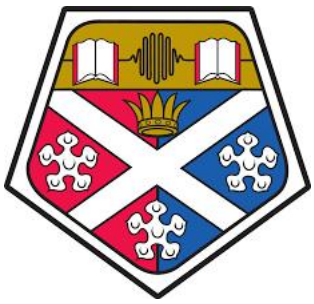
University of Strathclyde

Department of Computer and Information Sciences



A Strategic Plan for Improving the Digital Skills of University Library Professionals in Nigeria for Sustainable Automated Library Services

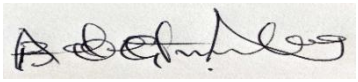
GBENGA ADETUNLA

A thesis presented in partial fulfillment of the requirements for the degree of **Doctor of Philosophy**

2026

Declaration of Originality

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Signed: 

Date: 27 / 08 / 2026

Dedication

To

My highly revered parents (Pastor S.O. & Barrister L.T., Adetunla) for their support and encouragement.

My beloved wife and children (Yetunde, Tiffany, Rex, and Zoe) for their love, support, and distraction.

My brother and his family (Dotun Adetunla PhD.).

My sponsor (TETFund through Ekiti State University).

&

My country (Nigeria)

Acknowledgments

I am deeply grateful to the Almighty God for granting me the strength, patience, and resilience to complete this journey successfully. I also extend my heartfelt appreciation to my parents, wife, children, and extended family for their unwavering support and encouragement throughout this endeavour.

I am writing to express my profound gratitude to my supervisor, Professor Gobinda Chowdhury, for his invaluable guidance, insightful feedback, and continuous support throughout my PhD. His constructive suggestions significantly enhanced the quality of this thesis, and it has been a privilege to work under his supervision. His mentorship and encouragement were pivotal to the successful completion of my PhD.

I would also like to thank Professor Diane Rasmussen McAdie, my initial supervisor. She offered me the opportunity to undertake this PhD and provided valuable support during my first year before moving to another institution. Her early guidance laid a solid foundation for this work.

I want to thank the iSchool research group and the Department of Computer and Information Sciences staff at the University of Strathclyde, Glasgow, UK, for their support and encouragement throughout my PhD journey.

Furthermore, I acknowledge and express my gratitude to my sponsor, Ekiti State University, Nigeria, through TETFund, for funding my PhD program.

I want to acknowledge and express my sincere appreciation to key Ekiti State University leadership members whose support and influence were instrumental in approving my PhD program. I am particularly grateful to Professor Edward Olanipekun, the immediate past Vice Chancellor, for approving the sponsorship of my program; to Professor J.B. Ayodele, the current Vice Chancellor, who graciously served as my guarantor during his tenure as Dean of the Faculty of Education; and to Elder Sanmi Ogunniyi, former Head of Academic Planning at the time of the program's approval, whose contributions were also significant.

Additionally, I would like to thank my colleagues from the University Library of Ekiti State University for their support. Most importantly, Dr A.A Osunrinde (Deputy University Librarian), who is my professional mentor and served as my second guarantor for this program, Mr. Olusola Obatikun, Dr. Ibrahim Badmus, Mr. Femi Ajayi, Mr. Ayo Fagbemiro,

and especially Mr. Ayodeji Aribisala who monitored my administrative correspondence throughout my program.

I also express my sincere gratitude to all the participants who participated in this research and generously contributed their time and insights. In particular, I am grateful to Dr. Priscilia Agbetuyi for her invaluable assistance in coordinating data collection in Nigeria and to Mr. Collins Omokaro for facilitating access to policy documents from the United Nations, Investment and Technology Promotion Office (ITPO) and the National Information Technology Development Agency (NITDA) in Nigeria.

Abstract

Nigerian university libraries have made progress in embracing technology to offer modern digital services but still struggle with effective digital operations. This was evident during the COVID-19 pandemic, when many could not shift to virtual services due to limited resources, especially a lack of a digitally skilled workforce.

This study investigates the digital skills gap among library professionals in Nigerian university libraries, examines existing digital skills development programs, and identifies the staff-side and managerial challenges impeding digital skills development for automated library operation.

Adopting a survey design using a sequential mixed-method approach, this study employs quantitative and qualitative data collection procedures. In the quantitative phase, a multi-stage sampling technique was used to select 453 respondents, of which 408 completed questionnaires were analysed using descriptive and inferential statistics via SPSS version 23. In the qualitative phase, purposive sampling was used to recruit twelve senior library management staff, and ten interviews were successfully conducted and thematically analysed.

The findings indicated that Nigerian university library professionals lack operational digital skills, particularly in management of serials, acquisition, and cataloging. In-house training also emerged as the primary means of digital skills development, while other training pathways were largely ineffective. Personal barriers such as financial constraints, lack of motivation, gender-related challenges, and institutional barriers such as the absence of policy framework, inadequate funding, and poor ICT infrastructure, were major impediments to digital skills development.

Based on the findings, a strategic plan in the form of a white paper is developed to address key issues, propose actionable solutions, engage stakeholders, and align with the UN SDGs.

The study concludes that Nigerian university libraries must prioritize building a digitally skilled workforce to meet post-COVID digital service demands. Tiered recommendations are made to stakeholders to support sustainable improvement.

Publications

Adetunla, G., Rasmussen Pennington, D. & Chowdhury, G. (2023). Automation of university library operations: an analysis of the covid-19 pandemic experience in the United Kingdom and Nigeria. *Springer, LNCS*, vol. 13972. https://doi.org/10.1007/978-3-031-28032-0_19

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Adetunla, G. & Chowdhury, G. (2025). Digital skills development of university library professionals in Nigeria: Testing the UTAUT model. *Information Research an International Electronic Journal*, *30* (iConf), 897–909. https://doi.org/10.47989/ir30iConf47170

Adetunla, G., & Chowdhury, G. (2025). Towards a sustainable automated library operation; the imperatives of digital skills and related factors of digital skills development of university library professionals in Nigeria. *Information Research an International Electronic Journal*,*30* (iConf), 884–896. https://doi.org/10.47989/ir30iConf47173

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CHAPTER ONE

INTRODUCTION

1.1. Contextual Background of Study

University libraries serve as the knowledge pillar to fulfill the vision and mandate of the parent institution by supporting teaching, research, and life-long learning activities of students, staff, and other library users in the academic communities. In pursuit of their goals, the library provides information resources to support the curriculum and extra-curricular activities of the users in the academic community, which positively contributes to their academic and research success (Ekpang & Ekeng, 2021). The provision of information services to library users has become significantly more efficient over the past seven decades through the adoption of Information and Communication Technology (ICT), giving rise to the concept of library automation. Library automation refers to the application of software and related hardware to manage core library functions such as acquisitions, cataloguing, circulation, serials control, and reporting. It typically relies on an Integrated Library Management System (ILMS) that acts as a single platform for all these activities (Tella et al., 2017).

Library automation in the United States of America (USA) and the United Kingdom (UK) , dates back to the 1950s and 1960s while developing countries in Sub-Saharan Africa, especially Nigeria, began to embrace automation in the 1970s (Tella et al., 2017). Thus, it is notable that automation of library routines and services has long emerged as an alternative to the traditional methods of information service provision, which has affected both information space and practice over the years. Patrons increasingly seek information and access e-resources from outside the library's physical space using their computers, smartphones, and other mobile devices (Hurst, 2013; Appleton, 2021). Library automation has contributed

significantly to the evolving nature of library services. It has transformed internal library operations from purely manual processes, such as cataloguing and classification, acquisition, and circulation, to technology-driven systems, enabling broader inter-library collaboration. This transformation has also led to the emergence of new roles within university libraries, including positions such as Systems Librarian, Cybrarian, Information Technologist, and Information Landscape Librarian. (Moonasar & Ngoepe, 2023).

Although it is too soon to imagine a bookless library, as libraries still maintain a hybrid measure of print and electronic resources, even though many print information collections are quickly replaced with electronic subscriptions. In most developed countries like the UK, the expenditure on electronic resources accounts for more than two-thirds of information provision expenditure (Greenhall, 2019; Poole, 2020; Appleton, 2021). Libraries are also taking sustainable measures by embracing open source and open-access models. In some institutions, acquisition activity is also carried out through academic staff and patron-driven collaboration in which the libraries promote and make more widely available unique collections original to their academic faculties, e.g., archives, original intellectual assets, research data set, teaching contents, virtual learning contents, etc. of their academic staff and research community (Witt, 2024; SCONUL, 2024). As a result, libraries have developed new resource discovery systems in response to users' demand. The focus is on how collections are managed and made available to users through a single search engine interface, which allows access to all full-text digital library collections (e-journals, e-book, databases, etc.), e.g., pre-harvested solutions such as Primo and EZproxy enable access both on and off campus. Access to these vast resources is given through a single authentication method, such as a university login or university email address and self-created password (Bunton, 2017; University of Edinburgh, 2024).

Investment in automation systems has significantly enhanced the productivity of libraries in developed countries such as the UK, USA, and Canada. These advancements enable libraries to provide round-the-clock access to services, independent of physical opening hours. As a result, users can access a wide range of electronic resources, and locate books and journals remotely in a fast and efficient manner, freeing time for research and teaching (SCONUL, 2024). Libraries are able to deliver these services to their users because of the automation of their housekeeping functions through library management software and technology to support their in-house operations (Hurst, 2013; Appleton, 2021). Technology such as NorMAN (a remote inquiry handling service) enables remote services such as instant messaging, email, and social media to reduce face-to-face provision of reference services. Other automation technologies such as Talis' Aspire, Ex Libris' Leganto, SirsiDynix's BLUE Cloud, and Koha are being used to enhance core in-house operations, such as Cataloguing, Online Public Access Catalogues (OPAC), Circulation, Acquisitions, Serials, Inter-library Loans, etc. (Stubley, 1989; McGarvey, 2018; UCU, 2020). Also, most university libraries in the UK run a help desk opening that lasts 9-8 hours per day during the week and 4- 5 hours on weekends (University of Edinburgh, 2024). However, the automation of operations has expanded service provision to include charging (loaning) and discharging (returning) of books or library resources, access to digital content, student registration, etc., even at unstaffed hours (Hurst, 2013; Chad, 2021).

1.1.1 National ICT Growth and Digital Infrastructure in Nigeria

Nigeria, the most populous nation in Africa, has experienced significant ICT growth since the early 2000s, marked by a transition from dial-up and radio-frequency technologies to broadband infrastructure such as Very Small Aperture Terminal (VSAT). This shift facilitated broader Internet adoption across institutions, media organisations, and the general public, propelled further by the introduction of mobile devices and services in 2001.

Subsequent developments included the expansion of Internet service providers and the digitalisation of radio and television broadcasting. International Telecommunication Union (ITU) statistics indicate steady improvement in Nigeria's global ICT Development Index ranking, driven largely by increased Internet penetration from 7 per 100 inhabitants in 2007 to 41 per 100 in 2024 exceeding the African average despite remaining below levels observed in advanced economies (ITU, 2024).

Nigeria now hosts the largest ICT market in Africa, valued at approximately US$10 billion annually, with substantial reliance on imported software from Asia, Europe, and the United States (David & Grobler, 2020). The rapid expansion of digital services has intensified demand for high-quality broadband, contributing to Nigeria's sizable share of regional telecom subscribers and Internet users. In response to emerging opportunities and infrastructural needs, the government introduced the National Digital Economy Policy and Strategy (2020–2030) and the National Broadband Plan (2020–2025), targeting improved Internet speeds and nationwide coverage. Although implementation faces obstacles including regulatory fragmentation, multiple taxation layers, infrastructural vandalism, and delays in permit processing. These initiatives represent Nigeria's strategic efforts to strengthen its digital ecosystem (NCC, 2024).

The current state of ICT infrastructure in Nigeria significantly influences all technology-dependent organisations. Libraries, in particular, have experienced substantial transformation in recent years as a result of the integration of ICT into their operational processes and service delivery models. The traditional methods of information dissemination have gradually given way to digitally mediated services, while the provision of electronic resources has increasingly become an essential complement to physical library collections (Sahabi & Otobo, 2021; Bashorun & Bashorun, 2021).

1.1.2 Evolution of Library Automation in Nigerian Universities

The evolution of library automation in Nigerian universities mirrors the country's wider political, economic, and technological transformations, revealing a complex interaction between imported technologies, donor-funded initiatives, and local institutional capacity. Early experiments with automation in Nigeria emerged in the 1970s, with pioneering efforts at universities such as Ahmadu Bello University, the University of Nigeria, Nsukka, and the University of Lagos. These initial initiatives focused primarily on serials control and cataloguing operations, utilising minicomputers and text-based software. Although limited in scope and largely restricted to back-office functions, these early efforts signaled a growing awareness among Nigerian academic librarians of the potential of computer technologies to enhance operational efficiency and improve access to library collections (Alabi, 1987: Adegbore, 2010).

During the 1980s and early 1990s, more ambitious attempts were made to institutionalise automation through the introduction of integrated library systems at a broader national level. These initiatives were largely facilitated by international funding and policy interventions. One significant centrally coordinated programme involved the National Universities Commission (NUC), which, with conditional funding from the World Bank, implemented the TINLIB integrated library system across twenty federal university libraries. Subsequent donor-supported projects further expanded automation efforts. Notably, the Carnegie and MacArthur foundations sponsored the deployment of the VTLS system in several federal universities under a five-year agreement that concluded in 2015. However, following the expiration of these agreements and the withdrawal of external support, many of these systems proved unsustainable due to limited expertise and insufficient local digital capacity within the beneficiary institutions (Ogunleye, 1997; Zubair et al., 2023).

By 2018, many Nigerian university libraries began transitioning away from proprietary integrated library systems as the cost of maintenance, licensing, and technical support became increasingly prohibitive. In response, numerous institutions either temporarily reverted to manual procedures or adopted open-source integrated library management systems, most notably Koha (a free Integrated Library System), which offered lower operational costs and greater flexibility (Adamu, 2023; Omodara, et.al, 2025). Studies show that university libraries in Nigeria indicate relatively high levels of adoption of the Koha ILMS, particularly for cataloguing functions and the provision of OPAC. However, other functions such as acquisitions, circulation, and serials management are frequently not fully implemented (Tella et al. 2017; Ojo & Otunla et al., 2022; Emasealu, 2019; Omopupa et al., 2020; Ojo, 2024).

Moreover, a number of institutions continue to depend on traditional systems such as card catalogues and manual circulation procedures, or employ ILMS only on a limited experimental or pilot basis within certain sections of the library. In some cases, circulation services are still administered manually despite the presence of a functional ILMS. The persistence of these practices is commonly linked to a range of factors, including staff resistance to technological change, inadequate training, and infrastructural challenges such as unreliable electricity supply and unstable network connectivity at service points. Additional contributing issues include insufficient funding, a shortage of ICT-skilled personnel, limited training opportunities, occasional system failures, network constraints, and the adoption of unsuitable software solutions (Omehia et al., 2021; Ajani & Buraimo, 2022).

Findings indicate that only a small proportion of Nigerian university libraries approximately 5% could be classified as fully automated, meaning that all core housekeeping functions, including acquisitions, cataloguing, circulation, serials management, and OPAC services, were supported by an integrated library management system. In contrast, nearly 95% of

university libraries were either partially automated or had not implemented automation at all (Lawal-solarin et.al., 2018; Omopupa et al., 2020; Olubiyo & Awoyemi, 2021).

The challenges facing automation initiatives in Nigerian university libraries are not mainly caused by a lack of funding for technology deployment or the absence of technological equipment but, they are largely due to the lack of a comprehensive and sustainable framework that includes consistent funding, appropriate technology selection, clear policy direction, effective regulation by professional bodies, and continuous staff training and capacity development. This implementation context shows not only the infrastructural and financial challenges but also the level of digital competence among library personnel. As a result, the development of library automation in Nigeria highlights the close interplay between technology adoption and the digital skills of library staff. This relationship is a key focus of the present study.

1.1.3 Interplay of Automation and Libraries' Operational Limitations

One of the major challenges affecting the technological advancement of libraries in developing countries such as Nigeria is the lack of operational framework (financial, technology and human resources). This limitation has a cascading effect on libraries' ability to maintain up-to-date technological infrastructure, including hardware and software systems, to provide access to licensed full-text digital resources, and to maintain a digitally skilled workforce (Sahabi & Otobo, 2021). In response to these challenges and in pursuit of sustainability, many Nigerian libraries have increasingly adopted open-source technologies and open-access information resources, but little is done about digitally skilled workforce (Sahabi & Otobo, 2021; Ajani & Buraimo, 2022; Adamu, 2023)

Despite the broader economic constraints within the country, university libraries in Nigeria continue to make efforts to subscribe to scholarly databases and electronic journals such as

EBSCO, Elsevier, ScienceDirect, and ProQuest, while simultaneously expanding the use of open-access resources (Eneh et al., 2023). Similar to practices in developed countries, these electronic resources are expected to be accessible to users both within university premises and remotely (Adeeko & Adetimirin, 2021; Uwandu, 2022; Dime, 2023). However, the mere availability of digital resources does not automatically guarantee effective access or utilisation. The automation of core housekeeping operations within university libraries remains essential for delivering modern digital services and enabling seamless remote access to library resources. Nevertheless, many university libraries in Nigeria remain only partially automated, while in some cases previously implemented automation systems have become non-functional, forcing institutions to revert to manual methods of service delivery (Lawal-Solarin et al., 2018; Ajani & Buraimo, 2022).

In contrast to library systems in developed countries, particularly in the United Kingdom and the United States, where users typically access the full range of electronic library collections through a single institutional login, often with their university email credentials, access to electronic resources in many Nigerian university libraries is more complex and less user-friendly. Users are frequently required to manage multiple usernames and passwords in order to access different databases and electronic journal platforms (see evidence from researcher's home institution https://eksu.edu.ng/e-library-resources/). Tella et al. (2018) observe that this fragmented authentication process significantly complicates the use of electronic resources, as separate login credentials are often assigned for each subscribed database.

In many cases, users must contact the library's e-library or reference team via email through the university library website to obtain these login details. However, such online reference services are typically asynchronous, meaning that responses are not provided in real time. Additionally, most university libraries in Nigeria do not operate on a 24-hour basis; rather,

they generally open from approximately 8 a.m. to 4 p.m., Monday to Friday, with occasional extensions during examination periods (Agboke & Oladokun, 2024). As a result, help desk services, particularly circulation and reference operations are unavailable outside these staffed hours. This limitation restricts timely access to library assistance and resources, leaving users unable to obtain needed support or materials until the next working day (Idhalama et al., 2025).

In view of these challenges, achieving sustainable digital library services in Nigerian university libraries requires a strategic and long-term approach that extends beyond the mere acquisition of technologies or subscription to electronic resources. Sustainability must involve framework for the adoption of integrated automation systems, continuous staff capacity building, reliable ICT infrastructure, and institutional policies that support seamless digital initiatives to improve the delivery of automated information services.

1.2 Research problem

The COVID- 19 pandemic disrupted the operations of university libraries worldwide, forcing the closure of physical facilities and interrupting traditional, face- to- face service delivery. In line with global trend, libraries were expected to strategically pivot toward virtual and digital services to sustain access to information resources (Onyeaka et.al., 2021; Ashiq et.al., 2022). In Nigeria, however, most university libraries shut down completely in compliance with government's work- from- home directives and were largely unable to migrate services online, despite prior investments in automation technologies. Their traditional methods of rendering information services became redundant during the pandemic (Ifijeh & Yusuf, 2020; Ebijuwa et.al, 2021). This experience exposed a critical strategic weakness: the absence of a skilled workforce and plan for developing and sustaining the digital skills of university library professionals which is required to effectively support automated services (Ameh et.al., 2021;

Goshie et.al., 2022; Kasa & Yusuf, 2022). Beer and Mulder (2020) argued that the effective implementation of technology in any organisation, including university libraries, depends not only on the availability of technological tools but also on the digital competencies of the workforce, which are critical for driving and sustaining the operational process.

In the post-COVID era, Nigerian university libraries have restarted their automation transformation, working to integrate digital technologies into their core operations (Odunlade & Ojo, 2023; Onwubiko, 2023). Libraries that had previously abandoned or underutilized integrated library systems and related tools are now reactivating and upgrading these platforms, seeking to move from manually driven to digitally mediated workflows. This renewed focus on automation underscores the urgent need for a deliberate, system-wide strategic plan to reorient, reskill, and upskill university library professionals to manage automated library services over time. However, the current digital environment faces the challenge of shortage of staff with the necessary digital competencies and fragmented approaches to digital skills development (Ameen & Ullah, 2020; Atchrimi & Ogunbodede, 2024)). Evidence from recent studies suggests that a substantial proportion of Nigerian information professionals lack the digital competencies required to effectively utilise emerging technologies in library services (Atchrimi & Ogunbodede, 2024; Agboke & Oladokun, 2024). Similarly, a nationwide survey conducted by Ajani et al. (2023), involving respondents from Nigeria's six geopolitical zones, found that approximately 78% of the information professionals sampled lacked the competencies required to effectively use emerging technologies in their professional practice. This skills gap has practical implications for library operations.

Guided by Martin's digital literacy model, digital skills in this study are conceptualized along a continuum from basic to advanced task-based competencies. Basic digital skills encompass

foundational abilities such as online searching, email communication, document creation, and network connectivity, while advanced digital skills refer to the capacity to deploy emerging technologies to perform library-specific operational tasks, including the use of systems like Koha for cataloguing, circulation, OPAC, institutional repositories, serials management, and acquisitions (Martin, 2006; Dube et al., 2024). Evidence also suggests that many university library professionals in Nigeria have limited access to structured, continuous training on these emerging tools, which restricts their ability to engage fully with automated and digital systems (Chigwada & Nwaohiri, 2021; Echem, 2022; Agboke & Oladokun, 2024). In the absence of a coherent strategic plan that links these skill requirements to institutional goals, staffing policies, and ongoing professional development, investments in automation are unlikely to yield sustainable service outcomes (Dahunsi & Adetunla, 2021; Odunlade & Ojo, 2023).

Existing studies on Nigerian university libraries have documented several challenges affecting automated and digital services, including financial, human, and infrastructural constraints; limited training opportunities; and a range of individual and institutional barriers such as socio-economic conditions, policy gaps, funding patterns and organizational culture (Omeluzor et al., 2021; Ajani and Buraimo, 2022; Dime, 2023; Agboke & Oladokun, 2024). While these studies highlight important obstacles, they rarely adopt a strategic planning approach and sustainability-oriented lens, focused specifically on improving the digital skills of university library professionals as a pathway to resilient automated services. Consequently, there is a notable gap in the literature regarding a context-sensitive strategic framework for building, consolidating, and sustaining digital competencies within Nigerian university libraries (Bakare, 2023; Ayinla & Aramide, 2023; Agboke & Oladokun, 2024).

It is against this backdrop that this present study, seeks to address these gaps to examine the current digital skills profile of university library professionals in Nigeria, assesses existing digital skills development programmes, and explores the contextual challenges that influence the sustainability of digital competencies. On the basis of these findings, the study aims to develop a practical, context- appropriate strategic plan for improving the digital skills of university library professionals, with the ultimate goal of driving effective, resilient, and sustainable automated library services across Nigerian universities.

1.3 Aim of the Study

The overall aim of this study is to develop a strategic plan for improving the digital skills of university library professionals in Nigeria on sustainable automated library operations. objectives were set to achieve the overall aim of this research:

1. To identify the current digital skills level of university library professionals in Nigeria,
2. To examine how the existing digital skills training methods enhance digital skills of university library professionals in Nigeria,
3. To explore the staff-side factors that impede the skills development of university library professionals in Nigeria; and
4. To explore the managerial perspective and challenges of digital skills development of university library professionals in Nigeria.

These objectives led to the following research questions.

1.3.1. Research questions

RQ1a: What basic digital skills do Nigerian university library staff possess for the implementation of automated library operations?

RQ1b: What operational task–based digital skills do Nigerian university library staff possess for the implementation of automated library operations?

RQ2a: How has the prior library school education contributed to enhancing the digital skills of Nigerian university library staff for effective automated library operations?

RQ2b: How has the continuing education training programs enhanced the digital skills of Nigerian university library staff for effective automated library operations?

RQ3: How has Individual (personal, socio-economic and work-related) factors influence the development of digital skills among Nigerian university library staff for automated library operations?

RQ4: How has institutional (policies, funding mechanisms, and leadership culture) factors impede the development of digital skills among library staff in Nigerian universities for automated library operations?

1.3.2 Research hypotheses

Arising from the literature review presented in Chapter 3, some factors were identified to contribute to the level of digital skills possessed and the impediments to digital skills development of university library professionals in Nigeria. Such factors are age, gender, education level, work experience, institutional ownership differences etc. Six hypotheses were particularly designed along these factors to address research question one, two and three**.** Accordingly, the following hypotheses were generated:

H1: There is no Gender difference in the digital skills possessed by Nigerian university library staff for automated library operations.

H2: There is no correlation between years of work experience and digital skills Nigerian university library staff possess for automated library operations.

H3: There is no significant correlation between the level of education and the digital skills Nigerian university library staff possess for automated library operations.

H4: There is no significant difference in the digital skills possessed by Nigerian university library staff for automated library operations based on the career cadre.

H5: There is no significant difference between the digital skills level of library staff in public and private universities for automated library operations.

H6: There is no significant correlation between the training programs attended and the digital skills possessed by Nigerian university library staff for automated library operations.

Hypotheses 1-5 address research question one (digital skills possessed) and research question three (staff-side factors that impede digital skills development) by analysing digital skills gap across staff demography (age, gender, education level, work experience, cadre) and how these factors impede the digital skills development of university library professionals in Nigeria. Hypothesis 6 explores the relationship between Research Question One (digital skills possessed) and Research Question Two (training programs attended).

1.4. Significance of the study

This research has shed new light on the skills gap and training requirements of library professionals in Nigeria, while also identifying the key factors and challenges involved in developing digital skills from a bottom-up perspective. The findings provide valuable, context-based insights into sustainability factors necessary for developing effective strategies to enhance digital competencies among professionals in university libraries across Nigeria. Beyond Nigeria, the findings are applicable to other developing and underdeveloped

countries experiencing similar challenges in delivering digital services in a post-COVID environment.

In addition to its broader implications, the research lays a foundation for addressing gender inequality among university library professionals by promoting equitable access to digital skills and competencies. The outcomes are also relevant to library and information science (LIS) schools, and administrators, offering sustainable recommendations to improve the LIS curriculum in Nigerian institutions. These improvements will benefit not only LIS students but also current information service professionals. For library administrators and university managers, the study provides guidance for formulating effective policies on staff training and professional development, thereby boosting library performance and overall institutional effectiveness.

Moreover, this study contributes meaningfully to several United Nations Sustainable Development Goals (SDGs), including SDG 4 (inclusive education and lifelong learning), SDG 5 (gender equality), SDG 8 (decent work and economic growth), and SDG 17 (partnerships for sustainable development through technology). In addition to its practical implications, the study enriches the academic discourse on digital skills and capacity building for LIS professionals, contributing to theoretical, conceptual, and methodological advancements in this evolving field.

1.5. Operational definition of terms

Automated library operations: The use of library technologies, particularly Koha and other related systems by library staff to perform daily task-based functions such as cataloging, serials management, reference services, acquisitions, circulation, and patron services.

Library professionals: These are university library staff within the librarian and library officer cadres who perform core professional library functions. Librarians are academic staff who are required to hold at least a master's degree in Library and Information Science at entry level. In contrast, library officers, often referred to as paraprofessionals, are non-academic staff who typically possess a minimum of a diploma in Library and Information Science at entry level. They provide essential support to librarians in the day-to-day operations of the library. Further details are provided in Chapter 2 (Section 2.2.2).

Digital skills: The basic and operational task-based digital knowledge and competence required to use library-related operational technology to render digital services to its users.

Sustainable skills development strategy: A context- driven capacity building approach that remains economically affordable and socially equitable, taking into account the specific socio-cultural challenges faced by library professionals in Nigeria to enhance automated library operations and services

1.6. Organisation of the thesis

The remainder of the thesis is organized into nine chapters as follows:

Chapter 2, Research Context, briefly describes the Nigerian university environment and university operations.

Chapter 3, Literature Review, presents a literature survey on the topics relevant to the research problem and objective. The chapter provides the theoretical framework that directs this study.

Chapter 4, Research Methodology, discusses the methodology and methods employed in the study. It presents the justification for the choice of methods, the procedures for data

collection, data analysis, and the procedures for testing the validity and reliability of the instruments.

Chapter 5 provides the demographic details of both quantitative respondents and interview participants.

Chapter 6 presents the quantitative results and discussions on the basic and operational digital skills of university library professionals in Nigeria. The chapter includes descriptive statistics of research questions 1a and b, and an inferential analysis of hypotheses.

Chapter 7 presents the quantitative results and discussions on the existing digital skills methods and staff-side factors that inhibit the digital skills development of university library professionals in Nigeria. The chapter addresses research questions two and three and the inferential analysis of hypotheses.

Chapter 8 presents the qualitative results and discusses the institutional-side challenges and factors related to digital skills development.

Chapter 9 presents a strategic plan for sustainable digital skills development of library professionals in Nigeria.

Chapter 10 concludes the thesis by summarizing key findings, contributions to knowledge, some of the study's limitations, and directions for future research.

Finally, the *Appendices* contain further information on the data collection instruments for both study phases.

1.7 Summary of Chapter

Chapter One introduces the study by examining the evolving role of university libraries in supporting teaching, research, and learning within higher education institutions. It highlights how the integration of ICT and library automation has transformed traditional library

operations globally, enabling improved access to electronic resources, remote services, and more efficient information management. The chapter also outlines the development of ICT infrastructure in Nigeria and traces the historical evolution of library automation in Nigerian universities. While several automation initiatives have been implemented through government programmes and donor support, many university libraries remain only partially automated due to infrastructural limitations, inadequate policy frameworks, and shortages of digitally skilled personnel.

The chapter further identifies the central research problem, emphasising that the sustainability of automated library services in Nigeria is constrained not only by technological and financial challenges but also by insufficient digital competencies among library professionals. In response, the study aims to develop a strategic plan for improving the digital skills of university library staff to support sustainable automated operations. The chapter outlines the research objectives, research questions, and hypotheses guiding the study. Finally, the chapter highlights the significance of the research, defines key operational terms and presents the overall organisation of the thesis. The next Chapter presents the institutional context of Nigerian universities and their libraries.

CHAPTER TWO

RESEARCH CONTEXT

2.1. Introduction

This Chapter provides insight into the Nigerian perspective of the university system and university library operations. Giving a chronological background of universities and university libraries in Nigeria, staff classifications in university libraries, and the research context of the study.

2.2 University Library in Nigeria

The establishment of Yaba Higher College in 1934 represented an early colonial initiative to provide limited tertiary education for Nigerians, primarily aimed at preparing them for subordinate administrative and technical roles rather than leadership positions (Ajayi, 1975). This narrow vocational orientation attracted criticism from West African intellectuals such as Edward Wilmot Blyden, James Africanus Beale Horton, Joseph Ephraim Casely-Hayford, and Nnamdi Azikiwe, who advocated for degree-awarding universities capable of promoting intellectual development, social mobility, and indigenous leadership (Ndlovu-Gatsheni, 2020). As nationalists' demands for self-government intensified, calls for universities comparable to English institutions gained momentum. Consequently, the Elliot Commission of 1943 and the Asquith Commission of 1945 recommended the establishment of a university college affiliated with the University of London, leading to the founding of University College Ibadan in 1948, a landmark development in Nigeria's higher education history (Kosemani & Okorosaye-Orubite, 1995).

Following independence in 1960, regional political autonomy stimulated competition for higher education expansion, as universities were increasingly viewed as instruments for socio-economic development (Anyanwu, 2011; Gberevbie & Oni, 2021). This period saw the

emergence of first-generation institutions such as University of Nigeria Nsukka (1960), Ahmadu Bello University (1962), and University of Ife (1962), while University College Ibadan became the University of Ibadan, Nigeria's first full university (Ajayi, 1975; Hamza et al., 2021). Subsequent military administrations expanded the system through the creation of additional federal and state universities, forming second and third generation institutions. With the restoration of democratic governance in 1999 and earlier legislation enactment of the Private Universities Act 1993, permitting private universities ownership, Nigeria entered a fourth phase of expansion, with institutions now regulated by the NUC but funded through federal, state, or private sources (Hamza et al., 2021).

The history of university libraries in Nigeria dates back to 1962 at the first and premier university in Africa/Nigeria, University College Ibadan, now known as the University of Ibadan. The library was named after the first Vice Chancellor, Kenneth Dike Library. Other university libraries sprang up as universities were established in Nigeria to date. The NUC regulates the running of the universities and, by extension, the libraries. The NUC structure for the university libraries is to run a decentralised operation that comprises a central library, faculties, colleges, and directorate libraries. The central library superintends over the other subset libraries. The operational staffing of a faculty library comprises a subject librarian, library officer, and library assistant (this was further explained in section 2.3.1).

2.2.1 Funding Model for Nigerian University Libraries

University libraries in Nigeria are primarily funded by their parent institutions, though additional support often comes from governmental bodies such as the Tertiary Education Trust Fund (TETFund), donor agencies, internally generated revenue, and private contributions (Ezekwe & Ani, 2023; Echono, 2024; Agbanu & Ezekwibe, 2025). According to the NUC, the recommended funding pattern requires parent institutions to allocate 10% of

their annual budget to library operations, covering resource acquisition and staff development (Adedoyin et al., 2026; Agbanu & Ezekwibe, 2025). However, persistent economic challenges in Nigeria, beginning in the 1980s, have severely constrained university funding, adversely affecting facilities including classrooms, laboratories, and libraries, as well as staff morale due to irregular payment of salaries and allowances (Edet, 2020; Agbanu & Ezekwibe, 2025) note that the chronic underfunding of Nigerian universities has effectively eliminated adherence to the NUC's recommended 10% budget allocation for libraries.

The TETFund emerged as a response to decades of advocacy and industrial actions by the Academic Staff Union of Universities (ASUU) against oppressive military regimes, aimed at improving university facilities and staff working conditions. Originally established as the Education Trust Fund (ETF), it was later reconstituted as TETFund to serve as an intervention agency supporting public tertiary institutions. Its primary mandate is to rehabilitate, restore, and consolidate tertiary education in Nigeria through the provision and maintenance of: (1) essential physical infrastructure for teaching and learning, (2) instructional materials and equipment, (3) research and publications, and (4) academic staff training and development (Ikutal & Edet, 2018; Echono, 2024).

TETFund has played a pivotal role in enhancing infrastructure, supporting conference participation, and facilitating staff training. Sector-wide analyses indicate that annual TETFund interventions exceed ₦683 billion (₦683,429,268,402.64; approximately US$413,474,707.38), with evidence from the 2024 intervention cycle showing that roughly 40% of these allocations support programs aimed at staff capacity development (Ezekwe & Ani, 2023; Agbanu & Ezekwibe, 2025; TETFund, 2024). Therefore, it can be concluded that while Nigerian university libraries are primarily managed and funded by their parent

institutions, TETFund serves as a critical co-funding agency that strengthens library infrastructure, resources, and staff development (Olubusayo, 2018)

2.2.2 Staff Cadres in Nigerian University Libraries

In Nigerian universities, staff are categorized as academic and non-academic. The academic staff comprises the core teaching staff (lecturers and librarians). In contrast, every other non-teaching staff members of the university, such as the administrative and technical staff, are non-academic (Okotoni & Kugbayi, 2024). The library staff cadres are also categorised in this manner; the academic wing of the library and the non-academic (Aziagba, 2009; Ibegbulam & Eze, 2016). The staff in the librarianship cadre and are called librarians. Librarians must hold at least a Masters degree in Library and Information Science from accredited library science programs as an entry requirement into the profession. They are considered the academic wing of the library as they have a career progression to becoming the University Librarian (Grade level 16, equivalent to being a professor) with evidence of teaching and continuous paper publication in scholarly journals (Aziagba, 2009; Akintola et al., 2022; Izah, 2020).

On the other hand, the non-academic wing of the library often referred to as paraprofessionals is further classified into two different cadres of staff, the library officer and library assistant cadre. Library officers must hold at least a Diploma certificate in Library and Information Science from accredited library science programs as an entry requirement into the profession. This category of staff also take on some key professional roles as they directly assist the librarians in the library's daily operations. They assist with cataloguing, circulation and reference activities and interface with users (Akintola et al., 2022; Izah, 2020). Ibegbulam & Eze (2016) assert that library officers have a career progression that allows

them to become senior staff, barring at grade level 13, though with an additional qualification of having a Bachelors degree and above in library and information science .

Another cadre in the non-academic wing of the library is the library assistant cadre, the library assistants are staff who posses a Senior Secondary School Certificate or equivalent. They help with the non-professional day-to-day tasks in the library, such as book packing, shelf dusting, cleaning, portals, etc. (Omotunde et al., 2024). Additionally, the library's digital environment has created new technical positions and roles in university libraries, such as System analyst, software manager, network operator, Information technologist, RFID manager, CCTV manager, etc. (Moonasar & Ngoepe, 2023). Forth going in this study, only the staff in the librarianship and library officer cadres will be recognised as library professionals.

2.2.3 Experiences of Nigerian University Libraries (pre-post COVID- 19)

Prior to the COVID- 19 pandemic, Nigerian university libraries exhibited varying levels of digital preparedness and digital skills among staff. While many institutions had implemented automation systems such as Koha and subscribed to online databases, these systems were often underutilised, with most digital services limited to cataloguing and OPAC access. Digital competencies among library personnel were largely task-specific, focusing on basic ILMS operations, with limited experience in remote service provision or advanced e-resource management (Ifijeh & Yusuf, 2021; Ameh et al., 2021). Institutional strategies for digital service continuity were generally weak, with libraries dependent on physical premises for most user interactions. As a result, even where infrastructure existed, the readiness of staff and institutions to provide fully virtual services was constrained.

During COVID-19

The emergence of the COVID-19 pandemic and subsequent lockdowns exposed these gaps more obviously. Most Nigerian university libraries closed their physical premises, and sustained virtual reference or information services were largely absent (Ifijeh & Yusuf, 2021). A small number of libraries attempted to maintain user contact via email, social media, or telephone, but these efforts were often informal, fragmented, and unsupported by institutional strategies or robust digital platforms (Ameh et al., 2021). Staff frequently lacked remote access to ILMS and e-resource authentication systems, making it difficult to assist users from home even when on-campus infrastructure was functional (Kasa & Yusuf, 2022).

Several factors compounded these challenges: inadequate remote access solutions (e.g., absence of proxy servers or VPNs), limited staff familiarity with ILMS functionalities, poor user awareness of e-resources, and socio-economic constraints such as unreliable home internet, interrupted power supply, and the need to self-fund internet bandwidth plan and equipment (Ebijuwa et al., 2021; Musa & Mang, 2022; Mabawonku et al., 2023). Institutional communication was also uneven, with university management prioritising core teaching and administrative functions, and providing minimal guidance to libraries regarding digital service continuity (Ifijeh & Yusuf, 2021).

Despite these constraints, some libraries demonstrated innovative responses. Institutions with relatively advanced digital infrastructure and skilled staff, especially the private universities were able to provide selected services remotely, including access to subscribed databases through institutional portals, virtual reference services via WhatsApp or email, rapid delivery of scanned documents, and COVID- 19 information portals (Omopupa et al. 2020; Ifijeh & Yusuf, 2021). These examples, however, were exceptional and largely reliant on pre-existing investments in technology and human capacity.

Post COVID-19

Following the easing of lockdowns, Nigerian university libraries have increasingly viewed the pandemic as a catalyst for renewed automation and digital transformation (Odunlade & Ojo, 2023; Onwubiko, 2023; Mesagan & Hossana, 2025). Libraries that had previously underutilised or abandoned their ILMS began reactivating these systems, upgrading Koha installations, digitising key documents, expanding institutional repositories, and revisiting remote access solutions for e-resources. The disruption experienced during the pandemic reinforced recognition among library managers and university administrators that manual, building-bound operations are inadequate for effective academic library services (Odunlade & Ojo, 2023).

Nonetheless, structural challenges persist. Funding constraints, inadequate infrastructure, and, critically, limited digital skills among library personnel continue to hinder the full realisation of automation benefits. Many staff still lack the operational competencies required to manage ILMS, support remote authentication, and design virtual services effectively. While some institutions have initiated training programmes, these efforts are often ad hoc, vendor-led, or focused on basic ICT skills rather than advanced operational digital skills (Friday & Onuh, 2022). Without a coherent strategic framework for digital skills development and automation, there remains a risk that post-COVID initiatives will replicate prior patterns of partial implementation and unsustainable systems.

2.3 Study's context of digital skills

Despite the efforts towards sustainable automated operations in university libraries in Nigeria, the current state of automation projects across university libraries in Nigeria is not impressive, as only 5% of university libraries in Nigeria run fully automated operations, while the remaining 95% account for non-automated or partially automated library operations (Lawal-

Solarin et al., 2018; Ajani & Buraimo, 2022). Several studies have identified a range of challenges that hinder the effective implementation of library automation in Nigeria, including erratic power supply, limited internet bandwidth, and inadequate technological infrastructure. However, the literature consistently highlights a more critical concern, the shortage of experienced and technologically proficient professionals capable of operating effectively within the evolving digital environment of Nigerian university libraries. Evidence suggests that a large number of Nigerian information professionals lack the competencies required to use emerging technologies, a situation that has contributed significantly to the poor state of automated library operations across Nigerian universities despite the formal adoption of automation technologies (Ameh, 2021; Ajani & Buraimo, 2022; Mesagan & Hossana, 2025; Agboke & Oladokun, 2024).

The successful deployment of technology in any organisation, including university libraries, is influenced by the quality of the workforce in terms of skills to drive and implement the process (Beer & Mulder, 2020). Alabi (1987) observes that the initial attempts at library automation in Nigerian universities during the 1980s and 1990s were largely unsuccessful, primarily due to insufficient technical expertise in managing and utilizing essential technological components such as software, hardware, and network systems for operational purposes. However, more recent developments indicate significant progress in this regard.

Contemporary Nigerian university libraries now benefit from dedicated teams of technical experts, either within their internal technical departments or through collaboration with university-wide ICT units, to oversee and maintain technological infrastructure, including software, hardware, and network systems (Rawayau, 2024; Mesagan & Hossana, 2025). Morgan (2002) contends that librarians are not expected to be programmers and, therefore, should not be burdened with the responsibility of developing complex technical ICT skills.

Rather, he emphasizes the importance of librarians acquiring the necessary competencies to effectively utilize emerging technologies within the library environment to carry out operational tasks, rather than mastering their underlying technical complexities. Despite this perspective, recent studies indicate that a significant skills gap remains, as many Nigerian university libraries lack digitally skilled professionals capable of operating effectively within the rapidly evolving digital landscape and this was earlier noted and evident during the Covid-19 pandemic (Enakrire et al., 2025; Adegbore, et al., 2025; Oladokun et al., 2025; Makinde & Oyekale, 2025).

Studies have identified various categories of digital skills required to function effectively within a digital environment, typically classified as basic, intermediate, and advanced digital skills (Tella, 2023; African Union, 2020; Lloyds Bank, 2018). However, empirical research within the context of digital libraries often distinguishes primarily between two major layers of digital skills, basic and advanced (Makinde & Oyekale, 2025). Drawing on Martin (2006) digital literacy model, Makinde and Oyekale (2025) define basic digital skills as general ICT literacy competencies necessary for operating digital hardware and software to perform everyday tasks such as online searching, email communication, word processing, and connecting to wireless networks. Studies such as Atchrimi, and Ogunbodede, 2024 and Makinde and Oyekale (2025) emphasize that these skills form the foundational level of digital competence.

In contrast, advanced digital skills are conceptualized as professional competencies required to utilize emerging technologies in executing library-specific operational tasks (Dube et al., 2024). These include proficiency in the use of integrated library management systems and digital repository tools such as Koha, DSpace, EPrints, and metadata standards like Dublin Core to manage functions such as cataloguing, circulation, OPAC, institutional repositories,

serials management, and acquisition services. Several scholars (Akintola et al., 2022; Okike & Adetoro, 2019; Atanda et al., 2021; Emezie et al., 2024) concur that Nigerian library professionals require both basic and operational task-based digital skills to function effectively in the contemporary digital environment. In the context of the present study, given that Koha is the most widely adopted automation software among Nigerian university libraries for managing digital operations, advanced digital skills is conceptualized as digital skills to use Koha for library tasks and operations.

According to Baro et al. (2019), who conducted a survey across Africa that included Nigeria, librarians in Nigeria, found that librarians in Nigeria generally possess basic digital skills such as online searching, emailing, social media use, document uploading, and file creation, but demonstrate low proficiency in advanced operational areas like metadata standards which is required for managing institutional repository. Similarly, Friday and Onuh (2022) observed that while skills such as word processing, internet browsing, and social networking are common, competencies required for advanced library operations including cataloguing, institutional repository management, e-resources management, and digital preservation remain limited. Supporting this view, Dube et al. (2024) reported low levels of familiarity with emerging technologies such as chatbots, RFID, WebOPAC, Large Language Model and other library automation tools among Nigerian librarians.

Although basic digital skills facilitate routine tasks, electronic communication with library user, internet search, and access to online resources, they are insufficient for managing automated library operations, which require specialised competencies in areas such as acquisitions, circulation systems, repository management, and digital preservation (Oguntade et al., 2025). Consequently, sustainable automation depends on continuous professional development that extends beyond general ICT literacy to advanced, library-specific digital

skills. Scholars such as Izah (2022) and Oguntade et al. (2025) therefore emphasise the need for targeted digital skills development programmes, while Osesi et al. (2022) and Echem (2022) note that opportunities for advanced operational training remain limited in Nigerian university libraries.

2.4 The concept of Sustainability

The idea of sustainability has been widely promoted by the United Nations (UN). The UN defines sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (UN, 1987). This concept of sustainability is built on three pillars: economic, social, and environmental development (Loach et al., 2017; Moore, 2017; Purvis, 2019; Allen, 2024). These three pillar gave rise to the 17 SDGs which emerged from the UN global consultation in 2015 to build on the success of the Millennium Development Goals (MDG) of the years 2000-2015 (Allen, 2024). Nicholas and Perpetual (2015) describes sustainable development as the overall change and improvement in any given society as related to individual progress which covers a wide range of interrelated issues in the areas of environmental, economic, social, and political, all within the limits of the world's natural resources to ensure that all people enjoy peace and prosperity by the year 2030. Figure 2.1 shows the 17 SDGs



Figure 2.1: Sustainable Development Goals (United Nations, 2025)

The Seventeen SDGs are designed to promote peace, prosperity, and sustainability for people and the planet addressing both present and future generations. Libraries, as pivotal institutions for knowledge dissemination, access, and preservation, play a crucial role in advancing these global objectives. By providing equitable access to reliable information, supporting educational and research endeavors, commitment to lifelong learning and community empowerment.

In aligning the libraries functions with specific SDGs, studies such as Nabina and Harikrishnan (2024), Gualvez et al. (2024) and Han and Yates (2016), show how libraries demonstrate their capacity to foster social, educational, and economic transformation:

SDG 4 – Quality Education: Libraries enhance literacy and lifelong learning by ensuring seamless access to digital resources and educational programs across institutions and communities.

SDG 5 – Gender Equality: As social institutions, libraries contribute to gender equity by organizing initiatives that raise awareness, challenge stereotypes, and promote inclusion.

SDG 8 – Decent Work and Economic Growth: Libraries support local economic

development by providing information on entrepreneurship, career development, and business opportunities that promote indigenous industries and cultural heritage.

SDG 10 – Reduced Inequalities: Through inclusive access to information and services, libraries help bridge knowledge gaps and reduce social inequalities.

SDG 16 – Peace, Justice, and Strong Institutions: By providing access to legal and human rights information and hosting civic dialogues, libraries strengthen public awareness and contribute to peaceful coexistence.

SDG 17 – Partnerships for the Goals: Libraries advance sustainability through partnerships with educational institutions, government agencies, and professional organizations, leveraging collaboration to achieve shared developmental objectives.

Collectively, these contributions demonstrate that libraries are important drivers of sustainable development. Their continued alignment with the SDGs not only promotes community development but also strengthens the long term sustainability and relevance of libraries in an evolving digital and globalized environment.

2.4.1 Sustainability of automated information services

Chowdhury (2014) adapted sustainability to the information profession by developing a framework for the sustainability of digital information services. Building it on the three pillars of economic, social, and environmental sustainability, he elucidates that the economic sustainability of digital information services is to ensure cheaper, easier, and better access to information by reducing direct and indirect costs, while the social sustainability of digital information services is to ensure equitable access. The environmental sustainability of digital information services is to ensure a reduction in greenhouse gas (GHG) emissions throughout the life cycle of digital information services.

Nabina and Harikrishnan (2024), in their study on the sustainable development of libraries in the era of digital transition, emphasize that libraries can contribute significantly to the

achievement of the SDGs by adopting open-source technologies, digitizing and providing access to legacy materials, and implementing e-learning strategies that promote environmental and economic sustainability. Drawing on earlier works by Mitchell (2005) and Han and Yates (2016), their study highlights examples from Monash University and the University of California, where the adoption of e-learning initiatives and open-source software supported lifelong learning, sustainable information access, and the operational sustainability of academic libraries. These efforts not only ensured the continuity of library services but also contributed to the broader objectives of sustaining the digital economy and fostering an environmentally responsible information ecosystem.

