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# Measuring the Influence of Emerging Technologies on Service Delivery among University Libraries in South-East, Nigeria

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***Abstract***

*This study examined the influence of emerging technologies on service delivery among university libraries in South-East Nigeria. Specifically, it assessed the influence of artificial intelligence, cloud computing, radio-frequency identification (RFID), virtual and augmented reality (VR/AR), and blockchain technology on library service delivery. A quantitative correlational research design was adopted, and data were collected from librarians in 13 university libraries in the south-east, Nigeria using a structured questionnaire. The demographic data and research objective data were analysed a descriptive statistics while the hypotheses were analysed using multiple regression analysis to determine the influence of the emerging technologies on service delivery. The findings revealed that artificial intelligence ($\beta = .224$, $t = 4.026$, $p < .001$), cloud computing ($\beta = .248$, $t = 4.290$, $p < .001$), RFID ($\beta = .289$, $t = 4.620$, $p < .001$), and VR/AR ($\beta = .173$, $t = 2.723$, $p = .007$) had statistically significant positive influences on library service delivery. RFID recorded the strongest influence, followed by cloud computing, artificial intelligence, and VR/AR. In contrast, blockchain technology had no statistically significant influence on service delivery ($\beta = .011$, $t = .180$, $p = .857$). The study concludes that emerging technologies exert varying influences on university library service delivery, with RFID, cloud computing, artificial intelligence, and VR/AR demonstrating significant positive influences. The study recommends that university libraries prioritise emerging technologies with demonstrated positive influences on service delivery, and blockchain technology with specific demonstrated service needs and empirical evidence*

**Keyword:** Emerging Technologies, Library Service Delivery, Artificial Intelligence, Cloud Computing, Radio-Frequency Identification, Virtual and Augmented Reality, Blokchain

## Introduction

The global transformation of tertiary education through information and communication technologies has significantly reshaped university library operations and service delivery. University libraries remain central to teaching, learning, research, and knowledge dissemination, providing access to information resources and services that support critical inquiry, innovation, and academic development (Wiche & Tom-George, 2018). As information environments and user

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expectations evolve, libraries increasingly require technology-driven approaches to remain relevant and responsive (Saibakumo, 2021).

Among emerging technologies, Artificial Intelligence (AI) has become particularly significant because of its capacity to transform library operations and services through machine learning and natural language processing, including classification, metadata enrichment, automated information retrieval, and personalised services (Ali et al., 2021). AI also supports electronic and virtual library services by automating routine operations, potentially allowing librarians to devote greater attention to knowledge dissemination and user support. The broader technological environment also includes blockchain, RFID, cloud computing, and augmented/virtual reality (AR/VR), which offer capabilities for secure information management, automated circulation and inventory control, remote access to resources, and interactive learning experiences, respectively (Hassan, 2020; Waljat, 2018; Want, 2022; Shen & Shirmohammadi, 2008).

Library service delivery encompasses the timely, efficient, and effective provision of resources and services to meet users' evolving information needs. In university libraries, this includes reference and referral services, user orientation, information-literacy instruction, resource access, and other activities supporting teaching and research (Umoh, 2017; Osisanwo & Adeola, 2024). Increasing user expectations, rapid technological development, alternative information sources, and reduced reliance on traditional intermediaries have consequently transformed how such services are delivered. Emerging technologies have therefore become increasingly important for contemporary library service delivery (Modiba & Chisita, 2023; Osisanwo & Adeola, 2024).

In Nigeria, university libraries must continually adapt to technological change to remain relevant to increasingly sophisticated users. Federal universities constitute an important component of the national higher-education system, with their libraries expected to support institutional teaching, learning, research, and development objectives. However, the effectiveness of technological transformation depends substantially on librarians' capacity to engage with and integrate new technologies into professional practice. Existing literature indicates that librarians' responses, beliefs, and perceptions concerning technological change can shape technology adoption and its application to library operations and services (Omosor, 2014; O'Donnel & Anderson, 2022).

