

An assessment of the professional competencies necessary for the Fourth Industrial Revolution (4IR) era among library personnel in universities in Southwestern Nigeria

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Abstract.

This study explored the competency gaps and development strategies necessary for librarians to remain relevant and effective within the Fourth Industrial Revolution (4IR) context. Employing a descriptive survey design, the study sampled 127 library personnel from three selected universities: University of Lagos, Olabisi Onabanjo University, and Covenant University. Data were collected using a structured questionnaire. Findings revealed that while library staff rated themselves as proficient in areas such as digital library systems and the use of AI tools, significant gaps remained in data management, interdisciplinary research collaboration, and comprehensive understanding of 4IR-related competencies. A majority (54.3%) of respondents acknowledged a discrepancy between their current skill sets and the demands of 4IR, with 66.1% indicating a need for further training. Furthermore, only 44.1% perceived their institutions as supportive of continuous professional development. Notably, most library staff held lower academic qualifications (BLIS, HND), with relatively few possessing advanced degrees such as MLS or PhDs, thereby limiting their capacity to lead digital transformation efforts. The study concluded that academic librarians in Southwestern Nigeria must engage in strategic, ongoing upskilling to address competency gaps and meet the changing demands of the profession. It recommended institution-led initiatives including targeted training programmes, enhanced institutional support mechanisms, incentives for postgraduate education, mentorship schemes, and access to customised digital learning platforms. Such interventions are vital to aligning librarian competencies with the technological imperatives of the Fourth Industrial Revolution, and to positioning academic libraries as active contributors to innovation in higher education.

Keywords: Assessment, professional competencies, Fourth Industrial Revolution, library personnel, universities, Southwestern Nigeria

Introduction

The advent of the Fourth Industrial Revolution (4IR) is defined by the convergence of physical, digital, and biological systems, fundamentally transforming industries, economies, and professional landscapes globally. The term "Fourth Industrial Revolution" was popularised by Klaus Schwab, founder of the World Economic Forum. It builds upon the digital revolution (the Third Industrial Revolution) and is distinguished by a suite of advanced technologies such as artificial intelligence (AI), the internet of things (IoT), robotics, blockchain, big data and analytics,

smart cities, augmented reality (AR) and virtual reality (VR), Cloud computing, and 3D printing, among others (Moonsar, 2024). These technologies are not only reshaping industry structures but are also revolutionising the creation, access, and utilisation of knowledge.

Nonetheless, the emergence of the 4IR brings with it both opportunities and challenges, particularly within the realm of academic librarianship (Schwab, 2017). Academic libraries, long considered custodians of knowledge and enablers of learning, are now being compelled to redefine their purpose in response to the

digital transformation permeating higher education institutions.

Historically, academic libraries served as the principal platforms for organising and disseminating knowledge, yet they now face immense pressure to respond swiftly to rapidly evolving technologies. Academic librarians, as key intermediaries in facilitating research and learning, must adapt in order to maintain their relevance within a highly digital, data-centric, and interconnected environment.

In this new era, academic libraries are evolving from traditional repositories of printed materials into dynamic learning environments and digital knowledge hubs. Librarians must, therefore, acquire the requisite skills to support users in navigating complex digital landscapes, including data repositories, open access resources, and institutional repositories. With the proliferation of digital content, it has become essential for academic librarians to educate students and academic staff on how to evaluate and utilise information critically and effectively. Increasingly, librarians are engaged in data curation, research data management (RDM), and ensuring compliance with open access policies. Today's libraries often function as collaborative spaces equipped with emerging technologies such as virtual reality training labs and makerspaces.

However, despite these expanded responsibilities, many academic librarians experience a significant gap in the competencies required to function effectively in the context of the 4IR. Deficiencies in knowledge related to AI, machine learning, data science, coding, and digital tools can hinder professional effectiveness. Moreover, many lack familiarity with digital content management systems and digital preservation methods. Insufficient training in data analytics, metadata standards, data

visualisation, and RDM, as well as poor integration into research workflows and limited awareness of developments in scholarly communication also pose considerable challenges. A lack of experience in designing and delivering digital literacy initiatives, or embedding information literacy within online and hybrid curricula, further limits impact. Resistance to change combined with gaps in innovation management, project management, and strategic planning, exacerbates the issue. In addition, limited leadership, communication, and collaboration skills hinder effective interdisciplinary teamwork and advocacy within academic institutions (Alolabi et al, 2021). To address these competency shortfalls, both library personnel's and institutions must commit to continuous professional development and reinvention.

Statement of the problem

Despite the increasing expectation for library personnel to align with the demands of the Fourth Industrial Revolution, a notable gap persists between existing professional competencies and those required to thrive in this technologically advanced environment. Many library personnel currently lack adequate training in advanced ICT tools, data science, artificial intelligence, and methods of digital preservation (Kaur & Rani, 2021). This mismatch in skills places the academic library at risk of becoming marginalised within the higher education landscape, undermining its relevance and potential impact. Aggravating this issue is the absence of coherent professional development strategies specifically designed to address 4IR-related skill deficits. Although some institutions have introduced isolated training initiatives, there is frequently a lack of systematic, forward-looking frameworks to guide librarians' ongoing learning and adaptation. This has led to inconsistencies in

preparedness across different institutions and geographical regions, particularly within developing contexts where access to professional development opportunities may be more restricted (Ifijeh & Yusuf, 2020).

Therefore, this study seeks to assess the professional competency gaps among academic librarians in the era of the Fourth Industrial Revolution and to identify effective development strategies that can bridge these gaps. It aims to offer insights that will inform policy and practice, ensuring that academic libraries are not only reactive to change but are proactive drivers of innovation and digital transformation in the higher education sector.

Objectives of the study

The objectives of this study are to:

1. Identify the core competencies required of university library personnel in the context of the Fourth Industrial Revolution (4IR).
2. Assess the current competency levels of university library personnel in South-Western Nigeria with regard to the demands of the 4IR.
3. Examine the perceived gaps between current competencies and emerging technological requirements.
4. Explore existing or necessary strategies for professional development aimed at addressing these competency gaps.
5. Identify and assess the existing professional development programs in the universities under study that support the integration of 4IR skills for library personnel.

Research questions

The study seeks to answer the following questions:

1. What are the key competencies required of university library personnel in the context of the Fourth Industrial Revolution?
2. What is the current level of professional competency among university library personnel in South-Western Nigeria in relation to 4IR-related skills?
3. What gaps exist between the required competencies and the current skill levels of university library personnel?
4. What strategies are currently in place or proposed to address competency gaps among university library personnel in the region?
5. What professional development opportunities are currently available in the universities under study to support the integration of Fourth Industrial Revolution (4IR) skills among library personnel?

