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EXAMINING THE RELATIONSHIP BETWEEN VIRTUAL REFERENCE SERVICES AND PUBLIC LIBRARY SERVICE DELIVERY IN SOUTH-EAST NIGERIA

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Abstract

***Purpose**: This study examined the relationship between Virtual Reference Services (VRS) and service delivery in public libraries in South-East Nigeria. Specifically, it assessed the availability of VRS infrastructure and determined the relationship between VRS adoption and public library service delivery.*

***Design/Methodology/Approach:** The correlational survey research design was adopted for the study. The*
study involved a census of 64 professional librarians across five public libraries in South-East Nigeria. Data were collected using a validated structured questionnaire and analyzed using descriptive statistics and Pearson Product-Moment Correlation (PPMC). The null hypothesis was tested using the t-test for significance of correlation at the 0.05 level. The decision rule was to reject the null hypothesis if $p \leq 0.05$.

***Findings:** The findings revealed that the availability of VRS infrastructure in the public libraries was generally low. However, a very strong and statistically significant positive relationship was found between VRS adoption and overall public library service delivery. The result indicates that greater adoption and effective utilization of virtual reference services are associated with improved service delivery, particularly in terms of responsiveness, accessibility, and service efficiency.*

***Implication**: The findings imply that strengthening VRS infrastructure and improving librarians' competencies in delivering virtual reference services could enhance the capacity of public libraries to provide accessible, responsive, and efficient services to users. Public library authorities should therefore prioritize investment in digital infrastructure, staff training, reliable internet connectivity, and the integration of VRS into existing reference service frameworks.*

***Originality/Value:** The study contributes empirical evidence on the relationship between virtual reference services and public library service delivery in South-East Nigeria, a context that remains underrepresented in the literature. It demonstrates that VRS can serve as an important mechanism for extending library services beyond traditional physical spaces and supporting more accessible and responsive public library services.*

***Keywords**: Virtual Reference Services; Digital Inclusion; Public Libraries; Service Delivery; Librarians; South-East Nigeria*

Paper type: Empirical research

Introduction

Digital transformation has redefined the operational services of public institutions worldwide. The integration of digital technologies into public library service delivery remains uneven, reflecting broader structural inequalities associated with the digital divide. The digital divide extends beyond mere access to infrastructure; it encompasses disparities in digital skills, institutional readiness, and the capacity to leverage technology for meaningful information use (van Dijk, 2020). Public libraries, as foundational components of

community knowledge infrastructure, are central to addressing these inequalities by expanding inclusive access to information through digital platforms. Virtual Reference Services (VRS) are services delivered through email, live chat, video conferencing, and social media which represent one dimension of this transformation. These services enable libraries to transcend spatial and temporal barriers, enhancing responsiveness and extending outreach to underserved populations. Empirical evidence consistently demonstrates that the integration of digital reference platforms enhances the effectiveness of library service delivery by improving response speed, accessibility, and user engagement. Studies by Rafiq and Ameen (2022) and Luo et al. (2023) indicate that Virtual Reference Services (VRS) enable libraries to provide timely assistance beyond physical boundaries, thereby increasing user satisfaction and strengthening librarian–user interactions. These findings suggest that digital reference technologies have the potential to transform traditional reference services into more responsive and user-centred models. However, the realization of these benefits is uneven, particularly in developing countries where structural and institutional constraints limit effective implementation. Ubogu (2020) and Odunlade and Ojo (2023) observed that inadequate ICT infrastructure, insufficient funding, unreliable internet connectivity, and varying levels of digital competence among library personnel impede the successful deployment and sustainability of VRS. Consequently, many public libraries experience fragmented implementation, where digital tools exist but are not fully integrated into routine service delivery.

These disparities reflect the notion of the second-level digital divide advanced by van Dijk (2020), which argues that the value derived from technology depends not merely on physical access but on the capacity to use, manage, and institutionalize technological innovations effectively. Thus, differences in staff competencies, organizational readiness, and institutional support determine whether digital reference technologies translate into meaningful service improvements.