Against this background, Artificial Intelligence represents a particularly important technological development whose implications for university library service delivery require closer examination. Although AI offers opportunities for automation, personalisation, improved information access, and service efficiency, its effective application depends on the professional and institutional context in which it is implemented. Consequently, this study focuses specifically on the influence of Artificial Intelligence on service delivery among federal university libraries in South-East Nigeria, addressing the need for empirical evidence on how AI is shaping contemporary library services in the region.

**Problem Statement**

Emerging technologies, including cloud computing, blockchain, and virtual/augmented reality, have become prominent in various sectors, notably within university libraries in developed countries like the UK, Turkey, and Sweden (Digby 2021: Devaki &Deivan, 2022). Observation

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revealed that the influence of the integration of these technologies in university libraries in Nigeria, particularly in the South-East region, remain insufficiently explored. Existing studies indicate a lack of empirical evidence regarding the actual contribution of these technologies to library service delivery, leading to assumptions about their effectiveness.

Key impediments to leveraging these technologies include infrastructural limitations, insufficient technological capacity, high implementation costs, and the need for staff training, which hinder their integration and practical use. For example, artificial intelligence can enhance operational efficiency through chatbots and personalized recommendations, while RFID aids in resource tracking and security. Similarly, cloud computing enhances remote resource access, blockchain ensures secure information sharing, and virtual/augmented reality provides interactive learning opportunities.

The core issue is not merely the recognition of available technologies by librarians but rather the extent to which these technologies translate into improved service delivery. University libraries must adapt to users' evolving needs by embracing innovative technologies in their operations. Given the rapid advancements in emerging technologies and increasing user expectations, this study, titled "Measuring the Influence of Emerging Technologies in Service Delivery among Selected University Libraries in South-East Nigeria," aims to empirically investigate the effects of artificial intelligence, blockchain, cloud computing, virtual/augmented reality, and RFID on service delivery in this regional context, with an emphasis on assessing their effectiveness. This focus addresses the critical gap in understanding how these technologies can enhance library services within Nigerian universities.

**Objectives of the Study**

The objective of this study is to:
Examine the influence of the emerging technologies on service delivery among the federal university libraries in South-east, Nigeria.

**Research Hypotheses**

$Ho_1$: Artificial intelligence has no significant influence on service delivery among federal university libraries in south-east, Nigeria.
$Ho_2$: Blockchain technology has no significant influence on service delivery among federal university libraries in south-east, Nigeria.
$Ho_3$: Cloud computing has no significant influence on service delivery among federal university libraries in south-east, Nigeria.
$Ho_4$: Radio frequency identification has no significant influence on service delivery among federal university libraries in south-east, Nigeria.
$Ho_5$: Virtual/augmented reality has no significant influence on service delivery among federal university libraries in south-east, Nigeria

**Literature Review**

**Emerging Technologies and University Library Service Delivery**

Emerging technologies have increasingly transformed the organisation, management, and delivery of services in university libraries. Among the technologies receiving growing attention are cloud

computing, Radio Frequency Identification (RFID), artificial intelligence (AI), blockchain technology, and virtual and augmented reality (VR/AR). Their applications provide opportunities to improve accessibility, efficiency, automation, security, resource management, and user engagement, thereby enabling university libraries to respond to changing information environments and increasingly sophisticated user expectations.

Within this technological landscape, cloud computing provides an important foundation for the delivery and management of digital library services. It is a web-based technology through which data, software, and applications are stored, managed, and processed using centralised remote servers. It enables users to access professional and private files from internet-connected devices without installing software locally (Waljat, 2018). In university libraries, cloud computing can integrate digital information resources, facilitate the processing and reconfiguration of distributed resources, and support services that respond more effectively to users' information needs (Lijuan, 2020). Its application through private, public, and hybrid cloud environments also provides varying levels of scalability, flexibility, security, and cost efficiency. However, security, privacy, data loss, and multi-tenancy concerns remain important considerations in cloud deployment (Alghofaili et al., 2021).