Literature review

The Fourth Industrial Revolution (4IR), characterised by innovations such as artificial intelligence (AI), big data, the internet of things (IoT), robotics, and cloud computing, is transforming the field of librarianship on a global scale. According to Chigwada and Chisita (2021), librarians must now possess digital fluency, critical thinking, and adaptability in order to navigate this increasingly integrated digital-physical environment. A comparative study conducted in Ghana and South Africa reached similar conclusions, highlighting the growing need for competencies beyond traditional librarianship, such as emotional intelligence and effective people management.

However, research indicates that librarians in Southwestern Nigeria display limited awareness and utilisation of information and communication

technologies (ICT). Akparobore et al. (2020) observed low awareness of 4IR technologies and underdeveloped digital skill sets among library professionals. Similarly, Adetunla and Chowdhury (2023) reported significant gaps in digital competence, often attributed to a lack of interest, fear of technology, and inadequate training opportunities.

A study by Adjei and King (2024) identified chronic underfunding and poor infrastructure as major barriers to technology adoption in Nigerian academic libraries. Their research found little evidence of strategic continuing professional development (CPD) programmes aimed at preparing librarians for the 4IR. Manda and Dhaou (2019) underscored the importance of CPD policy frameworks to foster digital transformation; yet, this remains an overlooked area within the Nigerian library sector. In support of reform, Kamba (2011) recommended integrating 4IR topics such as AI, IoT, and big data into the curricula of Library and Information Science (LIS) programmes. Hussain (2019) further argued that many LIS programmes in Nigeria continue to focus on outdated generalist skills, thereby failing to equip graduates with the digital competencies demanded by modern librarianship.

As universities worldwide strive to align with technological advancements, academic librarians are increasingly expected to acquire skills that extend beyond traditional library functions. According to Cox et al. (2019), the integration of digital tools for information management, data curation, user-centred design, open access publishing, and digital literacy instruction is now essential. Additionally, librarians are being called upon to contribute to institutional research, digital scholarship, and learning analytics, thereby transitioning from service providers to strategic partners in the

production and dissemination of knowledge (Corrall, 2020).

Nonetheless, not all scholars believe Nigerian libraries are entirely unprepared for the 4IR. Tella et al. (2022) conducted interviews with chief librarians from six university libraries—namely, the University of Ilorin, Federal University Wukari, Bayero University, University of Nigeria, University of Calabar, and University of Ibadan. Respondents generally agreed that some Nigerian libraries are prepared for the 4IR, particularly academic libraries that have adopted technologies such as cloud computing, social media, e-resources, and online databases. However, they also acknowledged that most libraries remain largely unautomated and have yet to integrate advanced 4IR technologies such as AI, robotics, IoT, or blockchain into their operations.

When asked to suggest strategic actions to improve readiness for the 4IR, the respondents emphasised the need to raise awareness, organise training programmes (including workshops, seminars, and webinars), enhance collaboration among libraries, and secure adequate funding for technological investment. They advocated for direct government funding and the recruitment of young, tech-savvy librarians. Furthermore, they stressed the importance of upgrading existing infrastructure and services to align with the expectations of library users in the 4IR era.

These recommendations closely align with findings from a study by Lee et al. (2018), which outlined key strategies for 4IR readiness. These included strengthening linkages and collaborations among libraries, enhancing professional competencies in critical technologies, expanding technical and vocational training, promoting talent development, and securing sufficient

budgetary allocations to support human and technological resources.

Methods

This study adopted the descriptive survey research design, which is appropriate for gathering quantitative data to assess the competencies of university library personnel in the context of the Fourth Industrial Revolution (4IR). The design enabled the researcher to collect, analyze, and interpret data regarding professional competency levels, gaps, and development strategies among academic librarians in Southwestern Nigeria.

The population comprised university library personnel (librarians and library officers) working in selected universities across Southwestern Nigeria, including both public and private institutions. A purposive sampling technique was used to select three institutions representing diverse ownership structures and levels of technological advancement: the University of Lagos (UNILAG) – federal, Olabisi Onabanjo University (OOU) – state, and Covenant University – private. From these institutions, a total of 127 academic library staff were surveyed, including librarians and library officers across various cadres.

The primary instrument for data collection was a structured questionnaire divided into four main sections: Section A – Demographic Information: Age, gender, job role, institution, and educational qualification; Section B – Core Competency

Awareness and Proficiency: Measuring self-assessed proficiency levels in various 4IR-related skills such as AI, data management, digital literacy, etc.; Section C – Perceived Competency Gaps: Respondents' perceptions of skill deficiencies relative to 4IR demands; Section D – Professional Development and Institutional Support: Types of training received, preferred learning methods, and institutional support for professional development.

To ensure content validity, the instrument was reviewed by experts in library science and information technology. The questionnaires were administered both physically and digitally, ensuring flexibility and improved response rates. Respondents were given informed consent forms assuring confidentiality and the voluntary nature of their participation. Data collection took place over a span of two weeks.

Analysis was conducted using SPSS version 20 and the result obtained were presented in percentages, frequency count and charts. The study adhered to ethical research standards. Ethical clearance was obtained from the universities studied. Participation was voluntary and data were anonymised, and confidentiality was maintained throughout the research process.

Results

This section provides a comprehensive presentation and discussion of the results obtained from the analysis

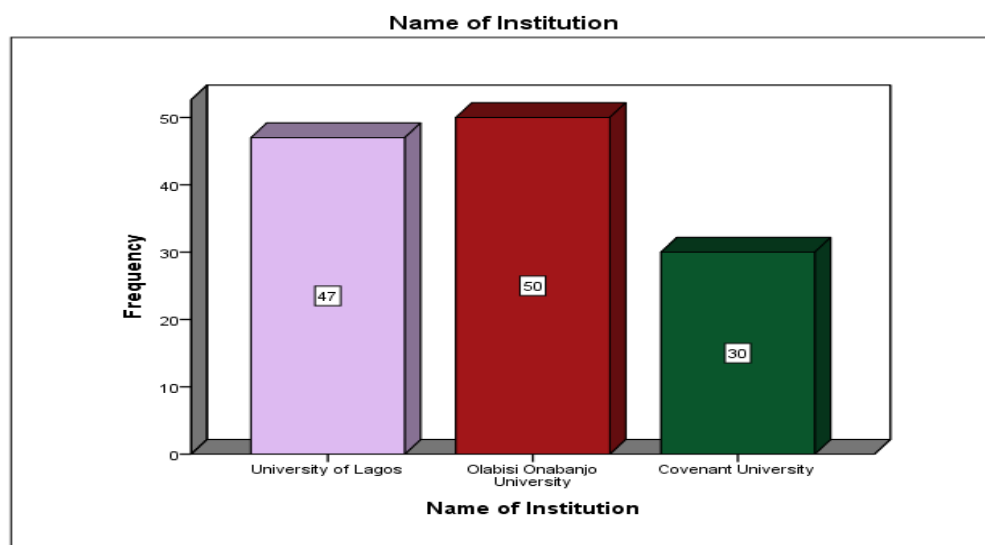


Figure 1: Institutions of the respondents

Figure 1 indicates that Olabisi Onabanjo University (OOU) had the highest number of respondents, with 50 participants representing 39.4% of the total. The University of Lagos (UNILAG) followed closely with 47 respondents, accounting for 37.0%. Covenant University had the fewest

respondents, with 30 participants, making up 23.6%. Overall, the distribution reflects a relatively balanced input from the three institutions, although there is slightly higher representation from the public universities (OOU and UNILAG) compared to the private university (Covenant).