Similarly, Gualvez et al. (2024) underscore the importance of collaboration and consortium-building in promoting sustainability within the evolving digital library environment. Their study sheds light on the South Manila Educational Consortium (SMEC) initiative in the Philippines, which unites academic libraries under a shared framework for collective resource bargaining and standardized, technology-focused training for librarians. This collaborative model demonstrates how strategic partnerships can enhance both operational efficiency and sustainable capacity building within academic library systems

Emerging studies from Nigeria have contextualized what constitutes sustainable automated library services in the country's higher education system. Scholars emphasize that sustainability in this regard involves the adoption of open-source library technologies which significantly reduce financial barriers through minimal or no licensing costs. Also, the promotion of open-access information resources to ensure equitable and continuous access to scholarly content. Additionally, advocacy for context-sensitive skills and capacity development programs tailored to the unique infrastructural, economic, and institutional realities of Nigerian university libraries. Such initiatives are essential for equipping librarians with the competencies required to manage and utilize automated systems effectively.

Furthermore, the literature underscores the importance of establishing organizational policy frameworks that promote the integration of digital technologies into library operations (Karioja, 2013; Anunobi, 2013; Adetunji & Oladokun, 2020; Onwubiko, 2023; Odunlade & Ojo, 2023; Zubair et al., 2023).

Without supportive institutional policies, coupled with strategic technology infrastructure adoption and investment in professional development, efforts toward automation are likely to be fragmented and unsustainable. Collectively, these studies suggest that achieving sustainable automated library services in Nigeria requires a holistic approach**,** one that integrates technological, human, and institutional dimensions. By prioritizing open-source/access solutions, fostering digital literacy, and embedding policy principles into library governance structures, Nigerian university libraries can align more closely with global trends in sustainable digital transformation while addressing local challenges related to funding, infrastructure, and workforce capacity. Figure 2.2. provides a schematic view of the various factors that have implications for sustainable automated library operations.

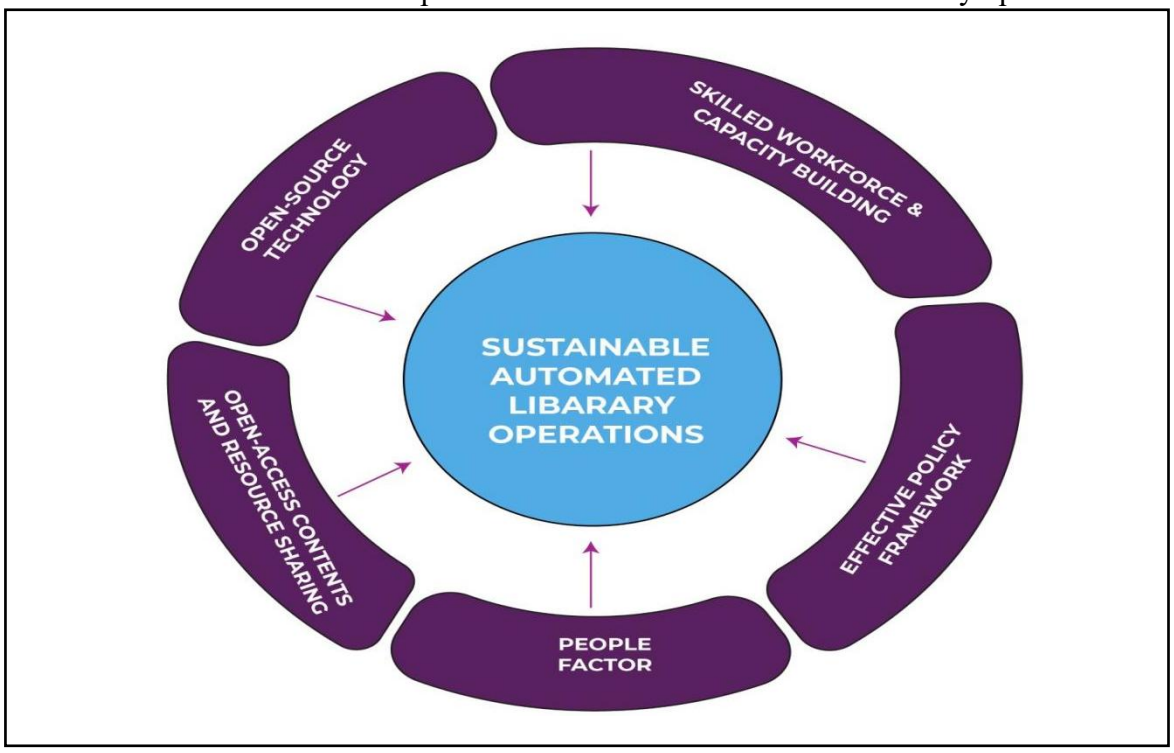


Figure 2.2: Automated library operations' sustainability chart (self-developed)

2.4.2 Nigerian Evidence of Sustainability Measures

The current state of automation in Nigerian university library environment shows there is appreciable effort to achieve economic and social sustainability by embracing open-source software for automated operations and open-access resources in university libraries in Nigeria. However, little has been seen regarding digital skills development (Ukwoma & Onyebinama, 2021; Okuonghae & Achugbue, 2022; Oladokun & Kolawole, 2018; Ojo, 2024). By 2018, many Nigerian university libraries began transitioning away from proprietary integrated library systems as the cost of maintenance, licensing, and technical support became increasingly prohibitive. After support by donors (World Bank and Carnegie/ MacArthur foundations) for automation projects was withdrawn, numerous institutions either temporarily reverted to manual procedures or adopted open-source integrated library management systems, most notably Koha, which offered lower operational costs and greater flexibility (Adamu, 2023; Zubair et al., 2023).

Koha gave hope to automation projects in Nigerian universities as most university libraries now use Koha for their operations (Zubair et al., 2023). The development of Koha was economically driven because of its free software license permit that allows users to run, share, and modify (Tella et al., 2017). Koha is most appropriate as it answers the question of sustainability from the angle of affordability, user-friendliness, flexibility, and adaptable modules. Koha keeps track of the library's primary in-house task-base operations in modules, such as cataloging, billing, acquisition of holdings, such as books, journals, newspapers, circulation, reference, etc. (Vera & Edore, 2015; Oladokun & Kolawole, 2018). Koha is used worldwide by public, school, and academic libraries in the USA, UK, Australia, Nigeria, etc. and the significant justification for its adoption are low cost of purchase, low cost of maintenance and provision of support community (McGarvey, 2018; Ojo & Otunla, 2018; Omopupa et al., 2020).

There is an emerging national discussion on open-access resources and open publishing in Nigerian universities. This comes with strong advocacy by the regulatory body of Nigerian universities, the NUC on Open Education Resources (OER), which mandates that all Nigerian university academic publications such as books, journals, thesis, dissertations, data set, etc., be hosted in their university's institutional repository (Adedoyin et al., 2026). DSpace and Eprint are the two major software in use for hosting OER (Ogunbodede & Cocodia, 2023). Libraries are charged to ensure high level of awareness and promote the use of OER in their various institutions. Currently, the OER project is just accelerating (Ukwoma & Onyebinama, 2021; Okuonghae & Achugbue, 2022; Ogunbodede & Cocodia, 2023). Similarly, with regard to policy direction in Nigerian university libraries, studies by Anunobi (2013), Akintola et al. (2020), and Dime (2023) reported that many of the university libraries surveyed have policy documents but it is unclear if they support staff capacity development.

2.5 Summary of Chapter

Chapter Two presents the institutional context of Nigerian universities and their libraries. It traces the development of higher education from colonial foundations to the expansion of federal, state, and private universities. Nigerian university libraries operate under the regulation of the NUC and are primarily funded by their parent institutions, with additional support from the TETFund. Despite these funding sources, persistent economic constraints have affected infrastructure, resources, and staff development. The chapter also outlines the staffing structure of university libraries, including academic librarians and non-academic cadres such as library officers and assistants.

The chapter also examines automation, digital skills, and sustainability in Nigerian university libraries. Although some libraries adopted systems such as Koha before COVID-19, limited digital skills and infrastructure restricted effective use. The pandemic exposed these weaknesses but also prompted renewed interest in automation and digital services. Current

sustainability efforts focus on open-source technologies, open-access resources, and staff capacity development, though challenges such as funding constraints and digital skills gaps remain. The next chapter present a more grounded insight into the themes of this study through the review of literature.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter reviews the body of literature that informs the development of a strategic plan for improving the digital skills of university library professionals in Nigeria for sustainable automated library services. The review interrogates how library automation has evolved globally and in Nigeria, the nature and level of digital skills required for automated operations, the approaches used to develop these skills, and the sustainability and SDG frameworks within which these developments occur. Rather than listing studies sequentially, the chapter adopts a thematic structure that foregrounds Nigerian evidence while drawing selectively on international literature where it offers useful comparative perspectives or conceptual tools.

The chapter is organised into twelve substantive sections. Following this introduction, section 3.2 explains the search strategy, scope, and inclusion and exclusion criteria used to identify relevant literature, including the role of the University of Strathclyde Library's discovery layer as a gateway to scholarly databases. Section 3.3 clarifies key concepts, including library automation and ILMS, digital, traditional and hybrid skills, and sustainability and SDGs as they relate to automated library services. Subsequent sections (3.4 – 3.12) examine library automation in Nigerian university libraries; the adoption and use of Koha modules; the experience of Nigerian university libraries during COVID- 19; digital skills requirements and existing skills profiles; factors influencing digital skills; approaches to skills development; and capacity- development challenges. Section 3.13 concludes the chapter by synthesising key insights and identifying gaps in existing knowledge that justify the present study's focus

on a sustainability-oriented strategic plan for digital skills development in Nigerian university libraries.

3.2 Search strategy and scope

3.2.1 Overall approach

According to Oloyede et al. (2023), drawing on Bosman et al. (2006) and Burnham (2006), institutional discovery tools provide access to reputable scholarly databases such as Scopus, EBSCO, ProQuest, and Web of Science, where search results can be refined using Boolean operators like AND and OR. However, when relevant materials are not located within these databases, researchers may extend their search to additional sources such as Google Scholar and institutional websites to identify further relevant literature (Boeker et al., 2013; Oloyede et al., 2023).

This literature search used the University of Strathclyde Library's discovery layer (SUPrimo) as a gateway to trusted databases such as Emerald Insight, EBSCOhost (LISTA and LISA), ScienceDirect, Taylor & Francis, Scopus, SAGE Journals and Web of Science, enabling simultaneous searches across multiple publishers while restricting results to scholarly, peer-reviewed material. Where potentially relevant studies were not indexed in these databases or were known to be published in regional outlets, complementary searches were conducted using Google Scholar and institutional websites, including those of the NUC National Information Technology Development Agency (NITDA), Nigerian Communications Commission (NCC) and the TETFund.

The search process was iterative and spanned the full duration of the study, with an initial broad sweep to map the terrain, followed by more targeted searches as key themes and gaps became clearer. The time frame focused on publications from 2010 to 2025 to capture contemporary developments in library automation, digital skills and sustainability, while

allowing inclusion of earlier, seminal works where these provided indispensable historical or conceptual grounding (for example, on the early history of automation in Nigerian university libraries). The geographical scope was deliberately anchored in Nigeria, but extended to Sub-Saharan Africa and selected high-income countries (e.g. UK, USA, Canada, Australia) where their experiences offered useful comparators for automation practices, ILMS adoption and digital-skills frameworks.

3.2.2 Databases, search engines and Boolean strings

The design of search strings was guided by the need to capture the intersection of four central themes: library automation and digital services; digital skills and competencies; training and capacity development; and sustainability/SDGs and strategic planning in academic libraries. Consistent with best practice in information retrieval, combinations of keywords were linked using Boolean operators ("AND", "OR") and searched across title, abstract and keywords fields in structured databases, with broader field searching used in Google Scholar (Boeker et al., 2013).

- For automation and digital services, searches used combinations such as: ("digital library" OR "library automation" OR "virtual library" OR "digital library services" OR "automated operations" OR "online services") AND ("university library" OR "academic library" OR "higher education").
- To capture digital skills and competencies in the library workforce, strings included: ("digital skills" OR "digital competencies" OR "digital literacy" OR "ICT skills" OR "information technology skills of library staff") AND ("librarians" OR "library professionals" OR "library staff") AND ("Nigeria" OR "university library").
- Training and capacity-development literature was identified via: ("training approaches and techniques for librarians" OR "skills development of library staff" OR

"skills updating of librarians" OR "training of librarians") AND ("training challenges of library staff" OR "barriers of skills development" OR "professional development") AND ("university library" OR "academic library" OR "Nigeria").

- Managerial and institutional challenges were explored using: ("institutional challenges of libraries" OR "managerial policies of libraries") AND ("training and digital skills development of library staff" OR "capacity development" OR "staff development") AND ("Nigeria").
- Finally, sustainability and SDG-related work was targeted using: ("sustainable automated library operations" OR "sustainability approach to digital library services" OR "sustainable digital information services") AND ("strategic planning" OR "strategic management") AND ("university library" OR "academic library") AND ("Nigeria" OR "Africa" OR "SDGs").

All search strings were executed through SUPRIMO, enabling simultaneous access to multiple databases, including Scopus, Web of Science, Sage, Emerald, LISTA,LISA, etc. The initial search yielded 2,567 records. Inclusion and exclusion criteria were applied to the selected materials to ensure relevant sources were identified.

3.2.3 Inclusion and exclusion criteria

Database-specific filters, such as "peer-reviewed journals," "full-text," and "English language," were utilised within the respective database filtering tools to refine search results and eliminate irrelevant materials. These formed part of the study's inclusion criteria (Jabaley et al., 2019). The screening of titles and abstracts was conducted using clearly defined inclusion and exclusion criteria aligned with the objectives of the study. Duplicate records were removed, and selected studies were required to meet the following inclusion criteria:

- Published in English

- Empirical or conceptual in nature (excluding purely opinion-based works)
- Full-text materials
- Peer-reviewed journal articles, conference papers, or authoritative reports from recognised professional or regulatory bodies (e.g., International Federation of Library Associations and Institutions (IFLA), NUC, NCC, NITDA, TETFund)
- Address at least one of the core thematic areas of the study, including:
  - Automation, digital, or virtual services in academic or university libraries
  - Digital skills, ICT competencies, or digital literacy of librarians or library staff
  - Digital skills training, staff development, or capacity-building strategies
  - Managerial or institutional challenges affecting digital skills or automation
  - Sustainability, SDGs, or strategic planning in relation to digital or automated library services

Priority was given to studies conducted in Nigeria. However, relevant African regional studies and selected international literature were also included where they offered transferable insights into socio-cultural dynamics, digital skills frameworks, or sustainable capacity development practices applicable to the Nigerian context.

The exclusion criteria eliminated:

- Publications not written in English
- Non-full text materials
- Studies not focused on academic or university libraries (e.g., school or public libraries), unless findings were directly transferable
- Studies that referenced digital skills or automation only superficially without substantive analysis
- Non-scholarly web content, promotional materials, and unreferenced opinion pieces

Applying these criteria across all search stages reduced the initial pool of several thousand records to 97 core sources, which were subjected to full-text review and thematic synthesis. These sources were broadly distributed across the key areas of the chapter, including: (i) automation and Koha systems; (ii) digital skills levels and requirements in Nigeria; (iii) training and capacity development approaches; (iv) institutional and managerial challenges; and (v) sustainability, SDGs, and strategic planning.

3.2.4 SDG- focused searches and filtering process

Because sustainability and alignment with the United Nations SDGs are central to the present study, a dedicated search stream investigated the intersection of libraries, digital technologies, skills development and SDGs. Initial searches using broad strings such as ("sustainable development goals" OR "SDG 4" OR "SDG 5" OR "SDG 8" OR "SDG 10" OR "SDG 16" OR "SDG 17") AND ("libraries" OR "university libraries" OR "digital libraries" OR "open access" OR "open educational resources") across Google Scholar and major databases returned several thousand hits, most of which were too general or did not address the academic library context.

To refine this, filters were progressively tightened: the publication window was restricted to 2015–2025 to reflect the SDG era; searches were limited to documents in which "library" or "higher education" appeared in the title, abstract or keywords; and preference was given to works that explicitly connected SDGs with libraries' use of digital technologies, open- source systems, open educational resources, or staff capacity development (Amadi et al., 2020). In parallel, targeted searches of IFLA, UN and African Union websites were undertaken using similar keywords to retrieve policy documents and reports on libraries' roles in achieving SDGs and digital transformation in higher education. Through this multi- step filtering process, the pool of SDG- related documents was reduced to fewer than

100 items, from which a subset most relevant to sustainable automated library services and digital-skills development in Nigerian or comparable settings was selected for detailed analysis.

3.3 Key concepts: automation, skills and sustainability

3.3.1 Library automation and integrated systems

In this study, library automation is defined as the application of ILMS and associated digital technologies to computerise and streamline core library functions such as acquisitions, cataloguing and classification, circulation, serials control, reporting and online public access catalogues within a unified Platform (Ahmad & Bakhshi, 2021). Typical ILMS deployments in university libraries integrate bibliographic databases, user records and transaction logs, enabling functions such as searching, lending, renewals, inventory management and statistical reporting to be executed electronically rather than through manual, paper-based systems (Nwagwu & Sulaimon, 2022). These systems often interface with external resources, including licensed databases, institutional repositories and discovery layers, thus forming the backbone of digital and automated services in academic libraries.

Historically, library automation in high-income countries such as the USA and UK dates back to the 1950s and 1960s, when early computer-based systems were introduced to manage cataloguing and circulation using machine-readable records (Saffady, 1983; Stubley, 1989). In Nigeria, experiments with automation began in the 1970s, with pioneering efforts at Ahmadu Bello University, University of Nigeria Nsukka and University of Lagos focusing initially on serials and cataloguing operations using minicomputers and text-based software. These early projects were followed in the early 1990s by a centrally coordinated initiative in which the NUC, using World Bank conditional funding, deployed TINLIB across twenty federal university libraries; subsequent donor-supported projects such as the

Carnegie/MacArthur VTLS initiative extended automation to several large government universities (Ogunleye, 1997; Adegbore, 2010).

Although these initiatives signalled a commitment to modernising university library operations, many struggled with sustainability due to a combination of factors: insufficient local technical expertise; inadequate training for library staff; unreliable power supply and network infrastructure; vendor dependency; and weak provision for ongoing maintenance and upgrades. As proprietary systems became obsolete or too costly to maintain, many Nigerian university libraries either reverted to manual methods or sought alternatives in open-source ILMS, particularly Koha, which offered lower licensing costs and greater flexibility (Adamu et al., 2020; Adamu, 2023; Jimoh & Jimoh, 2024). The Nigerian experience shows that automation is not a one time technical event but an ongoing socio-technical process in which choice of technology, funding, infrastructure and human capacity interact to determine whether automated services can be sustained.

Within this context, ILMS are not merely tools but socio-technical systems that shape and are shaped by organisational structures, workflows and competencies. In Nigerian university libraries, ILMS deployments typically include modules for cataloguing, circulation, acquisitions, serials management (Nwagwu & Sulaimon, 2022), patron management, reporting and OPAC, although studies show that in many institutions only a subset of these modules most commonly cataloguing and OPAC are fully implemented (Tella, et.al. 2017; Igbudu et.al., 2020; Ojo, 2024). This partial implementation reflects not only infrastructural constraints but also the digital skills profile of library staff, underscoring the interplay between automation and human capacity that motivates the present study.

3.3.2 Digital, traditional and hybrid skills

The literature consistently emphasises that effective operation of automated library systems requires a combination of traditional librarianship, generic digital skills and system-specific operational competencies (Golub, 2021). Traditional library skills encompass core professional functions such as cataloguing and classification, reference and information services, collection development and evaluation, acquisitions, and serials management, which remain essential regardless of the degree of automation. These skills embody domain knowledge about information organisation, retrieval principles and user needs, and they provide the conceptual foundation upon which technology-mediated services are built (Asiri & Finlay, 2020).

Digital skills, by contrast, refer to the knowledge and competences required to use digital technologies to achieve personal, social and work-related goals (Chigwada & Nwaohiri, 2021; van Laar et al., 2017). In workforce contexts, digital skills frameworks generally distinguish basic or foundational abilities such as operating devices, using web browsers and email, creating and managing simple digital content, and behaving safely and responsibly online from more advanced, job-specific competencies (Atchrimi, & Ogunbodede, 2024; Asiri & Finlay, 2025).

In the library domain, these advanced competencies include using ILMS modules, managing e-resources, maintaining digital repositories, managing web content and social media, Web 2.0 tools and emerging technologies (e.g. chatbots, RFID, AI) to deliver library services (Nisha, 2018; Odunlade & Ojo 2023; Adegbore et.al., 2025).

Bilson and Markwei (2019) advocate a hybrid skill set for contemporary librarians, combining traditional professional expertise with robust digital and managerial competencies. Reports such as CARL (2010) and more recent LIS skills studies argue that librarians must

not only understand cataloguing rules or reference interviewing techniques but also be able to operate within complex digital ecosystems, collaborate across organisational units, analyse usage data and contribute to technology related decision making (Mayowa-Adebara & Opeke, 2019).

In African contexts, including Nigeria, empirical studies further stress that librarians need specific competencies in the use of open-source ILMS (particularly Koha), repository platforms (DSpace, EPrints), Electronic Resources Management System (ERMS) tools, and institutional portals to deliver effective automated and digital services (Odunlade & Ojo, 2023; Adegbore et.al., 2025).

As earlier stated in Chapters one and two, this current study conceptualised "digital skills" as comprising two interrelated layers. The first is basic digital skills, understood as general ICT literacy required for everyday digital tasks, including online searching, email communication, word processing, file management and connecting to wireless networks (Atchrimi & Ogunbodede, 2024; Makinde & Oyekale 2025). The second is advanced or operational task-based digital skills, defined as the professional competencies needed to use emerging technologies to execute library-specific operational tasks, such as using Koha modules for cataloguing, circulation, OPAC management, acquisitions, serials control and institutional repositories (Ahmed & Tsagem, 2024; Ojo, 2024).

Hybrid skills, therefore denote the integrated capability to combine traditional library knowledge, generic digital literacy and system-specific operational competencies in practice (Kardo, 2018; Nnadozie et.al., 2017). Nigerian and African literature increasingly refers to "hybrid librarians" to capture this profile, emphasising that staff who can bridge the analogue–digital divide are better placed to manage transitions to automated services, support users across formats, and contribute to strategic digital initiatives. However, multiple studies suggest that such hybrid skill sets are not yet widespread in Nigerian university libraries,

where many professionals have strong grounding in traditional librarianship and basic digital skills but limited experience with advanced, task-based ILMS and repository operations (Nwagwu & Sulaimon, 2022; Atchrimi & Ogunbodede, 2024).

3.3.3 Sustainability, SDGs and automated library services

Sustainability in the context of digital information services builds on the classic three-pillar model of economic, social and environmental sustainability but applies it to the life cycle of information systems and services (Witt, 2024; Allen et al., 2024). Adapting this to libraries (Chowdhury, 2014) proposes that economic sustainability involves delivering information services at lower direct and indirect costs while maintaining or improving quality; social sustainability relates to equitable access and inclusiveness; and environmental sustainability concerns minimising greenhouse gas emissions and resource consumption across the design, deployment and maintenance of digital services.

For libraries, and particularly for university libraries in low- and middle-income countries, sustainability is closely linked to the use of open-source technologies, open-access content and context-sensitive capacity-building strategies. Studies from different regions (Cullen & Chawner, 2010) show that adopting open-source ILMS such as Koha and implementing institutional repositories using platforms like DSpace can substantially reduce licensing costs, enhance local control over systems and support long-term access to scholarly content, thereby contributing to economic and social sustainability (Khalid et al., 2021). At the same time, initiatives that digitize legacy print collections, provide e-learning support and foster digital literacy among students and staff extend the reach and resilience of academic libraries, aligning them with sustainable development agendas.

The United Nations' 17 SDGs further reinforce the relevance of libraries to sustainability(Chowdhury, 2016) . Libraries are frequently cited as key actors in advancing SDG 4 (quality education) through support for teaching, research and lifelong learning; SDG

5 (gender equality) by providing safe, inclusive spaces and equitable access to information and skills; SDG 8 (decent work and economic growth) by supplying labour-market information and supporting digital upskilling; SDG 10 (reduced inequalities) by bridging information and digital divides; SDG 16 (peace, justice and strong institutions) by promoting access to legal and civic information; and SDG 17 (partnerships) by participating in consortia and collaborative networks (Mnzava & Katabalwa, 2017). IFLA and other global bodies have therefore urged libraries to align their strategies with SDGs, including through digital transformation, open access and community-focused capacity development (Stilwell, 2014; Mnzava & Katabalwa, 2017)

Nigerian scholarship (Ukwoma & Onyebinama, 2021; Okuonghae & Achugbue, 2022; Ogunbodede & Cocodia, 2023) echoe these themes, arguing that sustainable automated library services in the country require: (i) adoption of affordable, open-source systems such as Koha; (ii) development of institutional repositories and open educational resources in line with NUC's OER and IR policies; (iii) investment in digital skills development for library professionals that is sensitive to local infrastructural, economic and socio-cultural realities; and (iv) supportive institutional policies that integrate digital technologies into library operations and recognise staff development as a core sustainability issue. Yet, the same literature notes that without deliberate strategic planning and coherent frameworks that tie digital skills to SDG-oriented goals, automation projects risk being fragmented, underutilised or unsustainable . This observation reinforces the rationale for the present study's focus on a strategic, sustainability-driven approach to digital skills development for Koha-based automation in Nigerian university libraries.

3.4 Library automation in Nigerian university libraries

3.4.1 Historical development of automation in Nigerian universities

The trajectory of library automation in Nigerian universities reflects broader political, economic and technological changes in the country and illustrates the complex interplay between imported technologies, donor-driven projects and local capacity. Early accounts trace experimental automation efforts to the 1970s at first-generation universities such as Ahmadu Bello University (ABU), University of Nigeria Nsukka (UNN) and University of Lagos, where main libraries began using minicomputers and machine-readable cataloguing formats to automate parts of serials and cataloguing operations (Alabi, 1987: Adegbore 2010). These initiatives were modest in scope and typically confined to back-office tasks, but they signaled a growing awareness among Nigerian academic librarians of the potential of computers to streamline operations and improve access to collections.

The 1980s and early 1990s saw more ambitious attempts to introduce integrated library systems on a national scale, driven largely by international funding and policy interventions. A landmark development was the NUC deployment of TINLIB in twenty federal university libraries under a World Bank–supported library development programme. TINLIB, a text-based proprietary system, was installed to support cataloguing, circulation and serials control, with centralised training provided to selected librarians and systems staff who were expected to cascade skills within their institutions (Ogunleye, 1987; Emasealu, 2019). Around the same period, a number of universities experimented with other commercial systems, including VTLS, Alice for Windows and X-Lib, etc. (Zubair, 2023).

Furthermore, six universities in Nigeria were selected to benefit from the joint library automation grants of the Carnegie Corporation and the Mac Arthur Foundation. The project funded the implementation of LMS for the federal government universities in Nigeria: Amadu Bello University, Bayero University Kano, Obafemi Awolowo University, University

of Ibadan, the University of Jos, and the University of Port Harcourt. These university libraries implemented the Virtua Integrated Library system with the assistance of the Mortenson Center of International Library Programs at the University of Illinois (University of Illinois, 2012). This project was signed at an initial agreement for 5 years from 2010 to 2015. The support of the Carnegie Corporation and MacArthur Foundation at the time profoundly impacted the automation project in the six university libraries. However, after the expiration of the agreement and the Mortenson Centre withdrew its support, the integrated systems became unsustainable because of a lack of expertise on the side of the benefiting universities (Zubair et al., 2023).

In 2018, these university libraries started switching from the proprietary systems to open-source systems as their license renewal rate increased beyond the affordability of their parent institutions. This was due to the dwindling economic situation of most developing countries and the change in ownership of the software companies. For example, the original company known as VTLS changed to another Innovative Interfaces Company, which acquired Virtua ILS in 2014 (Breeding, 2014). Many libraries struggled with sustainability due to a combination of factors: insufficient local technical expertise; inadequate training for library staff; unreliable power supply and network infrastructure; vendor dependency; and weak provision for ongoing maintenance and upgrades. As proprietary systems became unpopular or too costly to maintain, many Nigerian university libraries either reverted to manual methods or sought alternatives in open-source ILMS, particularly Koha, which offered lower licensing costs and greater flexibility (Adamu, 2023; Zubair et al., 2023). The Nigerian experience thus illustrates that automation is not a one-off technical event but an ongoing socio-technical process in which technology choice, funding, infrastructure and human capacity interact to determine whether automated services can be sustained.

Despite these investments, some authors observe that many early automation projects in Nigerian universities failed to reach full implementation or to achieve long-term sustainability. Factors frequently cited include inadequate and unstable power supply, limited local technical expertise, poor vendor support, high recurrent costs for licences and maintenance, and insufficient staff training tailored to library workflows (Ajidahun, 2006; Egunjobi & Awoyemi, 2012; Barfi, 2015; Ajani & Buraimo, 2022). In some institutions, automation was implemented as a stand-alone project managed primarily by ICT units with minimal involvement of library professionals, resulting in systems that did not align well with existing processes and were therefore underused. In others, automation gained initial traction but was disrupted by hardware failures, software obsolescence or leadership changes that shifted priorities away from ICT (Lawal-solarin et.al., 2018; Emasealu, 2019; Omopupa et.al., 2020).

These early experiences affected the way some Nigerian university libraries approached automation. As a result, many became more cautious about investing in large-scale automation, although the global trend was moving steadily towards digital and online library services. (Ojo & Otunla 2018; Emasealu, 2019). At the same time, they generated a cohort of librarians and systems staff with valuable yet uneven experience of ILMS deployment, and they highlighted the importance of context-appropriate technologies, sustained funding, and continuous staff capacity development for successful automation (Oladokun & Kolawole, 2018; Omehia et.al, 2021). This historical context forms an essential backdrop for understanding the later adoption of open-source systems such as Koha and the current emphasis on sustainable, skills-driven approaches to automation in Nigerian universities.

3.4.2 Contemporary status and patterns of automation

Recent studies have provided a better picture of automation in Nigerian university libraries, although the findings remain mixed because of differences in the institutions studied and the

methods used. National surveys reported that only a small minority of university libraries around 5% could be considered fully automated, in the sense that all major housekeeping operations (acquisitions, cataloguing, circulation, serials and OPAC) were supported by an ILMS, whereas approximately 95% were either partially automated or not automated at all (Lawal-solarin et.al., 2018; Olubiyo & Awoyemi,2021). Closer examination of these studies reveals that the "fully automated" group consisted largely of private universities and a few well-resourced federal institutions, while many public universities, particularly in the northern and south-south regions, had only automated cataloguing or OPAC functions, or had systems that were no longer functional.

Regional case studies provide additional nuance. Investigations of university libraries in south-west Nigeria, for example, show relatively high levels of automation adoption in Nigerian institutions, with Koha and other ILMS deployed for cataloguing and online public access, but with acquisitions, circulation and serials modules often not fully implemented (Ojo, 2024). In some cases, circulation activities continue to be managed manually despite the presence of a functioning ILMS, due to staff reluctance, insufficient training or infrastructural constraints such as unreliable power and network connectivity at service points (Omehia et al., 2021; Ojo, 2024; Omodara et.al, 2025). Conversely, surveys of university libraries in north-central and north-west Nigeria report lower levels of automation, with several institutions still dependent on card catalogues and manual circulation, or using ILMS only for experimental or pilot projects in limited sections of the library (Kasa & Abdulsalam, 2020; Igbudu et al., 2020; Ahmed & Tsagem, 2024).

Comparative studies between public and private university libraries suggest that private institutions are more likely to have up-to-date automation systems and broader module coverage, reflecting higher and more flexible funding, stronger ICT infrastructure and more centralised decision-making (Ojo & Otunla, 2018 ; Olagoke & Kolawole, 2019; Fasola &

Mamudu, 2020; Michael & Olayemi, 2023). However, even among private universities, authors note underutilisation of advanced ILMS functionalities such as acquisitions, serials and reporting, as well as challenges in integrating ILMS with learning management systems and institutional portals. In public universities, particularly those reliant on government funding and TETFund interventions, automation projects are more vulnerable to budgetary cuts, procurement delays and policy shifts, which can disrupt implementation and maintenance.

These diverse findings explain why automation statistics in the literature sometimes appear contradictory. Differences in data collection periods, definitions of "full automation" and sampling frames (for example, focusing only on federal universities, only on a particular geopolitical zone, or mixing university and non-university libraries) all influence reported adoption rates. A consistent pattern nonetheless emerges: automation is widely recognised as desirable and many Nigerian university libraries have made efforts to implement ILMS, but actual implementation is often partial and uneven across regions and institution types. This pattern underscores the central argument of this thesis that sustainable automation in Nigerian universities requires not only technology acquisition but also systematic, context-sensitive development of strategic planning.

3.4.3 Evidence and clarification of specific automation claims

Institutional case studies help to clarify the nature of automation in Nigerian university libraries and provide concrete examples of progress and challenges. For instance, studies of Ahmadu Bello University (ABU) library describe the implementation of an ILMS with multiple "modules", a term used in the literature to refer to distinct functional components of the system such as cataloguing, circulation, serials, acquisitions and OPAC. In ABU's case, cataloguing and OPAC modules were implemented first, with serials and acquisitions planned for later phases, reflecting both technical priorities and staff capacity at the time.

Similar phased approaches are reported in other federal universities, where libraries begin automation with cataloguing and online catalogue access and then attempt to extend ILMS use to circulation and acquisitions as staff skills and infrastructure improve.

Empirical evidence also supports claims about the fragility of automation systems in some Nigerian universities. Lawal-Solarin et al., (2018) document several cases where ILMS installations became unusable due to server failures, virus attacks or expired licences, leading libraries to revert temporarily or in some cases permanently to manual processes. Ajani and Buraimo (2022) and Adamu et.al. (2023) report that at the time of their study, many university libraries they assessed were either partially automated or had "packed up" systems that were no longer maintained, often because key technical staff had left, vendor support had lapsed or institutions could not afford necessary upgrades. These accounts provide empirical backing for the assertion that mere presence of an ILMS does not equate to sustained automation; continuous technical and human investment is required.

At the same time, newer studies highlight promising successes. Investigations of university libraries in Ogun State and other parts of south-west Nigeria show institutions where Koha has been implemented across most major modules, with online catalogues accessible via institutional portals, barcode-based circulation in operation, and staff reporting increased efficiency and improved user satisfaction (Ayodeji et al., 2022; Otunla et.al, 2022; Ojo, 2024; Omodara et.al, 2025). Some libraries have integrated ILMS with institutional repositories and discovery tools, enabling unified search across print, electronic and digital collections. These positive examples illustrate that with adequate support, Nigerian university libraries can achieve robust automation that approaches international best practice, but they also reinforce that such outcomes are closely linked to staff skills, management commitment and stable infrastructural support (Ajani, 2024; Ojo, 2024).

The evidence from literature shows that the level of automation in Nigerian university libraries cannot be described using broad generalizations. Statements that portray automation as either a complete success or a widespread failure "95% of Nigerian university libraries are not automated" do not fully reflect the reality and should be treated with caution. (Ajani, 2024; Omodara et.al, 2025). Automation projects are best seen as a continuum rather than a one off process. University libraries are at different stages of automation depending on the number of ILMS modules they have implemented, how consistently these modules are used, and how well they are maintained. This reality, where automation is often partial, uneven, and influenced by different institutional factors, highlights the importance of developing a uniform and coordinated strategy towards the management of automation procedures and the digital skills of library staff who manage and use ILMS in Nigerian university libraries.

3.5 Koha Automation Modules

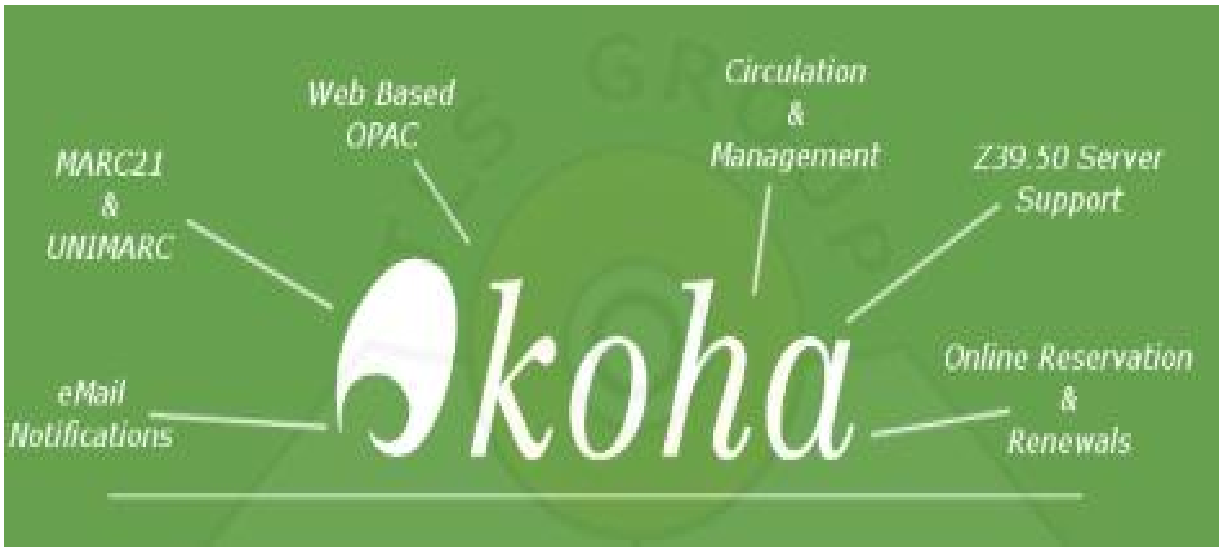


Figure 3.1 Koha library management systems

3.5.1 Rationale for Koha adoption

In response to the limitations of earlier proprietary systems, many Nigerian university libraries have turned to Koha, an open- source ILMS developed originally in New Zealand and now maintained by a global community of developers and users. Nigerian authors

repeatedly cite Koha's cost advantages, flexibility, web-based interface and strong community support as key reasons for its popularity (Tella, 2017; Emasealu, 2019). The absence of per-seat or annual licensing fees is particularly significant in a context where library budgets are constrained and foreign currency fluctuations make proprietary licences difficult to sustain. Koha's open-source licence allows libraries to modify the code, adapt the interface and integrate the system with institutional authentication or discovery services without vendor lock-in, which is attractive to universities with competent ICT units (Nwagwu & Sulaimon, 2022).

Case studies from various regions of Nigeria document the migration of university libraries from proprietary or locally developed systems such as X-Lib, Alice for Windows and VTLS to Koha. These migrations are often motivated by a combination of factors, including high renewal costs for proprietary licences, lack of vendor support, hardware obsolescence and the desire to join wider communities of practice around open-source solutions (Endouware & Omehia, 2022). In several institutions, Koha implementation has been supported by collaboration between the library and the university's ICT or MIS unit, with systems analysts and network engineers taking responsibility for server installation, configuration, backup and security while librarians focus on data migration, cataloguing and circulation workflows. Such collaborations are frequently cited as a critical success factor in Nigerian Koha projects (Ekere et al., 2016).

Koha's alignment with broader open-source and open-access movements is also important in the Nigerian context. National policies and institutional strategies increasingly encourage the use of open-source software and the development of institutional repositories and open educational resources as cost-effective ways of expanding access to scholarly content (Nwagwu & Sulaimon, 2022). By adopting Koha, libraries not only reduce direct software costs but also symbolically align themselves with these policy directions, potentially

strengthening their case for support from university management and external funders such as TETFund. Nonetheless, the literature warns that Koha's potential benefits can only be realised if libraries invest in building and retaining staff with the necessary technical and operational skills to install, customise and use the system effectively.

3.5.2 Koha modules and their use in Nigerian university libraries

Koha is modular in design, with distinct components that support different library functions, including cataloguing, circulation, acquisitions, serials management, patron management, reporting and OPAC. Nigerian case studies consistently report that the cataloguing and OPAC modules are the most widely implemented and used (Ikenwe & Aiyebelehin, 2024; Otunla et.al, 2022). Libraries typically begin by using Koha to create and manage bibliographic records, often importing MARC records where available, and to provide users with a web- based OPAC that replaces or supplements traditional card catalogues (Tella et.al, 2017). This phase is frequently perceived as the most tangible and immediate benefit of Koha adoption, as it visibly modernises access to the library's collection.

Implementation of other modules varies considerably between institutions. Some university libraries have configured the circulation module to support barcode- based lending, returns, fines and renewals, integrating Koha with student ID cards and extending circulation services beyond the central library to faculty or departmental branches. Others continue to manage circulation manually despite having Koha installed, citing reasons such as unreliable barcode scanners, staff unfamiliarity with the module, or concerns about data loss during system downtime (Emasealu, 2019). Acquisitions and serials modules are the least implemented, with many libraries continuing to handle ordering, invoicing and serials check- in manually or through basic spreadsheets, even where Koha is in use for other functions(Ahmed & Tsagem, 2024; Ojo, 2024).

It has been argued that the limited use of Koha's advanced modules shows gaps in staff digital skills and organisational readiness rather than to inherent limitations of the software (Nisha, 2018). For example, librarians may be comfortable creating and editing MARC records but lack training in defining circulation rules, setting up item types and categories, or configuring budgets and suppliers in the acquisitions module (Otunla et.al., 2022). Systems librarians and ICT staff may have the technical ability to install and maintain Koha but are not always familiar with library workflows, which can lead to configurations that do not fully reflect operational realities and thus discourage staff from adopting new modules (Asimah & Osman, 2021). These challenges highlight the interdependence between technical configuration and operational task-based digital skills among library professionals (Ojo, 2024).

Where Koha modules are fully implemented, studies report significant benefits. Libraries describe improvements in the speed and accuracy of cataloguing, greater visibility of their collections through online catalogues, and more efficient circulation management, including the ability to generate overdue notices, track user borrowing histories and produce management reports on usage patterns (Ahmed & Tsagem, 2024; Ojo, 2024; Omodara et.al., 2025). Koha's reporting tools also enable librarians to monitor collection development, weeding and circulation statistics, supporting data-informed decision-making. In some Nigerian universities, Koha has been integrated with institutional repositories and single sign-on authentication, offering users a more seamless discovery experience across print, electronic and digital resources (Nisha, 2018; Omodara et.al., 2025). These positive outcomes provide concrete examples of how Koha can support sustainable automated services when staff possess the necessary operational skills.

3.5.3 Sustainability issues in Koha-based automation

Although Koha mitigates some of the financial barriers associated with proprietary ILMS, Nigerian literature emphasises that open-source does not automatically equal sustainability (Ummah, 2019). Successful Koha implementations require stable server infrastructure, regular backups, security updates, and processes for handling software upgrades, all of which demand technical expertise and institutional commitment. In libraries where Koha is hosted on local servers without robust backup and maintenance plans, system failures or data loss can seriously undermine staff confidence and disrupt services, sometimes prompting a retreat to manual methods (Taylor et al., 2013). Cloud-based hosting solutions are used in a few institutions to reduce local technical burdens, but these introduce dependency on external providers and recurring hosting costs that must be budgeted for sustainably.

Human capacity is a recurring concern. Studies report that many Nigerian university libraries rely heavily on one or two key individuals often a systems librarian or an ICT staff member who hold critical knowledge about Koha configuration and maintenance (Ummah, 2019). Staff turnover, transfers or extended absences can therefore pose serious risks to system continuity. To mitigate this, some authors recommend developing local Koha implementation teams that include multiple librarians and ICT personnel, establishing documentation and standard operating procedures, and providing regular in-house training for both new and existing staff (Taşkın, 2021). However, empirical evidence suggests that such systematic capacity-building strategies are not yet widespread, and many institutions remain vulnerable to knowledge loss.

From a broader sustainability perspective, Koha's open-source community offers valuable support in the form of documentation, mailing lists, user groups and shared code contributions, but participating effectively in this community also requires a baseline of digital skills and leadership support. Nigerian librarians who are active in Koha user groups

report benefits such as access to peer advice, shared solutions to common configuration problems, and opportunities to influence future software development, yet they also note that many colleagues lack the time, connectivity or confidence to engage in these networks (Emasealu, 2019). Thus, while Koha can be considered an economically and technically appropriate choice for Nigerian university libraries, the literature indicates that its sustainability is highly contingent on the availability of staff with appropriate operational task-based digital skills and on institutional strategies that prioritise ongoing capacity development (Gbadamosi, 2012).

3.6 COVID-19 and automated/digital services in Nigerian university libraries

3.6.1 Global expectations versus Nigerian realities

The COVID-19 pandemic of 2020–2022 constituted a global stress test for academic libraries' capacity to provide services digitally. International bodies such as the IFLA advised that decisions about closing library buildings should be accompanied by strategies to sustain access to information resources through virtual and digital services, leveraging existing automation systems, online databases and remote support channels (Owolabi et al., 2022). In many high-income countries, university libraries responded by rapidly scaling up or re-purposing digital infrastructures, extending remote access to e-resources, expanding virtual reference and instruction, and enhancing discovery systems to support fully online teaching and research.

In Nigeria, however, the pandemic revealed significant gaps between the aspirations of automation and the practical capacity to deliver remote services. In line with federal government directives, most university campuses shut down and staff were instructed to work from home, but empirical studies show that many university libraries ceased virtually all operations during the initial lockdown periods. Despite prior investments in ILMS and electronic resources, very few institutions were able to transition quickly to comprehensive

virtual library services, and users experienced prolonged disruptions in access to both print and digital collections (Mukhtar & Maidabino, 2021). This divergence from global patterns underscores the structural vulnerabilities of Nigerian university libraries' digital infrastructures and skills bases.

3.6.2 Experiences of Nigerian university libraries during the pandemic

Case studies and surveys conducted during and after the pandemic provide detailed accounts of how Nigerian university libraries coped with COVID-19. Ifijeh and Yusuf (2021) report that most university libraries in their sample closed their physical premises and did not offer sustained virtual reference or information services, even though some had existing automation systems and subscriptions to online databases. Ameh et al. (2021) similarly find that while a few libraries attempted to maintain contact with users via email, social media or telephone, these efforts were often informal, individualised and not supported by institutional strategies or robust digital platforms. Kasa and Yusuf (2022) highlight that in many cases, staff lacked remote access to ILMS and e-resource authentication systems, making it difficult to support users from home even when technical infrastructure existed on campus.

Several studies identify common constraints that limited Nigerian university libraries' ability to deliver virtual services during lockdown (Jegede, 2020; Ameh, 2021; Adomi & Oyovwe-Tinuoye, 2022). These include inadequate remote access solutions (for example, absence of proxy servers or VPNs that would allow off-campus authentication), poor awareness among staff and users of existing e-resources and how to access them, and limited staff familiarity with the full range of functionalities offered by ILMS and digital platforms. Socio-economic factors compounded these challenges: many library staff did not have reliable internet connections, laptops or uninterrupted power supply at home, and were expected to self-fund data and equipment if they wished to work remotely (Ebijuwa et al., 2021; Musa, & Mang, 2022). Institutional communication was also often fragmented, with university management

focusing on core teaching and administrative issues and giving limited guidance or support to libraries regarding digital service continuity.

Despite these constraints, there were pockets of innovation. A few Nigerian university libraries with relatively advanced automation and digital infrastructures were able to sustain selected services, such as remote access to subscribed databases via institutional portals, virtual reference via WhatsApp or email, and rapid document delivery using scanned chapters or articles. In some cases, libraries created COVID-19 information portals or curated online resources to support health information needs. However, these examples remain exceptions rather than the norm in the Nigerian literature, and they often depended on pre-existing investments in automation, strong ICT support and a small cadre of digitally skilled librarians (Ifijeh and Yusuf , 2021; Adomi & Oyovwe-Tinuoye, 2022).

3.6.3 Post-COVID recovery, renewed automation and skills implications

Post-COVID analyses suggest that the pandemic has acted as a catalyst for renewed interest in automation and digital transformation within Nigerian university libraries. Mesagan et al., (2022) have claimed that libraries which had previously abandoned or underutilised their ILMS began reactivating these systems and exploring new ways of integrating digital technologies into operations as campuses reopened. This included upgrading Koha installations, digitising key documents, expanding institutional repositories and revisiting remote access solutions for e-resources. The experience of total service disruption during lockdowns reinforced perceptions among library managers and university administrators that manual, building-bound operations are no longer adequate for resilient academic library services.

At the same time, the literature emphasises that the same structural barriers that limited libraries' pandemic responses funding, infrastructure and, crucially, digital skills remain largely in place. Friday & Onuh (2022), report that Nigerian university libraries continue to

face significant shortages of staff with the operational task-based digital skills required to manage ILMS, support remote authentication, and design and deliver virtual services. While some institutions have initiated training programmes to address these gaps, many such efforts are ad hoc, vendor-led or focused on basic ICT use rather than on in-depth operational competencies for systems like Koha. Without a coherent strategic framework, there is a risk that post-COVID automation initiatives will repeat past patterns of partial implementation and unsustainable projects.

From a sustainability and SDG perspective, the pandemic has sharpened awareness of the role that university libraries can play in supporting quality education (SDG 4), reducing inequalities (SDG 10) and fostering resilient institutions (SDG 16) through robust digital and automated services. However, the Nigerian evidence shows that achieving these contributions requires more than installing ILMS or subscribing to databases; it demands deliberate, context-sensitive investments in the digital skills of library professionals, coupled with supportive policies and infrastructures. The COVID-19 experience thus provides both a warning and an opportunity: a warning that automation without sustainable skills development is fragile, and an opportunity to rethink digital skills strategies as integral to libraries' preparedness for future disruptions and their alignment with national and global development agendas.

3.7 Digital skills requirements for automated library operations

This section detailed the skill requirement for sustainable library operation in the current era of automation

3.7.1 Generic, traditional and digital skills for librarians

Librarians need digital skills to manage the digital resources, supporting library automation through secure data curation. Morgan (2002) admonished that library professionals are not programmers, and there is no reason they should put an undue burden on on themselves or

developing complex and technical ICT skills areas but they should focus on acquiring skills and competence to use the emerging technology in the library rather than the technicalities around them. Hence, acquiring digital skill that will prepare them to effectively navigate library automation cannot be overemphasized. Across the literature, there is strong consensus that librarians working in automated environments require a blend of generic, traditional and digital skills rather than purely technical competencies (Asimah & Osman, 2021).