Beyond facilitating digital access and resource management, emerging technologies also contribute to the automation of routine library operations, particularly through RFID. In this regard, Radio Frequency Identification (RFID) provides an important technological mechanism for the automated management, circulation, and security of library collections. An RFID system comprises tags, readers, antennas, middleware, self-service kiosks, book drops, and security gates that facilitate the identification and tracking of library materials (Ayre, 2012; Mishra, 2012). Unlike conventional barcode systems, RFID enables materials to be identified without direct line-of-sight scanning. Consequently, it supports faster circulation, inventory control, materials handling, security, and the location of missing or misfiled resources (LibBest, 2025). These capabilities can contribute to more efficient library operations and greater user convenience.

While RFID primarily strengthens the physical management of library resources, artificial intelligence extends technological application to the automation and enhancement of intellectual and user-oriented services. Artificial intelligence (AI) therefore represents another significant dimension of technological transformation in university libraries**.** AI uses computational models to simulate aspects of human cognitive processes and supports applications involving machine learning and natural language processing. In libraries, these capabilities have been applied to book classification, metadata enrichment, automation, and digital and virtual library services (Ali, Naeem & Bhatti, 2021). AI can reduce repetitive tasks and errors while enabling librarians to concentrate on knowledge dissemination and more meaningful user services (Omame & Alex-Nmecha, 2020; Yusuf et al., 2022). Moreover, AI applications can support virtual tutoring, personalised resource recommendations, feedback generation, virtual assistants, content organisation, and adaptive learning environments (Adams, 2024).

Alongside these intelligent and automated applications, blockchain technology provides a complementary mechanism for strengthening the security, integrity, and management of information generated and exchanged within library systems. Blockchain technology contributes

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to library service delivery through its decentralised approach to recording, validating, and protecting information. It provides a digital ledger in which operational records are organised into blocks and collectively accessed through a secure system for validating stored information (Zayyad, 2022). Within university libraries, blockchain can improve service efficiency, data integrity, information security, and decentralised metadata management (Tella, Amuda & Akani, 2021). Its resistance to alteration, duplication, and fraud further provides potential applications across different areas of library services (Hassan, 2020). Whereas blockchain primarily strengthens the integrity and security of library information, virtual and augmented reality extend technological innovation to the experiential dimension of service delivery by creating more interactive environments for users.

Virtual reality (VR) and augmented reality (AR), accordingly, provide immersive and interactive approaches to university library services. VR can facilitate virtual tours and simulated learning environments, while AR overlays digital information onto physical environments and library resources. These technologies can enhance information access, user experience, personalised interaction, learning, and engagement with library collections (Singh & Rana, 2022; Barman, 2023; Agwuna, Ejezie, & Nwankwo, 2024). Taken together, cloud computing, RFID, AI, blockchain, and VR/AR provide distinct but complementary mechanisms for transforming university library operations and services. The applications these emerging technologies underlines considerable potential for improving the accessibility, efficiency, effectiveness, security, automation, and user-centredness of library service delivery.

## Research Method

This research adopts descriptive survey research design to investigate the influence emerging technologies on the delivery in 12 federal university libraries in the South-East States of Nigeria. The federal university libraries are: Alex-Ekwueme Federal University Library, Ndufu Alike Ikwo (AE-FUNAI), Alvan Ikoku Federal University of Education, Owerri (AIFUEO), David Umahi University of Health Sciences (DUHS), Federal University of Technology Library, Owerri (FUTO), Michael Okpara University of Agriculture Library, Umudike (MOUAU), Nnamdi Azikiwe University Library, Awka (NAU), and University of Nigeria Library, Nsukka (UNN), Abia State University Library, Uturu, Chukwuemeka Ojukwu University (formerly Anambra State University) Library, Ebonyi State University Library, Abakaliki, Enugu State University of Science and Technology Library, Imo State University. The population of the study is 556 librarians out of which 299 was determines a sample through a proportionate sample determination. Structured and validated questionnaire with a reliability coefficient of 0.761 was used to collect data. The contents of the questionnaire are structured into two sections. Section A is comprised of the respondents biodata, while section B contained the five questionnaire clusters divided according to the objectives of the study, and organized based on the modified 4-point Likeat Rating Scale. Simple percentages are used to analyze Section A while the hypotheses was tested through a multiple regression analysis with SPSS version 27 at 0.05 level of significance.