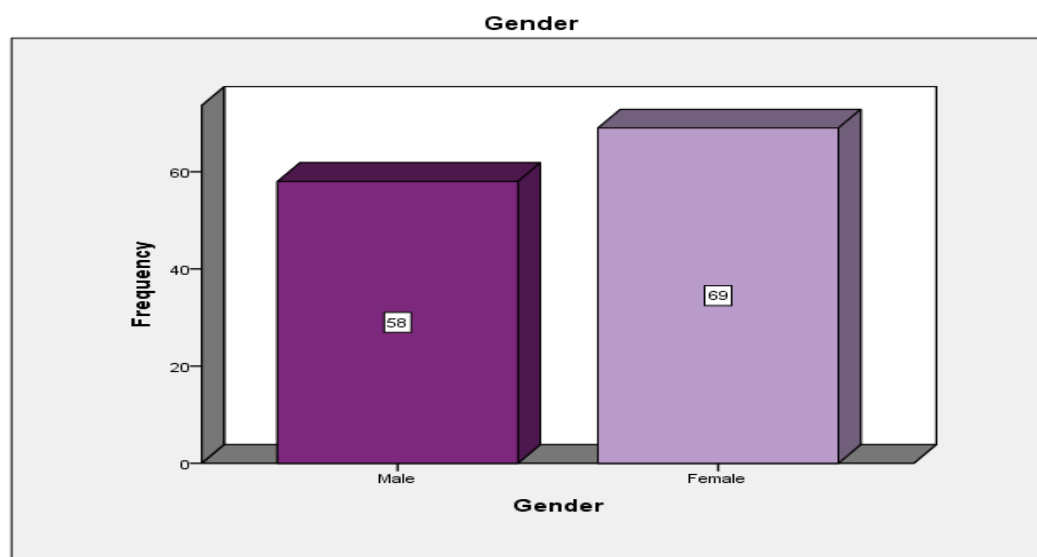


Figure 2: Gender of the respondents

Figure 2 shows the gender distribution of the respondents: females constituted 69 (54.3%), while males accounted for 58 (45.7%) of the

total. This suggests that there were more female than male librarians in the universities surveyed.

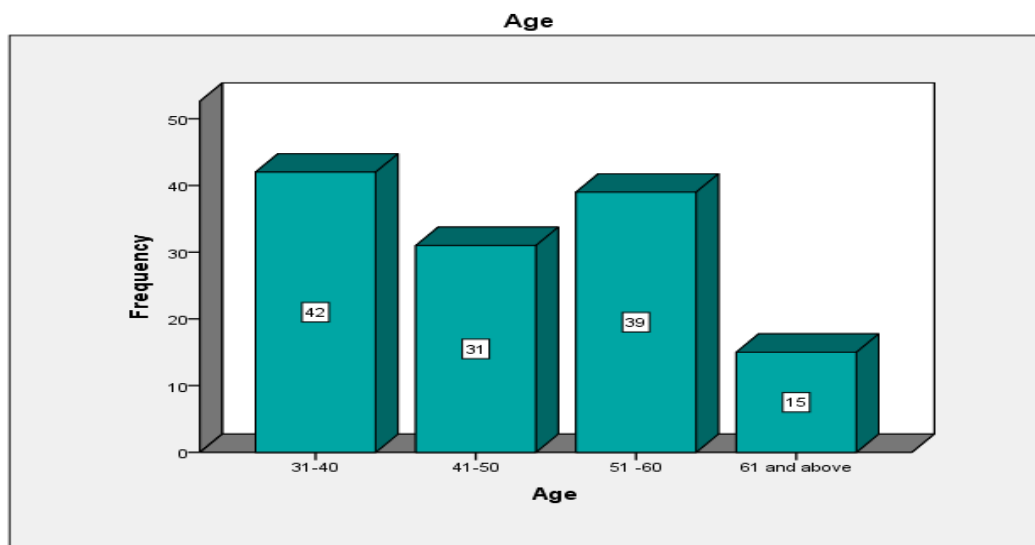


Figure 3: Age of the respondents

Figure 3 displays both the frequency (actual count) and relative frequency (percentage) of respondents across specific age intervals. The most represented age group is 31–40 years, with 42 respondents, accounting for 33.1% of the total sample. The 51–60 age group follows closely, with 39 respondents (30.7%), indicating that late middle-aged

adults comprised a significant portion of the study population. Respondents aged 41–50 totaled 31, representing 24.4% of the sample, a moderate frequency that still reflects a notable segment of the group. The least represented age group is 61 years and above, with only 15 respondents, making up just 11.8% of the total.

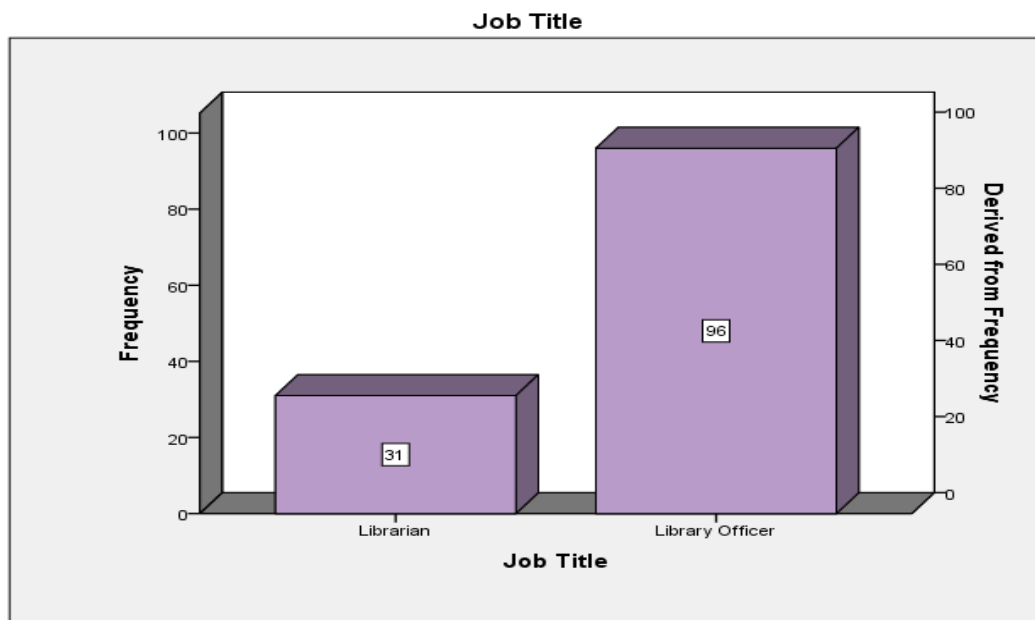


Figure 4: Job title of the respondents

Figure displays a categorical variable indicating the job roles of the respondents. librarians were the category with the lowest frequency (n = 31), comprising 24.4% of the

total sample. Conversely, library officers were the most common role, with 96 respondents, accounting for 75.6% of the sample.