The literature further suggests that the uneven adoption of VRS can be understood through the lens of Diffusion of Innovation Theory (Rogers, 2003). According to Rogers, the adoption of an innovation is influenced by users' perceptions of its relative advantage, compatibility with existing practices, complexity, trialability, and observability. In the context of public libraries, these attributes interact with organizational factors such as leadership commitment, policy frameworks, technical expertise, and resource availability. Where

such enabling conditions are absent or weak, adoption tends to be slow, selective, and symbolic rather than comprehensive and institutionalized.

In Nigeria, public libraries have historically relied on traditional face-to-face reference interactions and print-based services. Although digital innovations are increasingly discussed in policy and professional discourse, empirical evidence on how virtual reference services influence measurable service delivery outcomes in public libraries remains limited. Most existing studies focus on academic libraries, leaving a gap in understanding the role of VRS in community-oriented public library systems. Moreover, few quantitative investigations examine the strength of association between VRS adoption and service performance indicators within sub-national contexts. South-East Nigeria presents a particularly relevant case. The region's public libraries operate within broader national challenges of infrastructural instability, limited ICT funding, and uneven digital literacy. At the same time, growing reliance on mobile communication and social media platforms suggests potential pathways for expanding virtual engagement. Understanding whether and how VRS contributes to service effectiveness in this context is critical for informing digital inclusion strategies and strengthening public information infrastructure.

This study therefore investigates the relationship between virtual reference services and public library service delivery in South-East, Nigeria using a correlational design. By quantifying this relationship and situating the findings within digital divide and innovation diffusion frameworks, the study contributes to global discussions on how technology-enabled services can enhance institutional responsiveness and equitable access in resource-constrained environments. The findings offer evidence relevant to policymakers, library administrators, and development planners seeking to leverage digital technologies for sustainable public knowledge systems.

Research Questions

The following research questions guided the study:

1. What is the level of availability of virtual reference services in public libraries in South-East, Nigeria?
2. What is the relationship between virtual reference services and library service delivery in public libraries in South-East, Nigeria?

Hypotheses

The following null hypothesis was formulated and tested at a 0.05 level of significance:

H_{01}: There is no significant relationship between virtual reference services and

library service delivery in public libraries in South-East, Nigeria.

Significance of the Study

This study is significant because it provides localized empirical data on how digital reference technologies influence public library performance in Nigeria. While existing studies (e.g., Odunlade and Ojo, 2023; Mariano, 2024) have examined digital service innovations in other contexts, there remains a paucity of research specifically correlating virtual reference services with service provisions in Nigerian public libraries. The findings will help library management identify strategic areas for technological investment, enhance user engagement, and inform public library policies aimed at achieving digital inclusiveness. Moreover, public libraries can leverage digital technologies to enhance responsiveness, broaden outreach, promote inclusion, and support sustainable service delivery, particularly in developing contexts where digital divides and infrastructural challenges are prominent (Bello & Adepegba, 2023).

Review of Related Literature

The term Virtual Reference Services (VRS) refers to the provision of reference and information assistance through digital, online or remote-access communication channels (e.g., chat, email, video conference). Olubiyo and Jamogha (2022) note that in academic libraries, reference services have evolved from traditional face-to-face consultations to online/virtual formats in response to changing user needs and digital technologies. A recent study by Maesaroh, Haddow, Kholis and Mujib (2024) found that librarian expertise and responsiveness are significant predictors of VRS quality, with communication channels mediating that relationship. In the Nigerian context, Ubogu (2020) examined the provision of digital reference services in selected state university libraries and found that digital reference tools (email, live chat, social media) were in use but still hampered by infrastructural and training limitations.

Virtual Reference Services (VRS) refer to library services that enable users to seek reference assistance and obtain information support through digital communication channels such as email, live chat, video conferencing, and text messaging. These services provide users with convenient and timely access to librarians without requiring a physical visit to the library, thereby extending the reach of reference services beyond traditional settings (Lisedunetwork, 2023). Through VRS, trained librarians assist users in locating books, journal articles, and other information resources, answering research-related queries, and guiding patrons in the effective use of library collections and services. In some instances, specialized

assistance may also be offered in subject areas such as science, engineering, business, and the social sciences.