## Data Analysis and Discussion of Findings

A total of 299 copies of the questionnaire were distributed to the 13 universities libraries in the South-East region of Nigeria. Out of the 299 copies distributed, 249 copies were filled and

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returned, representing 83.28% of the total sample; 32 copies representing 10.70%, were not returned, while 18 copies, representing 6.02%, were rejected for incompleteness and wrong entries.

**Respondents Bio data**

Table 1: Respondent's Bio Data

| Demographics | Distributions | Frequency | Percent |
|---|---|---|---|
| Gender | Male | 152 | 61 |
| | Female | 97 | 39 |
| Age | 18 - 22 Years | 14 | 5.6 |
| | 23 – 27 years | 20 | 8 |
| | 28 – 32 years | 33 | 13.3 |
| | 33- 37 years | 55 | 22.1 |
| | 38 – 42 years | 63 | 25.3 |
| | 43 and above | 64 | 25.7 |
| Years of Working Experience | 1 – 4 years | 22 | 8.8 |
| | 5 – 7 years | 31 | 12.4 |
| | 8 – 10 years | 20 | 8 |
| | 11 – 13 years | 53 | 21.3 |
| | 14 – years | 51 | 20.5 |
| | 16 years and above | 72 | 28.9 |
| Academic Qualification | WASSCE | 19 | 7.6 |
| | HND | 34 | 13.7 |
| | B.Sc/BLIS | 49 | 19.7 |
| | M.Sc/MLIS | 114 | 45.8 |
| | Ph.D | 33 | 13.3 |
| | **Total** | **249** | **100** |

Above table presents the demographic characteristics of the 249 study participants, specifically regarding gender, age, years of professional experience, and educational qualifications. The results indicate that 152 participants (61.0%) were male, while 97 (39.0%) were female,

Regarding age, participants were distributed across six age groups. The 43-and-older group constituted the largest segment, with 64 participants (25.7%), followed closely by the 38–42 age group with 63 participants (25.3%). The 33–37 age group comprised 55 participants (22.1%), while the 28–32 group included 33 participants (13.3%). The 23–27 age group consisted of 20 participants (8.0%), and the 18–22 age group represented the smallest segment, with 14 participants (5.6%). According to years of professional experience, participants with 16 or more years of experience formed the largest group, comprising 72 participants (28.9%). This was followed by the group with 11–13 years of experience, comprising 53 participants (21.3%), and then the group with 14–15 years of experience, with 51 participants (20.5%). There were 31 participants (12.4%) with 5–7 years of experience, while the experience categories of 1–4 years and 8–10 years accounted for 8.8% (22 participants) and 8.0% (20 participants), respectively. Consequently, the distribution indicates that a significant proportion of participants possess extensive professional experience, with 70.7% having at least 11 years of practical experience.

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Regarding academic qualifications, holders of a Master's degree (M.Sc./MLIS) constituted the largest group, numbering 114 participants (45.8%), followed by those with a Bachelor's degree (B.Sc./BLIS) at 49 participants (19.7%). Participants holding a Higher National Diploma (HND) numbered 34 (13.7%), while those with a PhD totaled 33 (13.3%). The smallest group consisted of holders of the WASSCE certificate, numbering 19 participants (7.6%).

