từ thời thuộc Pháp đến nay" 03/01/2023 Chưa khóa Xem
4 Hồ sơ độc giả Đỗ Đình Lâm Khang – chủ đề nghiên cứu "Chủ nghĩa đa văn hóa các quốc gia Đông Nam Á 1920-1980" 03/01/2023 Chưa khóa Xem
5 Hồ sơ độc giả Nguyễn Vũ Hiệu – chủ đề nghiên cứu "Tìm thông tin về tù nhân Nguyễn Huy Sán (Nguyễn Huy Thảo), cựu tù Côn Đảo 1931-1936" 03/01/2023 Chưa khóa Xem
6 Hồ sơ độc giả Lê Quốc Hưng – chủ đề nghiên cứu "Tìm thông tin tù nhân Lê Văn Được (cựu tù Côn Đảo khối 9 năm kháng pháp 1948-1954" 03/01/2023 Chưa khóa Xem
7 Hồ sơ độc giả Trần Công Đại – chủ đề nghiên cứu "Phong trào Cách mạng Miền Nam, Trung ương Cục Miền Nam, 1954-1975" 03/01/2023 Chưa khóa Xem
8 Hồ sơ độc giả Trần Quốc Duy – chủ đề nghiên cứu "Mỹ thuật Việt Nam giai đoạn trước 1975 và Mỹ thuật đương đại" 04/01/2023 Chưa khóa Xem
9 Hồ sơ độc giả Vũ Phạm Hồng Tú – chủ đề nghiên cứu "Lịch sử văn hóa kinh tế xã hội giai đoạn 1945 đến 1975" 04/01/2023 Chưa khóa Xem
10 Hồ sơ độc giả HÀ TRIỆU HUY – chủ đề nghiên cứu "Hoạt động ngoại giao của Việt Nam Cộng hòa với các nước Đồng minh của Mỹ trong Chiến tranh Việt Nam (1965-1973)" 05/01/2023 Chưa khóa Xem
11 Hồ sơ độc giả Phạm Minh Thiện – chủ đề nghiên cứu "Tài liệu cũ trước năm 1975" 05/01/2023 Chưa khóa Xem
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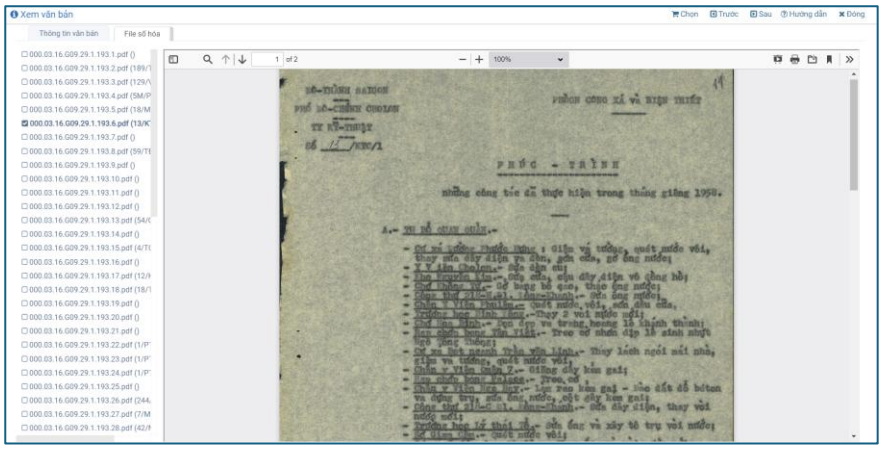
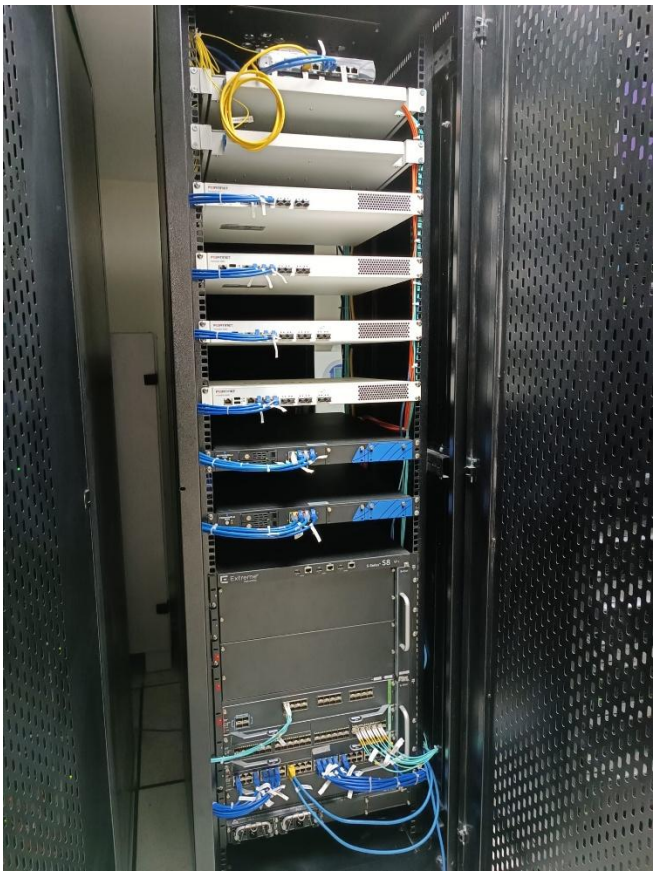
Quản trị Hệ Thống
QUẢN LÝ LƯU TRỮ
QUẢN LÝ VÀ KHAI THÁC TÀI LIỆU LƯU TRỮ
THU THẬP TÀI LIỆU
Cơ quan nộp lưu
Kế hoạch nộp lưu
Tiếp nhận
Sưu tầm bổ sung
QUẢN LÝ DỰ ÁN SỐ HÓA
Quản lý dự án
Thiết lập dự án
Biên mục và kiểm tra
KHO VÀ BẢO QUẢN
Quản lý kho
Quản lý giá kệ
Tiếp nhận và bàn giao
Thống kê, kiểm kê kho
CƠ SỞ DỮ LIỆU
Quản lý mục lục
Quản lý hồ sơ
Quản lý tài liệu điện tử
LƯU THÔNG TÀI LIỆU
Quản lý độc giả
Phê duyệt yêu cầu
Giao nhận tài liệu
Ghi nhận mượn trả
KHAI THÁC TRỰC TUYẾN
Tìm kiếm tài liệu
Xem tài liệu trực tuyến
Yêu cầu khai thác, sao chụp
Yêu cầu chứng thực
DANH MỤC
Quản lý phông
Quản lý loại hình
Quản lý danh mục, từ điển
HỆ THỐNG
Cấu hình hệ thống
Quản lý người dùng
Bảo mật
Nhật ký hệ thống
© AIMS -HM
Đơn vị sử dụng: Trung tâm Lưu trữ quốc gia II