Generic skills encompass abilities such as communication, teamwork, problem-solving, critical thinking, adaptability, and basic project management, which enable staff to collaborate effectively with colleagues in ICT units, faculty members, and external vendors, and to navigate organisational change processes associated with automation (Endouware & Omehia, 2022). These skills are particularly important in contexts like Nigeria, where library professionals often need to advocate for resources, negotiate with management, and support users who have diverse levels of digital readiness.

Traditional librarianship skills remain foundational even when operations are automated. Cataloguing and classification expertise underpins the creation of accurate bibliographic records within systems such as Koha; reference and information literacy skills are needed to interpret user needs and guide them in using online catalogues, databases and digital repositories; and collection development skills support rational selection and evaluation of print and electronic resources (Ikenwe & Aiyebelehin, 2024). Studies from Nigeria and other African countries consistently argue that automation does not eliminate the need for these skills but instead requires librarians to apply them in new ways, such as mapping subject headings to MARC fields, designing search strategies in discovery systems, and evaluating usage data to inform collection decisions (Ikenwe & Aiyebelehin, 2024).

Digital skills, in turn, comprise both general ICT literacy and job-specific competencies. Literature search have shown that although there are several professional bodies regulating the practice of librarianship such as IFLA, African Library and Information Associations and Institutions (AfLIA), Canadian Library Association (CLA), Nigerian Library Association (NLA) among others have advocated for the importance of digital skill acquisition for Librarians but, none of these bodies have develop any adaptable framework for measuring digital skills among Librarians. This knowledge gaps motivated the researcher to examine the existing International frameworks such as the Lloyds "Essential Digital Skills" model (Lloyds, 2018) and the African Union's digital skills continuum (ITU, 2024) which described the basic functional skills such as using devices, handling information and content, communicating online, performing transactions, and staying safe and legal in digital environments (Endouware & Omehia, 2022) and operational task-based digital competencies. In the library context, these are prerequisites for everyday work, enabling staff to use office software, navigate web interfaces, manage files and communicate with users and colleagues via email and messaging platforms (Diseiye et al., 2024).

However, although Lloyds and ITU, 2024 model were developed for other sectors, literature stresses that the basics skills highlighted by these authors are not sufficient to sustain automated library operations; they must be complemented by operational task-based digital competencies tailored to ILMS and related systems. Hence, Martin (2006) digital literacy model bridged this knowledge gaps by extending it further to include task-based digital competencies tailored to ILMS and related systems which is the ability to deploy emerging ICT tools and platforms to execute library-specific operational tasks, such as using Koha to manage cataloguing, circulation, OPAC, institutional repositories, serials, acquisitions and related reporting functions. Hence, this study adapted the components of the three authors discussed here in the development of the conceptual model for this research.

3.7.2 Operational task-based skills and Koha-specific competencies

Operational task-based digital skills are defined in recent LIS and ICT literature as the ability to use specific digital tools to perform job-related tasks and solve work problems, as distinct from general digital literacy used in everyday life (Enakrire et al., 2025). For library professionals in automated university libraries, these skills include configuring and using core ILMS modules; administering institutional repositories; managing electronic resource management systems; and supporting authentication, discovery and access tools (Bhati & Kumar, 2020). In the Nigerian context, where Koha has become the predominant ILMS, task-based skills are particularly associated with the effective use of Koha's cataloguing, circulation, OPAC, acquisitions, serials, patron management and reporting modules.

Empirical studies from Nigerian university libraries demonstrate how gaps in these task-based skills limit the realisation of automation benefits (Ojo, 2024). For example, some librarians are proficient at entering basic bibliographic data but struggle with more complex MARC fields, authority control or batch import/export of records, resulting in inconsistent catalogues and limited use of advanced search features. Others lack experience in defining circulation rules, fines structures and borrower categories in Koha, which constrains full automation of loan transactions and leads to continued reliance on manual procedures (Endouware & Omehia, 2022). Similarly, limited familiarity with acquisitions and serials modules means that ordering, invoicing and journal check-in are often carried out manually or in spreadsheets, even when Koha could support end-to-end workflows (Ojo, 2024).

Koha-specific operational skills also extend to system administration tasks such as configuring item types and locations, customising OPAC interfaces, generating statistical reports, and troubleshooting common errors. Nigerian case studies report that in many libraries only one or two individuals typically a systems librarian or ICT staff member possess these skills, creating bottlenecks and vulnerabilities when those individuals are

unavailable. Where broader teams have been trained and librarians across sections (cataloguing, circulation, serials) understand the basic logic of Koha modules, automation is more deeply embedded and resilient. This reinforces the argument that Koha-focused operational task-based digital skills are central to sustainable automation in Nigerian university libraries (Adegbore et.al., 2025; Oladokun et.al., 2025).

3.7.3 Conceptualising digital skills for this study

Drawing on Martin's digital literacy model (Martin, 2006) and the empirical patterns described above, this study conceptualises digital skills along a continuum from basic to advanced, with particular emphasis on the operational task-based operations (Adekeye & Odunlade, 2025). Basic digital skills are defined as foundational abilities to use technology for everyday tasks, including online searching, email communication, word processing, simple data entry, and connecting to networks. Advanced or task-based digital skills refer to the ability to deploy emerging ICT tools and platforms to execute library-specific operational tasks, such as using Koha to manage cataloguing, circulation, OPAC, institutional repositories, serials, acquisitions and related reporting functions.

In operational terms, the study focuses on digital skills that directly support automated library operations, particularly those associated with Koha and related digital systems used in Nigerian university libraries. This includes not only the technical ability to use system interfaces but also understanding of how these tools embed and reshape traditional library practices, for example, how MARC fields correspond to cataloguing rules, how circulation parameters reflect local loan policies, or how repository metadata supports discoverability and long-term access. By adopting this two-layer conceptualisation and foregrounding operational task-based skills, the study aligns its measurement and analysis with the types of competencies that are most critical for sustaining automated services in the Nigerian context.

3.8 Factors influencing digital skills among Nigerian university library professionals

3.8.1 Socio-cultural perspective

Sociocultural factors represent the intricate environmental conditions, influences, and systems rooted in social and cultural contexts that profoundly shape human behavior, beliefs, wellbeing, and adaptive capacity (Mohammad, 2025). In the Nigerian context, sociocultural factors manifest as influences that shape individuals' behaviours, attitudes, and opportunities within a society. These factors include cultural beliefs, traditions, norms, religious practices, social structures, and shared values that guide interpersonal relationships and community life. Sociocultural factors influence how individuals perceive their roles within society and how they interact with others in economic, social, and familial contexts. Cultural norms often determine expectations regarding gender roles, household responsibilities, decision-making within families and extended family obligations (Mensah, 2023).

Gender roles in Nigeria are largely shaped by sociocultural traditions that define the responsibilities of men and women within households and communities. In many Nigerian cultures, men are expected to serve as household heads and decision-makers, while women are often assigned domestic responsibilities including childcare, household management, and caregiving. Research indicates that these gender norms are reinforced through cultural traditions, religious teachings, and family socialisation processes (Emmanuel & Omolade, 2025). From an early age, children are socialised into gender-specific roles that shape their expectations regarding family life and social responsibilities.

Within many Nigerian communities, sociocultural expectations place significant economic responsibilities on men. Traditionally, men are perceived as the primary breadwinners responsible for providing financial support for their families. This goes beyond nuclear families, but includes financial support to extended relatives and community obligations

(Adisa et al., 2017; Harris, 2018). This expectation is deeply rooted in patriarchal social systems that associate masculinity with economic provision and household leadership. These cultural expectations can create substantial economic pressure on men, particularly in a Nigerian environment riddled with unemployment and economic instability. In situations where men are unable to fulfil the socially defined role of provider, they may experience social stigma, psychological stress, and diminished social status (Ogunyemi & Adedokun, 2020). Such pressures illustrate the intersection between cultural norms and economic behaviour within Nigerian society.

Marital relationships are also influenced by these sociocultural expectations, women's roles within families are often associated with nurturing and caregiving responsibilities. These roles, while socially valued, may limit women's participation in economic activities and leadership positions in certain contexts (Emmanuel & Omolade, 2025. Adisa et.al, 2017) found that Nigerian professional women often experience significant strain due to the dual demands of career and family responsibilities. Emmanuel and Omolade, (2025) reported that during lockdown, female medical professionals frequently experienced reduced work performance when professional duties conflicted with family obligations. Recent study also demonstrates that during the COVID-19 pandemic, many women experienced increased domestic responsibilities due to school closures and remote working conditions (Akanji et al. (2022; Emmanuel & Omolade, 2025). Akanji et al. (2022) conducted a qualitative study among married female academics in Nigeria and found that many participants experienced heightened stress levels as the boundaries between work and home life disappeared during lockdown. Women continued to carry primary responsibility for household tasks and childcare while maintaining their academic duties. These findings are consistent with broader global trends. Skinner et al. (2021) reported that women in academia experienced significant

disruptions in research productivity during the pandemic, largely due to increased caregiving responsibilities and emotional burnout.

Religion is a powerful sociocultural force in Nigeria, where Christianity, Islam, and traditional belief systems coexist. Religious doctrines often influence moral values, gender roles, and family structures. For example, religious beliefs can shape attitudes toward reproductive health, family planning, and gender relations (Ugwu & de Kok, 2015). Religious institutions also serve as important social structures that influence community norms and behaviour. Clergy and religious leaders often play influential roles in shaping public opinion and reinforcing cultural traditions.

3.8.2 Staff- side (individual) factors

Existing studies have indicated that socio-cultural factors and individual characteristics such as age, gender, educational background, prior exposure to ICT, self- efficacy and attitudes toward technology significantly influence the digital skills of library professionals (Charlton et al., 2022). As previously discussed, sociocultural norms in Nigeria often position men as primary economic providers for their families (Adisa et al., 2017; Harris, 2018). For male library staff, these expectations may create pressures to prioritise income-generating activities over professional training or further education. Since many professional development opportunities require financial investment or time away from work, individuals facing strong financial responsibilities may find it difficult to participate in such programmes.

Age is frequently highlighted, with evidence suggesting that younger librarians and library officers tend to report higher levels of comfort with digital tools and greater willingness to experiment with new technologies than their older counterparts, who may have been trained in predominantly analogue environments and may feel less confident navigating rapidly changing systems (Diseiye et al., 2024). However, age effects are not uniform; some older

professionals actively pursue training and attain high levels of digital competence, while some younger staff lack formal training and rely heavily on informal, self-taught skills that may not align with professional requirements.

Gender is another important factor, particularly in a profession where women constitute a numerical majority but may face structural barriers to accessing technology training and career progression. Studies of digital skills in Nigerian university libraries and related sectors report that female staff often encounter constraints linked to domestic responsibilities, limited mobility, and cultural expectations that can reduce their participation in ICT-intensive workshops or conferences (Awoyemi & Okojie, 2024). At the same time, some research suggests that when opportunities are equally accessible, gender differences in self-reported digital skills narrow or disappear, indicating that structural and opportunity-related factors, rather than intrinsic ability, drive observed gaps. This highlights the importance of designing inclusive digital skills development initiatives that consciously address gendered barriers to participation (Makori et al., 2013).

Educational background and prior ICT exposure also shape digital competencies. Librarians and library officers who graduated from LIS programs that included substantial practical ICT components, such as hands-on training in ILMS, digital libraries and web technologies, tend to report higher levels of digital skills and greater confidence in using automated systems (Anyim, 2018). Conversely, professionals whose initial training pre-dated the widespread introduction of ICT into LIS curricula often rely on sporadic in-service workshops or self-directed learning to acquire digital skills, resulting in uneven and sometimes superficial capabilities. Personal attitudes toward technology including openness to change, perceived usefulness of digital tools and anxiety about failure further influence whether individuals engage with training opportunities and apply newly acquired skills in practice (Awoyemi & Okojie, 2024).

3.8.3 Institutional and environmental factors

Institutional context exerts a powerful influence on the development and utilisation of digital skills among Nigerian university library professionals. One of the most frequently cited factors is funding both overall library budgets and specific allocations for ICT infrastructure and staff development (Oladokun et.al., 2025; Agbanu & Ezekwibe, 2025). Libraries with more stable and generous funding, whether through their parent institutions, TETFund or external donors, are better positioned to invest in up-to-date hardware and software, provide regular training, and support attendance at conferences and workshops where staff can gain exposure to new tools. In contrast, libraries in under-resourced institutions struggle to maintain basic infrastructure, let alone invest in ongoing digital skills programmes, leading to stagnation or decline in competencies (Boateng et al., 2014; Omopupa et al., 2020; Omodara et.al., 2025).

Infrastructure quality particularly power supply, internet connectivity and availability of functional computers also shapes digital skills in practice. Even staff with strong theoretical knowledge of digital tools cannot apply or deepen their skills if systems are frequently offline, if bandwidth is insufficient to support ILMS access across service points, or if there are too few workstations for staff to engage meaningfully with digital platforms (Enakrire et al., 2025) . Nigerian studies repeatedly note that erratic power supply and network outages disrupt automation workflows, discourage staff from relying on ILMS for core operations, and make it difficult to practice and reinforce newly acquired skills (Awoyemi & Okojie, 2024). These conditions can create a vicious cycle in which low system reliability reduces usage, which in turn reduces motivation to invest in skills, thereby undermining the sustainability of automation efforts.

3.8.4 Organisational culture and leadership as further critical determinants.

Libraries whose leadership actively champions digital transformation, sets clear expectations for ILMS use, and models commitment by allocating time and resources for training tend to exhibit higher levels of staff engagement with digital tools (Nkiruka & Thomas, 2015). Conversely, where management is indifferent or sceptical about automation, or where competing institutional priorities crowd out investment in library ICT, staff may perceive digital skills as optional or low-value, resulting in limited uptake of training opportunities (Mayowa-Adebara & Opeke, 2019). The presence or absence of formal policies and strategic plans for ICT development, including documented roles and responsibilities for systems management, also influences whether digital skills development is systematic or left to individual initiative (Appiah et al., 2016; Dime, 2023).

3.8.5 LIS education, curriculum and learning environments

The quality and orientation of LIS education in Nigeria plays a foundational role in shaping the digital skills of current and future library professionals. Authors have argue that many African, including Nigerian LIS programmes have historically emphasised traditional librarianship cataloguing, reference, collection development while treating ICT-related courses as add-ons or electives, often delivered in theory-heavy formats without sufficient hands-on practice (Uzoagba et.al., 2026; Abubakar, 2021; Makori et al., 2013). Practical exposure to ILMS, digital libraries, web development, metadata standards and data analysis tools is frequently limited by inadequate computing facilities, outdated software and lack of staff with advanced digital expertise. As a result, graduates may leave LIS schools with only basic ICT familiarity and minimal operational experience in the kinds of systems they will encounter in automated university libraries (Hirsh et al., 2015; Kacunguzi & Samuel, 2016).

Recent curriculum reform efforts seek to address these gaps by integrating more ICT content, encouraging partnerships between LIS schools and university libraries, and promoting

internships or practicum experiences that expose students to live ILMS environments. Nevertheless, progress is uneven across institutions, and many educators themselves require upskilling to teach advanced digital topics effectively (Uzoagba et.al., 2026; Ahiauzu et.al, 2020). The literature suggests that without systemic improvements in LIS education including investments in digital infrastructure, staff development for lecturers, and curriculum alignment with contemporary automation practices efforts to develop digital skills among practising librarians will continue to face an uphill struggle (Ogunjimi et.al., 2026; Oduma & Ile, 2014). This underscores the need for complementary strategies: strengthening pre-service education while simultaneously designing robust in-service digital skills programmes for current professionals.

3.9 Digital skills in Nigerian university libraries: empirical evidence

3.9.1 Skills profiles and self-assessed competencies

Empirical studies of Nigerian university library staff consistently report a pattern of moderate basic digital skills coexisting with significant gaps in advanced, task-based competencies (Ahiauzu et.al., 2020). Surveys that ask librarians and library officers to self-assess their ICT abilities often find high confidence in everyday digital activities such as sending and receiving emails, browsing the web, using word processors and engaging with social media platforms (Oladokun et.al., 2025). For example, Dube et al. (2024), in a multi-country African study that included Nigerian participants, report that librarians typically rate their proficiency as high in general internet use and basic office applications but much lower in areas such as database administration, web design, scripting, and digital preservation.

Nigeria-specific investigations confirm this pattern. Some studies show that while most university library staff are comfortable searching online databases, downloading articles and using simple reference management tools, fewer feel confident configuring access to e-resources, troubleshooting off-campus authentication issues, or customising ILMS

interfaces (Endouware & Omehia, 2022). In one survey, a majority of respondents described their overall digital literacy as “moderate” but acknowledged weaknesses in security-related skills, such as recognising phishing attempts, using encryption tools, or managing permissions in collaborative platforms (Ikenwe & Aiyebelehin, 2024). These findings suggest that self-perceived competency may overestimate readiness for the complex tasks involved in sustaining automated library operations.

When skills are assessed in more granular, task-based terms, gaps become even more apparent (Awoyemi & Okojie, 2024). Studies focusing on ILMS use reveal that many staff have limited experience with higher-level functions such as batch processing of records, authority control, report generation or parameter configuration. In some cases, librarians report that they primarily use Koha or other ILMS for basic search and record display, leaving data entry and system configuration to a small number of specialists. This division of labour can create dependencies and limit opportunities for broader staff engagement and learning. Overall, the empirical evidence indicates that while basic digital skills are relatively widespread among Nigerian university library professionals, the advanced operational competencies required for robust automation are far less so.

3.9.2 Evidence from librarians and paraprofessionals

Differences in digital skills between professional librarians and paraprofessional staff (such as library officers) have been the subject of several Nigerian studies. Librarians, who generally hold at least a master’s degree in LIS and have some exposure to ICT courses during their training, tend to report higher levels of digital competence than paraprofessionals, whose formal qualifications may emphasise general education or clerical skills rather than specialised ICT content (Diseiye et al., 2024). For example, surveys of library officers in public universities show that while many are comfortable with basic computer use, they often lack training in the specific software used for cataloguing, circulation or e-resources

management, even though they perform frontline tasks in these areas (Nwagwu & Sulaimon, 2022).

Paraprofessionals play crucial roles in Nigerian university libraries, especially in routine operations such as shelving, user registration, circulation desk activities and basic reference (Aziagba, 2009). When these staff have low digital skills, the overall effectiveness of automated systems suffers, as they may revert to manual workarounds, mis-enter data or avoid using ILMS altogether. Studies have documented situations where library officers prefer to handle circulation and reference queues manually, while librarians manage transactions with the ILMS. This action of the library officers undermines real-time data accuracy and the very purpose of automation. This highlights the need to include paraprofessionals not only librarians in digital skills development strategies.

At the same time, some Nigerian research points to positive examples where paraprofessionals have been successfully trained as "automation champions", taking lead roles in Koha data entry, barcode labelling, and user support (Emasealu, 2019). In such cases, structured in-house training and mentoring, complemented by external workshops, have enabled library officers to acquire substantial operational task-based skills, reducing over-reliance on a small number of librarians (Gbadamosi, 2012). These cases demonstrate that with appropriate support, paraprofessionals can significantly contribute to sustaining automated services and that digital skills development should be conceptualised as a whole-library endeavour rather than restricted to those in the librarianship cadre.

3.9.3 Regional and Institutional Variations

The Nigerian evidence also reveals considerable variation in digital skills across regions, institution types and ownership structures. University libraries in urban centres with better ICT infrastructure and stronger funding often federal or well-resourced private institutions tend to report higher levels of staff digital competence and more extensive use of automation

tools than those in rural or less-resourced settings (Olakoge & Kolawole, 2019; Fasola & Mamudu, 2020). For example, studies conducted in south-west Nigeria, where many universities benefit from proximity to ICT hubs and stronger economic bases, frequently report more advanced ILMS implementations and higher reported digital skills than investigations in parts of the north or south-south regions (Oyovwe-Tinuoye et.al., 2021; Ajani. & Buraimo, 2022; Dime, 2023; Abdul & Waziri, 2024; Ahmed, & Tsagem, 2024; Adegbore et.al., 2025; Omodara et.al., 2025). These disparities reflect broader socio-economic inequalities and highlight the importance of context in understanding digital skills development (Appiah et al., 2016).

Ownership differences also matter (Michael & Olayemi, 2023). Private university libraries, particularly those established in the last two decades, often build automation into their operations from inception and recruit staff with explicit digital skills expectations, leading to higher baseline competencies (Olakoge & Kolawole, 2019; Fasola & Mamudu, 2020). Federal universities may benefit from larger overall budgets and access to TETFund interventions but face more complex bureaucratic processes and competing institutional priorities, which can delay ICT investments and training (Endouware & Omehia, 2022; Echono, 2024). State universities frequently operate with the most constrained resources, which impacts both infrastructure and opportunities for staff development (Echem, 2022). These institutional variations underscore that digital skills gaps are not solely individual deficits but are deeply shaped by structural conditions that any strategic plan must acknowledge and address (Echono, 2024; Abdul & Waziri, 2024; Ahmed, & Tsagem, 2024; Adegbore et.al., 2025).

3.10 Skills development efforts for library professionals in Nigeria

3.10.1 Digital skills development through LIS education

Efforts to develop the digital skills of Nigerian library professionals begin in LIS schools, which provide the foundational training for future librarians and paraprofessionals (Abubakar, 2014). However, multiple studies indicate that until recently, LIS curricula in Nigeria were predominantly oriented toward traditional librarianship, with limited attention to practical ICT content and hands-on experience with automation systems. Reviews of the NUC Benchmark Minimum Academic Standards (BMAS) for LIS programmes in the 2010s show a heavy emphasis on courses such as Introduction to Library and Information Studies, Information in Libraries and Society, Serials Management, and Indigenous Knowledge Systems, with few compulsory modules explicitly devoted to digital libraries, ILMS, web development or data analytics (Lai, 2005).

Empirical work across Nigerian LIS schools reveals structural obstacles to embedding meaningful digital skills training (Islam et al., 2011). Abubakar (2021) notes that while some LIS departments have computer laboratories or access to central ICT facilities, these are often poorly equipped, with insufficient numbers of computers, outdated software, unreliable power supply and limited internet connectivity, which constrains students' opportunities for practical engagement with digital tools. Ezema et al. (2014) further report that some universities "window-dress" facilities during accreditation periods repairing equipment, hiring ad-hoc technical staff and providing temporary alternative power only to allow these arrangements to lapse afterwards, leaving students with limited ongoing access to ICT resources. In addition, staffing shortages and the limited digital competencies of many LIS educators, whose own training pre-dated the digital era, hinder the delivery of advanced ICT courses (Ocholla, 2014).

Recognising these weaknesses, professional bodies and regulators have initiated reforms. The Librarians' Registration Council of Nigeria (LRCN) convened a national summit on LIS curriculum review in Lokoja in 2015, aiming to align LIS education with contemporary digital requirements and global best practices. Outcomes from this process informed the development of a new Core Curriculum Minimum Academic Standards (CCMAS) for LIS, approved by NUC in 2022, which places greater emphasis on ICT, digital libraries, information systems and data-driven services. Nevertheless, early assessments suggest that implementation is uneven across institutions, and many LIS schools still lack the infrastructure and staff capacity needed to translate curriculum changes into substantial digital skills gains for students. Consequently, while pre-service education is evolving, there remains a strong need for structured in-service skills development for practising librarians and paraprofessionals.

3.10.2 In-service and continuing professional development

In the absence of uniformly robust LIS education, most Nigerian library professionals acquire digital skills through continuing professional development (CPD) and on-the-job learning once they enter the workplace (Chigwada & Nwaohiri, 2021). Empirical studies consistently report that librarians in Nigerian academic libraries gain ICT and automation-related skills primarily via self-study, collegial assistance, informal mentoring and short training events, rather than through comprehensive, planned programs. Obuh (2019) investigated librarians as managers of library systems in Nigerian academic libraries found that the majority had not attended specialist ILMS or digital library courses; instead, they relied on personal initiative, peer support and sporadic workshops to develop their skills (Rehman et al., 2022).

A series of recent studies provide a detailed picture of the CPD landscape. Izah (2020) conducted an assessment of training and development in federal university libraries revealed that on-the-job training is the dominant strategy, favoured because it is relatively

inexpensive and does not require staff to leave their posts for extended periods (Iwuchukwu & Echedom, 2020). Off-the-job training such as external workshops, conferences or formal diploma and degree programmes is less common, largely due to financial constraints and the perceived disruption to routine operations (Iwuchukwu & Echedom, 2020). Scholarly analysis of capacity-development programmes in Nigerian university libraries found that on-the-job training, in-service courses, off-the-job training and mentoring all show weak but positive correlations with librarians' overall capacity development, suggesting that while these interventions have some impact, they are neither sufficiently intensive nor systematically planned to close the digital skills gap (Moonasar, 2024).

Studies of specific institutions confirm that professional development opportunities are often limited in scope. Osesi et al. (2022) for instance, report that staff at a federal university library had access mainly to orientation sessions, in-house workshops, seminars and instructor-led training, with little or no access to distance education programmes, study visits, international conferences or TETFund-sponsored training. Ikolo and Nongo (2022) study on continuing professional development shows that librarians express strong preference for seminars, workshops and face-to-face short courses, but very few have attended specialist digital skills training, especially in areas such as ILMS administration, institutional repositories or metadata standards. Cost emerges repeatedly as a major barrier, with staff citing high registration fees, travel expenses and foreign-currency denominated charges as obstacles to attending high-quality external training.

International and African literature offers examples of more structured CPD models that could inform Nigerian practice. Munoz and Whyte (2003) described an integrated skills-development strategy at a Canadian university library that combined workshops on adult learning and instructional design, staff development forums, individual goal-setting and ongoing performance review to support librarians' adoption of web-authoring tools and

course-management systems. Shepherd (2010) recounts how an in-service IT training programme at Rhodes University Library in South Africa, prompted by the realisation that many staff lacked basic technical skills, equipped librarians to function effectively in a digital environment. These cases highlight the benefits of sustained, institutionally supported CPD frameworks over ad hoc, one-off training events.

3.10.3 Stakeholder and policy-level initiatives

Beyond individual libraries, several stakeholders play important roles in skills development for library professionals in Nigeria. Professional associations such as the NLA and the LRCN provide national platforms for training and knowledge exchange (Akintola, et.al, 2020). The NLA organises annual conferences and general meetings where librarians present papers on emerging trends, and its interest groups, including the Information Technology Section, conduct specialised workshops such as the "Library and Information Technology Today" (LITT) series aimed at enhancing members' ICT skills (Anyim, 2018). LRCN has engaged in partnerships with organisations such as NUC (for joint accreditation of LIS programmes), IFLA (for career and professional development), Emerald Publishing (for training on electronic publishing), and NITDA (for training on free and open-source software and electronic library standards) (Okojie and Omotosho, 2020).

Also, AULNU (Association of University Librarians of Nigerian Universities), formerly known as the Committee of University Librarians of Nigerian Universities (CULNU), is an association that aims to exchange ideas, discuss and deal with matters of joint and common interests of the university libraries in Nigeria. Its membership formation is exclusive to the headship of the university libraries (University Librarians). They operate like the UK's Standing Conference of University Libraries (SCONUL). The AULNU has not been active, as the last known of them was the establishment of a consortium known as NULIB (Nigerian University Libraries). The primary aim of the Consortium, according to Rosenberg (2005)

and Igbo et al. (2022), is to bargain for drastically reduced unit costs for the universities' access to digital information resources. Through the initiative, NULIB was granted one-year free access to various international full-text electronic journals, which expired in 2005. Thereafter, it successfully negotiated highly discounted costs and mobilised contributions by the university libraries to pay for a two-year extension (January 2005 - December 2006) of access to some 8,000 full-text electronic journals in the EBSCOhost database (Ternenge & Kashimana, 2019). AULNU was expected to facilitate follow up training for the initiative but has not been proactive since 2006.

Government agencies also contribute to digital skills development through policy frameworks and funding schemes. NITDA issues guidelines on ICT deployment in tertiary institutions, including expectations for library services such as the provision of OPACs, e-books, e-journals and integrated library systems, and collaborates with NUC and other regulators to monitor implementation and organise digital literacy training for university staff. TETFund is mandated to support physical infrastructure, instructional materials, research and staff development in public tertiary institutions, funds conference attendance, postgraduate studies and sometimes ICT-related workshops for library staff. TETFund has played a significant role in supporting infrastructure development, conference participation, and the training of university staff. Sector-wide analyses show that TETFund annual interventions amount to over ₦683 billion (₦683,429,268,402.64), equivalent to more than US$400 million (US$413,474,707.38). Evidence from the 2024 intervention cycle suggests that 40% of these allocations support programmes that contribute to staff capacity development (Ikuta & Edet, 2017; Ezekwe & Ani, 2023, TETFund, 2024), although evidence suggests that the scale and targeting of such support varies widely. Womboh (2008) and subsequent authors have urged TETFund to prioritise short ICT and automation courses for librarians as part of its human-capital development agenda.

Despite these initiatives, the literature emphasises that training remains scarce relative to need and often fails to focus specifically on the operational task-based digital skills required for automated operations (Adegbore et.al., 2025). Many vendor-led workshops on ILMS or database platforms are characterised as superficial, short-term and expensive, with little follow-up support or local capacity-building. Moreover, professional bodies and government programmes have historically focused more on librarians than on paraprofessional staff, reinforcing skill disparities within library teams and threatening the sustainability of automation projects that depend on contributions from staff at all levels. These limitations reinforce the argument for a more coherent, inclusive and sustainability-oriented approach to digital skills development in Nigerian university libraries.

3.11 Challenges and gaps in digital skills development

3.11.1 Financial and economic constraints

Financial constraints cut across almost all discussions of digital skills development in Nigerian university libraries. At the institutional level, poor and irregular funding of libraries undermines investment in both ICT infrastructure and staff development, leading to outdated equipment, limited access to current software and an over-reliance on once-off donor or vendor initiatives. Akintola et al. (2022) study of library staff training and career development in federal universities in south-west Nigeria found that although staff perceived management as generally supportive of capacity building, available programmes were inadequate, especially in relation to ICT and new technologies, and sponsorship for external training was irregular. A broader analysis of capacity development in public universities (Friday & Onuh, 2022) similarly identifies poor library funding, negative managerial attitudes to staff development, and weak ICT infrastructure as intertwined barriers to sustainable skills upgrading.

At the individual level, staff financial constraints further limit access to training. Many high-quality digital skills programmes including online courses and international workshops are priced in foreign currencies and beyond the reach of most Nigerian library professionals, particularly when employers do not provide subsidies or study leave. Studies by Ikolo and Nongo (2022) and by Izah (2020) report that librarians frequently self-fund attendance at conferences, short courses and even postgraduate programmes, but that rising costs and unfavourable exchange rates make such self-sponsorship increasingly difficult. As a result, on-the-job and informal learning become the default modes of skills acquisition, even though they may not provide the depth and structure needed for complex systems such as Koha.

3.11.2 Managerial, policy and organisational challenges

Managerial attitudes and organisational policies also shape the extent and focus of digital skills development. While some Nigerian university library managers are proactive in advocating for automation and staff training, others are perceived as indifferent or resistant, seeing training as a cost rather than an investment. Anunobi (2013) investigated staff capacity-development policies in federal university libraries found that although the majority of libraries had written policies on ICT training often specifying objectives, staff categories, training types and modalities implementation was hampered by inadequate funding and weak monitoring mechanisms. This gap between policy rhetoric and practice contributes to sporadic, unsystematic training that does not align with clearly defined competency frameworks or long-term automation strategies.

Organisational cultures sometimes exhibit resistance to developing subordinate and paraprofessional staff. Aziagba (2009) and Osiesi et al. (2022) note that training opportunities are often concentrated among professional librarians, who are perceived as having a greater "right" to CPD, while library officers and assistants receive little attention. Ukwoma and

Akanwa (2008) further report resistance in some libraries to investing in subordinate staff, which not only perpetuates skills gaps but also undermines the sustainability of operations that depend on competent frontline workers. This pattern contradicts evidence that paraprofessionals can effectively assume key roles in automated workflows when given appropriate training and mentoring, and suggests a need to reframe digital skills development as a whole-team responsibility.

3.11.3 Gender and Equity Issues

Gendered dynamics add a further layer of complexity to digital skills development in Nigerian university libraries. Although women constitute a large proportion of the library workforce, research indicates that they face specific barriers to participating fully in technology-focused training and career advancement. International studies by (Couto, 2021; Shillcutt & Silver, 2019; Mars, 2018; Deyrup, 2014; Golub. 2010), though undertaken in different contexts, highlight a global pattern in which digital and technical roles within LIS increasingly attract men, while women are channeled into management or service-oriented roles, reinforcing a gendered division of labour. Nigerian studies (Adu & Ngulube, 2021; Iguodala-Cole et.al., 2024; Adeniyi et.al., 2024; Dagunduro et.al., 2024) echo this trend, noting that women's responsibilities for child-care, family obligations and social expectations can limit their mobility and availability for off-site or intensive training programmes, especially those requiring travel or evening/weekend participation.

Adjah and Walt (2019) examined female professionals in university libraries, recommend targeted career-development support systems including mentoring, flexible training schedules, and childcare-sensitive policies to help women overcome barriers to technological advancement. Without such measures, digital skills initiatives may inadvertently exacerbate gender inequalities by disproportionately benefiting those with fewer domestic constraints, often male staff, and leaving women under-represented in high-skill technical or leadership

roles related to automation. From a sustainability and SDG perspective, this is problematic, as it conflicts with commitments under SDG 5 (gender equality) and SDG 10 (reduced inequalities), and undermines the potential of the largely female library workforce to drive digital transformation.

3.11.4 Curriculum and Trainer Capacity Gaps

Finally, gaps in LIS curricula and trainer capacity constitute structural obstacles to sustained digital skills development. Kacunguzi and Samuel (2016) comparative analysis of LIS programs in East and West Africa concludes that many curricula are not aligned with the current digital demands of the information market, lacking sufficient coverage of practical ICT competencies, digital library management and emerging technologies. Friday and Onuh (2022) work on capacity development in Nigerian public universities similarly points to the non-availability of digital courses in library school curricula and poor ICT infrastructure as major challenges. These findings corroborate earlier critiques by Saleh (2011) who argued that the quality and quantity of LIS educators in Nigeria are inadequate to meet global standards, particularly in digital domains.

Ahaiuzu et al (2020) assessment of LIS educators' ICT skills in a Nigerian university suggests that many teachers have limited digital competencies and do not incorporate digital tools into their own work. This weakens their ability to mentor students effectively in digital librarianship and underscores the need for educator-focused CPD in addition to student and practitioner training. Ocholla and Bothma (2013), as well as Inyang and Mngutayo (2018), advocate re-orientation, curriculum review and increased use of ICT in teaching as key strategies for updating librarians' skills in the digital environment. Until such systemic changes take root, in-service digital skills development in university libraries will continue to carry much of the burden of preparing staff to manage automation and digital services.

3.12.1 Libraries, SDGs and Sustainable Digital Services

The sustainability literature reviewed earlier demonstrates that libraries can make significant 45contributions to multiple SDGs by leveraging digital technologies and automation in context-sensitive ways (Nikita Shivaji, 2024). In relation to SDG 4 (quality education), academic libraries support teaching, research and lifelong learning by providing equitable access to digital resources, information literacy training and virtual reference services. SDG 5 (gender equality) and SDG 10 (reduced inequalities) are advanced when libraries design inclusive digital skills programs and e-services that accommodate diverse user groups and address gendered and socio-economic barriers to access. By supporting research, innovation and employability through digital resources and skills development, libraries contribute to SDG 8 (decent work and economic growth), while their roles in providing access to legal and civic information and hosting dialogue spaces relate to SDG 16 (peace, justice and strong institutions). Partnerships for technology, content and training, including consortia and collaborative projects, align with SDG 17 (partnerships for the goals).

International case studies illustrate concrete pathways through which libraries operationalise these contributions. Nabina and Harikrishnan (2024) show how universities such as Monash and the University of California used open-source software, digitisation projects and e-learning initiatives to support sustainable access to information and reduce environmental impacts associated with print-based services. Gualvez et al. (2024) describe how the South Manila Educational Consortium in the Philippines pooled resources across member institutions, negotiated collective licences, and coordinated technology-focused training for librarians, thereby enhancing both economic and human-capital aspects of sustainability. These examples highlight that sustainable digital services emerge where technological choices, staff skills and institutional strategies are consciously aligned with broader development goals .

3.12.2 Nigerian Perspectives on Sustainable Automated Services

Emerging Nigerian scholarship contextualises sustainability concepts for the country's higher education and library systems. Authors such as (Karioja, 2013; Anunobi, 2013; Adetunji & Oladokun, 2020; Onwubiko, 2023; Odunlade & Ojo, 2023; Zubair et al., 2023) argue that sustainable automated library services in Nigeria require three mutually reinforcing components: the adoption of affordable and adaptable technologies (particularly open-source ILMS like Koha and repository platforms such as DSpace and EPrints); the promotion of open-access resources and institutional repositories to ensure equitable and continuous access to scholarly content; and the development of context-sensitive staff capacity-building programs tailored to local infrastructural and socio-economic realities.

Policy developments support some of these directions. The NUC's advocacy for OER and institutional repositories, including guidelines that encourage universities to host theses, dissertations, books and datasets on their own platforms, has spurred many institutions to establish repositories based on DSpace or EPrints. Libraries are charged with raising awareness of OER and training faculty and students in their use, which implicitly demands digital skills among library staff in metadata creation, repository administration and copyright management. At the same time, national ICT frameworks, such as NITDA's guidelines for ICT deployment in tertiary institutions, call for the adoption of integrated library systems and digital resources, but provide only high-level direction and limited detail on how staff skills development should be operationalised.

Despite progress, Nigerian authors emphasise that technology adoption without commensurate investment in human capacity and supportive policy environments leads to fragmented and unsustainable outcomes. Studies such as (Nwaohiri, 2021; Ukwoma & Onyebinama, 2021; Okuonghae & Achugbue, 2022; Oladokun & Kolawole, 2018; Ojo, 2024) note that although many Nigerian university libraries have embraced open-source ILMS and

open-access content, relatively little has been done to develop the digital skills of staff in systematic, long-term ways. Evidence shows that where Koha installations and OER repositories exist, they are often underused or poorly maintained, undermining their potential contributions to Sustainability. This reinforces the central argument of the present study that a sustainability-oriented strategic plan for digital skills development is essential for aligning automation and digital services in Nigerian university libraries with national and global development agendas.

3.13 Conceptual Framework

This study develops an integrated conceptual framework that synthesizes a digital skills perspective with a sustainability oriented model of digital information services. The framework is developed in response to a central analytical gap identified in the literature: while digital skills models clarify what competencies are required, they insufficiently explain how such competencies can be sustained in resource-constrained university library systems. Integrating Martin's digital literacy model, adapted to the operational realities of Nigerian university libraries; with Chowdhury's sustainability framework for digital library services. advances a multilevel model linking individual competencies, institutional enablers, and sustainable automated operation outcomes.

3.13.1 Digital Skills Frameworks and their Limitations

A wide range of international digital skills frameworks provide valuable conceptual guidance but are not fully tailored to the operational realities of Nigerian university libraries. In the LIS domain, frameworks such as the IFLA's Digital Literacy Statement, the Chartered Institute of Library and Information Professionals (CILIP) Professional Knowledge and Skills Base (PKSB), and the Canadian Association of Research Libraries (CARL) Digital Literacy

Framework outline broad competency domains including information organization, professional knowledge, project management, strategic planning, and technological fluency.

While these frameworks are indispensable for high-level professional benchmarking, they remain largely abstract and generic. They offer limited operational specificity regarding the task-based competencies required to manage ILMS modules, institutional repositories, electronic resource platforms, and other digital infrastructures within contexts characterized by financial and technological constraints (IFLA, 2017; CILIP, 2021; CARL, 2024).

More operationally proximate frameworks such as Martin's digital literacy model (2006), the Lloyds Bank "Essential Digital Skills" framework, and the African Union Digital Skills Continuum distinguish between foundational, intermediate, and advanced work-related competencies. Martin's model is particularly relevant because it conceptualizes digital literacy as a developmental continuum comprising: Basic digital literacy (general ICT competence) and Advanced or task-based digital literacy (context-specific professional competencies).

Recent Nigerian studies (Khalid et al., 2021; Diseiye et al., 2024; Makinde & Oyakale, 2025) have adapted Martin's model to LIS contexts by distinguishing between: Foundational ICT skills (word processing, internet navigation, scanning, data storage, email use) and Advanced operational competencies (use of Koha, DSpace, EPrints, ERMS platforms, digital repository management, library website administration, and metadata systems).

This adaptation provides a clearer articulation of skill layers within Nigerian university libraries. However, even this refined digital skills framing remains limited: it primarily categorizes competencies without embedding them within broader institutional sustainability conditions.

3.13.2 Sustainability Framework

To address these limitations, this study incorporates Chowdhury's (2014) sustainability framework for digital information services. Chowdhury conceptualizes sustainability as a tripartite structure of Economic Sustainability – Ensuring affordable, cost-effective, and long-term financial viability of digital information services, Social Sustainability – Guaranteeing equitable and inclusive access to digital resources and service, and Environmental Sustainability – Reducing the environmental footprint of digital infrastructures across their lifecycle.

Chowdhury further emphasizes that sustainable digital services require attention to contextual and cultural factors, including institutional governance structures, policy clarity, leadership commitment, infrastructure quality, and socio-economic conditions. Subsequent scholarship (e.g., Harrington, 2016; Zhao et al., 2025) extends this model by highlighting "local context" determinants as both individual (socio-cultural and socio-economic factors) and institutional (resources, policies, and managerial capacity).

Empirical studies further demonstrate how digital library initiatives contribute to sustainability outcomes. Nabina and Harikrishnan (2024) argue that open-source adoption, digitisation initiatives, and e-learning strategies enhance both economic and environmental sustainability. Han and Yates (2016) show how digital initiatives at Monash University and the University of California supported operational continuity and lifelong learning. Gualvez et al. (2024) demonstrate that consortial collaboration at the South Manila Educational Consortium (SMEC), strengthens economic sustainability and capacity-building efficiency in academic libraries. Nikita Shivaji (2024) demonstrates that libraries, through these initiatives have significantly contributed to multiple SDGs .

3.13.3 Schematic of conceptual framework for the study

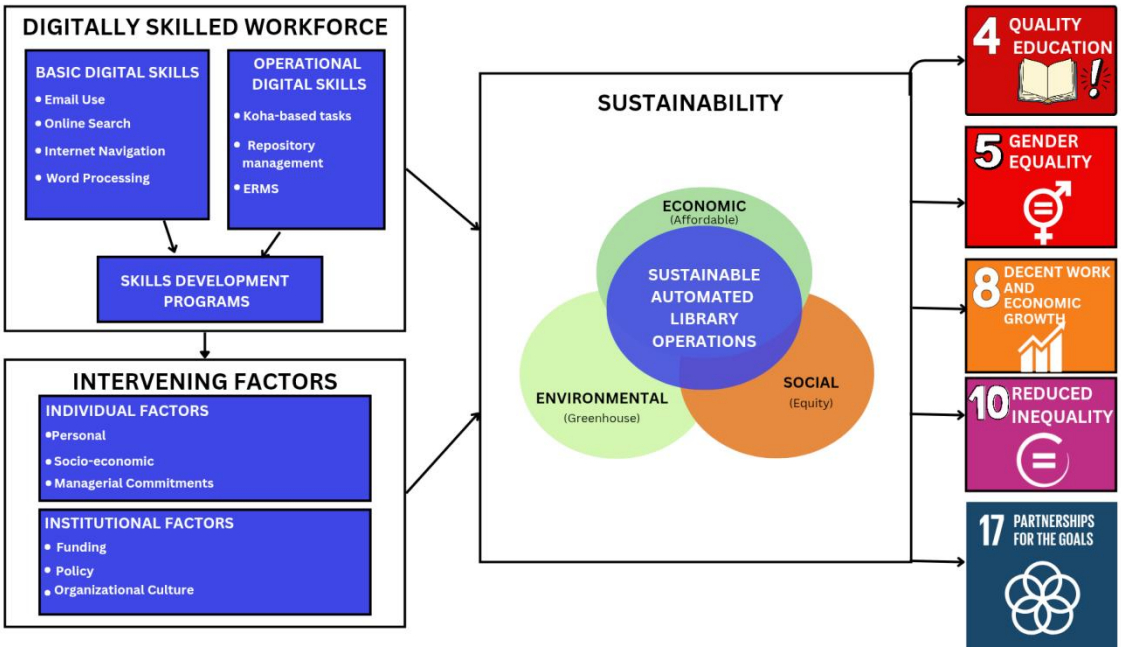


Figure 3.2 Integrated digital skills and sustainability framework

The schematic highlights the proposition that progression from foundational literacy to digital operational fluency is conditional upon continuous capacity building initiative and sustainability enablers such as funding, socio-cultural condition, equitable training policies etc contribute to sustainable automated library architecture. The framework aligns with key SDGs, illustrating how digitally skilled library personnel contribute to advancing sustainable development objectives.

3.14 Summary and identified gaps

The literature reviewed in this chapter demonstrates that automation has long been a strategic aspiration for Nigerian university libraries and that considerable efforts have been made to implement ILMS and digital services, particularly through the adoption of open-source systems like Koha and the promotion of open-access resources. Yet, these efforts have produced a landscape characterised by partial, uneven and sometimes fragile automation, with substantial regional and institutional disparities in implementation depth and

sustainability. Historical experiences with proprietary systems, combined with ongoing infrastructural and funding challenges, have underscored that technology alone is insufficient; sustainable automated services depend critically on the digital skills of the library workforce and on supportive institutional and policy environments.

The chapter has shown that Nigerian university library professionals generally possess moderate levels of basic digital skills but face significant gaps in advanced, operational task-based competencies, especially those required to configure and manage Koha modules, institutional repositories and related systems. These gaps are shaped by a complex interplay of staff-side factors (age, gender, education, prior ICT exposure, attitudes), institutional conditions (funding, infrastructure, leadership, organisational culture), and systemic issues in LIS education and trainer capacity. While a range of skills development efforts exist from LIS school curricula and on-the-job learning to professional association programmes and government-sponsored training these initiatives are often fragmented, underfunded, and insufficiently focused on the specific competencies needed for sustainable automation.

From a sustainability and SDG perspective, the literature indicates that Nigerian university libraries have begun to engage with open-source technologies, open-access content and policy frameworks that align with global development goals, but that these initiatives are not yet underpinned by coherent, context-sensitive digital skills strategies. Existing digital-skills frameworks provide useful conceptual starting points but require localisation and operationalisation for Koha-based, resource-constrained environments. Consequently, there remains a notable gap: the absence of a strategic, sustainability-oriented framework that (i) systematically assesses basic and operational task-based digital skills among Nigerian university library professionals; (ii) analyses staff- and management-side factors and institutional challenges affecting skills development; and (iii) proposes practical, affordable

and equitable strategies for building and sustaining the digital competencies necessary for resilient automated services.

Addressing this gap is the central aim of the present study. Guided by Martin's digital literacy model and informed by the SDGs and Nigerian policy and practice contexts, the study investigates the current digital-skills profile of university library professionals in Nigeria, examines existing training methods and barriers, and draws on these findings to develop a strategic plan for improving digital skills in support of sustainable, Koha-based automated library operations. In doing so, it seeks to contribute both theoretically and practically to the ongoing discourse on digital skills, automation and sustainability in Nigerian and wider Sub-Saharan African academic library environments.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter discusses the research methodology and approach employed to fulfill the research objectives. The chapter elucidated the justification for the research methods and their appropriateness to answer the research questions. The overall aim of this study is to develop a strategy for improving the digital skills of university library professionals in Nigeria on sustainable automated library operations. Four specific objectives were set to achieve the overall aim of this research; to identify the current digital skills level, examining the existing digital skills training methods, and explore the staff-side factors that impede the skills development of university library professionals in Nigeria (these objectives correspond with research questions 1-3); while the fourth objective explored the managerial perspective and challenges of digital skills development (that corresponds with the fourth research question).

Hypotheses 1-5 address research question one (digital skills possessed) and research question three (staff-side factors that impede digital skills development) by analysing digital skills gap across staff demography (age, gender, education level, work experience, cadre) and how these factors impede the digital skills development of university library professionals in Nigeria.

Hypothesis 6 explores the relationship between Research Question One (digital skills possessed) and Research Question Two (training programs attended).

4.2 Research philosophy

The research philosophy encompasses the foundational assumptions and beliefs about the nature of reality and the subject under study (Hall et al., 2019). It serves as a framework that

shapes the overall research strategy (Bryman, 2020; Gannon et al., 2022). According to Muhaise et al. (2020), research philosophy could take the form of positivism, pragmatism, and interpretivism to essentially guide the researcher's journey toward knowledge development within a specific field.

4.2.1 Positivism, interpretivism, and pragmatism

Positivism assumes that reality is objective, stable, and measurable through observable facts, and it is typically associated with quantitative designs, structured instruments, and statistical analysis (Baškarada & Koronios, 2018). In this tradition, the researcher aims for neutrality, reliability, and generalisable findings by testing theory-derived hypotheses using standardized measures

Interpretivism, by contrast, focuses on the subjective meanings that individuals attach to social phenomena and therefore privileges qualitative methods such as interviews and observations to capture rich, contextualised understandings (Saunders et al., 2019). The interpretivist researcher seeks depth rather than breadth and accepts that knowledge is co-constructed between researcher and participants.