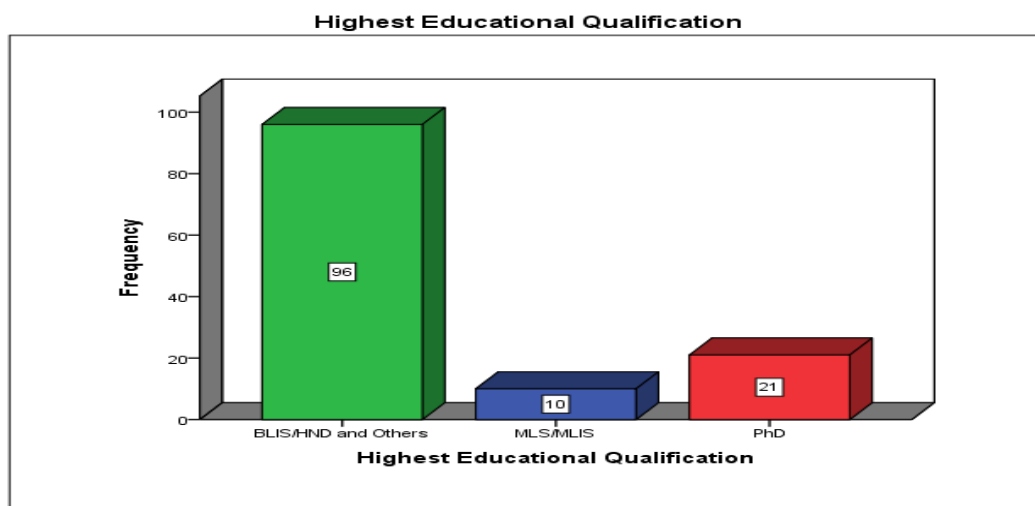


Figure 5: Educational qualification of the respondents

The data in Figure 5 indicate that respondents with a BLIS, HND, or qualifications categorised as others had the highest representation, with a frequency of 96, accounting for 75.6% of the total sample. This suggests that the majority of participants held either a Bachelor's degree in Library and Information Science, a Higher National Diploma, or other unspecified qualifications. This group constitutes the modal class, representing the most common educational qualification among the respondents. Following this group, 21 respondents held a Doctor of Philosophy (PhD) degree, comprising 16.5% of the sample. This is a

notable proportion, reflecting a significant presence of individuals with advanced academic qualifications. Respondents with a Master's degree in Library and Information Science (MLS/MLIS) formed a smaller segment, with 10 individuals representing 7.9% of the total sample. This relatively low percentage suggests that postgraduate academic attainment at the Master's level is less common among the participants. Overall, the predominance of the BLIS/HND and Others category implies that the majority of respondents may have had limited exposure to postgraduate research training.

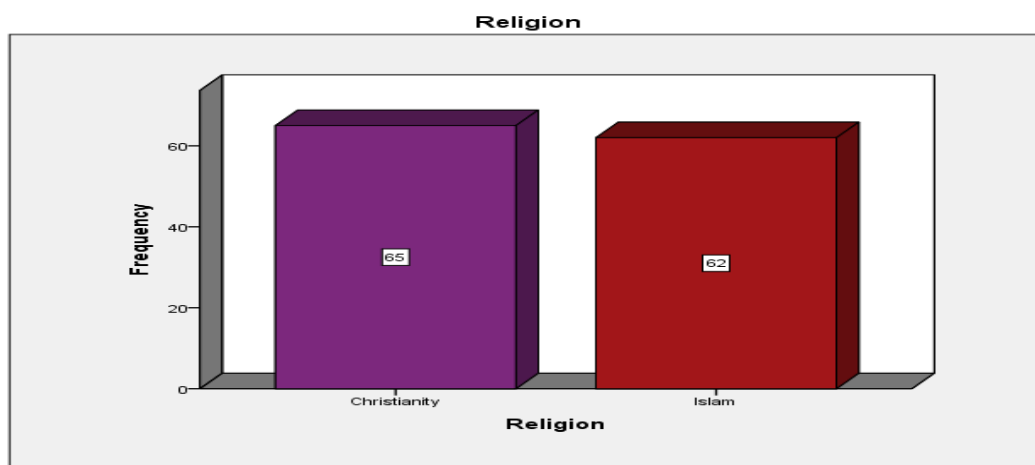


Figure 6: Religion of the respondents

The figure presents the distribution of respondents by religion. According to the frequency data, 65 participants (51.2%)

identified as Christians, while 62 participants (48.8%) identified as Muslims.

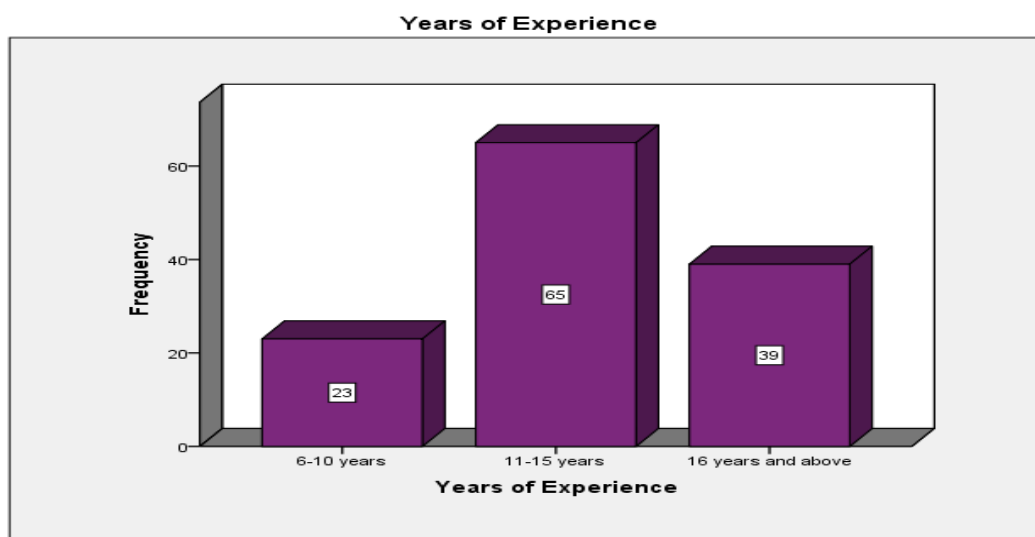


Figure 7: Work experience of the respondents

A majority of respondents, 65 (51.2%), have between 11 and 15 years of work experience. A significant proportion, 39 (30.7%), have 16 or more years of experience, while the smallest group, 23 (18.1%), have between 6 and 10 years of work experience.