University Library Participation

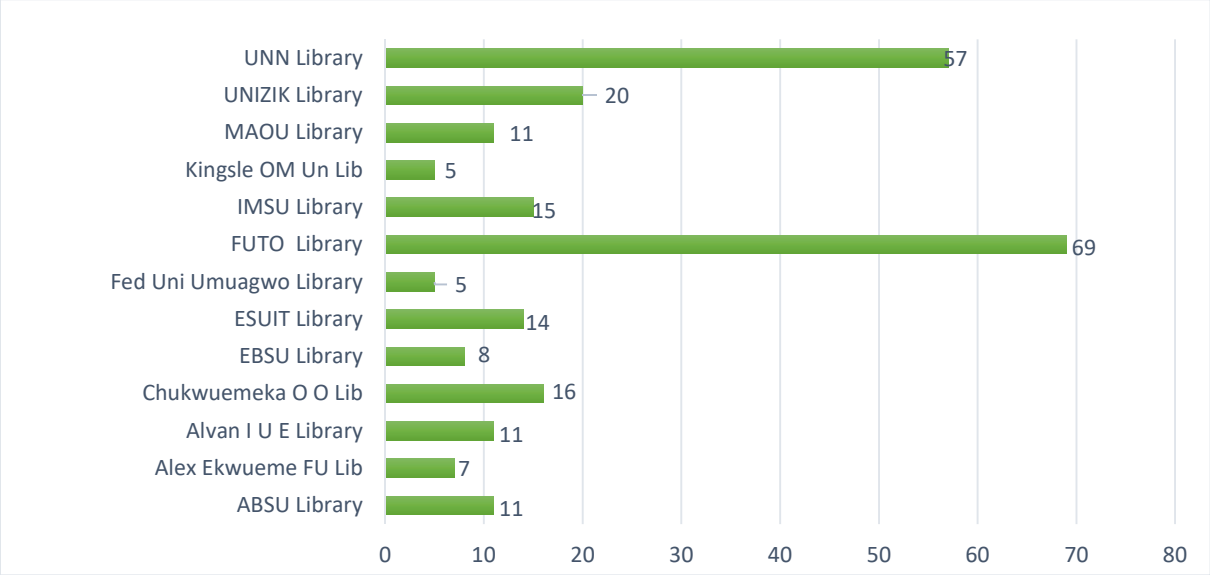



**Figure 1: Respondent's Libraries**

Figure 3.1 illustrates the distribution of 249 participants from 13 participating university libraries. The sample included participants from all the libraries, although numbers varied significantly; the FUTO University library recorded the highest representation with 69 participants (27.7%), followed by the UNN University library with 57 participants (22.9%), with these two libraries together accounting for approximately 50.6% of the total participants. The number of participants from the UNIZIK University library was 20 (8.0%), while the Chukwuemeka Ojukwu University library contributed 16 participants (6.4%) and the Imo State University library contributed 15 participants (6.0%). The ESUT University library included 14 participants (5.6%), whereas the MAOU University library, the Alvan Ikoku Federal University library, and the ABSU University library each contributed 11 participants (4.4%). The EBSU University library provided 8 participants (3.2%), and the Alex Ekwueme Federal University library provided 7 participants (2.8%). Finally, the Kingsley Ozumba Mbadiwe University library and the Umuagwo Federal University library recorded the lowest number of participants, with 5 participants each (2.0%). These data confirm that responses were received from all participated libraries based on the sample.

**Objective One:** To Examine the influence of the emerging technologies on service delivery among the federal university libraries in South-east, Nigeria.