Pragmatism offers a flexible, problem-centred philosophy that allows the integration of both quantitative and qualitative methods where they are most useful for answering the research questions (Jones, 2025). Pragmatists emphasize practical consequences and regard methods and paradigms as tools rather than fixed commitments, making the paradigm particularly suitable for mixed methods research (Jones, 2025). According to Saunders (2023), realism, positivism, pragmatism, and interpretivism are the four categories of research philosophies, in no particular order. These ideas were further blended with another research approach, including deductive and inductive, as well as methodological choices, i.e., qualitative,

quantitative, or mixed methods, time horizons to create the idea of the research onion, as seen in Figure 4.1 below

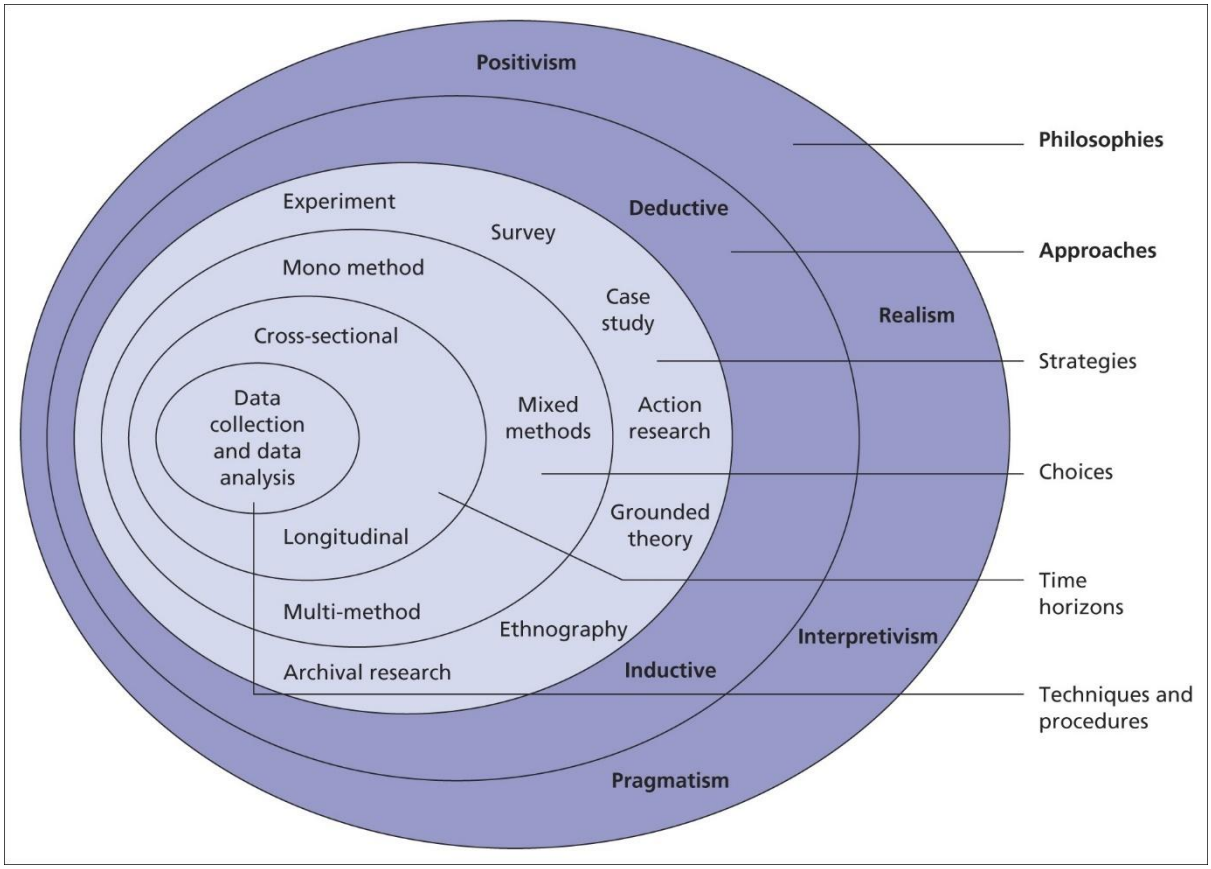


Figure 4.1: Research Onion (Saunders, 2023)

According to Saunders (2023), the outer layer of the research onion represents the researcher's overall philosophical stance, which shapes the assumptions about reality and how it can be known. In this study, the main focus is pragmatic, drawing on both positivist and interpretivist elements to answer the research questions on digital skills, training methods, and constraints among university library professionals in Nigeria. The quantitative strand is aligned with a positivist orientation, assuming that constructs such as levels of digital skills, perceived training adequacy, and institutional constraints can be measured objectively through a structured questionnaire and analysed statistically. The qualitative strand reflects an interpretivist orientation, recognising that library professionals and managers attach meanings

to their experiences and that these meanings are best explored through interviews and thematic analysis. Pragmatism allows the study to legitimately combine these orientations, selecting methods that most effectively address the aim of developing a sustainable digital skills improvement strategy.

The second layer concerns the approach to theory development: deductive, inductive, or abductive. In this study, the quantitative component follows a deductive approach, moving from existing theories and empirical findings on digital skills, training, and organisational factors to specific hypotheses that are tested using survey data from library professionals. At the same time, the qualitative component adopts a largely inductive approach, using semi- structured interviews with senior management staff to allow themes about challenges, opportunities, and managerial strategies to emerge from the data rather than imposing a rigid a priori coding frame. Taken together, the study can be described as predominantly deductive, complemented by an inductive strand that refines and explains the quantitative results within the Nigerian university library context.

The methodological choice layer of the onion specifies whether the study is quantitative, qualitative, or mixed methods. This study adopts a mixed methods choice, integrating quantitative and qualitative approaches to provide a more comprehensive understanding of digital skills gaps, training practices, and constraints in Nigerian university libraries. Quantitative data from the questionnaire offer breadth by capturing patterns across a relatively large sample of library staff, while qualitative data from interviews with senior management provide depth by exploring how and why these patterns arise and how management responds. The mixed methods choice supports triangulation, complementarity, and expansion, thereby enhancing the credibility and practical relevance of the findings for designing a sustainable digital skills development strategy.

The next layer identifies the research strategy, such as survey, case study, experiment, or ethnography (Ponto, 2015). Survey research involves collecting data from a sample of individuals by posing questions to them (Bryman, 2020). While the survey method has limitations, such as reliance on self-reporting and the potential lack of qualitative depth, it remains a valuable tool for capturing quantitative data and obtaining a broad perspective from a diverse sample. By employing the survey research strategy, the researcher can gather data, recruit participants, and utilize various procedures and tools to carry out the study effectively (Jones, 2025).

The survey method is a non-experimental, descriptive research method that is useful when a researcher wants to collect data on phenomena that cannot be directly observed, such as opinions on skills gaps and development for automated operations in university libraries. The survey research method has been selected for this study due to its compatibility with quantitative research objectives and the ability to collect data from many respondents. This method allows for standardized data collection and statistical analysis, providing insights into the phenomenon being investigated.

In line with the research questions and context, this study employs a sequential mixed methods strategy, centred on a survey in the first phase and semi-structured interviews in the second phase. In Phase One, a structured questionnaire was used as a survey strategy to collect quantitative data on digital skills levels, training methods, and staff-side challenges from library professionals in selected federal universities. In Phase Two, a qualitative interview strategy was implemented, using semi-structured interviews with senior management staff to build on the survey findings, clarify ambiguous results, and explore managerial perspectives on constraints and possible interventions.

The time horizon layer distinguishes between cross- sectional and longitudinal designs. This study adopts a cross- sectional time horizon, collecting data at a single point in time from the selected universities to obtain a snapshot of current digital skills, training practices, and constraints among library professionals in Nigeria. The cross- sectional design is appropriate because the primary objectives are to assess the existing situation and to inform the development of a sustainable strategy, rather than to track changes over an extended period. It also aligns with the practical constraints of access, resources, and security considerations in parts of the country. Lastly, the inner layers of the research onion concern the specific techniques and procedures used to collect and analyse data. In this study, these layers include the population, sampling, instruments, data collection processes, and analytical techniques that operationalise the outer- layer decisions

4.3 Philosophical focus of the study

Given the combination of questionnaires and interviews, this study adopts pragmatism as the main philosophical stance. Pragmatism accommodates both the positivist orientation of the quantitative component, which seeks to measure variables and test hypothesised relationships objectively, and the interpretivist orientation of the qualitative component, which explores participants' experiences and meanings in depth (Muhaise et.al, 2020). Accordingly, the quantitative strand is underpinned by a broadly positivist view. That is, the assumptions about reality, knowledge, values, and method that frame how research is done. These are usually expressed as ontological (Baškarada & Koronios, 2018), epistemological (Abu-alhaija, 2019), axiological (Saunders et al., 2019), and methodological assumptions (Wright, 2023). The constructs can be measured using structured items and subjected to statistical analysis to test hypotheses. The qualitative strand reflects interpretivist assumptions by examining how participants perceive, experience, and interpret it, thereby providing contextual explanations and insights that cannot be captured by numerical scores alone

(Rincon & Orero, 2004). Within a pragmatic frame, both strands are integrated to provide a more comprehensive and practically useful understanding of phenomenon under investigation than either approach could offer on its own.

4.4 Research approach: deductive and inductive reasoning

According to Gannon et al. (2022), scientific reasoning involves three forms of logical reasoning: Abduction, Deduction, and Induction. Abduction generates a cause for an observed phenomenon based on existing rules or theoretical knowledge, leading to creative ideas and new theoretical inferences. Inductive reasoning derives a general rule from repeated observations but does not generate new ideas.

Deductive reasoning proceeds from existing theory to specific hypotheses that are then tested empirically using collected data (Mohammed, 2024). Inductive reasoning moves in the opposite direction, beginning with empirical observations and building patterns and tentative theoretical propositions from the data (Mohammed, 2024). Abductive reasoning combines elements of both by iteratively moving between data and theory to develop the most plausible explanations for observed anomalies or surprising findings (Saunders et al., 2019). The quantitative component of this study follows a deductive approach. Drawing on existing literature and theoretical propositions about relationship between constructs in the study, explicit hypotheses were formulated and tested using survey data from the study population. This deductive logic is appropriate for examining whether established relationships reported in prior studies hold in the specific context of university Libraries in Nigeria.

The qualitative component adopts a primarily inductive orientation. Semi-structured interviews enabled participants to describe their experiences and perspectives in their own words, and themes were generated from these accounts without imposing a rigid a priori coding frame. Inductive analysis in this strand allows context-specific insights and nuanced

explanations of the quantitative findings to emerge, thereby enriching and, where necessary, challenging the deductive conclusions. Within the main pragmatic paradigm, the overall logic of the study can be described as predominantly deductive with an inductive qualitative strand, rather than purely deductive. The deductive testing of hypotheses through the survey is complemented by inductive exploration in the interviews, which helps interpret statistical patterns and identify additional factors not captured in the questionnaire.

4.5 Research design and mixed methods strategy

A mixed methods design was adopted because the research objectives require both measurement of prevalence and relationships. In an explanatory sequential variant, quantitative data are collected and analysed first, and qualitative interviews then follow to explain or elaborate on key survey findings, particularly unexpected or complex patterns. In this study, quantitative data are collected and analysed first, followed by qualitative data collection and analysis that are explicitly designed to explain or elaborate the quantitative results, enabling integration of numeric trends with rich narrative accounts in addressing the research questions.

Logic: The quantitative phase establishes patterns (e.g., levels of digital skills, key gaps, types of training used), and the qualitative phase then explores why these patterns exist, clarifies unexpected results, and adds depth and context.

Priority and integration: Usually gives priority to the quantitative strand; integration happens mainly when designing the qualitative phase (using survey results to select interviewees and questions) and when interpreting how interview themes explain or nuance the statistical findings

In all, the mixed methods design operationalises the pragmatic stance by allowing both deductive hypothesis testing and inductive theme generation in response to the same main

aim. Quantitative data provide breadth and generalisability across population, while qualitative data provide depth and insight into how and why the measured patterns occur in practice (Creswell & Creswell, 2017; Sunder & Bristow 2023; Muhaise et al., 2020). Figure 4.2 illustrates the types of research designs.

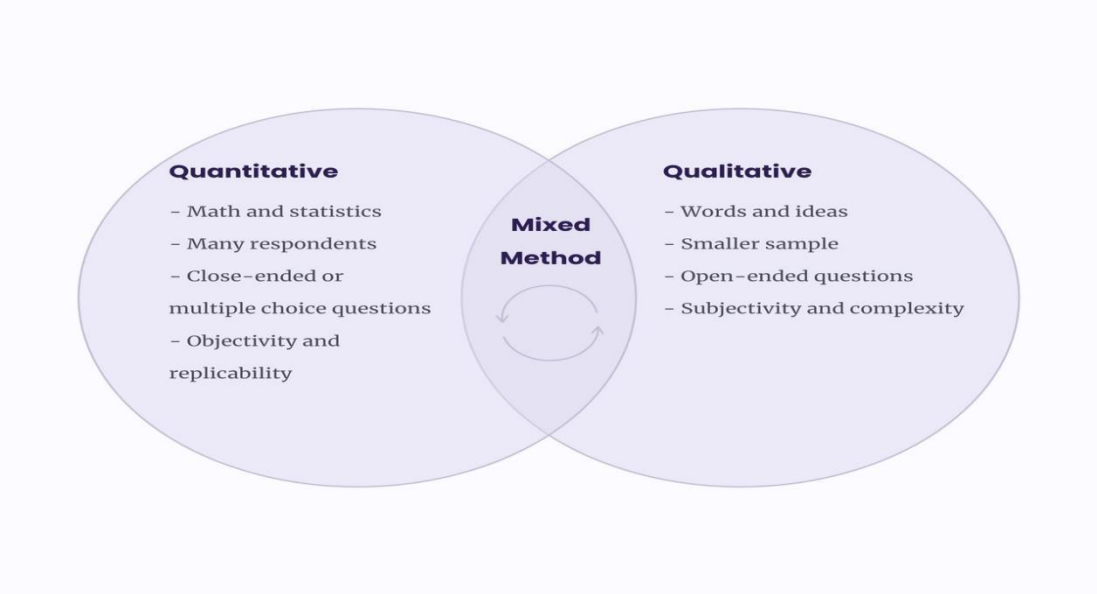


Figure 4.2: Research Design (Saunders, 2018)

This technique is appropriate for this study as it gives insight into the present situation. The mixed methods strategy of quantitative and qualitative procedures was employed to collect numeric information (by questionnaire) and text information (by interviews). This study collected data sequentially to address the research problems. Several studies have argued that multiple methods (e.g., qualitative and quantitative) can fulfill the research's credibility and validation process. There are several reasons for using the mixed methods approach, including triangulation, complementarity (to elaborate or illustrate the results), development (to develop a new method), initiation (to learn a new perspective), and expansion (to extend the scope of the study) (Campbell & Fiske, 1959; Greene et al.,1989). According to Yeasmin and Rahman (2012), triangulation means combining more than one theory, data, method, or

investigation. It allows for the use of both qualitative and quantitative studies to increase the credibility, reliability, and validity of the results (Creswell, 2013).

Mixed methods are further categorised into five families: parallel mixed designs (quantitative and qualitative data collection and analysis are conducted at the same time); sequential mixed designs (the research begins by employing either a quantitative or qualitative approach, then follows it with the other); conversion mixed designs (whereby the study's approach in the experiential phase can be converted into the other form); multilevel mixed designs (whereby qualitative data are collected at one level of analysis, and quantitative data at another level); and fully integrated mixed designs (whereby qualitative and quantitative approaches are employed interactively at all stages of the study) (Bryman, 2020).

Mixed methods research has gained traction, and researchers in information science constantly use it. For example, several studies focused on librarianship research, such as Huang et al. (2015), Hussain (2019), etc., used mixed methods to examine the interactions. Also, the sequential mixed method approach is commonly used. Bryman (2020) used a sequential exploratory mixed methods design to compare the success of Graduate Development Programs (GDPs) and informal graduate training activities. Brdesee (2013) used this design to identify factors that affect the adoption and use of e-commerce by travel operators and tourism in Saudi Arabia. Also, Hussain (2019) adopted the sequential mixed method to investigate researchers' self-efficacy sources and outcome expectations for sharing knowledge via social media, starting with the qualitative approach and following the quantitative approach.

The current research aims to develop a sustainable strategy for improving the digital skills of university library professionals in Nigeria towards automated library operations. In order to achieve this, it investigates the current digital skills gap, examines the existing digital skills training methods, and examines the factors that impede the skills development of university

library professionals in Nigeria from the staff and management level perspective. To better understand the subjects of this study, a sequential mixed methods design is considered appropriate and applied as a research design. Therefore, using a questionnaire, the researcher first conducted a quantitative study to identify the gaps in digital skill and training methods and the staff-side challenges. The second phase employed a qualitative approach by building on the quantitative findings from the study's first phase. The researcher intended to refine the quantitative findings and explore these phenomena to gain deeper insight into the research problem by conducting interviews with the senior management staff. According to Creswell (2012), the advantage of this approach is that it allows the researcher to identify measures grounded in the data obtained from study participants rather than approach a topic with a predetermined set of variables.

4.5.1 Methodological framework for the proposed strategic plan

To achieve the overall aim of this study which is to design a strategic plan as presented in Chapter 9, it is important that it is situated within a strategic management framework. A strategic management framework provides a systematic approach to creating, executing, and evaluating strategies. This involves initial goal setting and assessment, situation analysis, strategy formulation, strategy implementation, and strategy monitoring (David, 2009; Dahunsi & Adetunla, 2019). Accordingly, this study draws on the ASANA strategic management framework. Martins (2025) outlines the five key stages involved in the strategy development process, as illustrated in Figure 4.3 below, and further groups these stages into two broad approaches: prescriptive and descriptive. The prescriptive approach emphasises strategy formulation, whereas the descriptive approach focuses on strategy implementation (Pathak, 2024).



Figure 4.3: Stages of Strategic Management Process (Asana, 2023, cited in Martins, 2025)

This study adopts a prescriptive orientation, concentrating on the first three stages of the strategic management process. Stage one involves goal setting for the strategic plan; stage two entails investigating and analysing the situation; and stage three centers on strategy formulation. The prescriptive phase of the ASANA framework provides a structured approach for moving from the identification and analysis of the research problem to the formulation of appropriate strategies and actions. Its relevance to this study lies in its ability to provide a systematic pathway for analysing the research questions and problems identified in the study and translating the findings into a coherent and sustainable strategic plan. Thus, the framework supports the development of the strategic plan while maintaining the existing flow and theoretical structure of the study.

Synthesising the Prescriptive Stages of the ASANA Framework into the flow of the Study

Stage one involves identifying the research problem and defining the overall aim and objectives of the study, as presented in Chapter 1 (Section 1.3).

Stage two entails investigating and analysing the evidences relating to the research problems, including digital skills gaps, limitations of existing training programs, and staff-related and managerial challenges affecting digital skills development. This was presented in Chapters 6, 7 and 8.

Stage three centres on strategy formulation; accordingly, this study proposes a sustainable strategic plan aimed at enhancing the digital competencies of university library professionals in Nigeria as presented in Chapter 9.

4.6 Population

4.6.1 Background to Types of Universities in Nigeria

As discussed earlier in Chapter 2 (Section 2.2), Nigeria's university system has evolved through several phases of expansion. Following independence in 1960, the establishment of regional universities was prioritised as part of broader efforts to expand higher education and promote national development, reflecting the perception of universities as strategic instruments for socio-economic transformation (Anyanwu, 2011). This period witnessed the emergence of the first generation of Nigerian universities. Subsequent military administrations further expanded the higher education landscape through the establishment of additional federal and state universities, giving rise to the second and third generations of institutions (Hamza et al., 2021).

The restoration of democratic governance in 1999, together with earlier policy reforms such as the Private Universities Act 1993 Nigeria, which authorised the establishment of privately owned universities, ushered in a fourth phase of university expansion in Nigeria. At present, institutions across these different generations operate under the regulatory supervision of the NUC (Hamza et al., 2021). According to Statista (2024), Nigeria currently has approximately

272 universities licensed by the NUC. Figure 4.5 presents the distribution of these institutions by ownership category.

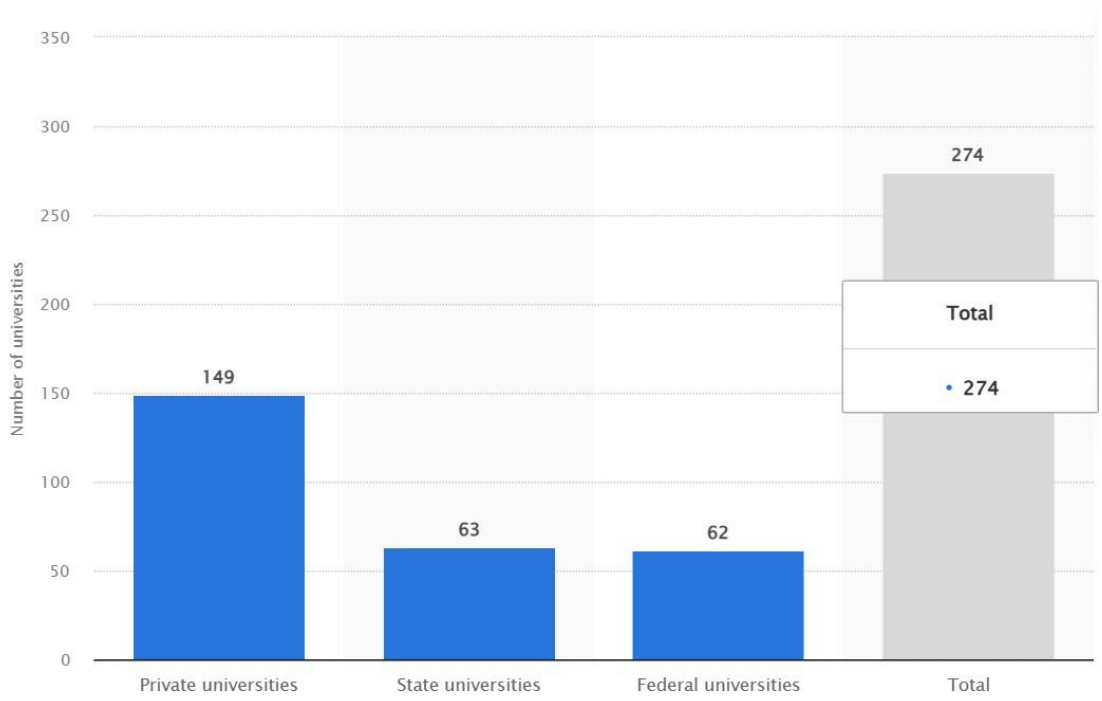


Figure 4.4: Breakdown of universities in Nigeria (Statista, 2024)

Tables 4.1 and 4.2 show a further breakdown. However, the target population for the current study comprised federal universities in the southern regions of Nigeria, from which 17 institutions were selected after excluding newly established universities with limited automation history and those in areas with significant security risks. Within these universities, library professionals formed the survey sample, while senior management staff were purposively selected for the qualitative interviews, ensuring that both staff-level and management-level perspectives on digital skills were captured.

Table 4.1: Breakdown of Universities in Nigeria (Source: NUC 2022)

UNIVERSITIES	NUMBER
Federal government	62
States government	63
Private ownership	149
Total	**274**

These universities are spread across the 36 states of the six geopolitical regions in Nigeria, namely, Northeast, Northwest, Northcentral, Southsouth, Southeast, and Southwest. For the sake of this study, federal universities and some private universities were considered because they have uniform funding patterns. Furthermore, the UK's Foreign Commonwealth and Development Office (FCDO) warned against travel to seven states in the north following the alarming terrorist attacks in Nigeria. (FCDO, 2022). Due to the level of insecurity in northern Nigeria, this study was limited to southern regions of Nigeria with a total of 20 federal universities. However, three newly established federal universities in the southern states of Nigeria that are less than 10 years old were excluded from this study because most do not have an automation history. Therefore, the population of this study consists of 17 federal universities. See Table 4.2 for the breakdown.

Table 4.2: List of Federal Universities that form the population of the study (Source: NUC 2022)

No	State	Year Of Est	University
South-South Region			
1	Edo	1970	University Of Benin
2	Rivers	1975	University Of Port-Harcourt
3	Cross River	1975	University Of Calabar
4	Akwa Ibom	1991	University Of Uyo
5	Delta	2007	Federal University Of Petroleum Resources, Effurun
6	Bayelsa	2011	Federal University, Otuoke,

Southwest Region			
7	Oyo	1948	University Of Ibadan
8	Lagos	1962	University Of Lagos
9	Osun	1962	Obafemi Awolowo University, Ile-Ife
10	Ondo	1981	Federal University Of Technology, Akure
11	Ogun	1988	Federal University Of Agriculture, Abeokuta
12	Ekiti	2011	Federal University, Oye-Ekiti,
South-East Region			
13	Enugu	1960	University Of Nigeria, Nsukka
14	Imo	1980	Federal University Of Technology, Owerri
15	Abia	1992	Michael Okpara University Of Agricultural, Umudike
16	Anambra	1992	Nnamdi Azikiwe University, Awja
17	Ebonyi	2011	Alex Ekwueme University, Ndufu-Alike,
Total 17		**Total Qualified: 17**	

The target population comprises university library staff in the selected 17 federal universities. For a participant to qualify for this study, he/she must belong to a professional or paraprofessional staff cadre in these university libraries. The consideration for these cadres of staff is because of their operational engagement with the core professional functions of the library.

4.7 Sampling

A multi-stage sampling technique was used for this study. The first stage involved cluster sampling to put the 17 universities in the three geopolitical regions in the South of Nigeria (see table 4.1 above). The second stage involved a random sampling technique to select three universities from each region to represent the three generations of universities in Nigeria and the selection of three privately funded universities (See Table 4.3 and Figure 4.5). In the third stage, a total enumeration technique was used to sample the 453 staff in the librarianship and library officer categories of these 12 universities (see Figure 4.5).

Table 4.3: Random selection of three generations of universities from each region

S/N	South-South	Southwest	South-East
1st Gen	University of Benin, Edo State (1970)	University of Ibadan, Oyo State (1948)	University of Nigeria Nsukka. Enugu State (1960)
2nd Gen	University of Uyo, Akwa Ibom State (1991)	Federal University of Technology, Akure Ondo State (1981)	Federal University of Technology, Owerri Imo State (1980)
3rd Gen	Federal University, Otuoke, Bayelsa State (2011)	Federal University, Oye-Ekiti, Ekiti State (2011)	Alexekwueme University,Ndufualike, Ebonyi State (2011)
Privately Funded University	Babcock University, Elizade University and Abuad		

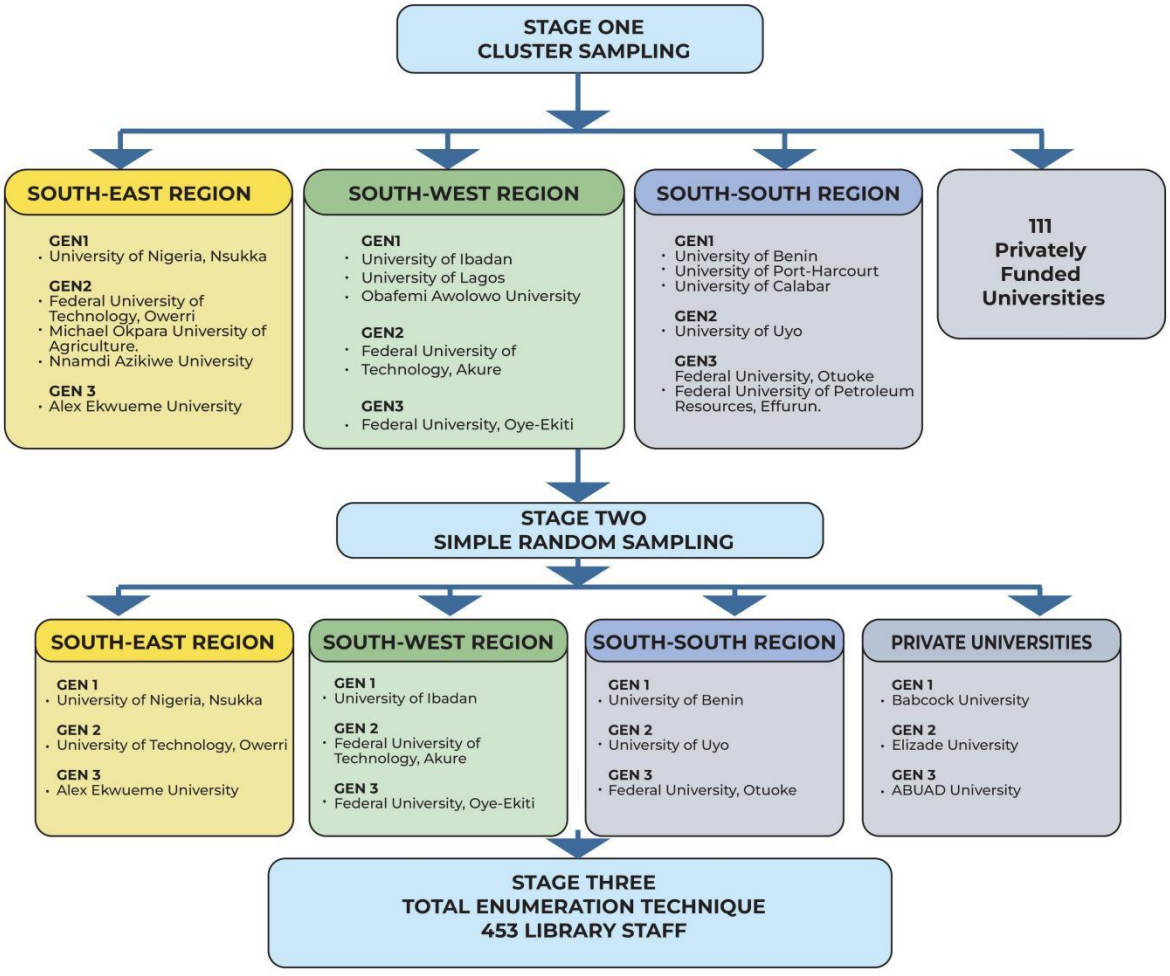


Figure 4.5: Multi-stage sampling procedure.

Figure 4.5 presents a schematic of the methodological sampling procedure for the study, depicting the grouping and selection process, as well as the stages.

4.8 Instruments: questionnaire and interview guide

4.8.1 Questionnaire design

A structured questionnaire was developed to operationalise the main constructs in the research objectives and to provide quantifiable measures suitable for statistical analysis with most items measured on a 5-point Likert scale ranging from strongly disagree to strongly agree. The quantitative instrument used mainly closed-ended items suitable for statistical analysis, whereas the qualitative guide used open-ended questions to elicit rich narratives. Items of measurement were derived from relevant literature and adapted to the local context, ensuring content coverage of each objective. The questionnaire for this study was designed to collect data in line with the research questions raised in this study. The questionnaire was formulated by adapting questions from similar studies in line with Research Questions 1 to 3:

- Basic digital skills (Ezema et al., 2014; Atchrimi & Ogunbodede, 2024)
- Operational task-based digital skills (Koha functions) (Halder & Halder, 2023; Dube et.al, 2024)
- Digital skills development programs (Atanda et al., 2021; Akintola et.al, 2022).
- Staff side and socio-cultural factors of skills development (Ezema et al., 2014; Emmanuel & Omolade, 2025)

The questions were measured using five-point Likert scales in which 1 = “strongly disagree” and 5 = “strongly agree” The initial draft was shown to the research supervisor and two research experts with experience in questionnaire design and an in-depth understanding of the research problem. Their input was used to evaluate the instrument based on clarity of statement, appropriateness of the questionnaire to measure the desired construct and the appropriateness of questions, the length, and the number of questions for desired respondents.

The feedback from the experts and supervisor was included in the design of the final draft of the questionnaire. After designing the questionnaire, a pilot test was run on it. Then, the researcher showed the questionnaire's final design to his supervisor, who agreed that the questionnaire was suitable for validity and reliability testing. The reliability of this questionnaire was tested using Cronbach's alpha, and questionnaires were sent out to university library staff in Nigeria.

4.8.2 Interview guide design

A semi- structured interview guide was developed to complement the questionnaire by exploring participants' experiences, perceived challenges, and managerial responses in greater depth as well as suggestions for improvement. Questions were explicitly aligned with the objectives. However, questions on "Managerial challenges" which address Research Questions four were adapted from Oladokun et.al. (2025).

4.8.3 Pilot Testing

After the research instruments were developed, a pilot test was conducted to assess the clarity, relevance, design, and flow of the instruments before the main data collection. For the quantitative phase, ten copies of the questionnaire were administered to five librarians and five library officers from Nigerian universities outside the sample of the study. The pilot test helped the researcher to identify areas that needed improvement in the questionnaire.

Based on the feedback received, some poorly understood questions were reworded, while complex language was simplified to make the questions easier to understand, considering that the respondents are none-native English speaker. Questions relating to existing skills development programs were also restructured to clearly distinguish between library school education and continuing professional development programs. The Likert scale was changed from four points to five points by adding a neutral option for questions not applicable.

Questions that were repeated in different sections were subsequently removed. These changes were made to the questionnaire layout and flow based on the comments from the pilot study participants. The revised questionnaire was then administered for data collection.

For the qualitative phase, the interview guide was also pilot-tested to assess the clarity, relevance, and flow of the questions. Two senior staff members of the Andersonian Library at the University of Strathclyde, who had relevant knowledge of the research area, participated in the pilot interviews. The pilot test showed that some questions were too long and would require considerable time to answer; and these questions were therefore divided into shorter questions. Additional follow-up prompts, such as *"Could you elaborate on this?"* and *"Can you give an example?"*, were introduced where further explanation was required. Questions that generated similar responses were removed, while questions that could result in simple yes/no answers were rephrased to encourage more detailed responses. Some questions were also clarified to better capture institutional and contextual differences.The necessary adjustments were made based on the pilot interviews, and the final interview guide was prepared for the qualitative data collection.

4.8.4 Validity and Reliability

These two concepts are also crucial in quantitative research. Validity is the extent to which the instrument accurately measures what it is intended to measure in a quantitative study. There are three main types of validity: content validity, construct validity, and criterion validity (Raykov & Marcoulides, 2014; Heale & Twycross, 2015). Content validity refers to the extent to which a research instrument accurately measures all aspects of a construct (Brod et al., 2023). Construct validity is the extent to which a research instrument measures the intended construct, and criterion validity is the extent to which a research instrument is

related to other instruments that measure the same variables (Sim et al., 2019; Brod et al., 2023).

Each of these types can be measured in one or more ways. According to Heale and Twycross (2015), content validity can be established by asking people with experience or expertise in the field to judge whether the measure reflects the intended concept. Construct validity can be measured on homogeneity, convergence, and theory evidence. Homogeneity is when an instrument measures one construct, while convergence occurs when the instrument measures concepts similar to those of other instruments. However, this will not be possible if no similar instruments are available. This is evident when behaviour is identical to the theoretical propositions of the construct measured in the instrument. (Heale & Twycross, 2015). Criterion validity can be established by comparing an instrument with any other instrument that measures the same variable. According to Heale and Twycross (2015), this can be done by conducting correlations to determine the extent to which these instruments measure the same variable, and this is done in three ways: convergent validity, divergent validity, and predictive validity (Bryman, 2012; Heale & Twycross, 2015). Convergent validity shows that an instrument is highly correlated with instruments measuring similar variables. Divergent validity shows that an instrument is poorly correlated to instruments that measure different variables, and predictive validity means that the instrument should have high correlations with future criteria.

Based on these descriptions, this study used content validity. According to DeVellis (2016), content validity is the extent to which a specific set of items reflects a content domain. Thus, the attempt to achieve content validity for the questionnaire in this study started at the questionnaire's development stage, when the researcher asked several experts in the field at the University of Strathclyde's Department of Computer and Information Sciences to review the questionnaire.

Reliability is the concept that fundamentally focuses on the consistency of the items of an instrument and whether or not they are stable over time. According to Muijs (2011), reliability in a quantitative study has two primary forms: repeated measurement and internal consistency. In repeated measurement, an instrument is used to measure the same thing at different times and to be reliable; it needs to come up with the same answer when used with the same participants. The second form, internal consistency, only applies to instruments containing more than one item, aiming to find how homogeneous these items are or how well these items measure a single construct (Heale & Twycross, 2015; Raykov & Marcoulides, 2014). With this form, there are two ways to calculate reliability: split-half reliability and coefficient alpha (called 'Cronbach's alpha') (Bryman, 2012; Raykov et al., 2024). According to Raykov et al. (2024), most researchers use a test of internal reliability known as Cronbach's alpha. Its usage has grown due to its incorporation into computer software for quantitative data analysis. Therefore, in this study, Cronbach's alpha was calculated to ascertain internal reliability for the items in the questionnaire. The result of the reliability test is presented in Chapter 5.

4.9 Data collection procedures

Quantitative data were collected by administering the questionnaire to 450 participants across 12 universities in Southwest, Nigeria over a month period, using self-administered paper forms, and online survey and researcher-administered interviews. Participants were informed about the study purpose, assured of voluntary participation and confidentiality, and provided written informed consent before completing the instrument.

Qualitative data were collected through individual semi-structured interviews among 10 participants. Initially, the researcher intended to select one interviewee from the 12 sampled university libraries. However, due to the schedule of the participants, only 10 interviews wee

conducted, other two university libraries could not participate due to other factors. The 10 participants were between the rank of Principal Librarian to University Librarian, for flexibility, participation availability, and exposure to library managerial issues. Table 4.4 provides a breakdown of the participants' demographic distribution. The selection was based on their experience and roles related to the focus of the study. Interviews were conducted in English language being the official language of communication in Nigeria via Zoom/face-to-face. Oliffe et al. (2021) note that COVID-19 restrictions led many researchers to adopt virtual platforms such as Zoom for data collection. Zoom interviews are considered cost-effective and convenient, enhancing participant comfort and supporting richer discussions (Archibald et al., 2019; Gray et al., 2020). Each interview lasted from 31 minutes to 1 hour and 23 minutes.

Table 4.4: Demographic distribution of interview Participants

S/N	Participant Code	University	Gender	Time: Hr: Min: Sec
1	P1	University of Ibadan (UI)	Female	00:38:45
2	P2	University of Nigeria, Nsukka (UNN)	Female	00:49:48
3	P3	Federal University of Technology, Akure (FUTA)	Female	01:22:52
4	P4	Federal University, Bayelsa (FUB)	Male	00:57:16
5	P5	Federal University, Oye Ekiti (FUOYE)	Female	00:31:07
6	P6	Afe Babalola University	Female	00:45:22
7	P7	Babcock University	Male	01:09:53
8	P8	Elizade University	Female	01:05:38
9	P9	University of Benin	Female	00:39:06
10	P10	University of Uyo	Male	00:49:21

4.10 Data analysis

4.10.1 Quantitative analysis

Quantitative data were coded and entered into SPSS software and screened for completeness, missing values, and outliers prior to analysis. Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed to summarise respondents'

socio-demographic characteristics and levels of the main constructs, thereby addressing Objective 1. Depending on variable measurement levels and distributions, appropriate tests such as e.g., chi-square tests for association, t-tests/ANOVA for group differences, correlation/regression for relationships] were used, with significance set at [alpha level, e.g., 0.05]. The choice of each test was guided by the type of variables and underlying assumptions, consistent with the deductive, positivist-oriented nature of the quantitative strand.

4.10.2 Qualitative analysis

Braun and Clarke (2006) outlined the process involved in the thematic analysis, as shown in Table 4.5.

Table 4.5. Processes of data analysis in thematic analysis

1	**Familiarising with data** Transcribing data, reading and rereading the data, and noting down initial ideas.
2	**Generating initial codes** Coding interesting features of the data systematically across the entire data set, collating data relevant to each code. **Searching for themes** Collating codes into potential themes, gathering all data relevant to each theme. **Reviewing themes** Checking if the themes work with the coded extracts and the entire data set, generating a thematic map. **Defining and naming themes** Ongoing analysis is needed to refine the specifics of each theme and the overall story that the analysis tells, generating clear definitions and names for each theme.
3	**Producing the report**

Studies have shown that themes and their subcategories in qualitative research may be predetermined or established in advance depending on the nature and objectives of the study

(Braun et al., 2019; Humble & Mozelius, 2022). In line with this approach, the present study adopted thematic analysis as the method for analysing the qualitative data.

The style of the interviews took a conversational approach and digitally recorded through Zoom. An inductive thematic analysis approach was employed, involving repeated reading of transcripts, although the platform automatically generated initial transcripts, but the researcher observed inaccuracies within the automated transcription. To ensure accuracy and avoid misinterpretation of participants' responses, the researcher carefully listened to the recordings and manually revised and completed the transcripts. This process ensured that important statements and contextual meanings expressed by the interviewees were accurately captured.

Subsequently, the verified transcripts were imported into NVivo 15 software to facilitate systematic analysis. The analytical process involved identifying and extracting relevant excerpts from the data, paraphrasing participants' responses where necessary, and incorporating direct quotations to preserve the authenticity of participants' perspectives. The process of theme identification, sorting, and categorisation was guided by predefined themes and subthemes that align with the study's research objectives and key factors identified in the literature review.

Data were organised into three main sections. The first section directly addressed Research Question Four, which examines the managerial challenges associated with the digital skills development of library staff. This section was structured around three predefined themes: (1) availability of policy frameworks (2) funding and budgetary allocation, with two subthemes, (a) statutory library allocation and (b) external funding; and (3) library management interventions, also comprising two subthemes (a) post-COVID-19 training initiatives and (b) post-COVID-19 infrastructure initiatives.

The second section explored library management perspectives on the quantitative findings in order to validate earlier results concerning factors influencing digital skills development. This discussion was organised under four predefined themes: (1) personal factors, (2) sociocultural influences, (3) library school education, and (4) training disparities.

The third section presented library management's suggestions for addressing challenges in digital skills development. These were categorised under three predefined themes: (1) funding patterns, (2) training delivery methods, and (3) stakeholder engagement.

Finally, the researcher carefully reviewed and proofread the transcripts and coded materials in order to become thoroughly familiar with the data and to ensure that the coded responses aligned with the broader predefined themes representing the central issues of the study. This systematic approach contributed to enhancing the reliability and internal validity of the qualitative analysis.

4.11 Ethical considerations

Given the nature of the study, which involved human participants through semi-structured interviews and questionnaire administration, obtaining ethical approval prior to data collection was an essential requirement (Hasan et al., 2021). Accordingly, ethical approval for the study was obtained from the University of Strathclyde's Departmental Ethics Committee in Computer and Information Sciences, in accordance with the University's approved research ethics policies and Code of Practice (https://www.strath.ac.uk/media/ps/rkes/Code_of_Practice_eighth_Feb17.pdf). The Committee reviewed and approved the data collection procedures for both the quantitative and qualitative phases of the study. These procedures were adhered to throughout all stages of the research, and several ethical considerations were carefully addressed during the data collection process. These included the following:

Voluntary participation: Participation in the study was entirely voluntary, and the participants were given a choice to decide whether or not to participate at any stage of the research process.

Informed consent: The surveys included the provision of a consent form to all the participants in both the quantitative and qualitative phases of the study. The participants were informed about the purpose and nature of the research before completing the questionnaire or participating in the interview, and consent was obtained prior to their participation.

Right to withdraw: The participants were informed of their right to withdraw from the process at any point without being required to provide a reason and without any negative consequences.

Confidentiality and anonymity: The participants were assured that all information, comments, and responses provided during the process would be treated confidentially. No personally identifying information was stored or reported in a manner that could identify individual participants.

Restricted access to data: Access to the participants' research data was restricted to the researcher and the supervisory team. Appropriate measures were taken to protect the data from unauthorised access.

Use of research data: This research followed the research data management policies of the University (https://www.strath.ac.uk/media/ps/rkes/Code_of_Practice_eighth_Feb17.pdf), which states that data collected from the participants should be used solely for the purpose of this research and should not be disclosed or used for purposes unrelated to the study.

The researcher's professional background as an active member of the national professional body (NLA) and a librarian working in a Nigerian university library, helped establish professional rapport and credibility with the participants. The researcher used established

professional networks through the NLA platforms to contact staff in the sampled universities, who served as institutional representatives in distributing and retrieving the research instruments for the quantitative phase and facilitating contact with the potential participants for the qualitative phase. However, trust was further strengthened by assuring the participants of the confidentiality, anonymity, and privacy of the information they provided. These measures encouraged the participants to engage voluntarily and provide their views openly and honestly.

Informed consent was obtained from all participants prior to the commencement of data collection. For both phases of the study (quantitative and qualitative), participants were provided with an informed consent form, which they signed before completing the questionnaire or participating in the interviews, respectively (see sample consent forms in Appendixes 1 and 2). Confidentiality and anonymity were maintained throughout both phases of the study. No participants' names, or other personally identifiable information were included in the thesis. For the qualitative data, each participant was assigned a unique identification code (e.g., P1, P2) to ensure that responses could not be directly attributed to individuals. Potentially identifying information was removed or generalised in interview transcripts and quotations to further protect participants' identities. In addition, links to Zoom recordings and other audio or video files were not included in the thesis. These measures were implemented to safeguard participants' privacy and ensure that the information provided was reported in a manner consistent with the ethical requirements of the study.

Data gathered during both the quantitative and qualitative phases of the study were stored on password-protected and encrypted devices, with access restricted to the researcher and

supervisory team. These measures were implemented to protect the participants' confidentiality and ensure the secure handling of the research data throughout the study.

4.12 Trustworthiness and rigour

For the quantitative strand, rigour was enhanced through careful instrument development, pilot testing, and assessment of reliability (e.g., Cronbach's alpha for internal consistency of multi-item scales). Standardised procedures for data collection and entry were followed to minimise measurement error and bias. For the qualitative strand, trustworthiness was addressed through strategies such as prolonged engagement with the data, peer debriefing with supervisors, and maintaining an audit trail of coding decisions and theme development. Credibility was supported by using verbatim quotations, transferability by providing description of the context, dependability by documenting analytic procedures, and reflecting on potential researcher biases.

CHAPTER FIVE

DEMOGRAPHIC INFORMATION AND RESULT OF RELIABILITY TEST

5.1 Introduction

This chapter presents the demographic distribution of the study's sampled participants. As mentioned in Chapter Four, a sequential approach was used to collect data: first, the quantitative and later, the qualitative phase. Therefore, the demographic distribution is addressed in phases. Also, analysis of the reliability test of the instrument is presented.

5.2 Demographic Distribution of Respondents in the Quantitative Phase

Table 5.1: Analysis of Respondents by Institution

S/N	Name of Institution	Frequency	Percentage
1.	Federal University of Technology, Akure	17	4.2%
2.	Federal University of Technology, Owerri	70	17.2%
3.	University of Nigeria, Nsukka	78	19.1%
4.	Federal University, Otuoke	18	4.4%
5.	Federal University, Oye Ekiti	10	2.5%
6.	Alex Ekwueme University, Ndufu Alike	22	5.4%
7.	University of Benin	32	7.8%
8.	University of Ibadan	80	19.5%
9.	University of Uyo	30	7.4%
10.	Babcock University	25	6.1%
11.	Elizade University	10	2.5%
12.	Afe Babalola University	16	3.9%

Table 5.1 revealed that University of Ibadan accounted for (19.5%, n=80) and University of Nigeria, Nsukka (19.1%, n=78) dominate, together accounting for nearly 39% of responses. This concentration highlights strong participation from these prestigious institutions, potentially influencing findings toward urban, well-resourced federal universities. Federal University of Technology, Owerri (17.2%, n=70) follows closely, while smaller private institutions like Elizade and Federal University, Oye Ekiti (both 2.5%, n=10 each)

contributed minimally. Overall, federal universities comprise 74% (n=303), suggesting the sample favours public over private sectors (26%, n=107), which may limit generalizability to private library contexts.

Table 5.2: Analysis of respondents by gender

S/N	Gender	Frequency	Percentage
1.	Male	168	41.2%
2.	Female	226	55.4%
3.	Prefer not to say	14	3.4%

Table 5.2 shows that females form the majority (55.4%, n=226), males 41.2% (n=168), and a small undecided group (3.4%, n=14). This female skew aligns with library professions in Nigeria, where women often outnumber men in support roles (e.g., 55% vs. 41%). The "prefer not to say" category indicates minor non-response bias, but the near-even split supports balanced gender perspectives in digital skills assessments.

Table 5.3: Analysis of professional designation of the respondents

S/N	Designation	Frequency	Percentage
1.	**Librarian**	**164**	**40.2%**
2.	**Library Officer**	**244**	**59.8%**

Table 5.3 indicated that Library Officers overwhelmingly lead (59.8%, n=244) over Librarians (40.2%, n=164). This operational bias (60% support staff) implies findings may emphasize practical, hands-on digital challenges in automated library operations rather than managerial views, as officers handle daily tasks like cataloging or circulation systems

Table 5.4: Analysis of Education of the Respondents

S/N	Education	Frequency	Percentage
1.	Diploma	65	15.9%
2.	Bachelors	159	39.0%
3.	Masters	156	38.2%
4.	PhD	28	6.9%

Table 5.4 revealed that Bachelor's (39.0%, n=159) and Master's (38.2%, n=156) holders dominate (77%, n=315), with diplomas at 15.9% (n=65) and PhDs low (6.9%, n=28).

Even though table 5.3 shows the library officer cadre populates the library workforce in Nigeria. This data must be interpreted with caution because many library officers come with higher degrees although the minimum entry requirement is a Diploma. As earlier discussed in Chapter 2 (Section 2.2.2), library officers cadre entry requirement is a Diploma, but many of them may acquire further qualifications after joining their posts. This mid-to-high education profile suits a study on advanced digital skills, yet the PhD scarcity (under 7%) suggests limited input from top-tier researchers, potentially under-representing strategic policy insights

Table 5.5: Analysis of work experience of the respondents

S/N	Years of Experience	Frequency	Percentage
1.	0 – 5	83	20.3%
2.	6 – 10	202	49.5%
3.	11 and above	123	30.1%

Table 5.5 shows that Mid-career staff prevail: 6–10 years (49.5%, n=202) and 11+ years (30.1%, n=123) total 80% (n=325), versus entry-level 0–5 years (20.3%, n=83). This experience-heavy sample strengthens credibility for evaluating automated systems but may overlook novice digital adoption barriers.