Research question one: What are the key competencies required of university library personnel in the context of the Fourth Industrial Revolution? This question is answered with the data in in Figure 8.

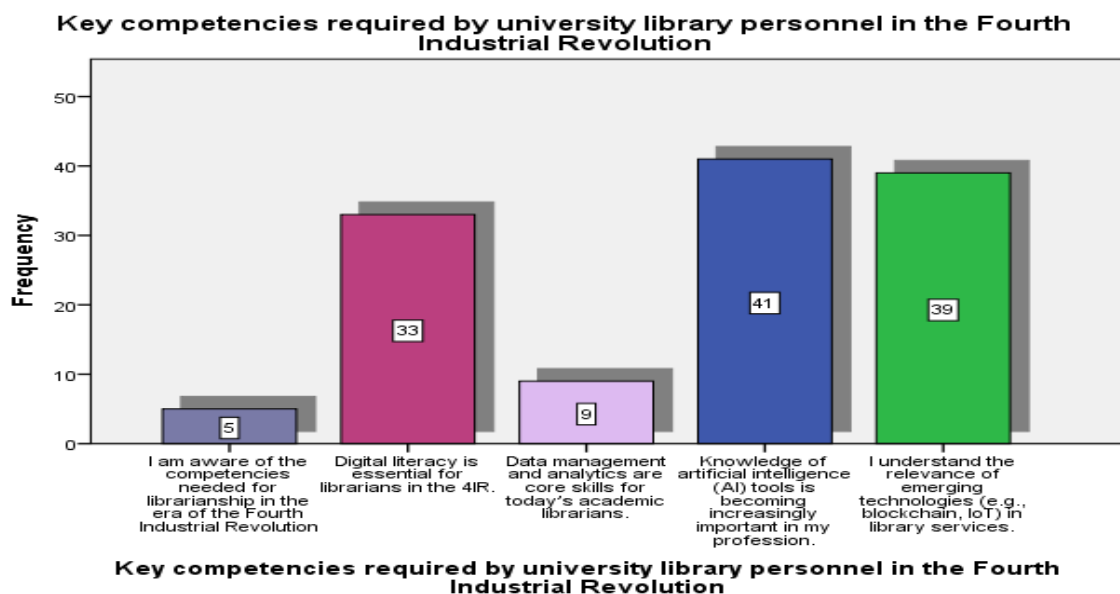


Figure 8: Key competencies required of university library personnel

According to Figure 8, the most frequently recognised competency among respondents is knowledge of artificial intelligence (AI), identified by 41 individuals (32.3%). This indicates that a significant proportion of academic librarians acknowledge the growing importance of AI tools in their profession. Such tools may include machine learning for information retrieval, chatbots for user assistance, and AI-driven cataloguing and classification systems.

Closely following is understanding of emerging technologies (e.g., Blockchain, IoT), cited by 39 respondents (30.7%). This highlights a strong awareness of how disruptive technologies like blockchain and the Internet of Things (IoT) can transform library services—for example, through secure digital records, decentralised access, or smart learning environments.

Similarly, digital literacy was identified by 33 respondents (26.0%) as a vital skill. This suggests that librarians continue to view the ability to navigate, evaluate, and create information using digital technologies as essential in the context of the Fourth Industrial Revolution (4IR). Digital literacy

serves as a foundation for leveraging more advanced tools and systems.

Data management and analytics was recognised by only 9 respondents (7.1%), making it the least acknowledged among the technical skills listed. Despite its critical role in evidence-based decision-making, research support, and digital resource management, its low ranking suggests a potential area for increased training or emphasis—particularly given the importance of data as a core asset in the digital age.

Finally, awareness of competencies needed for librarianship in the 4IR was noted by just 5 respondents (3.9%). This relatively low figure indicates that, while specific technical skills are being recognised, a broader understanding of the overall competencies required in the 4IR is not yet widespread. This points to a possible gap in strategic or future-oriented professional development.

Research question two: What is the current level of professional competency among university library personnel in South-Western Nigeria in relation to 4IR-related

skills? This question is answered with the data in Table 1.

Table 1: Current level of professional competency among competency among university library personnel in Southwestern Nigeria regarding 4IR-related skills

S/N	Questionnaire Item	VHP		VP		MP		LP		NP	
		F	%	F	%	F	%	F	%	F	%
1	Use of digital library systems	59	46.5	31	24.4	5	3.9	6	4.7	26	20.5
2	Data curation and digital preservation	47	37.0	47	37.0	4	3.1	23	18.1	6	4.7
3	Use of Artificial Intelligence tools in library operations	56	44.1	28	22.0	2	1.6	20	15.7	21	16.5
4	Information literacy instruction related to emerging technologies	6	4.7	74	58.3	12	9.4	14	11.0	21	16.5
5	Collaboration on interdisciplinary research involving technology	59	46.5	27	21.3	18	14.2	10	7.9	13	10.2

Key: VHP- Very High Proficiency, VP- Very Proficiency, MP-Moderate Proficiency, LP- Low Proficiency, NP- Not Proficiency

Table 1 presents the respondents' levels of professional competency in the use of digital library systems. A total of 59 librarians (46.5%) reported being very proficient, while 31 (24.4%) indicated they were very highly proficient, making a combined total of 90 librarians (70.9%) who rated themselves as either very proficient or very highly proficient. This suggests that a significant majority of academic librarians consider themselves to possess strong competency in Fourth Industrial Revolution (4IR)-related skills, indicating a high level of adaptability and professional proficiency within the sector. Conversely, 26 librarians (20.5%) reported being not proficient, and 6 (4.7%) indicated little proficiency, resulting in a total of 32 librarians (25.2%) demonstrating low levels of competency. This subgroup may benefit from targeted up skilling or training initiatives to better align their capabilities with the demands of the 4IR. Meanwhile, only 5 librarians (3.9%) reported moderate proficiency. This may imply that librarians tend to self-assess at the extremes of the competency scale, with relatively few placing themselves at a moderate level.

Similarly, a majority 94 (74.0%) out of 127 librarians, fall into the very proficient and very highly proficient categories. This indicates a strong level of competency among academic librarians in data curation and digital preservation, suggesting that many have successfully adapted to the skill requirements associated with the 4IR. In contrast, 6 librarians (4.7%) reported being not proficient, 23 (18.1%) identified as having little proficiency, and only 4 (3.1%) reported moderate proficiency. These figures imply that approximately one in four librarians still require further training or support to manage data curation and digital preservation effectively in alignment with 4IR competencies. Interestingly, the moderate proficiency category accounts for the smallest percentage (3.1%), again indicating a polarization librarians tend to consider themselves either well-versed or lacking in this area.