**Table 4:** Descriptive analysis of the influence of the emerging technologies on service delivery among the federal university libraries in South-east, Nigeria

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| S/No | Influence of Emerging Technologies on Library Service Delivery | SD | D | S | SA | M | SD |
|---|---|---|---|---|---|---|---|
| 1 | Artificial intelligence improves the speed and accuracy of the information services provided by the library. | 15 (6.02%) | 37 (14.86%) | 110 (44.18%) | 87 (34.94%) | 3.08 | 0.858 |
| 2 | Cloud computing enhances users' access to library resources and services anytime and from anywhere. | 13 (5.22%) | 30 (12.05%) | 124 (49.80%) | 82 (32.93%) | 3.10 | 0.806 |
| 3 | RFID technology improves the efficiency of circulation, self-checkout, and inventory management services. | 24 (9.64%) | 29 (11.65%) | 111 (44.58%) | 85 (34.14%) | 3.03 | 0.920 |
| 4 | Blockchain technology enhances the security, authenticity, and reliability of library records and transactions. | 13 (5.22%) | 40 (16.06%) | 110 (44.18%) | 86 (34.54%) | 3.08 | 0.843 |
| 5 | Augmented and virtual reality (AR/VR) technologies create more interactive and engaging library services for users. | 20 (8.03%) | 34 (13.65%) | 122 (49.00%) | 73 (29.32%) | 3.00 | 0.868 |
| 6 | The adoption of emerging technologies generally improves the quality and effectiveness of library service delivery. | 16 (6.43%) | 31 (12.45%) | 119 (47.79%) | 83 (33.33%) | 3.08 | 0.843 |
| | **Grand Mean/SD** | | | | | **3.06** | **0.86** |

Table 4 reveals a generally positive perception regarding the influence of emerging technologies on library service delivery. In this context, artificial intelligence is believed to improve the speed and accuracy of information services (mean: 3.08; standard deviation: 0.858), while cloud computing is viewed as enhancing user access to library resources and service with the highest mean score (3.10; standard deviation: 0.806). The relatively low standard deviation indicates a high degree of consistency in participants' opinions. With a mean of 3.03 and the highest standard deviation (0.920), participants generally agreed that Radio Frequency Identification (RFID) technology improves circulation and retrieval processes, self-service capabilities, and collection management. Meanwhile, blockchain technology is seen as enhancing the security, reliability, and credibility of library records and transactions (mean: 3.08; standard deviation: 0.843), whereas Augmented Reality and Virtual Reality (AR/VR) technologies can make library services more interactive and engaging (mean: 3.00; standard deviation: 0.868). Overall, the adoption of emerging technologies is considered to improve the quality and overall effectiveness of library service delivery (mean: 3.08; standard deviation: 0.843). With an overall mean score of 3.06 and a standard deviation of 0.86, participants generally agreed that emerging technologies positively

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influence and enhance service delivery in university libraries in southeastern Nigeria.

| Model | | *Sum of Squares* | *df* | *Mean Square* | *F* | *Sig.* | *R2* |
|---|---|---|---|---|---|---|---|
| 1 | Regression | 101.005 | 5 | 20.201 | 116.255 | .000b | |
| | Residual | 42.225 | 243 | 0.174 | | | |
| | Total | 143.23 | 248 | | | | 0.705 |

a Dependent Variable: Service Delivery
b Predictors: (Constant), RFID, CLOUD, AI, Blockchain, VRandAR

Consequently, based on the descriptive evidence, emerging technologies have a perceived positive influence on service delivery in university libraries in southeastern Nigeria.

**Research hypotheses**

The five research hypotheses were tested through a multiple regression with SPSS. The results are presented in table 5.

Table 5: ANOVA table of the Influence of emerging technologies on Library service Delivery

The results of the Analysis of Variance (ANOVA) indicate that the regression model that incorporate Radio Frequency Identification (RFID), cloud computing, artificial intelligence, blockchain, and virtual/augmented reality (VR/AR) technologies which significantly predicts the level of library service delivery. The model yielded an F-value of 116.255 ($F(5, 243) = 116.255$, $p < .001$), demonstrating a statistically significant influence of these combined emerging technologies on library service delivery. The coefficient of determination ($R^2$) of 0.705 indicates that the five emerging technologies collectively explain 70.5% of the variance in library service delivery. Furthermore, the regression sum of squares (101.005) substantially exceeds the residual sum of squares (42.225), confirming that the model accounts for a significant proportion of the observed variance in service delivery. The statistically significant ANOVA result ($p < .001$) provides evidence that these emerging technologies exerted a statistically significant influnce on library service delivery in university libraries across southeastern Nigeria. The hypothetical influence is highlighted in the coefficient