Table 5.6: Age analysis of the respondents

S/N	Age	Frequency	Percentage
1.	18 – 25	79	19%
2.	26– 45	210	52%
3.	46 and above	119	29%

Table 5.6 reflects the age distribution of the respondents shows that the majority fall within the 26–45 age bracket (n=210. 52%). This indicates that over half of the participants are within the active working-age population, which is typically associated with higher levels of professional engagement and career development. Respondents aged 46 and above(n=119 , 29%), reflecting a substantial proportion of experienced personnel who may possess

extensive institutional knowledge. Meanwhile, those aged 18–25(n=79,19%) represent the smallest group, , suggesting relatively fewer early-career or entry-level staff in the sample. Overall, the distribution reflects a workforce dominated by mid-career professionals, with a balanced representation of younger and older staff.

5.3. Demographic Distribution of Participants in the Interview Phase

Table 5.7: Demographic characteristics of Participants

S/N	Participant anonymised code	University	Gender	Time: Hr: Min: Sec
1	**P1**	University of Ibadan (UI)	Female	00:38:45
2	**P2**	University of Nigeria, Nsukka (UNN)	Female	00:49:48
3	**P3**	Federal University of Technology, Akure (FUTA)	Female	01:22:52
4	**P4**	Federal University, Bayelsa (FUB)	Male	00:57:16
5	**P5**	Federal University, Oye Ekiti (FUOYE)	Female	00:31:07
6	**P6**	Afe Babalola University, Ado Ekiti (ABUAD)	Female	00:45:22
7	**P7**	Babcock University	Male	01:09:53
8	**P8**	Elizade University	Female	01:05:38
9	**P9**	University of Benin	Female	00:39:06
10	**P10**	University of Uyo	Male	00:49:21

Table 5.7 details 10 interviewees, providing depth to quantitative trends. All major institutions from Table 5.1 appear (e.g., UI, UNN), with females dominant (7/10, 70%) mirroring the survey skew. Males (P4, P7, P10) hail from Federal University Bayelsa, Babcock, and Uyo, balancing perspectives. Interview durations average 48 minutes (range: 31–83 min), indicating substantive engagement longer sessions (e.g., P3 at 1:22:52 from FUTA) likely yielded richer data on operational challenges

5.4 Reliability Testing

Reliability testing is a crucial procedure for establishing the consistency and accuracy of measurements obtained through a questionnaire (Raykov et al., 2024; Muijs, 2011). The

primary objective of reliability assessment is to ensure that the instrument yields stable and error-free scores across its items (Raykov & Marcoulides, 2014).

As outlined in Section 4.2.6, reliability can be assessed through two main approaches: repeated measurement (test–retest reliability) and internal consistency (Muijs, 2011). This study adopted the latter approach by evaluating the internal consistency of the instrument using Cronbach's alpha coefficients for each scale.

According to Straub et al. (2004), a Cronbach's alpha value exceeding 0.60 is considered acceptable in exploratory research, while a threshold of 0.70 or higher is recommended for confirmatory studies. In addition, George and Mallery (2010) proposed a widely accepted guideline for interpreting Cronbach's alpha values, as presented in Table 5.7.

Table 5.8: Interpretation of Cronbach's Alpha Values

Cronbach's alpha (α)	**Status**
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor

As indicated in Table 5.8, alpha values of 0.90 and above are regarded as excellent, values between 0.80 and 0.89 are considered good, while values between 0.70 and 0.79 are deemed acceptable. These benchmarks provide a useful basis for evaluating the reliability of the measurement scales within the context of this study.

Table 5.9: Calculated Cronbach's Alpha Coefficients for the Four Dimensions

Scales	No of Items	Cronbach's Alpha
Basic digital skills for automated library operations (Email, internet connectivity, online search, word processing file).	8	0.92
Operational-task-based digital skills for automated library operations (Koha-based tasks; Cataloguing, Circulation, Serial, Acquisition, Patron, OPAC).	36	0.95
Digital skills training programs for automated library operations (Continuing education programs; Conferences, workshops, short course, online courses).	17	0.86
Staff-side challenges of digital skills development for automated library operations (socio-cultural and organisational factors)	12	0.80

The results presented in Table 5.9 indicate that all four scales demonstrate strong internal consistency. The scale measuring basic digital skills ($\alpha = 0.92$) and the scale assessing operational task-based digital skills ($\alpha = 0.95$) both fall within the "excellent" category, indicating a very high level of reliability. Notably, the task-based skills scale, which comprises the largest number of items (36), exhibits the highest alpha value, suggesting strong coherence and unidimensionality among the items measuring practical digital competencies.

The scale for digital skills training programmes recorded an alpha value of 0.86, indicating good reliability, while the scale measuring staff-side challenges achieved an alpha value of

0.80, also reflecting good internal consistency. These findings suggest that the items within each scale are well aligned and consistently measure their respective constructs.

Overall, the Cronbach's alpha coefficients, all exceeding 0.80, confirm that the research instrument is highly reliable. This level of reliability reduces the likelihood of measurement error and enhances the credibility of the data collected, in line with established methodological standards (Muijs, 2011; Raykov et al., 2024).

5.5 Summary of Chapter

Chapter Five presents the demographic characteristics of respondents and the reliability of the research instrument. The quantitative sample was dominated by respondents from major federal universities, particularly the University of Ibadan and the University of Nigeria, Nsukka, with federal institutions comprising about 74% of the sample. Females constituted the majority (55.4%), reflecting trends in the library profession, while library officers (59.8%) outnumbered librarians, indicating a strong operational perspective in the data. Most respondents held Bachelor's or Master's degrees (about 77%) and were mid-career professionals with 6–10 years of experience, supported by an age distribution largely within 26–45 years. The qualitative phase involved 10 participants from diverse institutions, with a similar female dominance and substantial interview duration, ensuring in-depth insights. Reliability testing using Cronbach's alpha revealed high internal consistency across all scales, with values ranging from 0.80 to 0.95, indicating good to excellent reliability. Overall, the findings confirm that the instrument is robust, and the sample is experienced and well-educated.

CHAPTER SIX

QUANTITATIVE RESULTS AND DISCUSSION OF THE DIGITAL SKILLS GAP

6.1 Introduction

The primary focus of the first phase of this study was to investigate the digital skills level and skills development of university library staff in Nigeria. This chapter presents the results of the statistical analysis of the collected quantitative data to ascertain the existing basic and operational digital skills of university library professionals in Nigeria. The chapter includes descriptive statistics of research questions 1a and b and inferential statistical analysis of hypotheses H1 to H5, while H6 is discussed in Chapter 7.

6.2 Result of descriptive Analysis of research question one

6.2.1 Research Question 1a: What basic digital skills do Nigerian university library staff possess for automated library operations?

Table 6.1: Analysis of basic digital skills possessed by university library staff in Nigeria

S/N	Basic Digital Skills	N	$\bar{X}$	SD
1.	I can connect my device to Wi-Fi	408	3.55	1.270
2	I can use word processing files, spreadsheets, and basic graphic designs	408	3.39	1.473
3	I can use the internet for e-mail, research, etc.	408	3.34	1.503
4	I can use search engines for online search and research, etc. (internet skills)	408	3.30	1.540
5	I can save and copy data into primary storage devices (e.g., hard disc, cloud drive, etc.)	408	3.28	1.557
6	I can use the computer for basic operations.	408	3.25	1.598
7	I can use a scanning machine to preserve a document	408	1.49	0.669
8	I can do document scanning, photocopying, and uploading	408	1.47	0.642

The analysis presented in Table 6.1 evaluates the basic digital skills of university library staff in Nigeria, reflecting their readiness for automated library operations. The data encompasses eight key digital competencies evaluated by 408 respondents, accompanied by their respective mean scores (M) and standard deviations (SD) to highlight proficiency levels and variability in skills.

At an aggregate level, The data suggest a bimodal distribution of competencies, with moderately high proficiency cluster of Items 1–6; with M = 3.25–3.55 and low proficiency cluster of Items 7–8; with M = 1.47–1.49. This indicates that while respondents demonstrate moderate competence in foundational ICT usage, they exhibit substantial deficiencies in equipment handling, digitisation and preservation-oriented digital skills. The mean scores indicate notable differences in proficiency across various skills.

Ability to connect devices to the internet received the highest mean score of 3.55, suggesting that library staff are generally capable of connecting devices to Wi-Fi and maintaining online access for data sharing. This proficiency is crucial for facilitating access to digital resources, email services and other automated library tasks making it a vital skill for modern library operations.

Furthermore, using word processing and spreadsheets, with a mean score of 3.39, indicating solid skills in document preparation, data management and reporting. Such capabilities demonstrates that administrative and reporting functions appear reasonably evident with library staff. These are essential for who must create reports, manage records, and engage in basic graphic design.

Additionally, examining the skills on an indicator basis reveals further insights. For instance, while staff exhibit adequate proficiency in Email usage (M = 3.34), Web Browsing (M = 3.30)

and Data storage (M = 3.28), these scores indicate that competence is moderately high but demonstrates there is still room for improvement. Being proficient in these skills is crucial for effective electronic communication and user query response, information search and retrieval, data storage management and digital archiving in library settings.

Conversely, there is a sharp decline in mean scores for equipment handling (M =1.49) and desktop publishing (M=1.47). This low mean score indicates limited competence in operating scanning, photocopying, and basic digital preservation tools. Also, Content creation, online publishing, and social media-based communication competencies are minimal among respondents. The comparatively low SDs (0.669 and 0.642) suggests general agreement on this deficiency and highlights an area of potential concern for practical digitization and preservation-related skills and online publishing and social media-based communication competencies among library staff in Nigeria.

The findings indicate that Nigerian university library staff possess a high level of digital competence sufficient for communication and administrative tasks (connectivity, document preparation, email communication and basic browsing); however, there is critical gaps in digitization equipment handling, desktop publishing and online content dissemination. These deficiencies have direct implications for, institutional repository management, digital preservation initiatives, library website content management and user engagement strategies. These may constrain the full operationalization of automated library services. These results underscore the need for structured digital capacity development strategies.

6.2.2. Research Question 1b: What operational-task-based digital skills do Nigerian university library staff possess for automated library operations?

Table 6.2: Analysis of staff proficiency in various library automated operational-task-based software.

S/N	Library Software	N	$\bar{X}$	SD
A	**Integrated Library Systems (ILS)**			
1.	Koha	408	3.50	0.693
2.	NewGen Lib	408	2.03	0.797
3.	Slim	408	2.13	1.336
4.	Virtua	408	1.96	0.765
B	**Repository management and Digital archiving software**			
5.	DSpace	408	2.23	0.749
6.	Eprints	408	2.18	0.725
C	**Plagarism tools**			
7.	Turnitin	408	2.50	1.266
8.	Grammarly	408	1.96	0.747

Table 6.2 assesses the operational-task-based digital skills of Nigerian university library staff concerning various software applications essential for automated library operations. The analysis includes responses from 408 participants, with mean scores (M) and standard deviations (SD) reflecting staff proficiency with different software.

The findings reveal varying levels of competence among library staff in the use of integrated library systems. Among the listed systems, Koha recorded the highest mean score (M = 3.50, SD = 0.693), indicating a relatively high level of skill among respondents. The low standard deviation suggests that respondents' opinions were relatively consistent regarding their competence in using Koha. This result may be attributed to the widespread adoption of Koha in many Nigerian academic libraries, as it is an open-source library management system that is relatively accessible and widely supported.

Notably, NewGen Lib and Virtua received the lowest scores, with means of 2.03 and 1.96, respectively. This raises concerns about staff training and familiarity with these systems, which are vital for comprehensive library services. The low scores in these areas might

suggest a need for increased training opportunities or resources to enable library staff to better utilize these applications.

The standard deviations associated with each software reflect variability in user competence. For instance, Turnitin has an SD of 1.266, which indicates that while there are users who are proficient with it, others may lack the required skills. Conversely, software like Slim and Grammarly shows lower standard deviations, suggesting a more uniform level of confidence and ability among users, although the average proficiency remains below expectations.

Breaking down the data into specific indicators of performance highlights the areas where library staff might require targeted development. While proficiency in using Koha is commendable, the lower scores in applications like DSpace (M = 2.23) and Eprints (M = 2.18) suggest that staff may struggle with digital repositories and open-access platforms a critical component of modern library services.

In all, Table 6.2 indicates a significant disparity in the proficiency for library software possessed by Nigerian university library staff. While proficiency in Koha indicates a strong foundation for automated operations, the widespread unfamiliarity with other essential software underscores the necessity for comprehensive training programs targeting these gaps. Such efforts would ensure that all library staff are equipped with the necessary skills to navigate and utilize the diverse range of digital tools in modern library environments.

Table 6.3: Analysis of the automated operational-task-based digital skills possessed by library staff.

S/N	Acquisition Operations	N	$\bar{X}$	SD
1.	I can manage vendors using automated systems	408	1.79	0.578
2.	I can manage budget planning and monitoring using automated systems	408	1.84	0.607
3.	I can create purchase orders using automated systems	408	1.82	0.719
4.	I can manage order receipts and invoices using automated systems	408	1.79	0.661
5.	I can handle purchase suggestions using automated systems	408	1.71	0.746
	Cataloging Operations	**N**	$\bar{X}$	**SD**
1.	I can catalogue library resources using the library management software	408	3.43	1.418
2.	I can create bibliographic records with the Z39.50 tool	408	1.75	0.728
3.	I can create a bibliographic record by importing files from the OCLC	408	1.83	0.684
4.	I can edit a record/item and merge identical records	408	3.50	1.337
5.	I can generate a barcode for the call mark/accession number	408	3.45	1.401
6.	I can forward catalogued details to the OPAC serve	408	3.48	1.345
	Serial Operations	**N**	$\bar{X}$	**SD**
1.	I can manage and monitor subscriptions using automated systems	408	3.43	1.416
2.	I can create new issues and manage serial collections using automated systems	408	1.87	0.650
3.	I can check the expiration of subscriptions using automated systems	408	3.50	1.343
4.	I can manage numbering patterns and the inner counter using automated systems	408	1.91	0.661
5.	I can manage frequencies and claim late issues using automated systems	408	1.82	0.656
	Circulation Operations	**N**	$\bar{X}$	**SD**
1.	I can register different categories of users using automated systems	408	3.37	1.439
2.	I can charge and discharge materials using automated systems	408	3.46	1.362
3.	I can renew documents and prompt due-dates notices using automated systems	408	3.43	1.400
4.	I can manage files using automated systems	408	3.50	1.332
5.	I can transfer documents from one library to another using automated systems	408	3.47	1.355
6.	I can generate reports (books borrowed and returned, OPAC user statistics, frequently borrowed books, etc.)	408	3.46	1.402
7.	I can use all the circulation hardware (Barcode Scanner, 3D printer, payment gateway, etc.)	408	3.46	1.366
	Patron Operations	**N**	$\bar{X}$	**SD**
1.	I can create a new user category	408	3.42	1.408
2.	I can register a new patron profile	408	3.40	1.423
3.	I can search for existing patrons	408	3.43	1.393
4.	I can manage and edit patron account	408	3.43	1.433
5.	I can define staff and patron permissions	408	3.42	1.391

Table 6.3 presents a comprehensive analysis of operational-task-based digital skills possessed by Nigerian university library staff across critical areas: acquisition, cataloging, serial operations, circulation, and patron management.

The library staff displayed varied competencies. The overall mean scores suggest a strong foundation in cataloging and circulation operations, while acquisition-related skills indicate significant gaps. For instance, the mean score for cataloging library resources is 3.43**,** indicating substantial proficiency in managing resources using library management software. In contrast, the acquisition operations exhibit mean scores ranging from 1.71 to 1.84**,** signaling low proficiency in managing tasks such as vendor operations and budget planning.

The substantially low standard deviations in acquisition tasks (e.g., from SD 0.578 - SD 0.746) suggest a wide variability in staff capabilities, indicating that staff members may struggle significantly with these automated tasks. Conversely, high standard deviations in cataloging, patron and circulation tasks indicate a more consistent level of proficiency, highlighting areas of strength.

When analyzing specific indicators, notable patterns emerge across different operational areas:

Acquisition Operations: Mean scores for acquisition tasks are significantly low. For instance, "I can manage vendors using automated systems" scored 1.79**,** while tasks like creating purchase orders registered at 1.82. These scores signal a need for extensive training and support in using automated systems for effective collection and resource acquisition management.

Cataloging Operations: This area showcases better proficiency, particularly apparent in tasks such as "Editing a record/item and merging identical records" (M = 3.50) and

"Generating a barcode for the call mark/accession number" **(**M = 3.45**).** These higher scores reflect essential cataloging competencies, indicating that library staff are well-equipped to handle critical functions. However, cataloging tasks related to using Z39.50 tool and OCLC pose potential operational gap with low SD 0.728 and 0.684 respectively. This indicates a moderate foundation in cataloging tasks, but competency for Z39.50 and OCLC tool require attention.

Serial Operations: Mean scores vary widely, with "managing and monitoring subscriptions" showing relatively strong proficiency (M = 3.43), while creating new issues scored lower at 1.87. This disparity suggests that while some aspects are well-managed, others require enhanced training.

Circulation Operations: Staff displayed solid competencies across this domain, with all tasks scoring above 3.30**.** Tasks such as "Charging and discharging materials" **(**M = 3.46**)** and "Generating reports" (M = 3.46) underline staff effectiveness in core circulation functions. **Patron Operations**: Scores in this category are similarly high, consistently above 3.40**,** indicating that staff are confident in managing user-related tasks. Skills like "creating a new user category" **(**M = 3.42**)** exemplify libraries' focus on user engagement and support.

Essentially, the analysis indicates a solid foundation in patron and circulation operations, while cataloging tasks require attention with using Z39.50 and OCLC tool, but notable skills deficiencies in acquisition and serial-related tasks.

6.2.3 Granularised interpretation of overall digital skills

The preceding section identified gaps in basic digital skills, software proficiency, and operational task–based digital competencies among library staff through descriptive statistical analysis. Building on these findings, the present section applies inferential statistical

techniques to examine variations in overall digital skills across selected demographic and professional variables.

Specifically, this section tests the study's hypotheses by analysing whether statistically significant differences exist in the overall digital skill levels (basic, software proficiency, and operational skills) based on gender, career cadre, age, educational qualification, and institutional type. Appropriate statistical tests were employed to determine group differences and assess the strength and direction of observed relationships. The results provide an empirical basis for the hypotheses and contribute to a quantitative understanding of the factors influencing digital competence among library staff.

Gender Differences and Digital Skills

Hypothesis 1: Gender difference in the level of digital skills among university library staff for automated operations.

Table 6.4: T-test showing gender difference in the level of overall digital skills (basic and operational) among university library staff for automated operations

Gender	N	Mean	SD	Df	$t_{(cal)}$	$t_{(tab)}$	Decision
Male	168	3.72	1.321	392	4.32	1.96	S
Female	226	3.43	1.285				

P<0.05 level of significance *S = Significant*

Table 6.4 presents a T-test analysis highlighting gender differences in the level of digital skills among university library staff involved in automated operations. The sample comprised 168 male respondents, with mean scores (M) and standard deviations (SD) provided to assess their digital proficiency comprehensively.

The data further reveals that male library staff possess a mean digital skills score of 3.72 (SD = 1.321**).** This score suggests a relatively high level of digital competency in automated operations, positioning male staff as generally confident in their ability to utilize digital tools

and systems effectively. The standard deviation indicates variability in skills, which may reflect differing levels of experience or training among the male respondents.

The T-test results show a calculated t-value (t(cal)) of 4.32 compared to a critical t-value (t(tab)) of 1.96 at a 392 degrees of freedom. This significant t-value indicates that there is a statistically significant difference in the level of digital skills between male staff and female staff, leading to the conclusion that gender differences exist in this context. The decision to indicate statistical significance (S) further emphasizes that the observed differences in digital skills are meaningful and warrant further investigation.

Looking closely at the indicators represented in the digital skills assessment is crucial. The mean score of 3.72 suggests that male staff are adept at various digital tasks related to automated library operations but does not provide insight into specific skills where they may excel or struggle. Section 6.2 already gave insight to the specific basic and operational tasks that library professionals in Nigeria generally struggle with. Comparing this mean score against future data could uncover specific areas of strength or challenge, directing training resources more effectively.

In summary, the analysis indicates that male university library staff exhibit a significant level of digital skills for automated operations, with a mean score of 3.72 and substantial variability. The results from the T-test highlight a statistically significant gender difference among university library staff in Nigeria.

Work Experience and Digital Skills

Hypothesis 2: Correlation between the years of work experience and overall digital skills level for automated library operations by university library staff

Table 6.5: Analysis of the correlation between the years of work experience and overall digital skills(basic and operational-task-based) level for automated library operations by university library staff

Correlations

		Work Experience	Digital Skills Level
Work Experience	Pearson Correlation	1	0.050
	Sig. (2-tailed)		0.310
	Sum of Squares and Cross-products	202.078	7.392
	Covariance	0.497	0.018
	N	408	408
Digital Skills Level	Pearson Correlation	0.050	1
	Sig. (2-tailed)	0.310	
	Sum of Squares and Cross-products	7.392	106.586
	Covariance	0.018	0.262
	N	408	408

P<0.05 level of significance *S = Significant*

Table 6.5 analyzes the correlation between years of work experience and the level of overall digital skills among university library staff for automated library operations. The data reflects a sample size of 408 respondents, providing insight into how work experience influences digital competence in library settings.

The Pearson correlation coefficient between years of work experience and digital skills level is 0.050, suggesting a very weak positive correlation. This value implies that as years of work experience increase, there is little to no corresponding increase in the level of basic digital skills. The significance value (p = 0.310) indicates that this correlation is not statistically significant at the 0.05 level, meaning confidence in the independence of these two variables.

The analysis of variance shows a sum of squares and cross-products of 202.078 for work experience and 7.392 for digital skills, with matching covariance values indicating the

relationships don't significantly fluctuate across the sample. The total sum of squares for digital skills (M = 106.586) further emphasizes a lack of cohesion between work experience and digital proficiency levels among staff.

Exploring the interplay of educational qualifications with work experience could also provide additional insights. Staff with advanced degrees or specialized training might show a different pattern in the correlation, which could point toward the influence of continuous professional development on digital skills. Analyzing the indicators individually allows for a clearer understanding of how specific experiences relate to particular skill areas. While the overall correlation suggests minimal relationship,

looking at specific digital skills such as proficiency in software applications, internet navigation, or data management can illustrate whether certain skills are more heavily influenced by years of experience than others. For instance, if staff members report a strong positive correlation in more complex digital tasks but not in basic operations, this may imply that experience enhances skills that require ongoing engagement with technology.

Furthermore, the analysis presented in Table 6.5 reveals a weak, non-significant positive correlation of 0.050 between years of work experience and the level of overall digital skills among university library staff. Given the lack of statistical significance ($p = 0.310$), these findings suggest that increasing work experience does not necessarily equate to enhanced digital competencies.

However, to obtain further analytical clarity, an independent samples *t*-test was conducted to determine whether significant differences in operational digital skill levels exist across experience ranges of library staff based on years of professional experience. Table 6.6

presents a detailed breakdown of the comparative analysis, highlighting the distribution of digital skills across the identified experience ranges.

Experience-based group comparison

Table 6.6: T-test analysis of the difference in the years of experience and the operational-task-based digital skills possessed by library staff

Years of Experience	N	Mean	SD	df	$t_{(cal)}$	$t_{(tab)}$	Decision
0 – 10	285	3.75	1.497	406	2.87	1.96	S
11 years and above	123	3.40	1.172				

P<0.05 level of significance *S = Significant*

Table 6.6 provides a T-test analysis examining the difference in automated operational-task-based digital skills between library staff with varying years of experience. This finding adds depth and nuance to the earlier correlation result. The analysis contrasts two groups: those with 0 to 10 years of experience and those with 11 years or more.

The data indicates that staff with 0 to 10 years of experience possess a mean digital skills score of 3.75 (SD = 1.497), which reflects a relatively strong proficiency in automated operational tasks. In contrast, those with 11 years and above have a lower mean score of 3.40 (SD = 1.172). The results suggest that less experienced staff may be more familiar with current digital tools and technologies, potentially due to recent training or educational advancements in library science and age differences as they potend to form the younger layer of the demography who might be digital natives.

The T-test results show a calculated t-value (t(cal)) of 2.87, which exceeds the critical t-value (t(tab)) of 1.96 at 406 degrees of freedom. This significant t-value indicates a statistically significant difference between the two groups, with the decision deemed significant (S). This

finding suggests that the level of experience has a meaningful impact on the digital skills possessed by library staff.

Looking into specific indicators of digital skills, this study deduced how well each group adapts to evolving technological demands. For example, staff in the 0 to 10 years category scored higher in automation operational tasks like managing digital resources or using new software, reflecting a contemporary educational foundation. Conversely, the 11 years and above group lag in newly introduced technologies but may have strengths in foundational skills and a broader contextual understanding of traditional library operations.

This pattern may reflect greater exposure to recent digital technologies among newer entrants into the profession. This significant finding highlights that experience alone does not correlate with enhanced digital competencies; rather, recent educational/training practices and age may play critical roles in developing relevant skills.

Educational Level and Digital Skills

Hypothesis 3: There is no significant correlation between educational level and digital skills possessed by library staff in the use of library automation in Nigeria

The findings from hypothesis 2 highlight that experience alone does not correlate with enhanced digital competencies; rather, educational practices may play critical roles in developing relevant skills. Table 6.7 shows the correlation breakdown.

Table 6.7: Correlation analysis between educational level and overall digital skills possessed by library staff in the use of library automation in Nigeria

Correlations

		Level of Education	Digital Skills Level
Level of Education	Pearson Correlation	1	0.055
	Sig. (2-tailed)		0.268
	Sum of Squares and Cross-products	221.490	11.863
	Covariance	0.544	0.029
	N	408	408
Digital Skills Level	Pearson Correlation	0.055	1
	Sig. (2-tailed)	0.268	
	Sum of Squares and Cross-products	11.863	210.578
	Covariance	0.029	0.517
	N	408	408

Table 6.7 provides a correlation analysis examining the relationship between the educational level of library staff and their overall digital skills in the context of library automation in Nigeria. The analysis includes a sample size of 408 respondents, with both Pearson correlation coefficients and significance levels presented to assess the strength and significance of the relationship.

The findings reveal a Pearson correlation coefficient of 0.055 between the level of education and operational-task-based digital skills, suggesting a very weak positive correlation between these two variables. This implies that as the level of education among library staff increases, there is only a marginal increase in their digital skills. The significance value of 0.268 indicates that this correlation is not statistically significant at the 0.05 level, thereby suggesting that educational attainment alone does not lead to enhanced digital competencies in using library automation tools.

In addition to the correlation coefficient, the sum of squares and cross-products for the level of education is 221.490, while digital skills have a value of 11.863. The covariance for

education and digital skills is 0.544 and 0.029, respectively, highlighting minimal variability in how these two factors relate across the sample.

Additionally, exploring how the educational background aligns with revisiting technological training or professional development opportunities can yield valuable insights. Staff members who have participated in ongoing training programs may show a stronger correlation between their educational level and digital skills, illustrating the impact of continuous learning on competency development. Examining specific digital skills can also provide additional insights. The overall correlation of 0.055 obscures potential positive relationships that may exist for particular skills. For instance, if staff members with advanced degrees exhibit higher proficiency in using specific library management systems but not in broader operational tasks, it may highlight a specialized application of their educational background.

Identifying which digital skills are impacted by educational level might inform future training initiatives, allowing library management to focus on enhancing specific competencies based on staff education profiles. For example, library staff could be assessed in various areas, such as software use, and digital resource navigation, to determine where training may best leverage their educational strengths.

The correlation analysis presented in Table 6.7 indicates a very weak and statistically insignificant correlation ($r = 0.055$, $p = 0.268$) between educational level and overall digital skills among library staff in Nigeria. This finding suggests that higher education does not necessarily correlate with improved digital competencies in library automated operations.

Career Cadre and Digital Skills

Hypothesis 4: There is no significant difference in the operational-task-based digital skills level possessed by library staff based on the career cadre in the use of library automation in Nigeria.

Table 6.8: T-test analysis of difference in the career cadre on the operational-task-based digital skills level possessed by library staff in the use of library automation in Nigeria

Career Cadre	N	Mean	SD	df	$t_{(cal)}$	$t_{(tab)}$	Decision
Librarian	162	2.25	.452	406	3.029	1.96	S
Library Officer	244	1.73	.592				

P<0.05 level of significance *S = Significant*

Table 6.8 presents a T-test analysis of the differences in digital skills levels possessed by library staff relating to their career cadre in the context of library automation in Nigeria. This analysis includes a sample size of 408 respondents, distinguishing between librarians and library officers, providing insights into how career positions influence digital competencies.

Table 6.8 reveals a significant difference in digital skills levels between librarians (M = 2.25) and library officers (M = 1.73). The calculated t-value of 3.029 confirms that this difference is statistically significant. The results reveals that librarians possess a mean digital skills score of 2.25 (SD = 0.452), indicating a moderate level of proficiency in library automation. In stark contrast, library officers have a lower mean score of 1.73 (SD = 0.592), suggesting a less developed skill set in this critical area. This disparity highlights the potential impact of career cadre on the level of competency in using library automation tools.

The T-test results show a calculated t-value (t(cal)) of 3.029, significantly exceeding the critical t-value (t(tab)) of 1.96 at 406 degrees of freedom. This points to a statistically significant difference between the digital skills levels of the two groups, with the decision marked as significant (S). The results imply that librarians, who typically have more

advanced training and responsibilities associated with library operational management, demonstrate higher digital competencies than library officers.

While the overall mean scores provide a general overview, investigating specific indicators can also enhance the analysis by diving into particular competencies such as proficiency in particular operational tasks or library management software, digital resource management, and user engagement technologies can identify strengths and weaknesses for each career cadre. For instance, if librarians score significantly higher in complex tasks related to library automation, it may indicate that their training focuses more on advanced technology applications compared to the more basic operational tasks expected of library officers. This trend could inform targeted training programs tailored to the specific needs of library officers to elevate their digital competency levels.

In all, Table 6.8 reveals a significant difference in digital skills levels between librarians (M = 2.25) and library officers (M = 1.73). The calculated t-value of 3.029 confirms that this difference is statistically significant. These findings suggest that career cadre significantly influences digital skill proficiency among library staff in Nigeria.

Institutional Ownership and Digital Skills

Hypothesis 5: There is no significant difference in the level of digital skills Nigerian university library staff possess for automated library operations between public and private institutions.

Table 6.9: T-test analysis of the digital skills difference between public and private institutions

Institution	N	Mean	SD	Df	$t_{(cal)}$	$t_{(tab)}$	Decision
Private	51	4.75	0.440				
Public	357	3.32	1.325	406	7.63	1.96	S

P<0.05 level of significance *S = Significant*

Table 6.9 presents a T-test analysis comparing digital skills between library staff at public and private institutions. The analysis involves a sample size of 408 respondents, with insights into mean scores, standard deviations, and T-test results facilitating an understanding of institutional differences in digital competency.

The library staff at private institutions demonstrate a mean score of 4.75 (SD = 0.440) for their digital skills, indicating a high level of proficiency. In contrast, staff at public institutions show a significantly lower mean score of 3.32 (SD = 1.325), highlighting a stark disparity in digital competencies between the two types of institutions.

The results of the T-test present a calculated t-value (t(cal)) of 7.63, far exceeding the critical t-value (t(tab)) of 1.96 at 406 degrees of freedom. This significant difference indicates that the variance in digital skills between the two groups is not only meaningful but statistically significant, with the decision marked as significant (S). This suggests that the educational environment and available resources for training may differ remarkably between public and private libraries, affecting skill levels.

Investigating specific indicators of digital skills can yield valuable insights into the nature of the competencies being assessed. While the overall mean scores provide a broad overview, examining particular skills (e.g., proficiency in library management software, digital resource management, or user interaction technologies) allows for targeted analysis.

For example, if staff at private institutions score significantly higher in specific tasks related to automation or digital libraries, this may imply that private institutions prioritize technology and provide resources aimed at enhancing these skills. In contrast, public institutions might need to focus on specific areas for development to improve their staff's digital competencies.

The T-test analysis presented in Table 6.9 reveals a significant difference in digital skills between staff at public institutions (M = 3.32) and private institutions (M = 4.75). The substantial t-value of 7.63 confirms that this difference is statistically significant. These findings underline the potential impact of institutional environments on the digital competencies of library staff.

6.3. Discussion of findings on digital skills level

This study provides new empirical insight into the structure of digital skills among Nigerian university library staff by moving beyond general assessments of digital competence. Unlike previous studies that largely reported overall competence levels or focused on isolated tools, this research investigates digital skills related to automated library operations across core library functions of acquisition, cataloguing, serials, circulation, and patron management. In doing so, it reveals a patterned and function-specific digital skills distribution and gaps rather than a uniform competence profile.The findings show that while staff demonstrate reasonably strong foundational digital skills, operational-task-specific skills are unevenly distributed, reflecting partial automation of core functions and uneven software implementation.

6.3.1.Basic digital skills

The descriptive analysis indicates that most Nigerian university library staff possess adequate foundational digital competencies required for routine professional tasks. Staff demonstrate proficiency in internet connectivity, data storage, web browsing, and word processing tools. These findings are consistent with earlier studies (e.g., Baro et al., 2019; Friday & Onuh, 2022), which reported generally strong baseline digital skills among librarians in Nigeria and comparable African contexts.

However, this study advances existing knowledge by disaggregating foundational skills to reveal uneven depth of competence. Despite this broadly encouraging picture, gaps persist in

specific basic operations, lower mean scores for certain “basic operations” indicate variability in practical mastery. Specifically, gaps were identified in tasks such as systematic equipment for preservation, content creation, and desktop publishing. This suggests that not all staff possess the foundational skills required to engage effectively in some yet basic, but technical activities. This aligns with the findings of Okeji et al. (2021), who observed that although Nigerian university librarians exhibit appreciable basic digital skills, they still lack competence for some seemingly elementary but technically more demanding activities, such as systematic document digitisation and publishing. This contributes to a more nuanced understanding that Nigerian university library staff are digitally literate at a functional level, but not uniformly digitally productive, amplifying distinction between usage and technical competence.

6.3.2 Operational task- based digital skills

Software- specific professional skills

The study shows a clear pattern of concentration of operational expertise around Koha, with limited proficiency in other critical systems. Staff report high competence in Koha, reinforcing earlier studies (Tella et al., 2017; Ojo, 2024; Omodara et.al., 2025) that identify it is the dominant open-source library management system in Nigeria. In contrast, skill levels for Turnitin, DSpace, Eprints, NewGen Lib, Slim, Virtua, and Grammarly are low. This reveals limited engagement with institutional repositories, digital preservation systems, and plagiarism detection tools which are central to contemporary scholarly communication, digital collections and archiving management, and research support services. While previous research established this trend, the present study reaffirms that this dominance persists in the post-COVID 19 context.

This uneven pattern of digital skills suggests that staff competence is influenced more by their practical experience with the specific ILMS modules available in their libraries than by having broad digital literacy that can be applied across different systems. It also shows that local automation decisions and institutional investment priorities play an important role in determining the skills staff are able to develop and use. In other words, staff proficiency is largely shaped by the technologies they have access to in their daily work, indicating that the availability of digital infrastructure has a greater influence on skill development than formal training alone.

Operational modules and routines

Across core operational domains such as acquisition, cataloguing, serials, circulation, and patron management the findings reveal a mixed but patterned skills landscape. For acquisition operations, staff report very low proficiency in managing vendors, planning and monitoring budgets, creating purchase orders, handling order receipts and invoices, and processing purchase suggestions using automated systems, with mean scores clustered between 1.71 and 1.84. These results suggest that financial and procurement-related workflows are still largely manual or only minimally automated in many Nigerian university libraries, leaving staff with limited exposure to end-to-end digital acquisition routines. In cataloguing operations, however, staff show substantial competence in cataloguing resources with library management software, editing and merging records, generating barcodes, and forwarding records to the OPAC server, which confirms Kari and Baro's (2014) and Ojo (2024) reports that Nigerian university libraries widely use Koha for cataloguing and OPAC access. Yet, even here there are gaps, as low scores for creating bibliographic records via Z39.50 and importing files from OCLC reveal limited practice with networked cataloguing tools and cooperative metadata workflows.

Serials operations exhibit a similarly uneven pattern: staff can manage and monitor subscriptions and check the expiration of subscriptions using automated systems, but they struggle with creating new issues, managing serial collections, handling numbering patterns and inner counters, and dealing with frequencies and claims for late issues, all of which receive comparatively low mean scores. By contrast, circulation operations constitute one of the strongest operational domains, with high competence reported for registering users, charging and discharging materials, renewing documents and sending due-date notices, managing files, transferring documents between libraries, generating standard circulation reports, and using circulation hardware such as barcode scanners, 3D printers, and payment gateways. Patron operations mirror this strength, as staff are generally able to create new user categories, register patron profiles, search for patrons, manage and edit accounts, and define staff and patron permissions, indicating that patron-facing modules of library management systems are relatively well understood and integrated into daily work routines. Overall, the findings show a strong operational skills base in cataloguing (excluding Z39.50/OCLC), circulation, and patron management, but serious deficiencies in acquisition and serials operations, a pattern that corresponds closely with national evidence that most Nigerian university libraries are only partially automated.

The outcome of the operational digital skills is buttressed by previous studies by Lawal-Solarin et al. (2018), Ajani and Buraimo (2022) and Ojo (2024), alluding that university libraries staff in Nigeria to an extent can manage automated cataloguing and circulation operations. Also, Igbudu et al. (2020) and Ojo and Otunla (2018) affirm that staff possess a moderate digital skill to handle some automated back-end operational routine while the customer-centred operations, such as the circulation, serials, reference routine, were handled manually.

6.3.3 Linking operational skills to partial automation and context

The predominance of skills in cataloguing and circulation, alongside weakness in acquisition and serials, is consistent with previous reports that 95% of Nigerian university libraries are only partially automated, typically with only one or two modules actively in use. Lawal-Solarin et al. (2018), Adegbore (2010), Igbudu et al. (2020), Omopupa et al. (2020), and Ojo and Otunla (2018) all documented that cataloguing (and to a lesser extent circulation) are the most commonly implemented modules, whereas serials and acquisition are least implemented, giving staff greater exposure and practice in back-end bibliographic and user transaction routines than in fully integrated collection development workflows. In some public university libraries, even circulation remains partly manual despite automation of cataloguing, reinforcing the connection between limited system rollout and the narrow operational skill set observed in this study. The much higher digital skills observed among staff in private universities can thus be interpreted not only as a function of individual capacity, but also as an outcome of greater institutional investment in complete automation across all modules, which increases both the necessity and the opportunity for staff to develop advanced operational task-based digital skills.

6.4 Moderating factors and digital skills gaps

The hypothesis tests further clarify how moderating variables influence overall digital skills (basic and operational) of library professionals in Nigeria. The inferential statistical analysis provided a granularised insight and foregrounded moderating factors to identify the digital skills gaps.

Gender differences and Digital Skills

Gender emerged as a significant individual-level determinant of digital skills, with male library staff demonstrating higher levels of digital competence than female staff. This finding

aligns with recent studies in sub-Saharan Africa that report persistent gender disparities in ICT adoption and digital skill acquisition among information professionals (Adu & Ngulube, 2021; Boateng et al., 2020). These studies argue that structural inequalities such as unequal access to ICT training, mentorship, and professional networks continue to shape digital competence outcomes.

However, this finding is different from evidence reported in more technologically advanced countries, where the gap in digital skills between male and female professionals has reduced considerably (Ankush, 2024; Adeniyi et al. 2024). The continued gender difference observed in this study suggests that individual characteristics do not operate independently but are influenced by the institutional and workplace environment. This implies that the differences in digital skills among Nigerian university library staff are not due to differences in ability, but are more likely related to unequal access to institutional support, learning opportunities, digital resources and socio-cultural conditions.

The hypothesis tests clarify how selected moderating factors shape the basic digital skills profile. The t-test on gender differences revealed that male professionals possess significantly higher overall digital skills scores than female professionals, an outcome that supports Deyrup's (2014) argument that the LIS digital space is increasingly gendered in favour of men and Adekoya & Busayo (2024) observation of a contemporary gender divide where technology-oriented roles are masculinised while women are channeled toward management-oriented tracks. Nigerian studies affirm the persistence of low digital skills among female library professionals (Izuagbe et al., 2019; Adeniyi et al., 2024; Adegbore et al., 2025)

Work Experience and Digital Skills

The study found a statistically significant but weak positive relationship between years of work experience and digital skills level. This finding supports recent scholarship indicating that experience alone is an unreliable predictor of digital competence in rapidly evolving technological environments (Kim & Smith, 2021). The weak relationship observed suggests that accumulated experience in traditional library workflows does not necessarily translate into proficiency with automated systems. This supports arguments by van Laar et al. (2017) that digital skills are perishable and must be continually updated through structured learning opportunities. Within the framework, this finding emphasizes that experience must be mediated by continuous training to positively influence digital skills outcomes.

Although the simple correlation between length of service and overall digital skills is weak, the significant group difference suggests that what matters is not experience in years but the technological exposure and curricular context in which professionals were trained and subsequently re-trained. Further analysis revealed that library staff with 0–10 years of experience possessed significantly higher digital skills than those with 11 years and above, indicating that younger or more recently employed staff often referred to as “digital natives” who naturally interact with technology are more proficient in practical use of automation tools than the older staff whose training pre-dated current digital requirements. This finding strongly aligns with recent studies which report that early-career professionals demonstrate greater digital agility due to earlier exposure to ICTs during formal education and professional socialization (Ariole et al., 2017; Manda & Backhouse, 2018; Chigwada & Nwaohiri, 2021; Olubiyo & Olubiyo, 2023).

This result reinforces the relevance of generational digital divide theories in professional contexts, where newer entrants adapt more easily to automation technologies and develop digital skills, particularly in environments undergoing rapid technological change.

Educational Level and Digital Skills

In line with the study's hypothetical assumptions, educational level showed a significant positive relationship with digital skills, although the relationship was weak. This finding supports recent evidence that higher academic qualifications provide foundational digital literacy and analytical competencies necessary for engaging with automated systems (Ogunsola & Okiki, 2018; Tondeur et al., 2021).

However, the weak association confirms arguments that formal education alone is insufficient for developing applied digital competence in professional contexts (van Laar et al., 2017). This suggests that possession of higher degrees alone does not guarantee stronger basic digital competence, and that what matters more may be the specific content of LIS curricula, exposure to ICT laboratories, and the quality of hands- on training, which earlier authors have argued often lag behind contemporary digital demands in Nigeria (Ariole et al., 2017; Olubiyo & Olubiyo, 2023). While education enhances readiness for digital work, institutional training and practice-based learning are critical mediating variables. The finding is therefore validated in showing that education contributes indirectly rather than deterministically to digital skills acquisition.

Career Cadre and Digital Skills

The study found a significant difference in digital skills based on career cadre, with librarians demonstrating higher competence than library officers. This finding is consistent with recent literature emphasizing role differentiation in access to digital tools and professional development opportunities (Ameen & Ullah, 2020; Quadri, 2023; Akintola et al., 2022).

Librarians are typically engaged in system-level decision-making, digital resource management, and policy implementation, which increases their exposure to automation technologies. In contrast, library officers often perform routine operational tasks with limited access to advanced ICT training (Akintola et al., 2022). Within the conceptual framework, this finding confirms that organizational role mediates access to digital skill-enhancing resources, thereby shaping competence outcomes.

Integrating education level and career designation, librarians (posses higher degrees in LIS) report significantly higher digital skills than library officers (typically diploma holders). This interplay reveals that a higher level of education and professional career progression even though not highly significant still contributes to enhancing digital skills. Confirming Inyang and Mngutayo's (2018) assertion that formal education remains one the channels for acquiring skills. Echoing Ibegbulam and Ejikeme (2021) that paraprofessionals in Nigerian university libraries have comparatively low ICT and e- resources management skills. These results show that, in the operational domain, education interacts with role expectations: librarians are more likely to be assigned advanced automation tasks and receive the training needed to perform them, thereby amplifying the skills gap between cadres.

Institutional Ownership and Digital Skills

Institutional ownership emerged as the strongest predictor of digital skills, with staff in private universities demonstrating significantly higher competence than those in public universities. This finding strongly supports recent studies which report that private universities in developing countries invest more consistently in ICT infrastructure, automation systems, and staff training (Adebayo & Ahmed, 2022; Yusuf & Onasanya, 2021). Similarly, echoing Omopupa et al. (2020), who found that private university libraries in

Nigeria are more automated and that their professionals tend to be more digitally skilled than those in public, partly automated institutions.

This result underscores the primacy of institutional context in shaping digital skills development. Even highly educated or motivated individuals may exhibit low digital competence in environments characterized by inadequate infrastructure, limited funding, and weak policy support. This finding therefore validates the framework's emphasis on institutional factors as critical enabling or constraining forces.

6.5 Integrating Digital Skills and SDGs

This study examined operational task-based gaps and the determinants of digital skills possessed by Nigerian university library staff for automated library operations. The discussion interprets the findings through the lens of the SDGs, recognizing digital competence as a critical enabler of inclusive education, innovation, and institutional capacity building in higher education systems.

SDG 4 (Quality Education)

Digital skills for Library Automation and educational support services.

SDG 4 emphasizes inclusive and equitable quality education and the promotion of lifelong learning opportunities. The findings of this study demonstrate that digital skills among university library staff are unevenly distributed across task demographic and institutional lines, with implications for the quality and sustainability of academic library services.

Recent studies affirm that digitally skilled library staff are essential to supporting teaching, learning, and research in higher education, particularly in technology-driven academic environments (Tondeur et al., 2021; Quadri, 2023). The generally weak influence of individual characteristics such as education and experience observed in this study suggests

that institutional investment in continuous professional development is central to achieving SDG 4 targets. Without sustained digital upskilling, library automation initiatives risk underutilization, thereby undermining the quality of educational support services.

Educational Level of library staff

The significant but weak relationship between educational level and digital skills supports recent scholarship indicating that formal education provides foundational digital literacy but is insufficient for applied competence in professional settings (Tondeur et al., 2021; Quadri, 2023). This finding aligns with SDG 4's emphasis on lifelong learning rather than terminal educational attainment.

In the context of university libraries, this suggests that professional qualifications must be complemented by continuous, practice-oriented digital training to ensure effective library automation. Failure to do so risks widening the gap between academic credentials and functional digital competence, thereby limiting the contribution of libraries to quality education outcomes.

SDG 5 (Gender Equality)

Gender Disparities in Digital Skills

The finding of a significant gender difference in digital skills, favoring male library staff, directly engages SDG 5, which seeks to achieve gender equality and empower all women and girls. This result aligns with recent empirical evidence showing persistent gender gaps in digital competence across African professional contexts (Adu & Ngulube, 2021; Adeniyi et al., 2024).

UNESCO (2023) and Adeniyi et al. (2024) identify unequal access to digital training and professional development as a key barrier limiting women's participation in digital

transformation processes. The persistence of gender disparities in Nigerian university libraries suggests that digital inclusion policies have not been fully mainstreamed into institutional capacity-building frameworks. This finding underscores the necessity of gender-responsive digital skills policies to ensure that library automation contributes to, rather than detracts from, the realization of SDG 5.

SDG 8 (Decent Work and Economic Growth)

Work Experience

SDG 8 promotes productive employment and lifelong learning as foundations for sustainable economic growth. The weak but significant relationship between work experience and digital skills found in this study highlights a critical challenge: experience alone does not guarantee employability or productivity in digitally mediated work environments. Recent literature emphasizes that digital skills rapidly depreciate in the absence of continuous retraining (van Laar et al., 2017; Kim & Smith, 2021). The finding that staff with fewer years of experience possess higher digital competence further suggests that early exposure to digital technologies enhances workforce adaptability. From an SDG 8 perspective, this underscores the importance of institutionalized lifelong digital learning frameworks to maintain the relevance and productivity of library professionals in automated systems.

SDG 10 (Reduced Inequalities)

Career Cadre and Digital Inequality

The significant difference in digital skills between librarians and library officers highlights intra-organizational inequalities in access to digital skill–enhancing opportunities. This finding directly relates to SDG 10, which advocates reducing inequalities within institutions and societies. Recent studies have shown that professional hierarchies often mediate access to advanced digital tools and training opportunities (Ameen & Ullah, 2020). The observed

disparity suggests that library automation initiatives may inadvertently reinforce internal digital divides if training opportunities are limited to professional librarians. Addressing this inequality is essential to ensuring inclusive digital transformation within academic libraries.

SDG 9 (Industry, Innovation, and Infrastructure) and SDG 16 (Strong Institution)

Institutional Ownership and Digital Infrastructure

The most pronounced finding of the study was the significantly higher digital skills level among library staff in private universities compared to public universities. This result strongly align with SDG 9, which emphasizes the development of resilient infrastructure and innovation capacity and SDG16 which reinforces coordination and focused capacity development by the university management to strengthen institutional effectiveness. Literature consistently reports that private universities in developing economies invest more effectively in ICT infrastructure and staff digital training than public institutions (Adebayo & Ahmed, 2022; Yusuf & Onasanya, 2021). The findings suggest that disparities in digital infrastructure and institutional commitment to innovation significantly shape digital skills outcomes. From an SDG 9 perspective, strengthening ICT infrastructure and automation capacity in public university libraries is essential for achieving inclusive innovation across the higher education sector.