In addition, a considerable proportion of academic librarians also demonstrate strong proficiency in the use of artificial intelligence (AI) tools. Nearly half of the respondents 56 librarians (44.1%), reported

being very highly proficient in applying AI technologies in their work. An additional 28 librarians (22%) indicated that they were very proficient. Combined, 84 librarians (66.1%) exhibit a high level of competency, suggesting a promising level of technological readiness and AI adoption within library services. A total of 21 respondents (16.5%) reported having no proficiency in using AI tools, while a further 20 (15.7%) indicated limited knowledge or experience. Together, these account for 41 librarians (32.2%) who may require additional training to effectively incorporate AI technologies into their professional practices. Only 2 respondents (1.6%) identified themselves as moderately proficient, again pointing to a clear polarisation in perceived skill levels most librarians either feel highly confident or not confident at all in their use of AI tools.

However, the majority of academic librarians also rated themselves as either very proficient or very highly proficient in teaching information literacy (IL) with an emphasis on emerging technologies and 4IR competencies. A total of 80 respondents (63%) reported a high level of proficiency in this area, indicating a relatively strong level of professional competence among a significant proportion of librarians. In contrast, only 12 respondents (9.4%) reported being moderately proficient, while 35 (27.5%) indicated either little proficiency or no proficiency. This suggests that more than a quarter of the librarians still lack adequate skills, which may hinder the consistent

integration of 4IR concepts into information literacy instruction.

Regarding collaboration on interdisciplinary research involving technological innovation and the 4IR, a majority of academic librarians also rated themselves highly. Specifically, 27 respondents (21.3%) identified as very proficient, and 59 (46.5%) as very highly proficient, amounting to a total of 86 librarians (67.8%). This indicates that over two-thirds of respondents consider themselves well-equipped to engage in interdisciplinary, technology-driven academic initiatives, reflecting strong capacity and readiness in this area. On the other hand, 13 librarians (10.2%) reported being not proficient, while 10 (7.9%) indicated little proficiency, making up a combined total of 23 respondents (18.1%) with lower competency levels. This suggests that although a skills gap exists, it affects a relatively small segment of the population. Additionally, 18 librarians (14.2%) reported moderate proficiency, suggesting that while they possess basic competency, they may benefit from further professional development to enhance their effectiveness in this domain.

Research question three: What gaps exist between the required competencies and the current skill levels of the university library personnel? This question is answered with the data in Table 2.

Table 2: Existing gaps between the required competencies and the current skill levels of academic librarians

S/N	Existing gaps between the required competencies and the current skill levels of the librarians	SA		A		N		D		SD	
		F	%	F	%	F	%	F	%	F	%
1	There is a noticeable gap between the competencies I possess and those required in the 4IR.	2	17.	4	37.	7	5.5	7	5.5	2	22.
2	I face challenges adapting to new technologies due to lack of training.	2	3	7	0	1	11.	1	11.	8	0
3	My institution provides adequate support for continuous skill development.	3	25.	5	40.	5	8	5	8	1	10.
4	More training is needed in areas such as AI, machine learning, and digital scholarship	2	2	2	9	7	5.5	3	26.	3	23.
		9	0	7	1	7	5.5	4	8	0	6
		4	34.	4	33.	1	11.	1	14.	8	6.3
		4	6	2	1	5	8	8	2		

Table 2 illustrates the perceived gap between required competencies and the current skill levels of academic librarians. A majority of respondents acknowledged the existence of a gap: 47 (37.0%) agreed and 22 (17.3%) strongly agreed, resulting in a combined total of 69 (54.3%). This majority suggests that over half of the respondents perceive a noticeable gap between the competencies they currently possess and those required to meet the demands of the Fourth Industrial Revolution (4IR), for example, digital literacy, data management, and artificial intelligence (AI). Conversely, a significant minority, 28 (22.0%) strongly disagreed and 23 (18.1%) disagreed. Amounting to a total of 51 (40.1%) who did not perceive a substantial gap. This could indicate that these respondents either feel adequately skilled or may be unaware of the specific demands posed by the 4IR. Furthermore, only a few respondents, 7 (5.5%) were neutral, suggesting that most participants had a definite opinion on the issue.

In addition, 53 (40.9%) agreed and 32 (25.2%) strongly agreed that more training is needed, resulting in a combined total of 84 (66.1%) respondents. This substantial majority indicates a clear consensus that a lack of training is a key challenge in adapting to AI, machine learning, and digital scholarship technologies. In contrast, 15 (11.6%) disagreed and 13 (10.2%) strongly disagreed, totaling 28 (22%). implying that a minority of respondents either feel

sufficiently trained or do not view training as the primary issue. A further 15 (11.8%) respondents remained neutral, possibly reflecting uncertainty or a lack of direct experience with the technologies in question.

Furthermore, 37 (29.1%) agreed and 19 (15.0%) strongly agreed that their institutions were supportive in this area, giving a combined total of 56 (44.1%). This suggests that just under half of the respondents felt their institution was supportive, indicating that while some effort is recognised, it is not widespread enough to counterbalance the prevailing negative sentiment. Meanwhile, 7 (5.5%) were neutral, which may indicate indecision or a lack of clear experience or understanding of the institution's support efforts. In the same vein, 30 (23.6%) strongly disagreed and 34 (26.8%) disagreed, totaling 64 (50.4%). Implying that over half of the respondents did not believe their institution provided adequate support. This reflects a significant level of dissatisfaction or concern regarding institutional backing for skill development relevant to the 4IR.

Lastly, 42 (33.1%) agreed and 44 (34.6%) strongly agreed, making a combined total of 86 (67.7%) respondents who acknowledged the presence of a skills gap and recognised the need for further training in AI, machine learning, and digital scholarship. In contrast, 18 (14.2%) disagreed and 8 (6.3%) strongly disagreed, totaling 26 (20.5%). Indicating that a

minority of participants either feel confident in their current competencies or do not perceive these skills as essential. Similarly, 15 (11.8%) respondents remained neutral, possibly reflecting uncertainty or a lack of awareness about the importance of these 4IR-related skills.

Research question four: What methods are currently in place or proposed to address competency gaps among university library personnel in the region? This question is answered with the data in in Figure 9.