**Table 6: Hypotheses and Results**

| | | *Beta* | *t* | *Sig.* |
|---|---|---|---|---|
| Ho1: | Artificial Intelligent → Service Delivery | 0.224 | 4.026 | 0.000 |
| Ho2: | Blockchain → Service Delivery | 0.011 | 0.18 | 0.857 |
| Ho3: | Cloud Computing → Service Delivery | 0.248 | 4.29 | 0.000 |
| Ho4: | RFID → Service Delivery | 0.289 | 4.62 | 0.000 |
| Ho5: | VRandAR → Service Delivery | 0.173 | 2.723 | 0.007 |

The results in table 6 indicate that artificial intelligence has a positive and statistically influence on service delivery ($\beta = 0.224$, $t = 4.026$, $p < .001$). Similarly, cloud computing demonstrates a

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positive and statistically significant influence on service delivery (β = 0.248, t = 4.290, p < .001). Radio frequency identification (RFID) recorded the strongest influence among the emerging technologies examined (β = 0.289, t = 4.620, p < .001), indicating that its adoption is significantly associated with improved service delivery while Virtual and augmented reality (VR/AR) also has a positive and statistically significant influence on service delivery (β = 0.173, t = 2.723, p = .007). Based on the above results, hypotheses 1, 3 4 and 5 were rejected and replace with the alternative hypotheses. Contrary to above results, blockchain did not pose a statistically significant influence on service delivery with (β = 0.011, t = 0.180, p = .857) t and p value which fall below the accepted benchmark of 1.96 and 0.05 respectively.

The findings demonstrate that RFID, cloud computing, artificial intelligence, and VR/AR are significant predictors of service delivery, with RFID exhibiting the strongest relative influence, followed by cloud computing, artificial intelligence, and VR/AR. The findings therefore suggest that emerging technologies do not contribute uniformly to library service delivery; their influences appear to depend on the specific technology and its level or nature of application within university libraries.

**Discussion**

The results indicate statistically significant positive influence on service delivery by artificial intelligence, cloud computing, radio-frequency identification (RFID), and virtual and augmented reality (VR/AR) technologies; conversely, blockchain technology did not demonstrate a similar influence. Among the significant predictors, RFID technology recorded the highest standardized coefficient (β = .289), followed by cloud computing (β = .248), artificial intelligence (β = .224), and finally VR/AR technologies (β = .173). This pattern provides empirical support for the study's central argument that integrating emerging technologies can enhance contemporary library service delivery, while highlighting the varying contributions of each technology based on its practical applications within the library environment.

The statistically significant influence of artificial intelligence on service delivery (β = .224, t = 4.026, p < .001) corroborates findings from the literature reviewed in the study, which highlighted the capacity of artificial intelligence to support classification processes, metadata enrichment, automated information retrieval, personalized services, and virtual library operations (Ali et al., 2021). This finding aligns with the observations of Omame and Alex-Nmecha (2020) and Yusuf et al. (2022) regarding the capacity of artificial intelligence to reduce repetitive tasks and errors, thereby enabling librarians to focus on higher-value professional activities and user support. Similarly, Adams (2024) identifies applications such as personalized recommendations, virtual assistants, instructional support, feedback generation, and adaptive learning as areas where AI can enhance library services. Thus, the current result provides empirical support for the argument that AI has evolved beyond a mere emerging technical possibility to become practically significant in improving service delivery (Ali, Naeem, & Bhatti, 2020).