6.6 Summary of Chapter

This chapter addressed research questions 1a and b and inferential statistical analysis of hypotheses H1 to H5 by presenting the quantitative results and discussions to identify the existing gaps in the digital skills of university library staff in Nigeria. Findings show that Nigerian university library staff demonstrate a reasonably strong level of basic digital skills but uneven and often limited operational task-based digital skills across acquisition,

cataloguing, serials, circulation, and patron operations. Also, Koha stands out as the task-based software staff are proficient with.

The overall moderating factors demonstrate that gaps in digital skills for library automation cut across individual and institutional developmental issues. While individual-level factors such as gender, education, experience, and cadre are significant, their influence is secondary to institutional conditions such as infrastructure availability, training investment, and policy commitment.

This study therefore contributes to SDG-oriented scholarship by empirically demonstrating that digital skills gap in academic libraries is a systemic development challenge, not merely an individual competency issue. Sustainable progress toward SDGs 4, 5, 8, 9, 10 and 16 requires coordinated institutional strategies that integrate digital inclusion, workforce development, and infrastructure investment.

The next chapter addresses research questions 2 and 3, thereby giving insight into the existing digital skills development programs and factors that impede skills development.

CHAPTER SEVEN

QUANTITATIVE RESULTS AND DISCUSSION OF DIGITAL SKILLS DEVELOPMENT

7.1 Introduction

Another primary focus of the first phase of this study was to ascertain the existing digital skills training programs and the challenges associated with the digital skills development of university library professionals in Nigeria. This chapter includes descriptive statistics of research questions 2 and 3 by presenting the results and discussion of the existing digital skills training and factors that inhibit the digital skills development of university library professionals in Nigeria. Also, inferential analysis of hypothesis 6 to establish the relationship between the existing digital skills development programs and the current digital skills level of library professionals in Nigeria.

7.2 Result of descriptive analysis of research question two

RQ2a: How has the prior library school education contributed to enhancing the digital skills of Nigerian university library staff for effective automated library operations?

Table 7.1: Analysis of the prior Library School Education and digital skills development of university library professionals in Nigeria

S/N	Prior Library School Education	N	$\bar{X}$	SD
1.	My LIS curriculum (undergraduate/postgraduate) included training in digital technology	408	1.61	0.649
2.	I took courses like metadata, automation, web design, database management, etc.	408	1.67	0.624
3.	I had the necessary laboratory support for the digital technology courses in my LIS curriculum (undergraduate/postgraduate)	408	1.75	0.632
4.	My LIS educator was skilled and efficient in the digital technology courses	408	1.74	0.595

The aggregate data in Table 7.1 presents a broad overview of the perceived effectiveness of library school education in preparing professionals for the demands of digital skills. The mean scores for various factors range from 1.61 to 1.75, indicating a general consensus that the education received in Library and Information Science (LIS) programs falls short of adequately preparing graduates for digital competencies. For instance, the statement "My LIS

curriculum included training in digital technology" scored 1.61, suggesting that a significant portion of respondents felt their programs did not sufficiently cover essential aspects of digital library technology due to enhance their digital skills. While these aggregate figures provide insights into the overall effectiveness of LIS curricula, they may conceal individual experiences and the underlying reasons for dissatisfaction. A granular analysis can reveal that while some professionals may find certain aspects lacking, others might have had differing experiences based on their specific educational institutions, geographic locations, or prior experience. For example, breaking down the data by sub-groups to compare responses from undergraduate and postgraduate professionals may uncover whether advanced programs placed more emphasis on digital competencies.

Detailed analysis by specific tasks or indicators provides a nuanced view of how well specific aspects of the LIS curriculum contribute to digital skills development. The lowest mean score of 1.61 for training in digital technology suggests significant room for improvement. The mean score of 1.67 regarding whether courses included relevant subjects like metadata, automation, and web design indicates that curriculum content may not align adequately with current industry expectations. The mean of 1.75 for the availability of necessary laboratory support for digital technology courses suggests that practical learning environments critical for skill acquisition are likely inadequate in many LIS programs. Additionally, the score of 1.74 for the perceived skill and efficiency of LIS educators in teaching digital technology courses implies that even when content is available, the quality of instruction could be lacking, possibly affecting engagement and understanding.

Assessing these specific indicators through qualitative methods, such as interviews, can further enrich this analysis by illuminating the barriers to effective learning and identifying what practitioners feel are most crucial for their development. While the aggregate data

indicates a concerning gap in how poorly library school education prepares professionals for digital competencies, a granulated analysis may reveal deeper insights across sub-groups. This analysis underscores the need for a curriculum that not only addresses contemporary digital challenges but also adapts to the diverse backgrounds and experiences of library professionals, ensuring their successful integration into the evolving landscape of automated library operations.

RQ2b: How has the continuing education training programs enhanced the digital skills of Nigerian university library staff for effective automated library operations?

Table 7.2: Analysis of continuing education programs and digital skills development of university library professionals in Nigeria

S/N	Digital skills development programs by contents	N	Mean	SD
1	I have attended training programs focusing on digital library services.	408	3.34	0.61
2	I have attended program that delivers hands-on sessions on the latest digital tools relevant to library operations.	408	2.10	0.74
3	I have participated in specialized workshops that focus on contemporary digital trends in libraries.	408	1.78	1.498
4	I have attended courses on essential topics for effective library automation.	408	1.69	0.693
5	I have been sponsored to training programs emphasizing practical digital skills on digital library operations.	408	1.63	0.634
	Frequency of attending digital skills development programs	**N**	**Mean**	**SD**
6	I attend in-house training programs that cover essential skills necessary for effective library automation.	408	3.34	0.61
7	I attend workshops focused on specific digital skills for library automation.	408	1.85	0.617
8	I receive sponsorship to attended conferences / seminars for comprehensive programs related to digital library operations.	408	1.73	0.6
9	I have attended a train-the-trainer program on digital skills for library automation.	408	1.72	0.565
10	I self-sponsored myself to workshops/conferences/courses aimed at enhancing digital skills for library automation.	408	1.66	0.68
	Delivery mode of digital skills program	**N**	**Mean**	**SD**
11	Digital services training is delivered through in-house training programs.	408	3.34	0.61
12	Digital services training is delivered through conferences.	408	2.05	0.73
13	I have received mentorship and support from colleagues during hands-on training in digital library operations	408	1.76	0.678
14	I have engaged in online webinars focusing on the use of automated library systems and digital services	408	1.73	0.672
15	Digital services training is delivered through a mix of seminars and practical workshops for comprehensive learning.	408	1.62	0.68

Interpretation of table 7.2 by Domains (Content, frequency and delivery mode)

Content of programs: The content within digital skills education programs is pivotal in determining the success of library staff training. A notable average score of 3.34 for internally organized training programs suggests strong staff engagement in foundational

digital library services. This implies that libraries are prioritizing essential training, equipping employees with the necessary skills to handle automated systems. Conversely, the mean score of 1.63 for sponsorship to workshops indicates potential limitations in external training opportunities. While basic skills are addressed, there might be gaps in exposure to contemporary practices and innovations often shared in professional conferences or specialized workshops. Moreover, the moderate engagement (mean score of 1.69) in library school courses presents an opportunity for libraries to strengthen partnerships with academic institutions, ensuring that staff remain updated on evolving digital practices. The emphasis on hands-on sessions, reflected by a higher mean score of 2.10, signals a positive trend toward practical training, crucial for effective skill application in real-world automated library settings. The inclusion of specialized workshops focusing on contemporary trends, with a mean of 1.78, indicates an awareness of the need to keep pace with current technological advancements. However, it may also highlight the necessity for increased participation and accessibility to these programs.

Frequency of attendance: The frequency of training programs attendance significantly influences the skill development of library staff. Responses were measured on a 4-point frequency Likert scale: 1 = Never, 2 = Rarely, 3 = Neutral, 4 = Occasionally, 5= Often.

Attendance at short-term workshops focused on specific digital skills for library automation recorded a mean score of 1.85 (SD = 0.617), indicating that respondents rarely attended such workshops. Respondents' participation in scholarship- or sponsorship-supported conferences and seminars related to comprehensive digital library operations recorded a mean score of 1.73 (SD = 0.600), which also falls within the "Rarely" category. This suggests limited access to funded professional development opportunities. The highest mean score was recorded for in-house training programs covering essential skills for effective library

automation with a mean of 2.15 (SD = 0.755). This corresponds to “Occasionally”, indicating that in-house training was the most frequently attended form of digital skills development among the respondents. Attendance at train-the-trainer programs on digital skills for library automation recorded a mean score of 1.72 (SD = 0.565), reflecting rare participation in such capacity-building initiatives. Similarly, respondents rarely self-sponsored their participation in workshops, conferences, or courses aimed at enhancing digital skills, as shown by the lowest mean score of 1.66 (SD = 0.680).

These findings reveal that respondents rarely attended most digital skills training programs related to library automation. Participation was relatively higher for internally organized training programs, while other training pathways (externally funded, self-sponsored, and train-the-trainer) recorded generally low attendance. This suggests that the pathways to enhance digital skills development were rarely engaged or under explored by Nigerian university library staff.

Delivery Mode: The delivery mode of digital skills education programs is vital in accommodating diverse learning preferences among library staff. The engagement in online webinars (mean score of 1.73) reflects a trend towards flexible learning formats. However, the short duration suggests that these sessions may provide only surface-level insights into complex topics, indicating that while they are convenient, they may not replace comprehensive in-person training. Additionally, the combination of mentorship and hands-on training (mean score of 1.76) emphasizes the value of collaborative learning environments. This approach can enhance knowledge retention and skill application, especially when tailored to specific digital library operations. The hybrid nature of training combining online seminars and practical workshops offers a robust learning framework. Yet, it must ensure that

all staff, including new and experienced personnel, have equal access and benefit from these varied modalities (mean score of 2.12 reflecting inclusivity).

Lastly, the commitment to seeking feedback after training sessions (mean score of 1.62) illustrates an ongoing dedication to improving both the content and delivery modes within training programs. This feedback loop can provide invaluable insights into the effectiveness of different delivery formats, contributing to an adaptive training strategy that evolves with staff needs and technological advancements.

In all, a detailed approach to interpreting the domains of content, frequency, and delivery mode provides a richer understanding of the digital skills education programs available to library staff. By evaluating participation rates and effectiveness across these areas, libraries can identify strengths and weaknesses, facilitating enhancements to training programs that better equip staff for the demands of automated library operations. This comprehensive analysis underscores the importance of tailoring training program's to meet the diverse needs of all library personnel, ultimately fostering a skilled and adaptable workforce in the rapidly changing landscape of library services.

7.3 Linking training programs to digital skills level

Having examined the strengths and weaknesses of the training programs available to library staff in Nigeria, it is imperative to determine their significance in relation to the digital skills possessed by library staff, as identified in Chapter 6. Accordingly, this section addresses Hypothesis 6 by analysing the relationship between the combined domains of training programs and the overall digital skills of library staff in the context of engaging with automated library operations in Nigerian university libraries. The results of this analysis are presented in Table 7.3.

Table 7.3: Analysis of the correlation between training programs attended and digital skills level possessed by library staff in using library automation in Nigeria

Correlations

		Digital Training Program	Digital Skill Level
Digital Training Program	Pearson Correlation	1	0.226**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	151.373	34.039
	Covariance	0.372	0.084
	N	408	408
Digital Skill Level	Pearson Correlation	0.226**	1
	Sig. (2-tailed)	0.000	
	Sum of Squares and Cross-products	34.039	149.998
	Covariance	0.084	0.369
	N	408	408

**. *Correlation is significant at the 0.05 level (2-tailed).*

Table 7.3 presents the correlation between digital training programs and digital skill levels of librarians with a Pearson correlation coefficient of 0.226, which is statistically significant with a p-value of 0.000. This indicates a moderate positive correlation, suggesting that as participation in digital training programs increases, so does the digital skill level of library staff. This aggregate analysis highlights the potential effectiveness of training programs in enhancing staff competencies, providing a compelling reason for continued investment in such education initiatives.

The correlation by specific tasks or indicators emphasizes the types of skills being developed through digital training programs. The positive correlation coefficient (0.226) suggests a general improvement in digital skills following training; however, more detailed analysis can uncover nuances related to particular competencies. For example, if the training programs primarily focus on basic digital literacy, the correlation may be weaker for tasks that require advanced skills, such as data management or digital resource curation. Conducting further statistical analyses on sub-indicators, such as proficiency in specific digital tools or technologies, can clarify how different components of the digital training programs directly influence skill acquisition.

Moreover, assessing the variance in skill level improvement e.g., through pre- and post-training assessments could provide insights into the effectiveness of each training program against specific tasks. Such an analysis would allow library administrators to refine their training offerings, ensuring they align with the specific skill sets needed for different library operations. In summary, while the aggregate correlation between digital training programs and skill levels provides a strong basis for advocating ongoing training initiatives, a granular analysis offers deeper insights into the efficacy of these programs. By exploring correlations within sub-groups and specific tasks, library administrators can identify the most impactful areas for training, customize programs to better fit the diverse needs of their staff, and ultimately enhance the overall competency of library services in the context of digital automation. This comprehensive analysis will facilitate targeted improvements in training strategies and resource allocation, ensuring the most effective development of digital skills among library staff.

7.4 Result of descriptive analysis of research question three

Research Question 3: What are the staff-side factors that impede the digital skills development of Nigerian university library staff for automated library operations?

Table 7.4: Analysis of the staff-side factors that impede the digital skills development of Nigerian university library staff for automated library operations in Nigeria

S/N	Staff-side Challenges of Digital Skills Development (Socio-cultural and Economic dimensions)	N	$\bar{X}$	SD
1.	I have a phobia for computers and technology	408	1.40	0.583
2.	My religious belief is averse to the use of computers	408	1.70	0.561
3.	I have health challenges that require me to avoid technology	408	1.70	0.568
4.	My formal LIS training excluded training on digital technology	408	3.65	0.624
5	I am not financially buoyant enough to afford training	408	3.86	0.621
6	My salary and wages are promptly paid	408	1.66	0.532
7	Family commitments give me little time for training	408	3.67	0.649
8	My marriage reduces my digital skills training opportunity	408	3.65	0.670
9	My gender provides little opportunity for digital skills training	408	3.41	1.422
10	My rank in the office reduces my training opportunities	408	1.66	0.672
11	I am rarely promoted, and there is no need to attend any digital skills training	408	1.39	0.581
12	My library management does not encourage digital skills training	408	3.67	0.649

Table 7.4 presents the analysis of staff-side factors that impede the digital skills development of Nigerian university library staff for automated library operations. The analysis is based on responses from 408 respondents, with mean scores and standard deviations used to determine the extent to which respondents agreed with each identified factor. For the purpose of interpretation, higher mean values indicate stronger agreement that a factor constitutes a significant impediment, while lower mean values suggest disagreement.

Socio-Cultural Factors

The results indicate that the socio-cultural and economic factors investigated exert influence on digital skills development and constitute major impediments.

Examining resistance to training that enhance digital skills due to fear of technology, recorded a low mean score of 1.40 (SD = 0.583). This suggests that the majority of respondents disagreed with the assertion, indicating that technophobia is not a widespread barrier among Nigerian university library staff. The relatively low standard deviation further implies a high level of consensus among respondents. Exploring the influence of religious beliefs on the use of digital technologies, also recorded a low mean score of 1.70 (SD = 0.561). This indicates that religious considerations do not significantly hinder the adoption or learning of digital skills among university library staff in Nigeria. In the same vein, health-related challenges, recorded a mean score of 1.70 (SD = 0.568), suggesting that health issues are not a major constraint on staff participation in digital skills training.

In contrast, gender roles and responsibilities produced a moderately high mean score of 3.41 (SD = 1.422). This implies that gender-related expectations and responsibilities significantly affect participation in digital training, particularly for some segments of staff. The relatively high standard deviation indicates variability in responses, suggesting that this factor may affect certain groups more strongly than others. Furthermore, marital and family commitments remain significant factors that impede digital skills development. Findings emphasize the role of personal and family responsibilities. Family responsibilities and marital commitments limiting time for training and reducing training opportunities. These constructs respectively recorded a mean score of 3.67 (SD = 0.649) and 3.65 (SD = 0.670). These results suggest that domestic and social obligations significantly constrain staff participation in digital skills development, particularly in contexts where work–life balance support is limited. A more granulated examination of specific sub-groups (e.g., male and female, age groups, career cadre etc) could reveal which particular demography is disproportionately affected. Therefore Table 7.5 shows demographic differences in sociocultural impediments of digital skills development among university library staff.

Table 7.5: T-test showing demographic differences in sociocultural impediments of digital skills development among university library staff for automated operations

Gender	N	Mean	SD	Df	$t_{(cal)}$	$t_{(tab)}$	Decision
Male	168	3.43	1.285				
Female	240	3.72	1.321	392	4.32	1.96	S
Female age							
18-45	185	3.75	1.497				
46-65	41	3.40	1.172	226	2.87	1.96	S
Cadre							
Librarian	162	1.73	.592				
Library officer	244	2.25	.452	406	3.029	1.96	S

P<0.05 level of significance *S = Significant*

Table 7.5 presents the results of independent samples t-tests conducted to examine whether demographic variables (gender, age, and cadre) significantly influence socio-cultural impediments to digital skills development among university library staff for automated library operations. All tests were evaluated at the 0.05 level of significance. The results indicate a statistically significant difference in perceived socio-cultural impediments between male and female university library staff. Female respondents (N = 226) recorded a higher mean score (M = 3.72, SD = 1.321) compared to male respondents (N = 168; M = 3.43, SD = 1.285). The calculated t-value (t = 4.32) exceeded the critical t-value (t = 1.96) at df = 392, leading to the acceptance of the significance decision. Furthermore, the age-based comparison among female staff reveals a statistically significant difference in perceived socio-cultural impediments. Female staff aged 18–45 years (N = 185) reported a higher mean score (M = 3.75, SD = 1.497) than those aged 46–65 years (N = 41; M = 3.40, SD = 1.172). The calculated t-value (t = 2.87) exceeded the critical value (t = 1.96) at df = 226, indicating statistical significance. This outcome suggests that female library staff are more strongly affected by socio-cultural impediments to digital skills development than their male counterparts. The result further foreclosed that younger female library staff experience socio-

cultural barriers more intensely than older female staff. This outcome may be attributed to family and domestic obligation expectations placed on women in many parts of Africa, including gender roles and caregiving responsibilities, which can constrain participation in professional development activities such as digital skills training. The relatively higher standard deviation among younger staff suggests greater diversity in experiences, possibly reflecting differences in marital status, child-rearing responsibilities, career progression pressures, or work–life balance challenges. Older female staff may have more stable family structures or institutional familiarity that reduces the perceived impact of such impediments.

Socio-economic factors

The interplay between income level and education forms the proponent of socio-economic factors. Income level emerged as a prominent socio-economic constraints on staff bouyancy to afford or pay for personal digital training programs, recorded one of the highest mean scores (M = 3.86, SD = 0.621). This indicates strong agreement that financial limitations significantly restrict staff access to digital skills development in developing countries like Nigeria, underscoring the economic burden associated with self-sponsored training. Additionally, respondents largely agreed that their prior formal LIS education inadequately covered digital technologies, as shown by a mean score of 3.65 (SD = 0.624). This finding highlights structural gap in LIS curricula, contributing to foundational deficit in digital operational skills among practicing library professionals in Nigeria.

However, the aggregate view obscured individual experiences underlying these challenges. For instance, while financial constraints are paramount, examining specific sub-groups (e.g., by age, gender, or rank) may uncover additional insights into how these factors disproportionately affect different demographics within the library staff. A granular analysis

was carried out to highlight nuanced barriers across some of the library staff demography. Table 7.6 shows the analysis.

Table 7.6: T-test showing sub-group differences in socio-economic impediments of digital skills development among university library staff for automated operations

Gender	**N**	**Mean**	**SD**	**Df**	$t_{(cal)}$	$t_{(tab)}$	**Decision**
Male	168	3.43	1.285				
Female	240	3.72	1.321	392	4.32	1.96	S
Age							
18-45	289	3.75	1.497				
46 and above	119	3.40	1.172	226	2.87	1.96	S
Cadre							
Librarian	162	1.73	.592				
Library officer	244	2.25	.452	406	3.029	1.96	S

P<0.05 level of significance *S = Significant*

Table 7.6 reveals that socio-economic impediments to digital skills development differ significantly across gender, age, and cadre sub-groups, indicating that these constraints are unevenly distributed among university library staff in Nigeria.

Female staff (N = 168, M = 3.72, SD = 1.321) reported significantly higher levels of socio-economic impediments than male staff (N = 226; M = 3.43, SD = 1.285). The calculated t-value (t = 4.32) exceeds the critical t-value (t = 1.96) at df = 392, confirming statistical significance. The mean difference (0.29) indicates that female library staff experience socio-economic impediments more intensely than male staff, suggesting that financial constraints and the burden of self-funded training are more salient among females.

Similarly, younger staff 18–45 years (N = 289, M = 3.75, SD = 1.497) recorded significantly higher mean scores than older staff 46years and above (N = 41; M = 3.40, SD = 1.172). The calculated t-value (t = 2.87) exceeds the critical value (t = 1.96) at df = 226. The mean

difference (0.35) suggests that younger staff experience socio-economic barriers more strongly than older staff. This suggests that younger staff who are often early/mid-career employees, with fewer years of work experience and positioned at lower rungs of the promotion ladder tend to experience stronger socio-economic barriers. These barriers are likely associated with lower income levels, relative job insecurity, and the burden of family and marital responsibilities, which collectively constrain their ability to invest in self-sponsored digital skills training. In contrast, older staff are more likely to occupy managerial or higher pay-scale positions, with greater job stability, fewer immediate family obligations, and more favourable personal economic circumstances, thereby possibly increasing their buoyancy to invest personal resources to access training opportunities.

More pronounced, however, are differences based on cadre. Library officers (N = 244, M = 2.25, SD = 0.452) reported significantly higher socio-economic impediments than professional librarians (N = 162; M = 1.73, SD = 0.592). The calculated t-value (t = 3.029) exceeds the critical value (t = 1.96) at df = 406. This implies that paraprofessional staff are more constrained by limited income, fewer professional development privileges, and weaker institutional support, typically associated with paraprofessional roles.

Comparative assessment of disproportionate impact demonstrates that both gender and age shape how socio-economic challenges to digital skills acquisition are experienced. More pronounced, however, are differences based on cadre. Library officers reported significantly higher socio-economic impediments, implying that paraprofessional staff are more constrained by limited socio-economic factors. A comparative assessment of mean differences shows that cadre (0.52) constitutes the largest source of disparity, followed by age (0.35) and gender (0.29). This indicates that occupational position within the library hierarchy exerts a stronger influence on socio-economic constraints than gender or age,

making library officers the most vulnerable group. Overall, the results underscore the need for cadre-sensitive, equitable, and targeted financial and training support mechanisms to enhance digital skills development for automated library operations.

Organisational factors

The findings on organisational factors demonstrate that institutional conditions significantly influence digital skills development among university library staff. Funding constraints emerged as a major barrier, as evidenced by the high mean score (M = 3.86, SD = 0.621), indicating strong agreement that libraries lack adequate financial resources to organise regular and comprehensive digital skills training programs. In contrast, respondents did not perceive staff rank (M = 1.66, SD = 0.672) or promotion prospects (M = 1.39, SD = 0.581) as limiting factors, suggesting that access to digital training is not strongly shaped by career advancement considerations.

However, the high mean score for managerial attitude (M = 3.67, SD = 0.649) reveals that insufficient encouragement from library management constitutes a significant organisational impediment.

Taken together, these results indicate that while individual career status does not restrict participation in digital skills training, systemic issues particularly inadequate funding and weak managerial support pose substantial barriers, highlighting the central role of organisational commitment and institutional investment in building a digitally competent library workforce.

7.5 Discussion of Findings

The findings of this study provide compelling empirical evidence that digital skills development among Nigerian university library staff is shaped by a combination of weak

formal preparation in regards to LIS education, limited continuing education opportunities, and powerful staff-side and organisational constraints. Collectively, these factors underscore a systemic rather than incidental challenge, reinforcing arguments in contemporary Nigerian LIS scholarship that digital competence deficits are largely structural and institutional in nature (Adeleke & Emeahara, 2022; Sambo et al., 2024).

Prior Library School Education and Digital Skills Preparedness

The consistently low mean scores across all indicators in Table 7.1 reveals profound dissatisfaction with library school curricula, indicating that Library and Information Science (LIS) education in Nigeria has not adequately equipped graduates with the digital competencies required for automated library operations. Respondents largely disagreed that their curricula included sufficient digital technology training, that they took relevant courses such as metadata, automation, and web design, or that adequate laboratory facilities were available.

These findings corroborate recent Nigerian studies and Chapter Three's documentation of outdated Nigerian LIS programs, which report that LIS curricula remain theoretically inclined, weak in practical digital orientation, and misaligned with contemporary workplace realities (Kacunguzi and Samuel, 2016; Okeji and Mayowa-Adebara, 2020; Abubakar, 2021; Gbuushi et al., 2025). Similarly, this curricular inadequacy aligns with Chapter Six's hypothesis on non-significant education-skills relationship (r=0.055), where higher degrees fail to translate into proficiency in operational tasks and tools (Dspace, Z39.50 or OCLC imports) (Table 6.5). Gbuushi et al. (2025) affirm that higher educational qualification has no significant influence on the digital competence of librarians in Nigerian university libraries.

The findings also indicate that LIS curricula lack adequate laboratory support for digital technology courses at both undergraduate and postgraduate levels, resulting in limited practical exposure. This suggests that most institutions do not provide sufficient hands-on training for digital technology components of the LIS curriculum. This outcome disagrees with the report of Abubakar (2021) that while some LIS departments possess dedicated computer laboratories, others rely on central university laboratories for practical instruction. These efforts are intended to enhance students' technological proficiency and prepare them for effective professional practice in an increasingly dynamic digital environment.

Nevertheless, the available computer laboratories in many universities are constrained by challenges such as insufficient equipment, unstable power supply, and shortages of skilled technical personnel (Olubiyo & Olubiyo, 2023). Furthermore, Adetunla and Familusi (2017) note that some institutions temporarily upgrade or showcase facilities during accreditation exercises by servicing equipment, employing ad-hoc staff, and providing alternative power sources. Once accreditation is completed, these facilities are often neglected until the next accreditation cycle.

Additionally, the low rating of LIS educators' digital proficiency suggests that even where digital content exists, instructional capacity may be inadequate, thereby limiting meaningful skill transfer. This aligns with observations by Gbuushi et al. (2025) that many LIS educators themselves require continuous digital upskilling to effectively prepare students for evolving digital environments. Saleh (2011) earlier observed that most library schools in Nigeria suffer from shortages of qualified academic staff, both in terms of number and expertise. These institutions face challenges related to inadequate student–lecturer ratios and a lack of suitably skilled personnel capable of addressing emerging digital developments in librarianship. Similarly, Ahaiuzu et al. (2020), in their assessment of the ICT competencies of LIS

educators in a Nigerian university, reported that these educators demonstrated minimal evidence of digital skills in their professional practice. Consequently, the advancement of LIS education to global standards and the production of competent information professionals largely depend on the availability and quality of faculty staff.

Studies show that the prior library school training and curricula that produced the current crop of library staff and the current leadership of the university libraries in Nigeria pre-date the requirements of this new digital environment and this ill-prepared them for the present-day challenges posed by technology. (Ariole et.al, 2017; Ogungbade & Ipadeola, 2019; Abubakar, 2021; Olubiyo & Olubiyo, 2023). The implication is that curricular reform must go beyond content revision to include faculty capacity building, laboratory infrastructure development, and industry-aligned pedagogical approaches.

Continuing Education Programs

Results from Table 7.2 reveal a narrow and uneven continuing education ecosystem. Internally organised training programs emerged as the most prominent avenue for digital skills development, while externally sponsored workshops, specialised training and conferences, and self-sponsored learning were rarely accessed. This outcome indicates that most Nigerian university library staff rely primarily on internally organized training programs for acquiring skills in digital library services and operations. This is consistent with Igbokwe (2023) emphasis that internal training programs have been the major strategy for digital skills development. Atanda (2018) and Inyang and Mngutayo (2018) jointly indicate that technology related training are often vendor-led, stating the suppliers and contractors commonly provide short-term in-house training when deploying digital equipment and software in libraries, primarily focusing on basic usage and maintenance, but often without building sustainable local support capacity. Even though recent findings from Oyovwe-

Tinuoye et al. (2021) and Onakoya et al. (2023), indicated that librarians acquired digital skills required to work in a digital library through self-efforts, emphasizing that self-sponsorship has been the primary method of acquiring ICT skills by library staff in Nigeria, Table 7.4 illuminated socio-economic factors that impede self-sponsorship. Income level emerged as a prominent socio-economic constraints on staff bouyancy to afford personal digital training programs.

The low frequency of participation in external training programs to enhance digital skills is particularly concerning, as such initiatives are often associated with advanced, specialised, and innovation-driven competencies. Without regular exposure to these higher-order training opportunities, staff are likely to remain confined to basic digital literacy rather than progressing toward advanced automation, data management, and digital curation skills. This outcome explains proficiency in basic digital operations but deficient in Koha (serial, cataloguing and acquisitions) and DSpace (repositories) driven operations as presented in Chapter Six. Similar trends have been echoed among academic librarians in Nigeria by Osesi et al. (2022) and Ikolo and Nongo (2022) that very few staff have attended any specialist digital skill training program. This could have been constrained by economic factors that limit staff's bouyancy to self-fund digital training programs.

Correlation between digital skills development programs and skills Levels

Chapters six and seven provided critical quantitative insight into the digital skills gaps and skills development practices for Nigerian university library staff, confirming a significant moderate positive correlation between training exposure and competencies ($r=0.226$, $p<0.05$, Table 7.3) provides empirical confirmation that training participation contributes meaningfully to digital competence. Although moderate in magnitude, this relationship is consistent with evidence from Nigerian contexts indicating that exposure to structured

training enhances librarians' confidence and functional use of digital technologies (Mohammad, 2025). Also, the correlation results by Echem (2022) revealed positive relationships between capacity development programs (on-the-job, in-service, off-the-job) in university libraries in Nigeria and the digital skills of librarians. This implies that well structured skills development programs can enhance workforce operational digital skills.

The modest strength of the correlation further suggests that training alone is insufficient; rather, training must be regular, adequately funded, practically oriented, and complemented by supportive organisational environments.

Staff-Side Impediments: Socio-Cultural and Socio-Economic Dimensions

Findings from Table 7.4 demonstrate that personal barriers such as fear of technology, religion, and health challenges exert minimal influence on digital skills development. Even though these factors are relevant but they hold minimal contribution to the discourse. This contradicts earlier narratives by Ajani & Buraimo, (2022) that attribute low digital competence primarily to personal resistance or technophobia and instead aligns with more recent studies showing that Nigerian librarians are generally positively disposed toward technology adoption (Sambo et al., 2024; Gbuushi et al., 2025).

In contrast, gender roles, income level, family and marital responsibilities, and inadequate formal education emerged as major impediments. These findings reflect broader socio-economic realities in Nigeria, where there is less institutional support for training programs. Professional development is often self-financed (Oyovwe-Tinuoye et al., 2021; Onakoya et al., 2023) and competes with pressing marital and household obligations (Akhtar and Soroya, 2021; Akanji et al., 2022; Esiaba & Kalu, 2025). The significance of funding as a barrier underscores the commodification of professional development, where library management

cannot assure sponsored training programs due to poor institutional funding, thereby making access to training contingent on personal financial capacity rather than institutional entitlement.

Demographic Disparities in Impediments

Socio-cultural dimension

The t-test analyses (Tables 7.5 and 7.6) reveal that impediments are not evenly distributed. Female staff particularly younger females experience stronger socio-cultural barriers to digital skills development, a pattern consistent with gendered expectations around caregiving and domestic labour in African societies. This supports arguments that digital inequality is deeply embedded in social role structures, rather than merely access to devices or connectivity (Sambo et al., 2024). Women in developing and underdeveloped countries are generally more deprived than men because of the cultural expectation of household chores and child care responsibility. Akanji et al. (2022) further buttressed this through a qualitative study among 28 newly married (between 3-10 years) female academics in Nigerian universities and revealed an intensification of stress levels among these women who find it very difficult to maintain balance between their work and their family duties. In a similar study of female medical practitioners, Adisa et al. (2017) found that work performance often suffered when it came in conflict with family duties and that the very demanding character of both hospital and family work took a heavy toll on the health of the medical and nursing staff. The library and information profession is widely regarded as female-dominated, representing a substantial majority of the workforce (Ankush, 2024; Ashiq & Warraich, 2023). Studies indicate that female library professionals often demonstrate lower confidence and slower adaptation in using digital technologies compared to their male counterparts (Daniali, 2022; Ashiq & Warraich, 2023). This imbalance suggests that technology-related spaces within librarianship are male dominant, which may be largely caused by the socio-

cultural factors that impede skills development of female library professionals with implications for the sustainability of digital library services (Adekoya & Busayo, 2024). This further explains the findings on low digital proficiency of female library professionals in Nigeria, as presented in Chapter 6 (Section 6.2.3).

Socio-Economic dimension

Socio-economic impediments were most pronounced among library officers and younger staff, with cadre producing the largest mean difference. The vulnerability of library officers reflects their lower salary scales, limited training privileges, and marginal positioning within institutional hierarchies. Ibegbulam and Eze (2016) examined the skill levels and training needs of paraprofessionals (library officers) in Nigerian university libraries and identified a pronounced disparity between professional librarians and paraprofessionals, largely attributable to differences in educational qualification requirements. This gap influences career advancement opportunities and, by extension, pay grades and income levels. Such inequalities constitute economic barriers to digital skills development, particularly in contexts where individuals are expected to finance their own training due to the absence of institutional support for structured capacity-building programs. These constraints also intersect with age and experience, as younger staff who typically have fewer years of service are more likely to occupy lower pay grades than their more experienced counterparts. This finding reinforces calls for equity-based staff development policies that prioritise paraprofessional and younger staff who constitute the operational backbone of university libraries (Omotunde, 2024).

Organisational Constraints

Organisationally, funding shortages and weak managerial encouragement constitute dominant barriers. These findings echo consistent Nigerian evidence that institutional underfunding

remains the single greatest constraint to ICT and digital capacity building in libraries. institutional constraints including inadequate policies, poor funding, and limited professional training opportunities (Jabeen 2024; Adekoya & Busayo, 2024; Yakubu & Bizi, 2026). Adegbore et al., (2025) agreed that the economic challenges in Nigeria like most other developing countries exacerbate the situation, leaving university management struggling to meet their obligations for staff development and prompt salary payments. The relationship between inadequate funding for university management and their difficulty in meeting salary obligations further illustrates how weak organizational commitment functions as an economic barrier to self-funded digital skills development initiatives.

The non-significance of rank and promotion status suggests that staff motivation to acquire digital skills is intrinsically driven; however, without strategic leadership commitment and dedicated funding, such motivation cannot translate into meaningful capacity development.

7.6 Synthesising key findings and SDGs

Digital skills deficits among Nigerian university library staff are less a problem of attitude and more a consequence of systemic educational, economic, and organisational failures. The observed inadequacies in LIS curricula and continuing education programs have important implications for the sustainability of digital transformation in Nigerian university libraries. Sustainable development within higher education institutions depends heavily on continuous human capacity development, particularly in digital competencies that support innovation, knowledge access, and service efficiency. From a sustainability perspective, the lack of digital content in LIS curricula suggest that current educational structures may be insufficient to support long-term institutional resilience in automated library operations. This finding aligns directly with SDG 4 (Quality Education), which emphasizes inclusive, equitable, and relevant education that equips learners with skills needed for employment and lifelong

learning. When LIS programmes fail to embed robust digital competencies, they inadvertently weaken the pipeline of digitally prepared professionals required to sustain modern library ecosystems. Recent Nigerian studies affirm that outdated LIS curricula undermine the sustainability of academic libraries' digital initiatives and limit their capacity to support teaching, learning, and research in technologically intensive environments (Adebayo & Ahmed, 2023; Nwankwo & Izuagbe, 2022).

Furthermore, the moderate positive correlation between training programs and digital skill levels reinforces the sustainability argument that continuous professional development constitutes a strategic investment rather than a peripheral activity. Sustained training ensures that libraries are not locked into cycles of technological obsolescence but instead maintain adaptive capacity over time. This resonates with SDG 9 (Industry, Innovation and Infrastructure), which advocates strengthening technological capabilities and promoting infrastructure development within institutions. In the context of Nigerian university libraries, digital skills training becomes a form of institutional infrastructure, enabling the effective utilisation of automation systems and emerging digital platforms.

The prominence of income level, family responsibilities, and marital commitments as barriers to digital skills development reflects deeper socio-economic sustainability concerns related to equity and inclusion. Sustainable digital transformation cannot be achieved if large segments of the workforce remain structurally disadvantaged in accessing training opportunities. The findings indicate that socio-economic vulnerabilities disproportionately affect females, younger staff and paraprofessional (library officer) cadres, thereby threatening the long-term continuity of skilled human capital in Nigerian university libraries. This pattern speaks directly to SDG 10 (Reduced Inequalities), which calls for reducing disparities within institutions and ensuring equal access to opportunities. Without targeted financial and

structural support for vulnerable staff categories, digital capacity building risks becoming uneven and unsustainable. Nigerian evidence shows that unequal access to professional development exacerbates skills gaps between librarians and library officer staff, reinforcing hierarchical digital divides within libraries (Ezeani & Eke, 2023; Yusuf & Adebayo, 2024).

Additionally, the finding that gender roles significantly shape socio-cultural impediments highlights the relevance of SDG 5 (Gender Equality). Sustainable workforce development requires institutional policies that recognise and mitigate the disproportionate domestic and caregiving burdens borne by women. Where such considerations are absent, digital training initiatives may unintentionally reproduce gendered inequalities, weakening the overall sustainability of library automation programs.

7.7 Methodological Limitation of Quantitative Findings (Chapter 6 & 7)

Recognizing methodological limitations is essential for assessing the validity of the data and ensuring careful interpretation of the results. As Fryer and Dinsmore (2020) note, although self-report methods offer valuable insights, they also present notable challenges related to research design, analysis, and validity, underscoring the need for reflective and methodologically rigorous application.

The study draws on self-reported data to capture participants' subjective experiences; however, this approach is inherently susceptible to potential inaccuracies. Respondents may unintentionally provide biased answers due to social desirability tendencies or limitations in memory recall. These limitations are especially important when interpreting comparative results across different groups, as social norms, cultural expectations and perceptions of competence may shape how respondents evaluate and report their own abilities. In the context of examining age and gender differences between male and female university library professionals in Nigeria, such influences may affect self-assessment patterns. Therefore,

findings indicating lower digital skills among women and older staff may partly reflect methodological constraints associated with self-report measures, rather than solely representing actual differences in competence.

Furthermore, the unequal distribution of respondents across national geographical distribution, arising from the exclusion of the northern region of Nigeria due to security concerns and the consequent restriction of the study to the southern region requires careful interpretation of statistically significant differences. Limited regional representation may affect the robustness and generalizability of the findings. Accordingly, although the results offer valuable insights into patterns of digital skills distribution, they should be interpreted with caution. Future research should strive for a more geographically balanced sample to improve statistical reliability and enhance the country-wide applicability of the findings.

During the presentation and discussion of the findings, the researcher observed that some questionnaire items in Tables 6.1 and 7.4 could have been slightly reworded to make them clearer and easier for the readers to understand. However, the original wording was retained in the tables in order to maintain consistency and clear connection between the research instrument and the findings presented. Although this approach improves methodological transparency, some of the original items may not appear very concise or immediately clear to the readers. Therefore, further explanation was provided during the interpretation and discussion of the findings where necessary, such as the discussion of basic digital skills in Chapter 6, Section 6.1, and socio-cultural and economic factors in Chapter 7, Section 7.4. This was done to clarify the meaning of the findings without changing the original questionnaire wording or the responses provided by the participants.

7.8 Summary of Chapter

This chapter addressed research questions two and three and inferential statistical analysis of hypotheses H6 by presenting the quantitative results and discussions on the existing capacity development programs enhance digital skills and the individual constraints to digital skills development of university library staff in Nigeria. This study uncovers a basic level of digital competency but also points out substantial digital operational tasks shortcomings that jeopardize the sustainability of automated library services. Addressing these challenges requires multi-level interventions: curriculum reform in LIS education, sustained and funded continuing professional development, gender and cadre-sensitive training policies, and strong managerial leadership. Without such comprehensive reforms, the ambition of sustainable automated and digitally driven university libraries in Nigeria is unlikely to be realised. This, in turn, supports sustainable advancement toward SDGs 4, 5, 8, 9, and 10, which requires coordinated institutional strategies that embed continuous and relevant lifelong learning, promote digital inclusion, adopt socio-culturally and economically responsive training policies, ensure sustained investment in workforce development, and demonstrate strong managerial leadership. Digital skills development among Nigerian university library staff is not only a professional necessity but also a sustainability imperative that intersects with national and global development agendas.

The next chapter presents the qualitative phase of the study, which addresses Research Question 4 through interviews with senior management staff of Nigerian university libraries in order to gain deeper insights into the managerial challenges associated with digital skills development, disparity in digital skills and training access, and to explore potential solutions.

CHAPTER EIGHT

MANAGERIAL CHALLENGES AND FACTORS RELATED TO DIGITAL SKILLS DEVELOPMENT

8.1 Introduction

This qualitative phase of the study involved analysing conversational interviews conducted with ten senior management staff. The analysis aimed to identify both explicit and implicit managerial and institutional challenges associated with digital skills development and training, while also eliciting suggestions on strategies for improving digital skills development initiatives that address critical gaps in operational digital skills and existing digital skills development programmes.

The specific research question addressed in this chapter is:

RQ4: What management-side factors impede the digital skills development of Nigerian university library staff for automated library operations?

8.2 Results

Demographic Characteristics of Participants

Table 8.1 illustrates the demographic profiles of the interviewees, which include senior management personnel from various universities, providing a broad spectrum of experiences and insights into library operations.

Table 8.1 demographic profiles of the interviewees

S/N	Participant Code	University	Gender	Time: Hr: Min: Sec
1	P1	University of Ibadan (UI)	Female	00:38:45
2	P2	University of Nigeria, Nsukka (UNN)	Female	00:49:48
3	P3	Federal University of Technology, Akure (FUTA)	Female	01:22:52
4	P4	Federal University, Bayelsa (FUB)	Male	00:57:16
5	P5	Federal University, Oye Ekiti (FUOYE)	Female	00:31:07
6	P6	Afe Babalola University	Female	00:45:22
7	P7	Babcock University	Male	01:09:53
8	P8	Elizade University	Female	01:05:38
9	P9	University of Benin	Female	00:39:06
10	P10	University of Uyo	Male	00:49:21

Table 8.1 provides a comprehensive overview of the demographic characteristics of the ten senior management staff members who participated in the qualitative phase of this study. Each participant is anonymized with a code (P1 to P10), facilitating the discussion of their insights while maintaining confidentiality. This approach enables referencing specific contributions without exposing identities, thus preserving the integrity of the information shared.

The universities represented in this table encompass a range of esteemed institutions across Nigeria, reflecting a diverse spectrum of experiences and operational contexts. For instance, the University of Ibadan (UI), as Nigeria's first university, brings a historical perspective on challenges and best practices in academic library management. In contrast, institutions like the University of Nigeria, Nsukka (UNN), renowned for its emphasis on research and innovation, may contribute forward-thinking practices that address contemporary library issues. The Federal University of Technology, Akure (FUTA), with its technology-oriented focus, provides insights into the integration of modern technological solutions in library operations.

Other participants hail from relatively newer institutions, such as the Federal University, Bayelsa (FUB), and Afe Babalola University (ABUAD). Their input may reflect the unique challenges faced by libraries that are still developing their infrastructure and digital competencies. The representation of both private universities such as Babcock University and Elizade University and public institutions underscores the potential differences in funding mechanisms, administrative processes, and operational challenges inherent in diverse educational contexts.

In terms of institutional positions, the participants occupy roles ranging from Deputy University Librarians to Principal Librarians. This hierarchy plays a significant role in shaping their perspectives and experiences. Senior management representatives, particularly those holding the title of Deputy University Librarian (P2, P3, P4, and P10), likely possess extensive experience and decision-making authority regarding library policies. Their insights contribute authoritative perspectives on organizational challenges, revealing complex layers of operational dynamics. Conversely, Principal Librarians (P1, P5, P6, P7) are typically involved in implementing the policies set forth by senior leadership. Their input may highlight the practical realities of policy execution and the day-to-day challenges of library management, providing balance to the discussions.

The duration of interviews varied significantly, ranging from approximately 31 minutes to over 1 hour and 22 minutes. This variance may indicate differing depths of discussion; longer interviews, such as that of P3 (1:22:52), suggest a more engaged dialogue or the sharing of intricate experiences, while shorter interviews may reflect more straightforward insights or succinct communication of major points without extensive elaboration.

Overall, the diverse representation of participants, encompassing various university types and hierarchical roles, enriches the data set and enhances the study's findings regarding digital

skills development in Nigerian university libraries. The breadth of experience and context represented offers valuable perspectives on the managerial challenges, strategies for training implementation, and the gaps in digital skills training that need to be addressed. This nuanced understanding is critical for developing tailored solutions that cater to the distinct needs of library staff across different institutional environments.

8.3 Thematic breakdown of managerial challenges

RQ4: *How has institutional (policies, funding mechanisms, and leadership cuture) factors impede the development of digital skills among library staff in Nigerian universities for automated library operations?*

This section captures the underlying institutional challenges that inhibit effective digital skills training. The findings are categorized into three primary predetermined themes: funding mechanism, policy framework and management efforts toward digital skills enhancement.

8.3.1 Theme 1: Availability of Policy Framework

The study participants acknowledged the existence of a policy framework for capacity development, they noted a lack of specificity regarding digital skills training. This is evidenced by statements reflecting the ambiguity in existing policies:

> ***P3:*** *"We do have documents outlining staff development, but they lack specific protocols for digital training."*

To validate this point, additional perspectives from participants highlight how policies are not uniformly applied across departments:

> ***P2:*** *"Our written documents exist, but actual training for digital competencies often depends on university management's discretion."*
>
> ***P9:*** *"We do have a university-wide policy document on capacity development; however, it does not specifically address the immediate training needs of librarians"*

This reinforces the need for a more explicit policy direction that details the requirements for digital skills development for library staff.

8.3.2 Theme 2: Funding and Budgetary Allocation

Virtually all participants remarked on poor funding and the failure of the statutory 10% annual budgetary allocation intended for libraries. However, external funding from organizations such as TETFund and NITDA have provided some relief to libraries.

Sub-theme 1: Statutory library Allocation Issues

Discussions regarding the 10% statutory budgetary allocation revealed that it is frequently unfulfilled, limiting the library's operational ability to conduct effective training programs:

> ***P5:*** *"The 10% allocation rarely translates into actual funds; it seems to exist more on paper than in practice."*
>
> ***P10:*** *"University management rarely allocate the statutory budget to the library, leaving us to scramble for additional funding sources."*

Some participants noted that the non-implementation of the statutory 10% annual budgetary allocation for libraries in public universities has shifted the responsibility for funding staff training from library managements to parent institutions. As a result, libraries depend largely on university-wide funding support, which is often subject to managerial discretion and may cause delays in training activities. This situation highlights the need for explicit budgetary prioritization of library staff training:

> ***P1:*** ***"****Requests for financial support for conferences are typically approved when submitted early; however, the release of funds is often delayed due to bureaucratic bottlenecks"*
>
> ***P10:*** ***"****Staff are required to apply to the bursary unit well in advance, as such requests must pass through multiple stages of approval before funds are eventually disbursed"*

The situation is different with privately owned universities, as statutory funding is often released to the library managements directly to meet their skills development needs:

P6: *"As a private institution, university management generally adheres to the NUC guideline, requiring a statutory 10% annual budgetary allocation be released to library management for operational use"*

P7: *"Libraries in private universities in Nigeria, especially mine, receive the institution's statutory 10% annual budgetary allocation to the library"*

Sub-theme 2: External Funding (Context on TETFund and NITDA)

TETFund and NITDA play significant roles in supporting educational funding for universities in Nigeria. TETFund primarily offers grants for capacity development, while NITDA concentrates on promoting technological advancement through the sponsorship of training and ICT-related initiatives. Although financial support from these agencies has provided some measure of relief to university libraries, access to such funding is often dependent on government priorities and institutional regulations.

P5*: "TETFund has always contributed to library staff's training and development"*

P1: *"We enjoy external funding for training and capacity building, sponsored by TETFund and NITDA"*

8.3.3 Theme 3: Library Management interventions

This theme examines the post COVID 19 proactive initiatives (or lack thereof) by library management to enhance digital skill competencies .

Sub-theme 1: Post-COVID 19 training Initiatives

Post-pandemic, some library managements have taken initiatives to improve training by engaging external resource personnel for training:

P9: *"COVID-19 shifted our focus; we've implemented more training sessions to enhance staff skills."*

P7: *"Library management brings in experts for hands-on workshops, which significantly benefits our staff."*

P2: *"We have held in-house training programs, which were facilitated by our in-house experts."*

Yet, there is also a difference in opinion indicating stagnation in training efforts:

> ***P8:*** *"After COVID-19, no new training sessions were initiated. We've largely maintained status quo."*

Sub-theme 2: Post-COVID 19 infrastructure Initiatives

Libraries where training initiatives have commenced, they are constrained by inadequate technological infrastructure (quality and quantity), resulting in training programs being delivered within limited and sub-optimal digital environments.