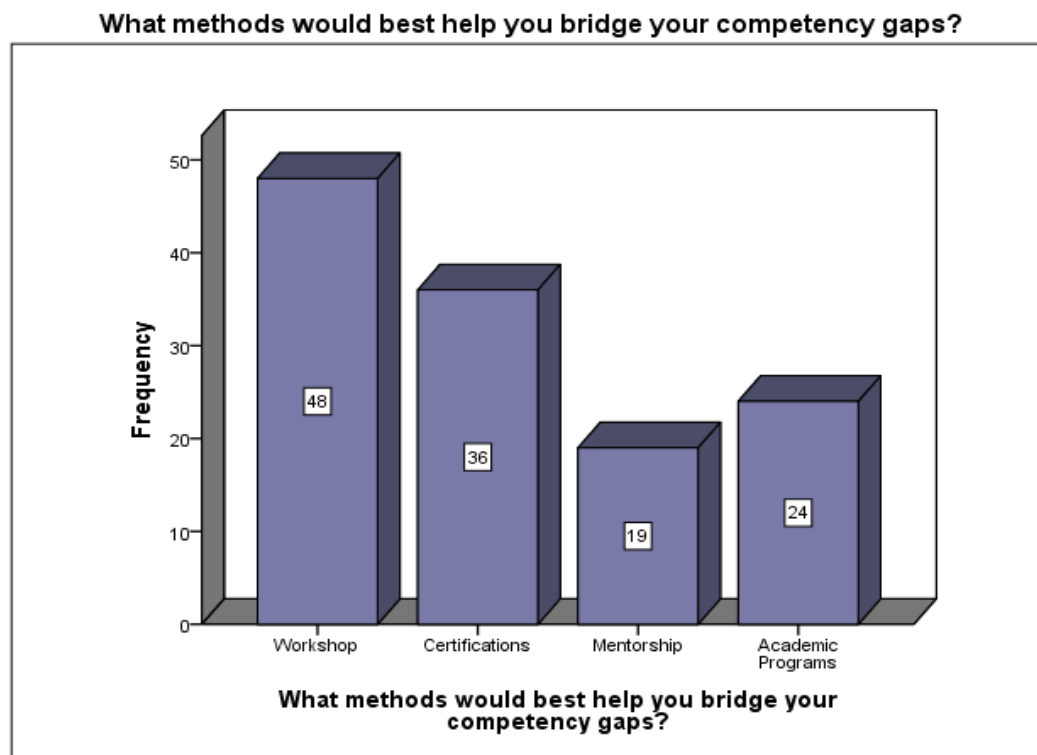


Figure 9: Methods that are currently in place or proposed to address competency gaps

Workshops were the most preferred method for bridging competency gaps, preferred by 48 respondents (37.8%). This indicates that librarians are seeking quick, practical, and immediately applicable skills, which are characteristic of Fourth Industrial Revolution (4IR) environments, where technologies evolve rapidly. Professional certifications were the next most popular option, selected by 36 respondents (28.3%). Academic programmes followed, with 24 respondents

(18.9%) opting for this method, while mentorship was the least accepted, selected by only 19 respondents (15.0%).

Research question five: What are the professional development opportunities currently available in the institutions under study for the integration of 4IR skills. This question is answered with the data in Figure 10.

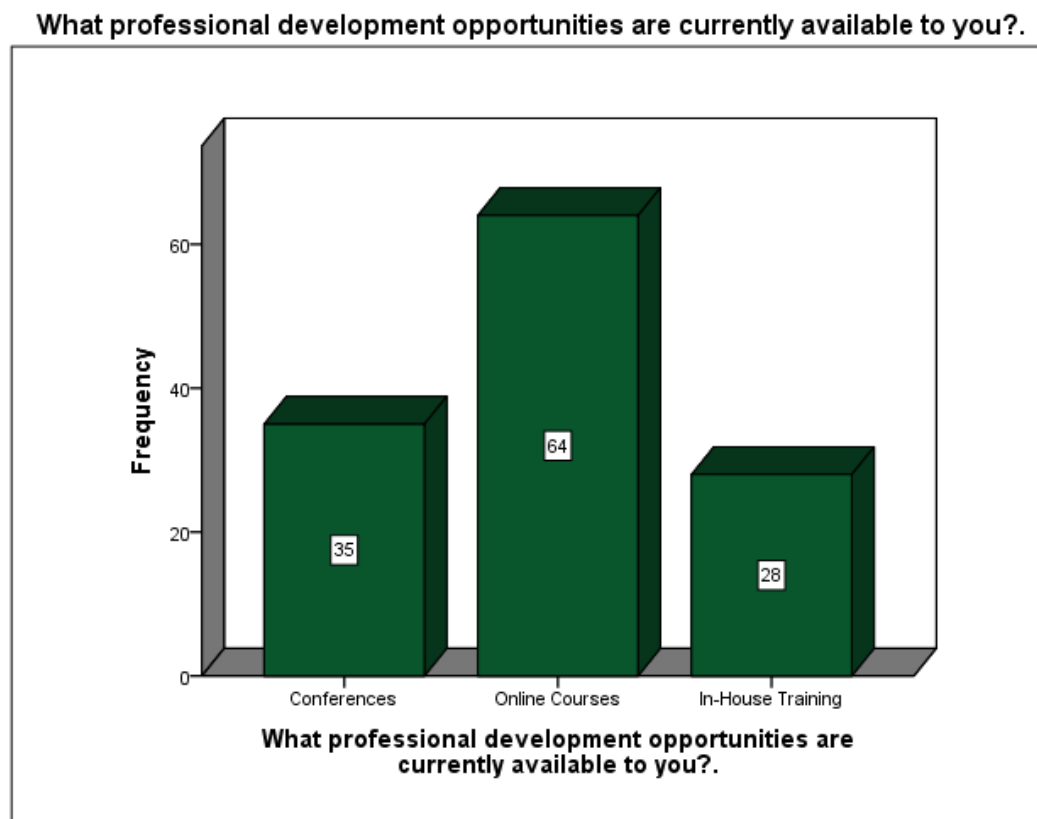


Figure 10: Methods are currently in place or proposed to address competency gaps among university library

Online courses accounted for 64 respondents (50.4%), making them the most prevalent form of professional development. This reflects a significant shift towards digital and flexible learning, which is essential in the Fourth Industrial Revolution (4IR) era, where technology, automation, and artificial intelligence are transforming industries. Conferences followed, with 35 respondents (27.6%), indicating that such events remain important for networking, staying up to date with the latest trends, and gaining insights from thought leaders. In-house training was

the least utilised, with 28 respondents (22.0%). While in-house training can be tailored to an organisation's specific needs, it may be limited in scope compared to more global submissions.

Research question 6: What methods can be implemented to effectively bridge the competency gaps of library personnel in relation to 4IR skills in the universities under study? This question is answered with the data in in Figure 11.