The finding regarding cloud computing (β = .248, t = 4.290, p < .001) is also statistically significant and consistent with the reviewed literature; cloud computing enables libraries to store, process, manage, and provide remote access to digital resources and applications, thereby supporting the delivery of flexible, user-oriented information services (Waljat, 2018). Lijuan (2020) further

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highlights the ability of these technologies to integrate and reconfigure distributed information resources to respond more effectively to user needs. The statistically significant coefficient obtained in this study indicates that these capabilities are closely linked to service delivery in the university libraries surveyed. Despite identified concerns regarding privacy, security, data loss, and multi-tenancy (Alghofaili et al., 2021), current findings suggest that the benefits of cloud-based service delivery are—within the study's context—sufficiently clear to generate a statistically significant positive influence.

Radio Frequency Identification (RFID) technology demonstrates the strongest positive influence on service delivery ($\beta = 0.289$, $t = 4.620$, $p < 0.001$). This result strongly supports existing literature regarding RFID's contribution to automating library processes and enhancing efficiency. The technology facilitates item identification and tracking, circulation management, inventory control, security, and the location of lost or mis-shelved resources. Its higher beta coefficient relative to others may be attributed to the direct link between RFID applications and routine library service operations. Consequently, the findings suggest that technologies with direct applications in core library operations may be particularly strongly associated with service delivery outcomes. The result regarding Virtual Reality and Augmented Reality (VR/AR) technologies ($\beta = 0.173$, $t = 2.723$, $p = 0.007$) is statistically significant; however, it represents the lowest positive coefficient among the four technologies that yielded statistically significant results. This finding supports previous studies linking VR/AR to virtual tours, interactive learning environments, improved information access, personalized interaction, user engagement, and an enhanced experience when interacting with library collections (Singh & Rana, 2022; Barman, 2023; Agwuna et al., 2024).

The results indicate that blockchain technology has no statistically significant influence ($\beta = 0.011$, $t = 0.180$, $p = 0.857$) on service delivery within the context of the study. This finding contrasts with theoretical literature suggesting that blockchain technology holds potential for enhancing information security, data integrity, decentralized metadata management, and information exchange in libraries (Hassan, 2020; Tella et al., 2021). This interpretation aligns with the study's conclusion that structural constraints, insufficient technical capabilities, implementation costs, and staff training requirements pose barriers to the effective integration of emerging technologies.

The results reveal a distinct pattern for each technology. Radio Frequency Identification (RFID) technology exhibits the strongest statistical influence on service delivery, followed by cloud computing, artificial intelligence, and virtual/augmented reality, whereas blockchain technology shows no significant influence.

## Conclusion

The study concluded that emerging technologies have varying influence on the delivery of library services. Artificial intelligence, cloud computing, Radio Frequency Identification (RFID), and virtual/augmented reality technologies demonstrated strong positive correlations with service delivery; RFID emerged as the strongest predictor, followed by cloud computing, artificial intelligence, and finally, virtual/augmented reality. In contrast, blockchain technology did not contribute significantly to service delivery within the study's context. Overall, the findings indicate that the effective integration of emerging technologies, particularly those directly linked to core library operations, can enhance the efficiency, accessibility, and user-centricity of academic library

services. However, successful technological integration requires adequate infrastructure, technical expertise, staff training, and institutional support.

## Recommendation

Based on the findings of the study, the following recommendations are made:

1. University libraries should prioritise RFID technology in their technology adoption strategies, as it recorded the strongest significant influence on library service delivery.
2. Cloud computing should be given greater attention because of its significant positive influence on service delivery. Libraries should consider expanding cloud-based systems and services where appropriate.
3. Library management should strengthen the application of artificial intelligence in library services, given its significant positive influence on service delivery.
4. Libraries should explore the use of VR/AR technologies to improve service delivery, particularly in areas where these technologies can enhance access and interaction with library services, as they also demonstrated a significant positive influence. And its adoption
5. Blockchain technology be prioritized to improve service delivery, and its adoption should be guided by specific demonstrated service needs and empirical evidence since its influence on service delivery was not statistically significant.
6. Technology adoption decisions should reflect the relative contributions of the technologies identified in the study, with greater attention given to those that demonstrated statistically significant influence on library service delivery.

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