> ***P5:****" We do not have sufficient ICT facilities for Effective digital training"*
>
> ***P4:****"Our existing ICT facilities are obsolete making it difficult to organize effective digital training session"*
>
> ***P2:****"Participants in our training programs encounter challenges such as poor internet connectivity and insufficient computers"*

Nevertheless, libraries that engage in strategic partnerships and intra-institutional collaborations tend to benefit from enhanced infrastructure.

> **P3:** *"Our library collaborates closely with the University Computer Resource Center on technology infrastructure, which ensures the availability of adequate facilities for digital skills training. Additionally, the parent institution provides consistent and reliable support."*

8.4 Thematic Analysis of Factors Influencing Digital Skills Development

This section examines the factors of personal demographic, socio-cultural influence and prior library school education, as they affect the enhancement of digital skills. These issues emerged from the findings in Chapter Seven concerning staff-related barriers to digital skills development. The present section seeks to validate those quantitative findings and provide deeper insight into them.

8.4.1 Theme 1: Personal Factor (Age and Health Challenges)

While age was noted not to be a significant barrier for some:

> ***P10:*** *"No age disparity; all staff are being trained according to their levels."*

Another voice suggested that older librarians may struggle with technology adoption:

> ***P6:*** *"Health challenges and age can impact some individuals' ability to engage with new technologies."*

8.4.2 Theme 2: Socio-cultural Factors (Gender and family commitments)

The female dominance in the LIS profession was highlighted in the quantitative phase of this study, with a recognition that socio-cultural factors associated to gender roles such as family and marital commitments can affect training access:

> ***P9:*** *"Family commitments often hinder women's attendance at training sessions."*
>
> ***P2:****"Marital and care-giving responsibilities could affect the digital skills level of library staff"*

However, another voice strengthens the argument that despite the socio-cultural factors, there is no gender bias in presenting staff for training opportunities, as library management maintains gender equality policy:

> ***P3:*** *"We ensure treating all staff equally, regardless of gender."*

8.4.3 Theme 3: Library School Education

The existing LIS curricula and course content in Nigeria are outdated and inadequately aligned with the demands of the evolving digital environment. Even where digital courses are included, there remains a pressing need to shift from predominantly theoretical instruction to more practical, hands-on approaches:

P8: "*Library schools in Nigeria lag behind. The curriculum approach is more theoretical than practical "*

P2: *"Our library schools have not advanced to bridge the gap in technological skills"*

There is renewed optimism, as participants noted that library schools are expected to transition from the BMAS framework to the NUC's 2022 CCMAS, which places greater emphasis on practical digital competencies:

P5:*"Library schools are expected to adopt the CCMAS, which provides for more practical digital library courses."*

P4:*"Some of the new courses introduced under the CCMAS will help meet the demands of the evolving digital environment if library schools implement the curriculum."*

Encouragingly, the adoption process has already commenced in some Nigerian universities.

P10: *"We already adopted the new CCMAS curriculum in my university"*

8.4.4 Theme 4: Cadre-Based Training Disparities

The findings reveal a clear pattern of training prioritization that favors the librarian cadre over paraprofessional (library officer) staff. This disparity appears to stem largely from limited financial and institutional resources available for capacity development. As a result, management tends to allocate scarce training opportunities to those perceived to have greater operational responsibility and strategic roles in digital service delivery:

P4:*"librarians are often prioritized because they handle more complex digital and operational tasks within the library"*

P10: *"Even though we send library officers for training, librarians are prioritized for digital skills training because they manage more digital operational responsibilities."*

P6:*"We place librarians above paraprofessionals because they hold higher academic qualifications, and due to resource limitations, when a librarian is trained, they can replicate the knowledge with their subordinates"*

While this approach may reflect a pragmatic response to financial constraints, it also reinforces existing cadre-based inequalities in access to digital skills development opportunities.

8.5 Thematic Breakdown of Potential Solution to Digital Skills Development Challenges

This section discusses the library managers' perspectives and suggestions on approaching digital skills training initiative towards sustainable automated library operations.

8.5.1 Theme 1: Funding Mechanism

Given the persistent funding challenges in Nigerian public universities, institutional-level allocations alone are insufficient to drive meaningful progress in digital skills development. Sustainable and well-structured funding mechanisms whether at the national or institutional level are therefore critical. Participants expressed a desire for TETFund and NITDA or any other relevant agencies to provide more direct financial intervention for the universities:

> ***P5:****"Libraries require sustainable funding beyond statutory allocations to effectively achieve their training objectives"*

> ***P3:****"To make the expected progress, there is very little that individual institutional funding can accomplish on its own"*

8.5.2 Theme 2: Training Delivery Methods

Participants proposed a range of strategies for delivering digital skills training, including national-level conventions, institution-based programs, and self-paced learning models. There was broad agreement that a multi-layered approach combining these three strategies would help consolidate resources, optimize expertise, and improve training outcomes:

> ***P4:*** *"School management should collaborate to provide training that meets collective needs."*

P1: *"A mixed approach where large-scale training offers broad, high-quality exposure and institutional-level programs provide more tailored and practical sessions would be more effective."*

P2:*"Developing digital repositories, such as toolkits or recorded training sessions uploaded to platforms like YouTube, could encourage self-paced learning initiatives"*

Thus, developing a unified strategy underscores the potential benefits of combining centralized coordination with localized customization to enhance the efficacy of training programs, ensuring broader participation without undermining individual flexible learning options.

8.5.3 Theme 3: Stakeholder Engagement

The involvement of professional bodies like NLA and LRCN is fundamental to creating a sustainable framework. Participants noted the importance of having strong regulatory support to guide libraries in developing competent and technology-savvy staff.

P4: *"National-level professional bodies like the LRCN and* NLA *should regulate library affairs, to ensure quality control of the information profession"*

P10: *"If training is organised at the national level by relevant professional associations, it will be of higher quality"*

P3: *"If we are to move as expected, there is nothing each university can Achieve, there is need for coordination by LRCN or NLA"*

8.6 Overview of Managerial Challenges of Digital Skills Development

The analysis of managerial challenges surrounding digital skills development in Nigerian university libraries reveals a multifaceted landscape fraught with obstacles. One of the predominant issues identified is the ambiguity in policy frameworks. Although participants acknowledged the existence of general policies governing staff capacity development, these documents often lack explicit directives concerning the enhancement of digital skills. This creates a situation where the implementation of training programs is subject to the discretion of university management, highlighting a critical gap in policy effectiveness and indicating

that the lack of specificity in policy documents often leads to inconsistent training opportunities across different libraries. The absence of clear directives weakens institutional alignment with SDG 4, which emphasizes inclusive and equitable quality education and lifelong learning opportunities.

Furthermore, the challenge of inadequate budget allocation significantly impedes efforts to foster digital skills. Participants consistently reported that the statutory 10% budget designated for libraries is seldom fulfilled, resulting in financial constraints that limit access to necessary training and resources. One participant lamented, "The 10% budget exists more on paper than in practice," indicating a pervasive disappointment regarding operational funding. This financial shortfall limits access to training, technological infrastructure, and professional development resources, thereby undermining progress toward SDG 9, which calls for strengthened infrastructure and innovation systems. The funding gap also affects workforce productivity and professional growth, linking directly to SDG 8. Many library administrators expressed frustration at being forced to seek alternative funding sources to meet basic operational needs, thus diverting attention away from proactive skill development initiatives.

In this context, external funding bodies such as TETFund and NITDA emerge as critical players. TETFund provides financial support specifically aimed at enhancing educational resources, yet participants noted that access to these funds can be inconsistent, particularly for private institutions. NITDA, focused on promoting technology and digital literacy, offers workshops and training programs, but similar limitations exist in terms of eligibility and accessibility. A participant hinted at the reliance on governmental priorities, stating, “While these organizations offer good support, how often we receive funding is dictated by administrative focus, which can vary significantly.”

Another key challenge is the disparity in training access based on staff categories. The distinction between professional librarians and paraprofessionals emerged as a significant theme in the discussions. Senior management acknowledged that while professional librarians often receive more training opportunities, paraprofessionals frequently miss out due to institutional policies that prioritize funding for higher-ranking personnel. For example, one participant noted, “Most training programs cater exclusively to professional librarians. This leaves paraprofessionals without the necessary skills, creating a notable skills gap within the library workforce.”. This unequal access to training contributes to workforce stratification and aligns with concerns addressed in SDG 10, which advocates reducing inequalities within institutions and societies.

The aforementioned challenges are further compounded by a lack of proactive managerial efforts aimed at enhancing digital skills. While some libraries have initiated training improvements post-COVID-19, others remain stagnant, relying on outdated practices and failing to adapt to the new digital landscape. Participants reported, “Management shifts post-pandemic have led to increased training initiatives, but the variation in effort across institutions is stark." This uneven institutional response reflects a broader need and deeper issue within library management practices, emphasizing the need for sustained leadership commitment, strategic planning, and continuous learning cultures for advancing digital transformation adaptation in the rapidly evolving technological age.

8.7 Summary of Chapter

This chapter has highlighted the complexities and managerial challenges associated with enhancing digital skills development in Nigerian university libraries. Through a conversational interview approach with ten university library senior management staff. It underscores the pressing need for clear policies, sustainable funding models, and strong

institutional support for comprehensive training programs to addressing disparities and strategic stakeholders engagement. In light of the quantitative and qualitative findings of this study, the next chapter proposes a strategic framework aimed at fostering a sustainable digital skills development initiative.

CHAPTER NINE
STRATEGIC PLAN TO SUSTAINABLE DIGITAL SKILLS DEVELOPMENT OF LIBRARY PROFESSIONALS IN NIGERIA

9.1. Introduction

This chapter harnesses the key findings regarding digital skills levels and gaps, existing training pathways, capacity development challenges, and insights from university library leadership in Nigeria, as presented in Chapters 6, 7, and 8. Building on this evidence, it proposes a sustainable framework for advancing the digital skills development of university library professionals in Nigeria.

9.2. Strategic Management Planning

Pathak (2024) describes strategic management planning as a systematic assessment of internal processes and external influences affecting an organization, aimed at ensuring the efficient management and utilization of resources to achieve defined objectives. This implies that developing a strategic plan requires the articulation of clear and realistic goals, alongside a thorough analysis of the current context and other influencing factors. This study adopts the prescriptive approach of the ASANA strategic management framework, as earlier discussed in Chapter 4 (Section 4.5) to develop the strategic sustainable plan aimed at enhancing the digital competencies of university library professionals in Nigeria. Specific objectives were set for this study as presented in Chapter 1 (Section 1.5) and here is the summary of key findings:

Findings show that Nigerian university library staff possess adequate foundational digital skills for communication and administrative functions but exhibit significant gaps in digitization and preservation at the basic skills level. A key empirical insight is the continued dominance of Koha as the primary open-source library management system, confirming earlier research while newly establishing that this pattern remains unchanged in the post-

COVID period. Operationally, competence is concentrated in Koha-based cataloguing and circulation, whereas acquisition, serials, and reference services remain weakly automated and under-skilled. These gaps have direct implications for institutional repository management, procurement workflows, digital preservation, website and media management, and user engagement strategies.

Demographic disparities in digital skills reveals a clear concentration of competence among male staff, librarians (professional cadre), and those in early to mid-career stages, particularly younger employees. In contrast, lower skill levels are more evident among younger female staff, paraprofessionals (library officers), and older personnel with longer years of service. These patterns reflect the combined influence of weak LIS educational foundations, socio-cultural and socio-economic constraints, and limited institutional support for structured capacity-building initiatives. Collectively, these disparities highlight issues of inequality, digital and institutional exclusion, and the absence of inclusive, institutionally supported professional development frameworks.

Overall, the findings highlight the need for targeted, structured digital capacity development that moves beyond basic literacy toward comprehensive operational efficiency with consideration for institutional sustainability enablers; effective funding mechanism, tailored training initiatives, clear and inclusive policy direction and continuous infrastructure upgrade.

9.3 Proposed strategic plan for sustainable digital skills development

This section outlines the proposed solutions and strategic recommendations emerging from the triangulation of the study's primary quantitative and qualitative findings (Chapters 6, 7, and 8). It also incorporates insights from interviews with ten senior university library management staff, which provided suggestions for enhancing digital skills development and training initiatives, including sustainable funding models, clear policy direction, and

strengthened training and infrastructure programmes (Chapter 8, Section 8.5). These recommendations are further supported by evidence from a literature-based market scan, highlighting comparable intervention efforts and relevant policy frameworks. The strategic plan is grounded in the study's theoretical framework, integrating Martin's digital literacy model with Chowdhury's sustainability framework to guide sustainable digital skills development.

9.3.1 Synthesized Digital Skills and Sustainability Model

The synthesis of Martin's digital literacy model with Chowdhury's sustainability framework (Martin, 2006; Chowdhury, 2014), provides a theoretically coherent and contextually grounded model for analyzing digital skills development in Nigerian university libraries. It establishes the foundation for subsequent empirical analysis and strategic recommendations aimed at achieving sustainable, equitable, and operationally mature digital transformation. This integrated framework posits that automation transformation in Nigerian university libraries is a function of dynamic interaction between:

(A) Digital Skills Progression (Martin Adapted Model)

- Basic ICT literacy
- Operational/task-based digital competence

(B) Sustainability Enablers (Chowdhury Framework)

- Economic sustainability (stable funding and resource mechanisms)
- Social sustainability (equitable training access across demography)
- Environmental sustainability (responsible and scalable infrastructure use)
- Institutional context (policy specificity, leadership, governance structures)

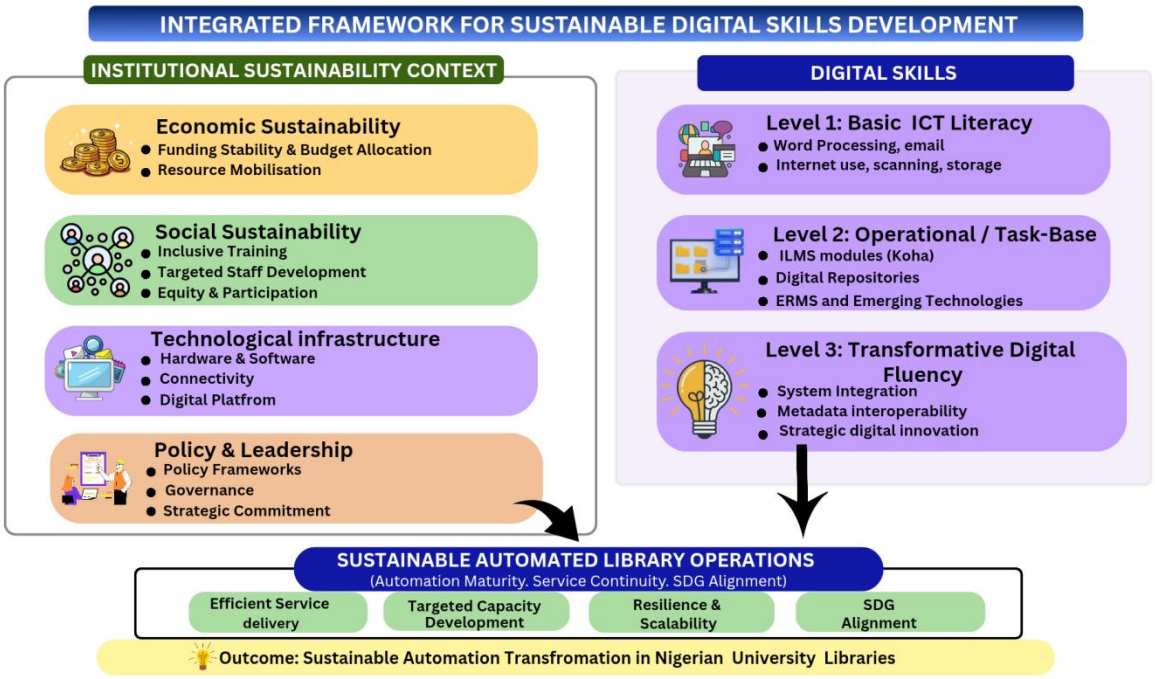


Figure 9.1: Integrated framework for sustainable digital skills development

The framework advances the central proposition that progression from foundational literacy to digital fluency is conditional upon sustainability enablers. Where sustainability pillars such as inconsistent funding, obsolete infrastructure, or inequitable training policies are weak, digital skills development becomes fragmented, exposure-dependent, and ineffective. Thus, digital skills are not treated as isolated technical attributes but as embedded outcomes of institutional ecosystems. A combination of both institutional enablers and digital skills will contribute to overall sustainable automated operation in Nigerian university libraries.

From the integrated model, several key variables emerge for consideration. These variables are structured across two strategic layers: local and external. The local layer focuses on internal strategic actions that address both staff- and management-related concerns, which universities should adopt to foster sustainable digital skills development. In contrast, the external layer involves strategic initiatives that require multi-level collaboration between university management and relevant stakeholders to provide systemic support and ensure long-term impact. The implementation of these strategies can be guided by the five stages of

the ASANA strategic framework (see Chapter 4, Section 4.5). Figure 9.2 illustrates a schematic representation of the key variables under discussion.

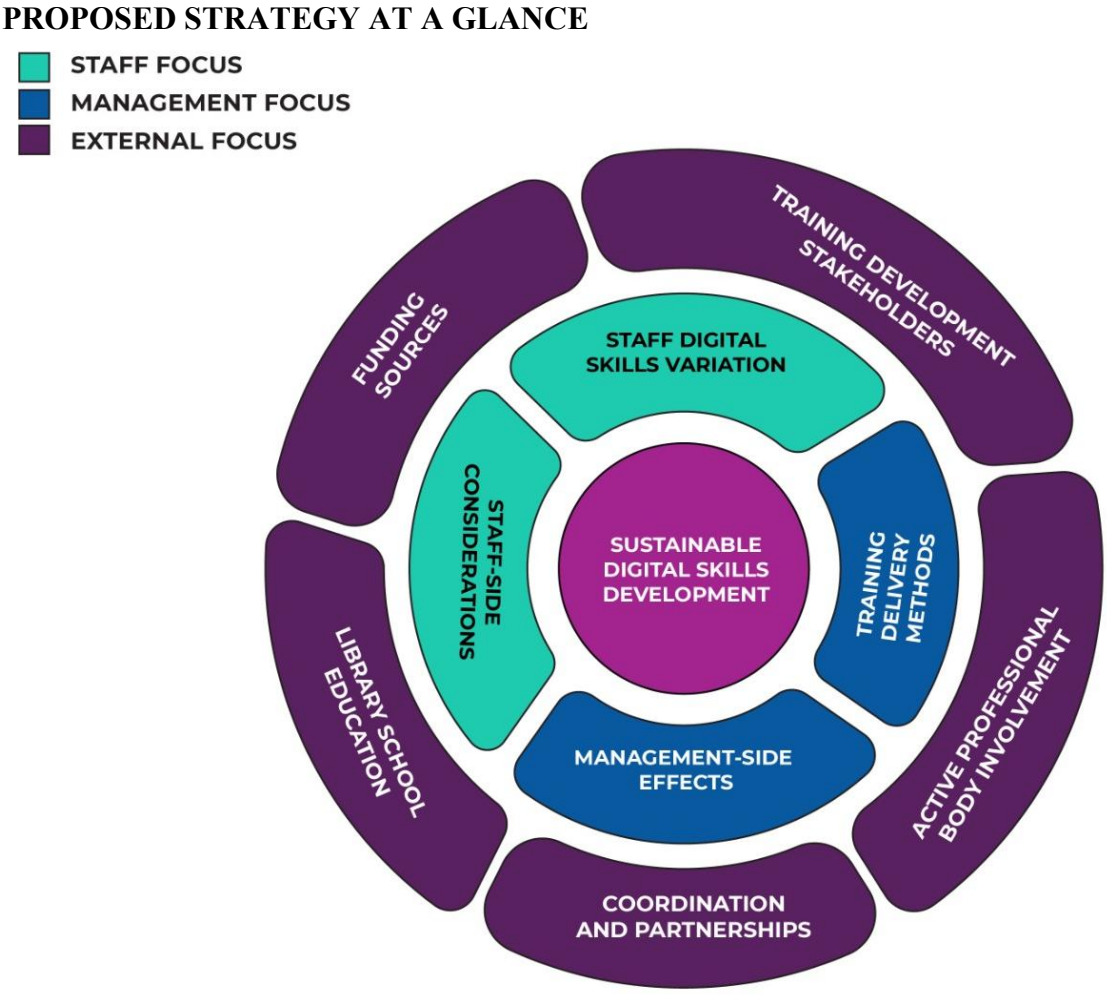


Figure 9.2: A strategy flowchart for sustainable digital skills development

9.4 Local Layer Strategic Focus

To foster sustainable digital skills development among library staff in Nigeria, universities and library management must address key internal challenges. These priorities fall into two broad areas: staff-focused interventions and management-focused strategies.

9.4.1 Digital Skills Disparities

Defining the problem

Although Nigerian university libraries operate under formal equality policies that provide staff with equal access to training opportunities, women's participation is constrained by contextual socio-cultural realities (e.g., childbirth, caregiving, and family responsibilities). In a predominantly female profession, a strict equality model can reproduce unequal outcomes. As Jabeen (2024) and Hebl and King (2019) note, gender equality ensures equal access, whereas gender equity introduces supportive mechanisms that enable fair participation. Global policy discussions similarly highlight the need for equity-focused frameworks providing compensatory support to ensure fairness are better suited to address persistent structural barriers affecting women's sustainable digital skills development (WEF, 2024; UNICEF, 2025).

Additionally, this study identified disparities associated with staff cadre and generational differences. Young early-career professionals demonstrate stronger digital competencies than older colleagues, while paraprofessional staff (library officers) report lower digital confidence despite performing many operational functions that support digital services. Previous studies have shown that professional development initiatives in Nigerian librarianship prioritised librarians, often overlooking paraprofessionals (Oke & Oguntase, 2010; Akintola et.al, 2020). This imbalance contributes to uneven digital capacity across the workforce and may undermine the sustainability of digital services within university libraries.

Proposed Solutions and Implementation Pathways

Addressing these disparities requires a more inclusive and structured approach to digital capacity development.

- **Gender-responsive training frameworks:** Universities should review existing staff development policies through gender impact assessments and embed equity-based provisions where necessary. Flexible learning options such as hybrid training, asynchronous courses, and modular certification programmes can enable staff with family responsibilities to participate more effectively. Where possible, institutions may also provide protected professional development time within official working hours or approved leave, and childcare support (e.g., stipends/allowances during in-person sessions).
- **Inclusive competency frameworks:** University libraries should adopt tiered digital competency frameworks that clearly define required skills for both librarians and paraprofessional staff. Training plans should explicitly allocate opportunities across all staff categories to prevent the concentration of capacity development within a single cadre. With guaranteed quotas for paraprofessional participation in all digital initiatives.
- **Targeted paraprofessional upskilling programme:** Library managements and professional body such as NLA/LRCN should include subsidised tracks for paraprofessionals, to deliver specialised and practical, role-based training for library officers and other operational staff whose work directly supports digital systems. These programmes may focus on areas such as digitisation workflows, repository support, metadata management, and troubleshooting of library systems. Partnerships with university ICT units and external training providers could support the delivery of practical micro-credential programmes tailored to operational library functions.
- **Intergenerational learning models:** University libraries should also leverage the complementary strengths of different staff groups. Younger professionals with stronger technological confidence can provide peer mentoring in digital tools, while senior staff contribute strategic insight, institutional knowledge, and professional experience.

Structured peer-learning environments such as “digital peer labs” could facilitate this reciprocal knowledge exchange.

- **Youth representation in digital decision-making:** Given the digital orientation of early-career professionals, library management should intentionally include younger staff in committees responsible for digital transformation, technology procurement, and innovation planning.
- **Modular and Webinar Learning:** Partnerships with reputable online learning providers and LIS professional bodies, i.e NLA and LRCN to co-design contextualised digital micro-credentials and short stackable digital skills certifications tailored to Nigerian university library needs to reduce the burden of long-duration/off-site programs.

9.4.2 Workforce Conditions and Staff Motivation

Defining the problem

Digital capacity development is also shaped by broader workforce conditions. This study identified several interconnected individual (age, health, finance, motivation) and organisational (underfunding, salary irregularities, industrial action, workload) factors that limit skills development among Nigerian university library staff. Older staff may experience physical strain from prolonged computer use including visual fatigue and musculoskeletal discomfort, an issue supported by ergonomics literature in academic libraries (Kahal et al., 2025; Newman, 2025). In many public universities, chronic underfunding lead to irregular salary payments and industrial actions. Also, heavy workloads resulting from staffing shortages further weaken staff motivation and reduce opportunities for professional development (Ojule & Oliobi, 2024; Vanguard newspaper, 2024). These findings align with research indicating that organisational conditions significantly influence staff commitment and performance (Shahzad & Khan, 2023; Omotunde et al., 2024).

Proposed Solutions and Implementation Pathways

- **Ergonomic and workplace wellbeing initiatives:** Libraries should conduct periodic ergonomic assessments of digital workspaces and introduce improvements such as adjustable seating and workstations, appropriate lighting, screen filters, and scheduled screen-break policies. Collaboration with university health services and occupational health partners can support annual ergonomic audits and staff wellness initiatives (Newman, 2025).
- **Dedicated training time and workload management:** Institutions should formally integrate professional development into operational planning. Rotational staffing arrangements or using interns/adhoc support during peak training periods may help ensure service continuity while employees participate in training programmes. Establishing a minimum number of annual digital training hours could also institutionalise staff development.
- **Motivation and recognition mechanisms:** University management should stabilise salary payments and communicate transparently during financial constraints; advocate for improved funding allocation at university governing council levels, introduce non-monetary recognition (e.g.,digital innovation awards); provide micro-grants/data stipends for online learning or recognition of digital achievements in staff appraisal systems. (Shahzad & Khan, 2023; Omotunde et al., 2024).
- **Link skills to appraisal and promotion:** Digital competence should be incorporated into performance evaluation and promotion criteria; require at least one certified digital course annually with Provision of institutional sponsorship to avoid perceptions of punitive enforcement. Evidence from international contexts such as the University of Edinburgh's integration of mandatory digital training during the COVID-19 transition suggests that embedding digital training within appraisal systems increases participation

and strengthens institutional commitment to continuous learning (Lingstadt & Tate, 2020).

- **Engagement with trade unions:** Given the strong influence of trade unions in Nigerian public universities, reforms related to staff evaluation and promotion should involve consultation with trade unions to ensure transparency and institutional acceptance. This can be achieved by establishing joint capacity- building committees with university trade unions (ASUU/NASU) representatives framing digital skills development as a staff welfare and employability initiative rather than managerial control. Also, new appraisal-linked training policies must be piloted before full-scale implementation. Nigerian private universities with this established criteria can serve as structured reference point.

9.4.3 Integrated Digital Training Framework (development and delivery)

Defining the problem

This study examined multiple pathways for digital skills development and findings confirm that Internal organised training is effective, but other pathways (conferences, national conventions, professional association workshops, university classroom-based courses, web- based learning) are unevenly leveraged. The key challenge is building an integrated, sustainable ecosystem balancing quality assurance, contextual relevance, and accountability (Fasola & Mamudu, 2020; Osesi et al., 2022; Izah, 2022; Echem, 2022).

Proposed Solutions and Implementation Pathways

Interviews with senior library management suggest that, rather than relying on isolated training initiatives, Nigerian university libraries should adopt an integrated training approach combining national-level programmes, institution-based initiatives, and supported self-learning to ensure optimal delivery models.

Hybrid national–institutional model: A combined approach that integrates national-level standardisation with institutional contextualisation will offer the most sustainable pathway.

- **National layer:** A coordinated multi-level stakeholders of the library professional bodies such as the NLA/LRCN, with relevant national agencies such as NITDA/NUC/TETFund should:
  - Develop a sector-wide digital competency framework for Nigerian university libraries. This framework would guide curriculum design, professional development, and certification standards across the sector, similar to the CILIP's PKSB framework for libraries in the UK (CILIP, 2021).
  - Host inclusive (cadre sensitive) annual/biannual conventions/bootcamps to address emerging priority areas (e.g., digital preservation, repository management, metadata standards) .
  - Partner with relevant stakeholders to co-design library-specific modules (e.g., open-source ILS, IR management, RDM, digital preservation, AI-enhanced discovery).
  - Adopt a Train-the-Trainer (ToT) approach where each participating university nominates representatives is formally mandated to replicate the training internally. This ensures that externally funded training produces institutional-level impact rather than benefiting only individual participants.

- **Institutional layer:** Institution-level training remains critical because digital needs vary across universities. There is need for tailored training initiatives. University library management should:
  - Conduct annual digital skills audits to identify institution-specific gaps.

- Develop a time-bound (multi-year) digital capacity plan that aligns with the library's strategic objectives.
- Organise regular in-house workshops or guest expert sessions to address identified gaps.
- Each university library should establish a formal liaison mechanism to track and align national/external training opportunities with local needs.
- This mechanism should ensure equitable staff participation, and facilitate training collaborations that address technological and operational context of university libraries.

Inter-institutional collaboration: Memoranda of Understanding (MoUs) between university libraries can formalise collaboration and exchange arrangements to accelerate knowledge exchange and skills transfer., with clear learning objectives and reporting mechanisms. Stakeholders such as the professional bodies can establish regional digital learning clusters where neighbouring universities share expertise and develop short-term staff exchange or shadowing programs focused on specialised digital functions (e.g., digitisation labs, repository units, ILS operations).

Structured self-learning: Formal training should be complemented by structured self-paced learning initiatives. National and institution level training sessions should be recorded and converted into webinars, toolkits, and micro-learning modules hosted on institutional or professional association platforms. A central knowledge repository can be developed to host these materials. The platform may incorporate access analytics, certification quizzes, and completion tracking, with participation recognised within staff appraisal systems to encourage sustained engagement. This would broaden access to training materials, particularly for staff in under-resourced institutions, promote equity and reduce duplication.

Over time, the repository would serve as a national knowledge archive, preserving institutional memory and ensuring that training investments are not lost.

9.4.4 Institutional-level Strategy

Defining the problem

The interviews with senior management staff reveals that institutional commitment is uneven; many initiatives remain generic rather than ICT- specific. Reflecting earlier observations by Akintola et al. (2022), who observed that although university libraries in Nigeria express commitment to capacity building, ICT-focused training receives limited strategic attention.

Furthermore, infrastructure is frequently inadequate (slow bandwidth, insufficient hardware), limiting both service delivery and training effectiveness. For example The university's ICT plan primarily focuses on basic internet usage and does not adequately account for other units of the university that rely on more technology-intensive systems, such as the library, which require higher bandwidth and specialised digital infrastructure.(Akande et al., 2024; Ameh, 2021).

Financial instability depresses advocacy and staff perception of management commitment, a perception that aligns with the quantitative findings of this study and echoed in Akintola et al. (2022), particularly regarding irregular sponsorship for ICT training programs.

Proposed Solutions and Implementation Pathways

Institution strategies remains critical because digital needs vary across universities and there is need for tailored strategic initiatives. To address management-level constraints, solutions must be strategic, structured, and advocacy-driven rather than reactive.

Library-Specific Digital Strategy: Library management should develop a formal Digital Transformation and Capacity Development Plan aligned with the university's broader ICT

strategy but tailored to library-specific operational needs. To secure institutional approval and sustained support, such a plan must be supported by internal data, clear needs assessments, and relevant national benchmarks.

Implementation steps:

- Conduct a comprehensive digital readiness audit (skills, systems infrastructure, funding).
- Identify priority training areas (e.g., repository management, digitisation workflows, preservation technologies).
- Outline costed implementation phases (short-, medium-, and long-term).

Targeted Advocacy and Lobbying: Rather than accepting or requesting generic training sponsorship from the university management, library leaders should advocate for expert-focused digital programs tied directly to operational needs and measurable service outcomes. Link proposed digital initiatives to institutional KPIs such as research visibility, repository growth, accreditation standards, and global rankings. Also, provide post-training impact reports demonstrating return on investment.

Dedicated Infrastructure Upgrade Plan: Given that libraries operate more technology-intensive services than many administrative units of the university, infrastructure planning must reflect operational realities. Library management should collaborate with university ICT units to conduct bandwidth usage assessments and propose tiered allocation models that account for high demand usage. Also,external intervention funding (e.g., TETFund) can be explored for infrastructure upgrades.

Accountability and Monitoring Framework: Finally, digital capacity development initiatives should be supported by formal monitoring mechanisms. Progress reports on staff training, infrastructure upgrades, and digital service expansion should be incorporated into

institutional reporting systems and considered during library accreditation reviews to university governing councils and relevant regulatory bodies especially NUC, NLA and LRCN.

9.5 External Layer Strategic Focus

9.5.1 Sector- level Coordination and Partnerships

Defining the Problem

Nigerian university libraries operate within a highly resource-constrained environment characterised by fragmented technology adoption and limited inter-institutional coordination. Each university typically manages its own digital systems independently, resulting in duplication of efforts, uneven technological development, and limited bargaining power in negotiations with vendors.

Although professional bodies such as the NLA and the LRCN have made commendable efforts through conferences, workshops, and collaborative partnerships (e.g., LRCN-NUC, LRCN-NITDA, LRCN-IFLA Africa), these initiatives remain largely episodic and broad-based rather than embedded within a unified national digital library strategy (Okojie & Omotosho, 2020; Goshie et al., 2022). Similarly, NITDA's ICT frameworks for tertiary institutions provide high-level guidance but lack library-specific operational standards and implementation roadmaps.

As resource dependency theory suggests (Celtekligil, 2020), institutions operating in resource-constrained environments benefit from inter-organisational collaboration to reduce uncertainty and share risk. The absence of structured coordination among Nigerian university libraries weakens collective bargaining power, strategic alignment, and long-term digital resilience.

Proposed Solutions and Implementation Pathways

National coordination framework

A coordinated governance structure could significantly strengthen digital development across Nigerian university libraries. Rather than creating yet another institution, this study recommends strengthening and repositioning existing professional bodies AULNU, LRCN, and NLA into a Coordinating Digital Library Council (CDLC) with clearly defined responsibilities. The goal is not to replace current structures, but to bring them together under a more focused and accountable coordination framework. Similar to the coordinated national structures of JISC (Joint Information Systems Committee) in the United Kingdom which demonstrates how shared digital infrastructure, sector-wide licensing negotiations, interoperability frameworks, and cybersecurity services can strengthen institutional capacity while reducing costs (Joint, 2011; JISC, 2026).

Implementation pathway:

For this to work effectively, the CDLC would require formal recognition from the NUC. Such endorsement would give it legitimacy and ensure that its guidelines carry sector-wide authority. The governance structure should be inclusive, bringing together representatives from AULNU, LRCN, NLA, NITDA, TETFund and selected university ICT directors. This ensures that both professional and technical perspectives shape decisions.

To avoid remaining a discussion forum, the Council should operate through specialised technical committees for example:

- Infrastructure and Standards
- E-resources Licensing and Procurement
- Digital Skills and Capacity Development

1. National Digital Infrastructure Framework

One of the Council's primary responsibilities should be to develop a time bound (multi-year) National University Library Digital Infrastructure Roadmap. This roadmap would provide direction and stability in an environment where technology changes rapidly and unpredictably. The framework should clearly define and specify minimum interoperability standards (ILS compatibility, metadata, authentication) to ensure systems can integrate across institutions while preserving local choice. The objective would not be to impose identical systems across institutions but to ensure interoperability and sustainability.

2. Shared Services Model

A coordinated sector-wide initiatives will create opportunities for consortium and collective bargaining, thereby improving efficiency and cost reduction. For example:

- E-resource licenses could be negotiated at the national level rather than individually.
- Framework agreements could be established for hardware and software procurement.
- Smaller institutions could benefit from shared cloud-hosting services.
- A national discovery platform consortium could allow users to search across multiple university collections seamlessly.

Such shared services would reduce duplication, strengthen bargaining power, and improve access equity across institutions.

3. Technology adoption advisory model

Currently, technology decisions are often made independently by each institution, leading to fragmentation and uneven progress. To address this, the CDLC should introduce a phased Technology Adoption Advisory Model. This should be Implemented through a three- phase process:

(1) annual environmental scanning of emerging systems.

(2) pilot testing by volunteer universities with structured evaluation.

(3) evidence- based sector guidance (non- prescriptive but interoperability- focused) with standard templates for procurement and technical documentation.

This phased process reduces institutional risk, prevents premature investment in unsuitable technologies, and promotes long-term sustainability.

4. National digital training repository

The CDLC should develop the digital competency framework and oversea the proposed three-layer training model (national/regional, institutional, and self-directed).To promote knowledge sharing, a central digital training repository should be established. This cloud-based platform would host recordings, manuals, and toolkits from publicly funded training programmes. It could also incorporate certification tracking, digital badges, and continuing professional development records. Over time, the repository would serve as a national knowledge archive, preserving training resources and ensuring that capacity development investments benefit the entire professional community.

5. Monitoring and Accountability

Coordination must also include accountability. The CDLC could conduct annual digital maturity assessments of university libraries and publish benchmarking reports. Over time, compliance with agreed standards could be linked to accreditation processes in collaboration with the NUC. This approach reflects collaborative governance principles, which emphasize shared decision-making, institutional trust, and collective responsibility rather than isolated institutional action.

9.5.2 Resources (Direct Funding and Funded Programmes)

Defining the Problem

Interviews with senior library managers revealed a shared concern: internal university funding alone cannot sustain meaningful digital capacity development, particularly in public universities facing broader financial instability. Even where allocations are available, competing institutional priorities often reduce what libraries can realistically access. As resource dependency theory suggests (Celtekligil, 2020), organisations that rely heavily on constrained internal resources struggle to innovate without diversifying funding partnerships.

While funding streams do exist, such as the statutory 10% allocation to university libraries, institutional staff development budgets, federal government intervention through TETFund, and capacity-building initiatives from NITDA, these resources are often insufficient, inconsistently accessed, or not strategically aligned with digital transformation priorities.

The issue, therefore, is not the total absence of funding mechanisms, but rather the lack of a coordinated, strategic approach to mobilising and aligning available funding toward clearly defined digital skills priorities. For example, librarians are often absorbed into general academic staff training streams, while library officers are placed under administrative

categories. Funding is allocated for librarians to attend conferences to present research papers similar to academic lecturers and library officers are sponsored to attend generic training programs. This structural ambiguity weakens targeted digital capacity building.

Proposed Solutions and Implementation Pathways

To move from reactive funding utilisation to strategic investment, addressing structural gaps and introducing a blended funding model is recommended. A blend of institutional allocations with structured national and international intervention support.

1. Addressing Structural Classification Challenges

The wrong classification of library staff: librarians as academic staff and library officers as administrative staff often results in inappropriate training placement. This structural gap requires attention from the relevant stakeholders.

Implementation pathway:

- Library management should advocate for policy clarification to address the structural gaps in staff designation and ensure better alignment with targeted digital capacity-building initiatives.
- University management should introduce institutional policy adjustments that properly recognise and position library personnel within staff development frameworks.
- Libraries should develop a structured, evidence-based digital skills proposals that clearly outline: identified digital skills gaps (based on internal audits) and technology systems requiring operational expertise that aligns with institutional digital transformation agenda
- A clearly defined training pathway should be established for library staff, focusing on their specific skill requirements and technology-related competencies that differ from those of general academic or administrative roles.

- Funding bodies should be engaged to recognise this structural distinctiveness, enabling the creation of dedicated funding streams that specifically support digital skills development for library personnel.

This approach will shift digital training initiative from discretionary access or selection process to strategic context targeted investment.

2. Leveraging TETFund and NITDA for Digital Skills Development

The earlier-identified structural misclassification of library personnel means that many of these funding opportunities are not consistently aligned with the specialised digital competencies required within contemporary library environments. Consequently, library staff frequently access funding for more generalised training programmes, which limits the development of targeted digital capabilities within the library workforce. Similarly, although NITDA delivers fully funded national ICT training initiatives across Nigerian universities, these programmes are typically designed at a broad institutional ICT level and may not sufficiently address the specialised technological requirements of university library systems and services.

Implementation Steps:

Through collective advocacy (via University management, AULNU, NLA and LRCN), engage TETFund and NITDA to:

- Recognise the structural distinctiveness of library personnel and position them rightly within staff development frameworks.
- Advocate for a library-specific training funding window, recognising digital librarianship as a specialised competency area.

- Library leadership and relevant professional bodies should engage NITDA proactively to co-design: Library-focused modules (e.g., open-source ILS management, institution repository management, research data management systems, digital preservation management and AI-driven discovery systems)
- Create a dedicated funding stream for emerging library technologies.
- Each university library should designate a Funding Liaison Officer to track national calls for training, Align applications with library-specific needs and ensure equitable distribution of fund to library staff
- Institutions should implement continuous monitoring and evaluation of training funding, requiring post-training impact reports to assess how newly acquired skills contribute to institutional goals and library services.

This recommendation aligns with Womboh (2008), who emphasised the need to revisit TETFund funding frameworks to better reflect technological developments in libraries. Adopting such measures would reposition digital training from discretionary expenditure to strategic institutional investment. It also ensures that externally funded training produces institutional-level impact rather than benefiting only individual participants

3. Engaging International Development Partners

Global and continental digital transformation agendas present untapped opportunities for Nigerian university libraries. University

(a) African Union Digital Transformation Strategy (2020–2030)

The African Union's Digital Transformation Strategy prioritises inclusive digital skills, emerging technologies, and capacity development across education sectors in Africa. This project has gathered funding support of over US$45bn from development finance institutions

e.g., World Bank, AfDB, ITU (African Union, 2024). This opportunity creates a policy window that libraries can strategically engage.

(b) EU-Funded Intra-Africa Mobility Scheme

The European Union (EU)'s €27 million mobility funding framework provides opportunities for university academic staff exchange and professional development in Africa. Nigerian federal government already secured and signed a €10.8 million agreement with the EU for capacity development in Nigerian universities (Businessday, 2024). However, without clear advocacy and addressing the structural distinction of library personnel from general academic staff notion, library professionals risk exclusion from such schemes.

Implementation pathway:

- Library management should advocate for structural clarification in staff designation to recognise and position library personnel within staff development frameworks.
- University libraries should align digital skills proposals with AU digital strategy priorities.
- Through collective advocacy (via University management, AULNU, NLA and LRCN) stakeholders should develop a consolidated funding proposal on behalf of university libraries toward these international interventions.
- University libraries should formally request and lobby for inclusion in institutional EU mobility proposals.

4 Developing a Sustainable and Proactive Funding Culture

Sustainable digital skills development requires shifting from opportunistic funding access to proactive partnership building.

Implementation pathway:

- Library should establish a funding strategy culture driven by intentional partnership initiative Maintain a multiple channel (national,internation and private partners) funding opportunity database for library professionals.
- Develop enduring and futuristic digital skills investment plans aligned with emerging technology roadmaps.
- Encourage co-funding models where institutional funds leverage national or international grants.
- Libraries should encourage consortium and coordinated funding applications to enhance improved bargaining power and cost efficiency (Rosenberg, 2005).

For these initiatives to succeed, financial planning must be realistic and diversified. A coordinated funding approach would therefore not only enhance sustainability but also maximise value for limited resources.

9.5.3. Library School Education

Defining the problem

Library schools play a central role in preparing professionals for the information workforce; however, evidence from this study indicates that limitations within library education have contributed to significant gaps in the digital competencies of Nigeria's current library workforce. Respondents noted that their initial training offered limited exposure to digital technologies and emerging areas of librarianship, and where technology-related courses existed, they were often taught theoretically due to inadequate laboratory facilities, weak infrastructure, and shortages of specialised teaching staff.

These observations align with earlier studies showing that many LIS curricula in Nigeria emphasise traditional library practices over essential digital skills such as metadata

management, database systems, web technologies, and library automation (Kacunguzi & Samuel, 2016; Abubakar, 2021), while broader structural challenges including poorly equipped computer labs, unstable power supply, and insufficient technical personnel, further constrain practical instruction (Okeji & Mayowa-Adebara, 2021). Additionally, the scarcity of faculty with expertise in emerging digital technologies limits the ability of library schools to deliver modernised curricula effectively, as the library schools do not have an adequate lecturer-to-student ratio (Saleh, 2011; Ariole et al., 2017), collectively restricting the capacity of LIS education to produce graduates equipped with the digital competencies required in contemporary library environments (Ogungbade & Ipadeola, 2019; Abubakar, 2021).

Proposed solutions and implementation pathways

1. Curriculum reform and implementation of CCMAS

Recent policy developments provide an opportunity to strengthen digital competencies within LIS education. The NUC has replaced the BMAS with the CCMAS framework, which introduces stronger digital and technology-oriented components into LIS education (NUC, 2022). These include courses on metadata standards, digital resource description using Resource Description and Access (RDA), online cataloguing protocols such as MARC and Z39.50, and the application of digital platforms for information organisation and sharing.

Implementation steps:

To translate this policy shift into meaningful outcomes, universities should prioritise systematic implementation of the CCMAS curriculum through several practical steps.

- LIS departments should establish curriculum transition committees responsible for reviewing existing programmes and aligning course structures with the new framework.
- Universities should ensure that digital courses include hands-on laboratory components, enabling students to engage with library management systems, digital repositories,

metadata tools, and data management platforms. Evidence from LIS education studies shows that experiential learning significantly improves students' technological confidence and professional readiness (Ogungbade & Ipadeola, 2019; Abubakar, 2021).

- Accreditation bodies such as the LRCN and NUC should strengthen periodic monitoring and evaluation to ensure that the revised curriculum is not only adopted on paper but also effectively implemented in teaching practice.
- Continuous curriculum review mechanisms should also be institutionalised to ensure that emerging areas such as digital curation, data management, artificial intelligence applications in libraries, and digital scholarship are progressively integrated into LIS education.

2. Strengthening practical training infrastructure

Effective digital skills development requires adequate technological infrastructure. Universities should therefore invest in dedicated LIS digital laboratories equipped with current software and tools used in modern libraries, including integrated library systems, metadata creation platforms, institutional repository software, and digital preservation tools. Where resources are limited, LIS schools can adopt shared infrastructure models, collaborating with university ICT centres or computer science departments to utilise existing laboratories for practical instruction.

In addition to physical infrastructure, institutions should establish sustainable technical support systems to maintain equipment, provide training support, and ensure continuous access to digital learning environments. Previous study shows that sustained investment in digital learning infrastructure significantly enhances the quality of professional education in information disciplines (Okeji & Mayowa-Adebara, 2021).

3. Faculty capacity development and recruitment

Curriculum reform cannot be effective without adequately skilled educators. LIS schools should therefore adopt a dual strategy of faculty development and strategic recruitment. Existing lecturers should be supported through targeted professional development programmes in emerging digital areas such as data management, digital librarianship, metadata standards, and information systems. Such training can be facilitated through collaborations with national ICT agencies, international development partners, or specialised professional programmes.

At the same time, universities should consider recruiting faculty with interdisciplinary expertise, particularly in areas intersecting with computer science, information systems, and data science. Scholars have long argued that strengthening faculty capacity in emerging technologies is essential for producing graduates capable of functioning in digital information environments (Olubiyo & Olubiyo, 2023).

4. Interdisciplinary and inter-faculty collaboration

The evolving nature of the information profession increasingly requires collaboration across disciplinary boundaries. Internationally, the development of the iSchools movement demonstrates how LIS education has expanded to incorporate fields such as information science, computer science, data analytics, and digital humanities (Chakrabarti & Mandal, 2017; Weech, 2019). These collaborations enable programmes to reflect the interdisciplinary nature of modern information work.

Nigerian LIS schools can adopt similar approaches by establishing formal partnerships with allied departments, including computer science, information technology, engineering, and data science. Such collaborations can support joint teaching arrangements, shared laboratory resources, and the development of specialised course modules in areas such as digital

libraries, data curation, and information systems design. Joint supervision of student projects and interdisciplinary research initiatives can further strengthen these partnerships while exposing LIS students to broader technological perspectives.

5. Strengthening policy coordination among LIS stakeholders

Effective transformation of LIS education also requires stronger coordination among key stakeholders, including the NUC, the LRCN, and professional bodies such as the National Association of Library and Information Science Educators (NALISE). These institutions should work collaboratively to ensure policy coherence, accreditation standards, and continuous curriculum innovation.

Regular national curriculum review forums, similar to earlier professional summits on LIS education (2015, 17th NALISE Conference at the University of Uyo, Akwa Ibom State, Nigeria) (Abubakar, 2021), can provide platforms for evaluating emerging technological trends and aligning training programmes with labour market needs. Such collaborative governance structures are essential for ensuring that LIS education remains responsive to the rapidly evolving digital information landscape.

9.6 White Paper on Strategic Digital Skills Development Plan for Nigerian University Library Staff

This white paper presents a tabular summary of the key issues, recommendations, stakeholders, and contributions to the United Nations SDGs.