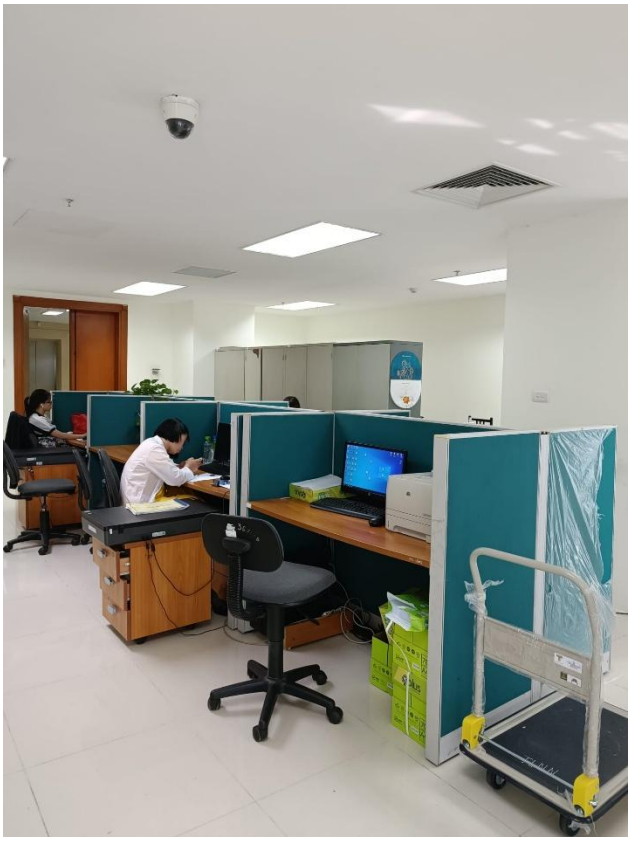
7.2. Reading Room of the National Archives Center III

7.3. The Archival Repository at the National Archives Center III

7.4. The Server System at the National Archives Center III



7.5. Digitization Equipment at the National Archives Center III



7.6. The Reading Room and Archival Repository at the Marburg Archive - HLA

7.7. Screenshots of the archival information system (Arcinsys Hessen)