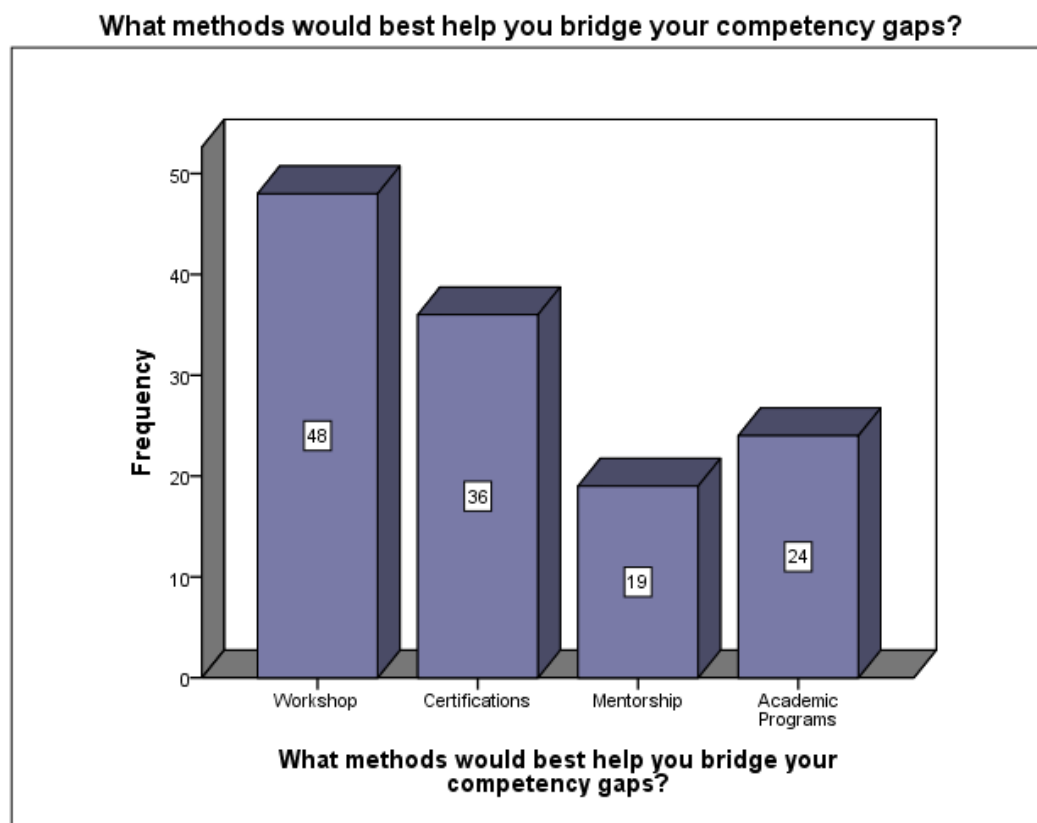


Figure 11: Methods that would best help to bridge in competency gaps

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Discussion

The findings from the study shows disparity between the evolving demands of the Fourth Industrial Revolution (4IR) and the current skill levels of many library personnel in the

selected university libraries in Ogun State, Nigeria. Globally, as noted by Chigwada and Chisita (2021) and Cox et al. (2019), librarians are increasingly expected to demonstrate advanced digital fluency, emotional intelligence, and competencies in areas such as artificial intelligence (AI), big data, and digital scholarship. The role of librarians is shifting from that of support staff to strategic partners in knowledge production and dissemination.

In contrast, Nigerian librarians, especially those in the South-West, display limited awareness and proficiency in technologies related to 4IR (Akparobore et al., 2020). While a majority claim competence in digital library systems and information literacy, there is a significant under-recognition of critical domains such as data management (7.1%) and overall 4IR awareness (3.9%).

A considerable proportion (54.3%) of respondents acknowledged a gap in their competencies, with 66.1% expressing a desire for further training in key areas including AI, machine learning, and digital scholarship. These findings indicate a partial state of readiness: although many librarians are comfortable with traditional digital tools, they are inadequately prepared for more advanced 4IR applications.

Institutional readiness and support for 4IR integration appear to be mixed. Some academic libraries, as observed by Tella et al. (2022), have made modest advances by adopting technologies such as cloud computing and electronic resources, representing isolated examples of innovation. However, a large number of libraries remain largely unautomated and underfunded (Adjei & King, 2024), facing infrastructural challenges and lacking robust Continuing Professional Development (CPD) frameworks (Manda & Dhaou, 2019).

Survey results further reinforce this fragmented scenario: only 44.1% of respondents reported feeling supported by their institutions, while 29.1% had not received any training related to 4IR. Although online courses and workshops were identified as the most used and preferred forms of training, both the availability and quality of such offerings remain insufficient. This points to an uneven approach to institutional capacity-building, where some libraries are progressive, but many lack cohesive support systems or policy direction.

The literature outlines a clear roadmap for addressing the 4IR readiness gap: curriculum reform: Scholars such as Kamba (2011) and Hussain (2019) advocate for the urgent revision of Library and Information Science (LIS) curricula to include core 4IR concepts such as AI, the Internet of Things (IoT), and data analytics. Training and CPD: Respondents strongly

support expanded training opportunities, particularly in the form of practical workshops and structured CPD. This is reinforced by Lee et al. (2018) and Tella et al. (2022), who call for policies that support talent development and critical technology training. Collaboration and Funding: Both international and Nigerian studies stress the importance of increased collaboration between libraries, enhanced government and institutional funding, and the recruitment of tech-savvy professionals to modernise library services.

Conclusion

The findings reveal that while a majority of library personnel in Southwestern Nigeria are aware of and engaged with competencies relevant to the Fourth Industrial Revolution, there remains a substantial gap in actual proficiency and broader competency awareness. Although many library staff considers themselves proficient in specific technical skills like AI and digital library systems, there is a significant lack of training in data management and strategic understanding of 4IR demands. There is also a notable perception of insufficient institutional support and a lack of advanced qualifications such as MLS/MLIS or PhDs among the majority of library staff. This limits the ability of libraries to effectively integrate and lead 4IR transformations within their academic environments.

The following are recommended in the light of the results of this study:

1. *Prioritise targeted upskilling initiatives:* Educational institutions and librarians should focus on delivering workshops and professional certification programmes that address underdeveloped competencies, particularly in areas such as data management, analytics, and broader

Fourth Industrial Revolution (4IR) frameworks.

2. *Strengthen institutional support mechanisms*: Universities ought to enhance their support for staff development by providing funding, incorporating it into policy frameworks, and providing internal training schemes centred on emerging technologies.
3. *Encourage Advanced Academic Pursuits*: Institutions should motivate and assist librarians in undertaking postgraduate qualifications such as MLS/MLIS and PhD programmes, thereby enhancing their subject expertise and research capacity essential for 4IR-aligned responsibilities.
4. *Create bespoke in-house training solutions*: Developing tailored, in-house training modules that address specific technological challenges within the institution can prove more practical and accessible than relying solely on external training.
5. *Promote mentorship and peer-led learning*: Although not widely utilised, structured mentorship and peer-learning programmes can provide cost-effective, contextually relevant professional development opportunities.
6. *Address competency gaps through strategic planning*: Library leaders should conduct regular evaluations of staff competencies and align professional development initiatives with the institution's strategic objectives for 4IR preparedness.
7. *Widen access to digital learning platforms*: Recognising the prevalent use of online learning, institutions should invest in or develop digital platforms providing 4IR-focused

content that is relevant both locally and globally.

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