Table 9.1: Tabular summary of the Proposed Strategic Skills Development plan

The aim/objective of this study is to develop a strategic plan to improve the digital skills of university library staff in Nigeria. This is expected to enhance digital library services and provide improved information access to library users (students and researchers), which in turn will improve the quality of research and education in Nigeria. This is expected to contribute to **SDG16 (access to information), SDG 4 (better education), and SDG8 (Decent work and economic growth)** for the university community in Nigeria.			
Categories	**Key issues**	**Call for action and contribution to SDGs**	**Stakeholders for the action**
1 Local issues **1.1 Staff focus**			
1.1.1 Digital skills variation	▪ Wide variation in digital skills across staff's education levels, job cadres, gender, and experience. ▪ Paraprofessional staff (lower cadre) possess significantly lower digital skills. ▪ Gender-based barriers exist, especially for women, due to family responsibilities.	**Tailor-made training content** • Use a skills gap analysis to prioritize tailor-made capacity-building interventions. • Provide tailored training programs for lower-cadre staff(paraprofessionals) who constitute most of the workforce. • Develop staff-specific digital training tracks (librarians vs library officers) • Promote gender equity (not just equality) by implementing inclusive training policies that consider women's unique needs (e.g.,self-paced open access digital training kits, flexible training hours, on-site childcare). **Contribution to SDGs** If implemented by university library management and other relevant stakeholders in Nigeria, this call for action will contribute to **SDG 10 (Reduced inequality)** by fostering inclusion and reducing inequality among library professionals. Also, this call for action extends to **SDG 5 (Gender equality)** Inclusion of women, especially **target 5.b: (Enhance the use of enabling ICT technology for women)**. Additionally, this will contribute to **SDG8 (Decent work and economic growth).** Overall improvement in the skilled workforce for university libraries in Nigeria. The provision of open-access digital training kits will contribute to the reduction of carbon footprint, thereby contributing to **SDG 13(Climate change)**	• Library management • University management • Professional associations (NLA, LRCN, AULNU & NALISA) and • Other complementary government agencies

1.1.1. Staff-side concerns	• Health concerns and age-related limitations • Overburdened staff impede participation in training. • Low staff morale due to unpaid salaries, workload, and strike actions. • Union restrictions affect training enforcement.	**Addressing staff-side concerns** • Conduct ergonomic assessments and provide comfortable, health-conscious work environments. • Motivate staff by ensuring prompt and regular payment of salaries, wages, and allowances and promoting a healthy work-life balance. • Also, staff should be relieved of excess workloads to have time for training. • Link training to promotions and offer scholarships or stipends for digital training, especially during off-peak work seasons. • Engage trade unions to negotiate digital skills training as a career development opportunity rather than a burden. **Contribution to SDGs** If adopted and implemented by university library management and other relevant stakeholders in Nigeria, this call for action will contribute to **SDG 3(Good health and wellbeing). SDG8 (Decent work and economic growth)** mainly **target 8.1(Sustain per capita economic growth by national circumstances)** and **8.7(Effective measures to eradicate forced labour, end modern slavery)**	• Library management • University management • Federal government. • Academic Staff Union of Universities (ASUU)
1.2. Management focus			
1.2.1. Training Delivery Techniques	• Ineffective training techniques for digital skills building • Generic training programs without digital skills expert-focused training • Lack of tailored capacity-building programs for different library staff demography • Weak advocacy from library management to university leadership to prioritize digital skills development needs of staff.	**Effective training delivery techniques** • Library management should design expert-focused, needs-based digital training programs instead of generic ones. • Develop training tracks that address staff peculiarities (librarians-library officers, male-female, etc.) • Develop clear digital skill development plans aligned with emerging technologies and the peculiar needs of their staff and present them to university management for approval and sponsorship. • Section 9.5.2.1.2 proposed the need for collaboration between the university library management and other relevant stakeholders, especially the professional bodies (local and international), to foster training and skills development partnerships hinged on a train-the-trainer approach. • Libraries should embrace inter-institutional staff exchange programs through collaborations and partnerships. Staff could seek knowledge from other libraries where such skills are available. **Contribution to SDGs** If adopted and implemented by university library management and other relevant stakeholders in Nigeria, this call for action will contribute to **SDG 10 (Reduced inequality)** by fostering inclusion and reducing inequality among library professionals' demography. Also, **SDG 5 (Gender equality)** ensures equitable training focus based on gender. **SDG 17(Partnerships for the Goals)** collaboration among stakeholders to deliver context-focused training.	• Library management • Library Advisory Committees • University Management-ICT Department • Professional associations (NLA, LRCN, AULNU & NALISA) • Private sector EdTech providers
1.2.2 Technology infrastructure	• Poor technological infrastructure, i.e., limited internet bandwidth and insufficient computers • Poor alignment between university ICT plans and library operational needs	**Comprehensive ICT plan** • Customize ICT policies to reflect the unique operational requirements of digital libraries. • Conduct a digital operational audit to inform tailored ICT investments for the library. • Provision and deployment of technological infrastructure • Library management should collaborate with university ICT	• Library management--Library ICT Units • University ICT Boards • National Universities Commission

		teams during the design phase of institutional ICT strategy. **Contribution to SDGs** This call for action, if adopted and implemented by university library management and other relevant stakeholders in Nigeria, will contribute to **SDG 9 (industry innovation and infrastructure) target 9.8(universal access to information and communications technology),** Significantly increase access to ICT and the Internet in developing countries and target **9.6 (Facilitate sustainable infrastructure development for developing countries)** ensure infrastructure development in developing countries through technological and technical support to African countries.	(NUC) • Tertiary Education Trust Fund (TETFund)
2. **External issues**			
2.1 Coordination and Partnerships			
2.1.1 Technology Adoption	• Fragmented institutional approach to technology management, each university operates in isolation, leading to duplicated efforts and inefficiencies. • Lack of shared digital infrastructure among university libraries**.** • Absence of a coordinating body or agency responsible for uniform university library digital infrastructure and shared licensing policy	**Technology adoption:** • Establish a national/central coordinating body or agency (like JISC in the UK) dedicated to uniform university library digital infrastructure and policy. • Embrace open-source technology and open-access content. • Promote interoperable systems and shared services for better scalability and integration. • Revive and empower AULNU/NULIB for joint procurement and shared licensing deals. **Contribution to SDGs** This call for action, if adopted and implemented by relevant stakeholders in Nigeria, will contribute to **SDG 9(Industry innovation and infrastructure),** target **9.5.2 (Promote inclusive and sustainable technology infrastructure) 9.6 (Facilitate sustainable technology infrastructure development to developing countries in African countries) 9.c (Significantly increase access to ICT in least developed countries) SDG 17 (Partnerships)** target **17.7(Promote sustainable technologies to developing countries)** target **17.17:** Promote effective partnerships	• Professional Associations(NLA,LRCN) • Universities and their library's ICT advisory committee • Government Agencies (NITDA, NUC)
2.1.1 Training development and delivery	• Uncoordinated training programs across institutions: One-size-fits-all training does not meet individual institutional needs. • Lack of coordinated national strategy for library digital skills development • Ineffective involvement of professional associations/bodies in developing/updating sector-wide training programs in the face of rapidly evolving technology • There are no tailored programs to cater to the diversity and personal factors (gender, age, disability, etc.) of professionals. • There is a need to shift focus from generic professional development to specialized digital skills training.	**Training development:** • Establish an advocacy network involving all library stakeholders to articulate digital skills needs and develop training solutions. • Develop and promote specialized training modules for digital literacy and emerging technologies specific to library and information services. • Active involvement of the relevant professional bodies such as the NLA, LRCN, AULNU, and NALISA in developing and updating tailored sector-wide training programs. • Develop a PKSB-like framework (as seen with CILIP in the UK) to guide professional development. **Training delivery:** • Adopt a hybrid training strategy through a tiered training model (national/regional, institutional, self-learning): National/Regional Workshops for standardization and knowledge transfer. Institution-specific programs to tailor content to local needs. Self-learning tools (webinars, toolkits) for continuing self-paced learning. • National/regional training should focus on digital literacy on emerging technologies and knowledge transfer through a train-the-trainer approach to institutions. • University library managers should tailor content towards local needs through internally organised training programs. • Set up a central digital training repository accessible on knowledge-sharing platforms (YouTube, social media, or institutional repositories)to house the digital recordings of training converted to digital toolkits for self-paced digital skills learning.	• University Libraries • University Management • Professional associations(NLA, LRCN, AULNU) • Private EdTech Firms • International Partners (e.g., IFLA) • Professional Training Bodies

		Contribution to SDGs If adopted and implemented by relevant stakeholders in Nigeria, this call for action will contribute to **SDG 17(Partnerships)** collaboration among stakeholders to develop and deliver a sector-wide digital skills development framework. **SDG 4 (better education), SDG8 (skilled workforce and employment), SDG 16(strong institutions) target 16.a** Strengthen relevant national institutions, including through international cooperation, to build capacity at all levels, particularly in developing countries.	
2.1.1. Active professional association and complementary government regulatory agencies:	• The low impact of professional associations is due to weak coordination. • Efforts by bodies like NLA, LRCN, and AULNU are underutilized. • Duplication of efforts by government agencies leading to overlapping of responsibilities. • Lack of coordination on the side of government intervention agencies (NITDA; technology advisory, TETfund: funding infrastructure projects, NUC: university standardisation and accreditation) leading to operational inefficiencies.	**Effective stakeholders involvement** • Reinforce coordination among **government agencies (e.g., NITDA, TETFund, NUC)** in designing targeted digital policy and funding guidelines tailored to university libraries and monitoring implementation. • Develop a national strategy and standards for digital library operations by involving multimodal stakeholders (government agencies, university management, and professional bodies). • **Unify and strengthen** the roles of professional bodies (NLA, LRCN, AULNU) in training development and delivery, infrastructure advocacy, and operational policy. • Professional bodies should push for **sector-specific standards and frameworks**, not just generalized advice. **Contribution to SDGs** If adopted and implemented by relevant stakeholders in Nigeria, this call for action will contribute to **SDG 9.5.2:** Promote inclusive and sustainable technology infrastructure, **SDG 16(strong institutions)** target **16.6**: Develop effective, accountable, and transparent institutions, target **16. a** Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, **SDG 17(Partnerships for the Goals)** target **17.17:** Promote effective partnerships	• Government agencies (Federal Ministry of Education, NITDA, TETFund, NUC) • Professional Associations (NLA, LRCN, AULNU, NALISA)

2.2. Funding sources	• Inadequate and fragmented funding Inadequate and fragmented funding from parent institutions for digital skills training of library personnel. • Irregular disbursement of the statutory 10% allocation to the library. • Internal university funding has a low impact as it is channeled to university-wide training interests. • The misalignment of library personnel structure with funding program categories, especially the TETFund intervention scheme, leading to categorizing library personnel under general academic or admin programs. • Funding generic training programs with no effect on expertise development in the library. • Low awareness of international funding opportunities	• Establish an advocacy network involving all library stakeholders to articulate digital skills needs and streamline funding access. • University management to encourage structured budget lines for library-specific ICT training • Library management to advocate for separate funding tracks for library staff development as against a blanket provision for general university staff • Library management should advocate for dedicated library funding frameworks and pursue and lobby the parent institution to promptly disburse the statutory 10% allocation or design other innovative funding sources. • Library mgt to leverage existing funding (Parent institution, TETFund, NITDA) more strategically towards ICT training • Review TETFund terms to address specific library roles and categorization to develop staff-specific digital training tracks (librarians vs library officers) • Redefine funding categories to accommodate unique library staff training needs (e.g., dedicated library workshops distinct from general academic or admin programs) • Combine internal funds with national and international interventions for a more robust framework. • Proactive engagement with global initiatives (e.g., AU Digital Strategy, EU Intra-Africa Mobility Scheme, DFIs, etc.) to support the digital transformation of library staff **Contribution to SDGs** If adopted and implemented by relevant stakeholders in Nigeria, this call for action will contribute to **SDG 17(Partnerships) target 17.3** Mobilise financial resources for developing countries. Target **17.17:** Promote effective partnerships. Target **17.9** Enhance international support for implementing effective and targeted capacity-building in developing countries. **SDG 16.6**: Develop effective, accountable, and transparent institutions	• University Library Management • Parent Institutions • TETFund, • International partners-World Bank, AU, EU, DFIs, etc -
2.3. Library school education	• Underdeveloped library school curricula with a weak digital focus • Shortage of skilled Library school educators in digital technologies • Lack of interdisciplinary collaboration within universities	**Innovative approach to library education** • Implement the CCMAS curriculum nationwide (details in section 9.5.2.2 no 3) • Prioritize practical training in ICT and digital library technologies • Attract ICT-proficient faculty and upskill existing lecturers/staff through international and national partnerships • Foster interdisciplinary collaboration through intra-and-inter-institutional partnerships (human and infrastructure resources collaboration with allied faculties/departments such as ICT, Engineering, and Computer Science) as seen with the iSchools • Promote joint programs and degree awards in digital librarianship (as seen with the iSchools) **Contribution to SDGs** If adopted and implemented by relevant stakeholders in Nigeria, this call for action will contribute to **SDG 9.5:** fostering innovation through educational reform; **SDG 4.3:** Ensuring quality technical, vocational, and tertiary education; **SDG 9.5.1:** Promoting research and development in emerging tech areas. **SDG 17.17:** Promote effective partnerships. **SDG 4.b:** Expand access to scholarships and knowledge-sharing	• LIS School Deans-University Administrators and allied Faculties • NUC(Accreditation body) • Professional LIS Associations (NALISA, NLA, LRCN, AULNU) • Academic Staff Union of Universities (ASUU)

9.6.1 Narrative Summary

University library staff in Nigeria face stark digital skill disparities based on cadre, gender, age and experience. These disparities threaten the sustainability and inclusiveness of digital library service delivery in Nigerian universities. The lack of digital skills among paraprofessionals, female professionals, and older staff, combined with systemic issues like unpaid wages and gender-based barriers, hinders nationwide digital transformation efforts in libraries. To bridge the digital skills gap in Nigerian university libraries, management-side engagement must be revitalised. This involves targeted advocacy for expert-led training, enhanced ICT infrastructure, more vigorous internal lobbying by library heads, and deliberate inclusion of libraries in university-wide digital transformation plans.

Furthermore, the digital transformation of university libraries in Nigeria demands a coordinated multi-stakeholder strategy. Addressing fragmentation, vague policies, and generic training approaches will require dedicated stakeholders' involvement, harmonized infrastructure planning, and a unified training framework tailored to the focused needs of library personnel.

Additionally, inadequate and fragmented funding is a significant barrier. While existing sources such as TETFund, NITDA, and international partners like the African Union and EU offer valuable support, the funding structure often overlooks the unique training needs of library staff. Therefore, Sustainable progress depends on national, institutional, and global collaborative efforts.

The outdated, theory-heavy curricula in Nigerian library schools have significantly limited the digital competencies of library professionals. Challenges include poorly equipped labs and insufficient skilled educators. While recent reforms like the CCMAS offer promise by introducing digital-focused content, implementation remains slow. This report calls for urgent

curriculum adoption and interdisciplinary collaboration with tech-related faculties to align LIS education with global standards and workforce demands.

Finally, if this proposed plan is adopted and implemented by relevant stakeholders, university libraries in Nigeria will not only create a sustainable ecosystem for the lifelong digital competency development of information professionals but also modernize academic service delivery in Nigerian universities, contributing significantly to achieving the United Nations 2030 agenda for sustainable development.

9.6.2. Nexus of the Proposed Strategic Plan to United Nations SDGs

Table 9.2: Nexus of the Proposed Strategic Plan to United Nations SDGs

SDG Goal	Relevance to Library staff's Digital Skills Development
SDG 3 - Good health and wellbeing	Providing comfortable, health-conscious work environments that meet technology usage requirements through ergonomic assessments improves the health and wellbeing of university library staff.
SDG 4 – Quality Education	Enhancing university library personnel's digital skills improves educational resource delivery and learning outcomes.
SDG 5 – Gender Equality	Promotes equitable access to digital skills, especially for women and other disadvantaged groups.
SDG 8 – Decent Work	Ensures digital competency contributes to career progression and job satisfaction.
SDG 9 – Industry, Innovation	Positions libraries as hubs for digital innovation and knowledge infrastructure.
SDG 10 –Reduced Inequalities	Advocates for inclusive development regardless of staff cadre, gender, or experience.
SDG 13- Climate change	Promoting a self-paced learning approach through open-access digital toolkits for disadvantaged groups, especially women, will contribute to reducing their carbon footprint.
SDG 16- Peace Justice and Strong Institution	Reinforces coordination among stakeholders such as government agencies, university management, professional associations, and international partners, strengthening institutional effectiveness.
SDG 17 – Partnerships	Encourages stakeholder collaboration among government, professional bodies, and international organizations.

CHAPTER TEN

SUMMARY, CONCLUSION AND RECOMMENDATION OF STUDY

10.1. Introduction

This chapter presents an overview of the study, a summary of the key findings, the contributions to knowledge, the limitations of the study, directions for future research, and the concluding remarks and recommendations.

10.2. Overview of the Study

The research began by reviewing the literature and identifying the gap in research. The results of this review indicated that the outbreak of the COVID-19 pandemic's outbreak affected the university libraries' operations across the globe, which has refocused their operations to become more digital-bound. University libraries in developed countries were able to transition to digital operations, but the developing nations, especially Nigeria, could not go digital despite their investment in automation technology. Factors such as socio-economic issues, poor infrastructure, and lack of skilled workforce were responsible for the inability to render functional digital library services. Studies have shown that at the center of the factors militating against the digital operation of libraries in Nigeria, the need for a digitally skilled workforce is key, which the Nigerian university library environment lacks (Ameh, 2021; Friday, 2022; Echem, 2022; Onwubiko, 2023).

The fast-changing pace of technology in this post-COVID era, coupled with the increasingly pressing demand of clients towards digital content. For university libraries in Nigeria to render up-to-date digital services like the rest of the world and to enhance the quality of education and research, there is a need for a conscious effort toward digital skills development. It is based on this background that this study set out to ascertain the current digital skills level of university library professionals in Nigeria, examine their existing digital

skills training programs, identify the factors that impede their digital skills, and develop a sustainable strategic framework for improving digital skills of university library professionals in Nigeria on digital library operations.

This was addressed in two phases; the 1st phase involved a mixed quantitative and qualitative design in a sequential pattern. There were four main research questions, three of which were answered using a quantitative approach (questionnaire administration to staff):

RQ1a:*What basic digital skills do Nigerian university library staff possess for the implementation of automated library operations?*

RQ1b:*What operational task–based digital skills do Nigerian university library staff possess for the implementation of automated library operations?*

RQ2a: *How has the prior library school education contributed to enhancing the digital skills of Nigerian university library staff for effective automated library operations?*

RQ2b: *How has the continuing education training programs enhance the digital skills of Nigerian university library staff for effective automated library operations?*

RQ3: *How has Individual (personal, socio-economic and work-related) factors influence the development of digital skills among Nigerian university library staff for automated library operations?*

The fourth question was answered using the qualitative approach (interviews with senior management staff of the libraries):

RQ4: *How has institutional (policies, funding mechanisms, and leadership cuture) factors impede the development of digital skills among library staff in Nigerian universities for automated library operations?*

In the 2nd phase, the quantitative and qualitative phases' findings helped develop a sustainable strategy proposal to improve the digital skills of library professionals in Nigeria towards digital library operations. The results and findings of each research question are discussed in dedicated chapters. Chapters 5, 6, and 7 discussed the three research questions

that addressed the quantitative phase. The qualitative phase that addressed the fourth research question was discussed in Chapter 8. Findings from the study's qualitative and quantitative phases helped develop a sustainable strategic framework, as shown in Chapter 9.

This chapter summarises the key findings, contributions to knowledge, study limitations, suggestions for future work, and recommendations.

10.3. Summary of Key Findings

The findings are therefore summarized below.

10.3.1. Digital skills gap

Basic Digital Skills

Lloyds Bank designed a framework for the UK government's essential digital skills. It highlighted the five categories of basic digital skills expected of UK citizens' every day and work lives. Also, through its Digital Transformation Strategy for Africa 2020–2030, the African Union adopted the International Telecommunications Union framework for basic digital skills. These basic skills include the ability to control devices, use accessible tools on the device, interact with the device home screen, understand how to connect to the internet and access information and content, ability to connect to a safe and secure Wi-Fi network, ability to use email services and use websites, word processing and ability to keep passwords and personal information safe (Lloyds Bank Consumer Index, 2018; African Union, 2020). This study has established in Chapter 6 that university library professionals in Nigeria possess basic digital skills, and this was supported by existing literature, such as Baro et al. (2019) and Friday and Onuh (2022).

Familiarity with library operational software

Most university libraries in Nigeria use Koha software for automated in-house operations (Tella et al., 2017). In Chapter 6, this study established that the university library staff in

Nigeria are more familiar with Koha than other library software and technology, such as Dspace, Eprint, Dublin core, etc., that power their daily housekeeping operations.

Operational task-based digital skills

Additionally, this study used the Koha software module template to evaluate the operational task-based digital skills of library professionals in Nigeria because they are more familiar with it. The quantitative findings in Chapter 6 revealed that they possess moderate skills in performing the circulation tasks, patron OPAC tasks, and some cataloguing tasks, except for cataloguing using Z39.50 and the OCLC tool. However, they lack the skills to perform acquisition, reference, and serial tasks. From the interview discussions with library management in Chapter 8, the reason given for the level of operational task-based digital skills is that most libraries have a long history of partial automation projects of over two decades, primarily the circulation and cataloguing operations. Some started with automating their circulation or cataloguing operation, or both in some cases, and as such, the long-standing exposure to these tasks was responsible for the moderate level of skills. However, the library management posits in Chapter 8 that it will be challenging to have a functional automated acquisition operation because of the current procedure of acquiring information resources from the libraries; the libraries do not have direct purchase orders with the publishers; instead, they acquire materials through vendors.

Digital skills disparities

- Gender plays a significant role in digital skills development, as there is a gender gap; male professionals are more digitally skilled than female professionals.
- Also, education level plays a role in digital skills development as the staff in the lower career cadre (library officers with lower education levels) have lower digital skills than

librarians with higher educational qualifications. This also explains the skills variation between the library officer and librarian cadre.

This study brought a different insight into ideal knowledge about work experience. Previous research has shown that the more years of experience staff possess, the more skilled they become (Hunter, 2017; Ratnawati et al., 2020; Orlandi et al., 2024). In this study, the staff with less than 10 years of experience have a higher level of digital skills than staff with years of experience above 11 years. This study attributes this insight to the prior library school education that produced the older staff, who do not have library technology courses included in the curriculum, and the few courses in the curriculum were more theoretical and had no practical approach (Chiware, 2007; Aregbesola et al., 2019).

10.3.2. Existing digital skills training programs

This study examined two veritable ways to update the digital skills of library staff in Nigeria: Library school education and continuing education programs. As detailed in Chapter 7, only in-house training methods allow for the development of library staff's digital skills. In contrast, other training methods such as formal library school education, continuing education programs (conferences, seminars, and workshops), and self-sponsored training have their limitations as they provide generic training that does not directly influence developing the digital operational skills required for staff. The current situation is that library staff jump on available programs that are available and not necessarily based on digital expertise needs. Training programs' attendance is premised on the strength of availability rather than the need for digital competencies. This study further established, through hypothesis 5 in Chapter 6, that the inadequacies of the existing training techniques and methods are responsible for the low digital skills of library professionals in Nigeria.

10.3.3. Factors/challenges of digital skills development

This study explored many factors surrounding the low digital skills of university library professionals in Nigeria and their digital skills development challenges. This was mirrored from the staff and university management perspective.

Staff-side factors of digital skills development of Nigerian university library professionals.

Personal factors such as gender-related issues affecting female professionals, health challenges, age, financial buoyancy of staff, and poor prior library school education were significant factors that impeded the digital skills development of library professionals in Nigeria.

Managerial factors of digital skills development of Nigerian university library professionals.

Through interviews with the heads of university libraries in Nigeria, this study gained insight into the management-side factors and challenges of digital skills development of library professionals in Nigeria. The findings highlighted factors such as policy on skills development, funding for skills development/access to funded skills development programs, and library management efforts towards digital skills development of library staff.

Policy: Library management does not have a dedicated policy for library staff; rather, they operate within the university-wide policy framework, which does not directly consider the skills needed by the library staff.

Funding: The Statutory 10% annual allocation from the parent institution, which is supposed to be the primary source of funding to the library, only exists on paper; in reality, it is not made available to the libraries due to dwindling budgetary allocation to the parent institution. However, the parent institution funds the library based on available resources. However, the libraries benefit from TETFund, an external federal government funding agency. However,

from one of the interview excerpts in Chapter 8, it was gathered that accessing funds from this government agency comes with many bureaucratic bottlenecks.

Institutional efforts: The library management has put poor effort into organising training programs geared toward digital needs. Also, there is a poor effort in providing necessary technology facilities to organise training. However, they attested to the availability of internet and computer hardware but stated that there is a challenge of slow internet bandwidth and an inadequate number of computers. Additionally, there is a poor top-bottom attitude and vice versa on the side of university and library management. Some university managements do not prioritise the needs of their libraries when it comes to the issue of training library staff. At the same time, some library heads do not even make a necessary case to the parent institution for training to improve the digital skills of their staff.

10.3.4. Proposed strategy framework for digital skills development

As presented in Chapter 9, section 9.3, this study has developed and proposed a strategy recommendation to the necessary stakeholders based on the pitfalls and challenges identified through the findings of this study. The proposal was created through the input and suggestions of the senior management staff of the university libraries in Nigeria, which were gathered during the interview discussions, contributions from existing literature with similar intervention efforts, and related market scan policy frameworks. The recommendations were categorised under two layers: local and external layers. The local layer recommendations are the internal strategy contributions expected to be implemented by the university to achieve sustainable digital skills development. In contrast, the external layer recommendations are strategy contributions to collaborating stakeholders and intervention bodies of the universities in Nigeria.

10.4. Contributions to Knowledge

10.4.1. Baseline data on the existing digital skills gap: This research provides baseline data on the current digital skills gap, ineffective training methods and techniques, and factors and challenges of digital skills development of university library professionals in Nigeria. Also, this study establishes the intervening factors that cause digital skills deficiencies in various demography, i.e., gender, age groups, staff cadres, education levels, etc. This data is vital for policymakers, educators, and library stakeholders aiming to tailor interventions that address gaps in digital literacy and skills development, as well as preparedness for the modern workforce in the library and information field in Nigeria and other developing countries with similar circumstances.

10.4.2 Analysis and interpretation of data towards new insights: The findings of this study were critically analysed and interpreted in alignment with the existing body of literature on digital skills gaps and development. In doing so, this research contributes new insights into this field, particularly highlighting how gender disparity and gender-related issues persist in access to digital skills training and workplace opportunities for women, which impacts their digital skills development and career advancement opportunities, reinforcing the need for equity-focused digital skills development interventions instead of the widespread ideology of gender equality. Moreover, the study explores how work experience is crucial in bridging the digital skills gap. Opposed to the common knowledge that the more years of work experience a staff member has, the more skilled a staff member becomes, this study has established that this does not apply to digital skills development. The staff with more years of experience on a job might have gathered other generic skills, i.e., communication, leadership, other operational skills, etc. However, digital skills development requires more conscious and concerted effort. Additionally, this study moves beyond the broad concept of digital skills, delving into the specifics of fundamental and operational task-based skills. It reveals that

while library professionals in Nigeria have acquired basic digital skills, they lack the task-based digital skills required to operate digital libraries efficiently.

10.4.3 Development of a sustainable strategic framework for digital skills development: A key contribution of this thesis is developing a framework on strategic proposed solutions and a call to action designed to guide the development and implementation of digital skills development programs for library professionals in Nigeria. This model integrates the findings from the data analysis, imbibes the contribution from the literature review, and incorporates the market scan from related policy frameworks. The strategic model offers a sustainable framework for creating more inclusive and practical digital skills development programs for overall functional automated operations (see section 9.7 for details).

10.4.4 Identification of key stakeholders, their roles, and actions: Arising from the developed strategic approach, this study identifies and maps the key stakeholders who have roles to play in digital skills development, including internal stakeholders like educational institutions, library management and staff, and external stakeholders like government agencies, professional bodies, and international partners. It outlines the roles and responsibilities of each stakeholder in promoting and addressing sustainable digital skills development. By highlighting the required multi-sector collaborative efforts, this research contributes to developing more targeted and integrated interventions to close the digital skills gap and the challenges of digital skills development.

10.4.5 Contribution to the United Nations SDGs: This thesis makes a novel contribution to the UN's ongoing global discussion on SDGs. No known study has established how developing university personnel's digital skills contributes to the overall SDGs. This study has linked how digital skills development can contribute to the United Nations SDGs, an area under-explored in existing studies. This linkage underscores the critical role of digital skills

in fostering equitable and sustainable development and the importance of aligning digital skills development programs with global development objectives. Specifically, the research addresses how enhancing digital skills can contribute to the achievement of SDG 4 (Quality Education), SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth), SDG 9 (Infrastructure), SDG10 (Reduced Inequalities), SDG 16 (Access to Information) and SDG17 (Partnerships). Furthermore, this study clearly connects skills development initiatives and SDGs. It offers a new perspective for future research and policy action, for example, the need to advance discussion beyond gender equality to gender equity (see section 9.7.2 for details).

10.5. Limitations of Study

While this study provides valuable insights into digital skills development among library professionals in Nigeria, it is important to acknowledge several limitations that may influence the scope, interpretation, and generalisability of the findings.

The geographical scope of the study was restricted to the southern region of Nigeria. This decision was informed by safety considerations, particularly the travel advisory issued by the UK's Foreign, Commonwealth and Development Office (FCDO) regarding terrorism and civil unrest in parts of northern Nigeria. Although this precaution ensured the safety of the researcher and the feasibility of data collection, it inevitably limits the extent to which the findings can be generalised to the entire country. Nigeria is characterised by significant regional diversity in terms of socioeconomic conditions, educational infrastructure, institutional capacity, and access to digital technologies. As such, the levels of digital skills and the nature of challenges associated with skills development among library professionals may vary considerably between northern and southern regions. Consequently, the findings of

this study should be interpreted within the context of the southern region, with caution exercised when extending conclusions to other parts of the country.

Moreover, the study focused exclusively on federal government-owned universities. While this focus enabled a detailed and context-specific exploration of digital skills gaps and challenges within a relatively structured institutional environment, it excludes other categories of universities, particularly those owned by state governments. State universities in Nigeria often operate under different funding arrangements, governance structures, and resource constraints, which may significantly influence the availability of digital infrastructure, staff training opportunities, and institutional support for skills development. Therefore, the findings may not fully reflect the experiences of library professionals working in non-federal institutions, where conditions and challenges may differ substantially.

Although the sample size was adequate for achieving the objectives of this study and ensuring meaningful analysis, it may not fully capture the diversity of experiences and perspectives among university library professionals across Nigeria. The Nigerian higher education system is extensive and heterogeneous, encompassing institutions of varying sizes, capacities, and technological advancement. A larger and more diverse sample, incorporating participants from multiple regions and institutional types, would likely provide a more comprehensive understanding of the digital skills landscape. Future studies could therefore benefit from broader sampling strategies to enhance representativeness and deepen insights into regional and institutional variations.

However, the study relied primarily on self-reported data obtained through questionnaires and interviews. While these methods are widely used in research and provide valuable insights into participants' perceptions and experiences, they are inherently subject to response bias. Participants may have overestimated their digital competencies due to social desirability or

professional expectations, or underestimated them due to lack of confidence or limited self-awareness. Additionally, some respondents may have been reluctant to openly discuss their limitations or challenges, particularly in a professional context where competence is highly valued. Such factors may have introduced a degree of subjectivity and potential inaccuracy into the data.

Finally, the assessment of task-based digital skills was based on a self-rating approach, which, although useful for capturing perceived competence, may not provide an entirely accurate measure of actual proficiency. Self-assessment methods depend heavily on individuals' ability to evaluate their own skills, which may not always align with objective performance levels. As a result, the study may not fully capture the practical capabilities of library professionals in executing specific digital tasks. Future research could address this limitation by incorporating more robust assessment methods, such as performance-based evaluations, direct observation, or practical skill testing, to provide a more objective and comprehensive measure of digital competencies.

In summary, while these limitations do not diminish the overall contribution of the study, they highlight important considerations for interpreting the findings and provide direction for future research aimed at advancing understanding of digital skills development among library professionals in Nigeria.

10.6 Directions for Future Research

This study was only conducted in the southern region of Nigeria, limiting its ability to generalise the findings to all library professionals nationwide. Future studies could explore the northern region of Nigeria and these regional differences to achieve a country-wide generalisation.

Data was collected using self-reported questionnaires and interviews, which may be subject to response bias. Library professionals might have overestimated or underestimated their digital skills or hesitated to acknowledge their lack of task-based skills and elaborate on the challenges of digital skills development in university libraries in Nigeria, leading to potential inaccuracies in the data. While the study highlighted the gap in task-based digital skills, it did not directly measure proficiency in these specific tasks. Future research could use more robust assessment tools or observational methods to evaluate task-based digital skills more accurately.

The data collected for this study is spatiotemporal and represents a snapshot of the current digital skills landscape. As technology constantly evolves, so do the required digital skills. Future studies could explore longitudinal trends to understand better how digital competencies in libraries evolve, especially in response to new technologies and practices.

This research drew attention to a new direction for future research. To obtain a greater understanding and insight, this study could be replicated with more institutions, using different data collection and analysis methods.

10.7 Research Conclusion and Recommendations

University libraries play a vital role by providing access to up-to-date scholarly content to support teaching, research, and lifelong learning. In the post-COVID era, libraries have become more digitally bound to meet user needs. University libraries in developed countries run efficient digital library services, while universities in developing countries still grapple with rendering digital services. This became more evident during the outbreak of the COVID-19 pandemic when university libraries in developed countries, especially in the UK, could transition to digital operations quickly. However, developing nations, especially Nigeria, could not go digital despite their investment in automation technology. Research shows that,

among many other factors, the lack of a skilled workforce to manage the digital environment played a key role in the transition process during the pandemic. A digitally skilled workforce is essential for libraries to meet the demands of the digital age. If Nigerian university libraries fail to adapt to the global trend, the quality of education and research will be impacted. As it stands, Africa accounts for 4% of global research, and the sub-Saharan region of Africa, with Nigeria being the leading country, contributes 0.72% to global research output (WEF, 2024). This is a poor research image for Africa, with 1274 universities and Nigeria having the highest number of universities (Statista, 2024). This backdrop, which is influenced by many other factors, may also be linked to the inefficiencies of the libraries in supporting research in Africa and especially Nigeria.

This study has identified gaps in operational digital skills and capacity development programs of library professionals in Nigeria, highlighting the challenges hindering capacity development and developing a strategic framework that proposes solutions to these issues. This study believes that implementing these proposed actions suggested in chapter 9 of this study will not only improve the digital skills of the library workforce and quality of services rendered by the university libraries in Nigeria but also positively impact the quality of education and research in Nigerian universities. Globally, this will contribute to the United Nations Sustainable Development Goals. The following recommendations are made:

Institutional-Level Action: In addition to the data provided in this study, university library administrators in Nigeria should conduct a thorough, context-based analysis of the digital skills needs of their staff and design focused training programs that should prioritise expert-focused training tailored to address digital operational gaps and needs rather than sending staff to generic, non-specialized training. Special attention should be paid to the digital skills gap variations established in this study. Support should be provided for female professionals to overcome gender-related barriers to skills development. Inclusion across staff cadres is

essential as it was observed that there is more emphasis on providing training and professional development opportunities for librarians in university libraries in Nigeria. In contrast, the paraprofessional staff receive little or no attention in that direction.

Furthermore, there is a need for a robust coalition among the universities and collaboration with relevant stakeholders to establish a new agency or strengthen the existing bodies/associations to make joint decisions regarding uniform technology infrastructure deployment for these libraries. This will allow coordinated and focused skills development and foster sustainability. Additionally, university management should prioritise staff motivation, ensuring that factors such as financial incentives, career progression, and recognition are in place to encourage staff to develop the digital skills necessary for enhancing their performance to deliver up-to-date service in their institutions.

Policy Development and Planning: Instead of relying on the university-wide policy on digital skills development, library management should develop a robust digital skills development policy for its libraries. The policy should define the categories of staff to be trained, the types and methods of training, the frequency, and the location (i.e., local or international) of these training programs. Library administrators and relevant stakeholders involved in policy formation should consider the impeding digital skills development factors identified in this study to guide policy formation, planning, and decision-making.

Gender Equity in Training: There is a need to implement effective policies and organisational frameworks for digital skills development to promote gender equity. University library management and other relevant stakeholders should implement tailored skills development programs for female professionals by addressing the structural and cultural barriers women face in most developing countries, especially Nigeria, where women are tied to family and marriage commitments. Providing equitable digital skills development opportunities will help balance career and family responsibilities and enhance overall

organisational performance by leveraging the diverse talents and perspectives of the university library workforce. This recommendation should help advance the UN SDG's five discussions on gender equality beyond equality to equity, especially for women in developing countries.

External stakeholders' action: Professional bodies, allied government agencies, and other stakeholders in the information science sector should be proactive in adapting and implementing some of the proposed solutions in chapter 9 of the study. The need for a multi-level collaboration and partnership of stakeholders to play key roles in the emergence of a new agency or strengthening the existing bodies/associations cannot be overemphasised, to oversee uniform technology infrastructure deployment for university libraries and continually develop required digital skills programs towards evolving needs. Also, Ukwoma and Akanwa (2008) have alleged that there is resistance and lack of dedication by professional bodies such as the Nigerian Library Association and Library Registration Council of Nigeria to create training sections for subordinate staff during their capacity development programs which limit the skills level of this category of staff and also pose a threat to the continuing sustainability of the university libraries operations. These professional bodies are therefore advised to be more inclusive in their training programs. Moreover, the library school administrators should adopt the proposed call for action outlined in Chapter 9. Even though this might not directly contribute to the effort to develop the digital skills of the existing professionals, it will create a foundation and prepare future professionals to be ready for the market.

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APPENDIXES

APPENDIX 1: PARTICIPANT INFORMATION SHEET AND QUESTIONNAIRE



Participant information sheet

Thank you for agreeing to take part in this survey.

Title of Research: Sustainable Automated Library Operation; Training Requirements on Emerging automation Technology for University Libraries in Nigeria.

Researcher: Gbenga Adetunla, PhD student, University of Strathclyde, UK

Purpose of Research

I am conducting research to identify the digital skills gap and training requirements of university libraries staff in Nigeria. The adoption of automation technology by university libraries is to significantly improve the quality of operations and services rendered. despite their investment in automation technology, their operations and services were shot down during the COVID19 pandemic while university libraries in the developed world switched to virtual operations. The key factor among other factors responsible for this was lack of staff digital competence.

Through this research study, we hope to ascertain the basic and professional digital skills level, existing training programs available and challenges of skills and training programs by library staff in the use of library automation in Nigeria. Findings from this investigation will help develop context-based training material on automation to update library staff's core digital skills and competencies.

Procedure

During your participation in the survey, some demographic questions are included to help us gain insights into level of competence across certain demography. Also, you will be asked questions related to your digital skills level, existing training programs available and challenges of skills and training programs. Gaining insight into the above stated objectives will help develop a context-based digital training material that is suitable for university library staff in Nigeria

What data will be collected / How these will be used and managed.

- Personal identifiable information / sensitive data will not be collected as part of this study. Where a participant chose to be added to the optional prize draw, their email address will be collected for use in the prize draw but will not be used further for the purposes of this research work.
- Any reports generated from the data collected will be used in the final thesis and for publications in scientific journals.
- Data collected may be referenced or used in future related research.
- All information provided will be kept strictly confidential.

- Any identifiable data will be removed in strict compliance with the UK Data Protection Act / the General Data Protection Regulation
- Data collected will be stored in the University of Strathclyde owned servers, password protected and accessible only by the research team members.

Length of Participation: It is estimated that this survey will take about 15 minutes to complete.
For any questions or further clarifications, please contact me, my supervisors or the department using the details below.

Researcher
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2. Prof Ian Ruthven - Email: ian.ruthven@strath.ac.uk

Departmental Contact - Email: ethics@cis.strath.ac.uk

Declaration and Consent
By proceeding to take this survey, you acknowledge the following:
- You have read the information provided above and have understood the purpose of the survey.
- Your participation in the study is entirely voluntary.
- You are aware that you may choose to terminate your participation at any time for any reason.
- You are at least 18 years of age.

Signature: **Date:**

QUESTIONAIRE

SECTION 1: DEMOGRAPHIC INFORMATION

Name of institution
☐ University of Benin, ☐ University of Ibadan, ☐ University of Nigeria Nsukka. ☐ University of Uyo, ☐ Federal University of Technology, Akure ☐ Federal University of Technology, Owerri ☐ Federal University, Otuoke, ☐ Federal University, Oye-Ekiti, ☐ AlexEkwueme University,NdufuAlike, ☐ Babcock University ☐ Elizade University ☐ Afe Babalola University
Gender: Male ☐ Female ☐ Prefer not to say ☐
Designation: Librarian ☐ Library officer ☐
Education: Diploma ☐ Bachelors ☐ Masters ☐ PhD. ☐
Work experience: 0-5 ☐ 6-10 ☐ 11 and above ☐

SECTION 2.

In order to understand the basic digital skills, you possess, please indicate your level of disagreement/agreement to the following statements.

(SA-strongly agree A-agree, N- Neutral, D-disagree, SD-strongly disagree)

S/N	**Basic digital skills possessed by library staff in the use of library automation in Nigeria.**	**SA**	**A**	**N**	**D**	**SD**
	I can use the computer for basic operations.					
	I can connect my computer to wifi					
	I can save and copy data into primary storage devices (e.g., hard disc, cloud drive, etc.)					
	I can use search engines for online search and use internet for e-mail, research, etc. (internet skills)					
	I can use word processing files, spreadsheet, and basic graphic designs.					
	I can do document scanning, photocopy and uploading.					
	I can use a scanning machine to preserve document					

	I can create and publish documents using computers (desktop publishing)					
	In your opinion, list additional basic digital skills you possess.					

SECTION 3.

In order to gain insight into the library operational digital skills, you possess, please indicate your level of disagreement/agreement to the following statements.

(SA-strongly agree A-agree, N- Neutral, D-disagree, SD-strongly disagree)

S/N	**library staff skill of using library automation software for in-house operation.**	**SA**	**A**	**N**	**D**	**SD**
	Acquisition operation					
	I can manage vendors using automated systems.					
	I can manage budget planning and monitoring using automated systems.					
	I can create purchase order using automated systems.					
	I can manage order receipts and invoices using automated systems.					
	I can handle purchase suggestions using automated systems.					
	Cataloging operation					
	I can catalogue library resources using the library Management software.					
	I can create bibliographic record with the Z39.50 tool					
	I can create a bibliographic record by importing file from the OCLC.					
	I can edit a record / item and Merge identical records.					
	I can generate bar-code for call mark/accession number.					
	I can forward catalogued details to the OPAC server.					
	Serial operation					
	I can manage and monitor subscription using automated systems.					
	I can create new issues and manage serial collections using automated systems.					
	I can check expiration of subscription using automated systems.					
	I can manage numbering patterns and the inner counter using automated systems.					
	I can manage frequencies and claim late issues using automated systems.					
	Circulation operation					
	I can register different categories of user using automated systems.					
	I can charge and discharge materials using automated systems.					
	I can renew documents and prompt due dates notices using automated systems.					
	I can manage fines using automated systems.					
	I can transfer documents from one library to another using automated systems.					
	I can generate reports (books borrowed and returned, OPAC user statistic, frequently borrowed books etc.)					
	I can use all the circulation hardware (Barcode scanner,3D printer, payment gateway etc.)					
	Patron operations					
	I can create new user category					
	I can register new patron profile					
	I can search for existing patrons					
	I can manage and edit patron account.					
	I can define staff and patron permissions.					

SECTION 4.

To understand the digital skills training programs you have attended, please indicate your level of disagreement/agreement to the following statements.

(SA-strongly agree A-agree, N- Neutral, D-disagree, SD-strongly disagree)

S/N	Existing digital skills training programes for library staff	SA	A	N	D	SD
	I have attended an Internally organized training program on digital library services.					
	I have been sponsored to workshops/ conferences on digital library operation.					
	I have been sponsored to attend courses in library schools on digital library operation.					
	I have attended short –term courses on digital library operation.					
	I have been awarded scholarships for programs on digital library operation.					
	I have attended a train the trainer program on digital library operation.					
	As a new staff, I attended orientation program on digital library operation.					
	I have received mentoring from senior colleagues on digital library operation.					
	I have attended training tour to digital library operation establishments.					
	I receive assistance through colleagues in the library on digital library operation.					
	I have attended online training programs on digital library operation.					
	I self-sponsored myself to training programs on digital library operation.					
	Please share other forms of training on digital library operation you have attended not listed above.					
	Kindly share other training programs that will help boost your digital skills.					

SECTION 5a: Challenges

This section will help understand the staff-side factors that impede your digital skills and training programs, please indicate your level of disagreement/agreement to the following statements.

(SA-strongly agree A-agree, N- Neutral, D-disagree, SD-strongly disagree)

S/N	**staff-side factors that impede my digital skills and training programs for library staff.**	SA	A	N	D	SD
	I have phobia for computers and technology					
	My age affects the use of computers and technology					
	My religious belief is averse to the use of computers					
	I have health challenges that requires me avoid technology					
	I am not financially buoyant to afford training					
	My salary and wages are promptly paid					
	My formal LIS training excluded training on digital technology					
	Family commitments give me little time training					
	My marriage reduces my digital skills training opportunities					
	My gender provides little opportunity for digital skills training.					
	My rank in the office reduces my training opportunities.					
	I am rarely promoted and there is no need to attend any digital skills training.					
	My library management does not encourage digital skills training.					

APPENDIX 2: INTERVIEW CONSENT FORM, QUESTIONS AND GUIDELINES



Participant information sheet

Thank you for agreeing to take part in this survey.

Title of Research: Sustainable Automated Library Operation; Training Requirements on Emerging automation Technology for University Libraries in Nigeria.

Researcher: Gbenga Adetunla, PhD student, University of Strathclyde, UK

Purpose of Research

I am conducting research to identify the digital skills gap and training requirements of university libraries staff in Nigeria. The adoption of automation technology by university libraries is to significantly improve the quality of operations and services rendered. despite their investment in automation technology, their operations and services were shot down during the COVID19 pandemic while university libraries in the developed world switched to virtual operations. The key factor among other factors responsible for this was lack of staff digital competence.

Through this research study, we hope to ascertain the management-side challenges of skills and training programs, and suggestions by senior management staff on possible solutions towards a sustainable library automation in Nigeria. Findings from this investigation will help develop context-based training strategy on automation to update library staff's core digital skills and competencies.

Procedure

During your participation in the survey, some demographic questions are included to help us gain insights into level of competence across certain demography. Also, you will be asked questions related to your digital skills level, existing training programs available and challenges of skills and training programs. Gaining insight into the above stated objectives will help develop a context-based digital training material that is suitable for university library staff in Nigeria

What data will be collected / How these will be used and managed.

- Personal identifiable information / sensitive data will not be collected as part of this study.
- Any reports generated from the data collected will be used in the final thesis and for publications in scientific journals.
- Data collected may be referenced or used in future related research.
- All information provided will be kept strictly confidential.
- Any identifiable data will be removed in strict compliance with the UK Data Protection Act / the General Data Protection Regulation
- Data collected will be stored in the University of Strathclyde owned servers, password protected and accessible only by the research team members.

Length of Participation: It is estimated that this interview will take about 1 hour to complete.

For any questions or further clarifications, please contact me, my supervisors or the department using the details below.

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2. Prof Ian Ruthven - Email: ian.ruthven@strath.ac.uk

Departmental Contact - Email: ethics@cis.strath.ac.uk

Declaration and Consent

By proceeding to take this survey, you acknowledge the following:

- You have read the information provided above and have understood the purpose of the survey.
- Your participation in the study is entirely voluntary.
- You are aware that you may choose to terminate your participation at any time for any reason.
- You are at least 18 years of age.

Signature: **Date:**

Interview questions

This section will help understand the managerial issues associated with digital skills training programs for library staff. Kindly express your opinion on the following statements.

MANAGERIAL ISSUES ASSOCIATED WITH EXISTING DIGITAL SKILLS DEVELOPMENT FOR LIBRARY STAFF.
Policy on digital skills development.
Does the library management have a written policy on capacity development? If yes, does this include training to improve digital skills of library staff?
Does the policies also give justification for category of staff to be trained, frequency of training, location of training, as well as the type/methods of training i.e conferences, workshops, seminars etc,
Are there challenges to implementing the policy?
Funding towards digital skills development.
Does the parent institution regularly release the statutory 10% annual budgetary allocation to the library? If yes, how much of this is allocated to digital capacity development?
With specifics to digital skills development, what is the library management funding pattern for staff training on digital operation/services?
Does the library professional bodies such as Nigerian Library Association (NLA), Librarian Registration Council of Nigeria (LRCN) etc. contribute to the digital skills development of library staff in terms of funding or organizing training programs?
Are there external bodies such as TETFund, NITDA, NUC and other govt/private partners that contribute to the digital skills development of library staff in terms of funding or organizing training programs?
Library management attitude towards digital skills development.
Since post-covid, has there been an increased effort by the library management to improve the digital skills of library staff? I.e through conferences, workshops, seminars etc.
Does the library have/search for experienced and highly skilled personnel to handle training on digital operations/services.
Does the library have the facilities to organize training on digital library operations/services.
Is the library neglected by parent institution on training programs for digital operations/services?
Does the library management make case from the parent institution for training to improve the digital skills of staff on digital operations/services?
Is there a perception of willingness from the staff side to develop digital skills?
Are the library staff burdened with workload that make them usually busy to attend training programs.
Any other challenges.
MANAGEMENT STANDPOINT ON THE QUANTITATIVE FINDING OF THIS RESEARCH
Digital skills level
There is low digital operational skills especially in cataloging(z39), serial and acquisition operations, which of these operations is considered by the library management to require an immediate/urgent training intervention?
Despite the low operational skill level, staff in the librarianship cadre are more skilled compared to paraprofessionals. Which cadre will the management prioritize for digital skills training on digital library operation/services.
Factors influencing digital skills development
Having identified gender as a key factor, women have lower skills compared to men. Marriage, family commitment, childbirth/caring etc affect capacity development of women more considering that the LIS profession is female dominated. What is the management plan in addressing this inequality.
How can the library school support and enhance the digital skills development of library professionals.
Digital skills training approach
Considering resources and infrastructure, would a national level training approach be effective for digital capacity? A training program organized by TETfund, NLA, LRCN etc
Would an institutional focused training approach be more appropriate for digital capacity development?
Would an individual staff training approach be more appropriate for digital capacity development?
Is there any other area of digital operation in the library that requires training intervention which has not been mentioned above?

Thank you for the time spent taking this survey.
Your response has been recorded and kept safe