The growing significance of VRS reflects broader shifts in information-seeking behaviour in the digital era, where users increasingly expect immediate and remote access to library support. The literature suggests that VRS has evolved from being a supplementary service to becoming an integral component of contemporary library operations. By eliminating geographical barriers and providing flexible access to professional assistance, VRS contributes to greater inclusivity and responsiveness in service delivery. Consequently, libraries are increasingly adopting digital communication platforms to meet the changing expectations of diverse user communities.

Empirical studies further highlight the benefits of VRS in enhancing accessibility, responsiveness, and service continuity. Mariano (2024), in a study of Philippine higher education libraries, found that librarians perceived virtual reference platforms as effective mechanisms for bridging the digital divide created by physical distance and mobility constraints. Similarly, a systematic review of African higher education libraries during the COVID-19 pandemic revealed that many institutions adopted virtual reference and other remote service technologies to sustain user support when physical library spaces were inaccessible. These findings demonstrate that VRS strengthens libraries' capacity to provide uninterrupted services during emergencies while expanding access to underserved and remote populations.

The literature also identifies a range of technologies that facilitate the delivery of VRS. According to Lisedunetwork (2023), libraries commonly employ chat applications to provide real-time assistance, with platforms such as LibAnswers, Springshare, and QuestionPoint enabling synchronous interactions between librarians and users. Email reference services allow patrons to submit queries and receive detailed responses asynchronously, while video conferencing applications such as Zoom and Skype support more personalized, face-to-face consultations. In addition, text messaging services provide users with quick and convenient access to basic information and guidance through mobile devices. The diversity of these tools underscores the adaptability of VRS to different user needs, technological capacities, and institutional contexts.

Overall, the reviewed literature suggests that Virtual Reference Services have become indispensable to modern library service delivery. Their ability to expand access, improve the immediacy of responses, and maintain continuity of

service positions them as critical instruments for promoting equitable access to information. Nevertheless, the effectiveness of VRS depends on the availability of appropriate technological infrastructure, staff competencies, and institutional commitment to integrating digital reference practices into mainstream library operations. These considerations are particularly important for public libraries seeking to enhance service delivery and remain relevant in an increasingly digital information environment.

Despite the body of research, notable gaps remain. First, most studies focus on academic rather than public libraries. Second, few empirical quantitative studies in Nigeria examine the correlation coefficient between VRS (or any digital reference technology) and service delivery metrics in public libraries. Third, there is limited regional focus (e.g., South-East Nigeria) in published work. The current study addresses these gaps by using a correlational design to quantify the relationship between VRS and service delivery in public libraries of South-East, Nigeria.

Methodology

This study employed a quantitative correlational survey design to examine the relationship between virtual reference services (VRS) and public library service delivery in South-East, Nigeria. A correlational approach was appropriate because the study sought to determine the strength and direction of association between two naturally occurring variables without experimental manipulation. The study was conducted in the five state public libraries in South-East Nigeria: Abia, Anambra, Ebonyi, Enugu, and Imo States. These libraries operate under state library boards and represent the formal public infrastructure within the region. The population comprised all sixty-four (64) professional librarians employed in the five state public libraries at the time of data collection. Due to the relatively small population size, a census sampling approach was adopted to ensure comprehensive representation and eliminate sampling error. Data were collected using a structured questionnaire titled *Virtual Reference Services and Public Library Service Delivery Scale (VRSPLSDS)*. Items were rated on a four-point Modified-Likert scale: 4 = Strongly Agree, 3 = Agree, 2 = Disagree, 1 = Strongly Disagree. For the availability analysis (Research Question One), a dichotomous coding approach (Available = 2; Not Available = 1) was used to compute mean scores. Content and face validity were established through expert review by five specialists: three in Library and Information Science and two in Educational Measurement and Evaluation,

all from Imo State University, Owerri. Their feedback informed revisions for clarity, construct alignment, and measurement adequacy. A pilot test was conducted with 30 professional librarians from Rivers State Library Board (outside the study area). Internal consistency reliability was assessed using Cronbach's Alpha. The overall reliability coefficient of the instrument was **0.71**, indicating acceptable internal consistency for social science research. The researcher administered the instrument in person. All completed copies of the questionnaire were screened for completeness prior to analysis. Data were analyzed using descriptive and inferential statistics: Descriptive statistics (mean) were used to determine the level of availability of VRS. Pearson Product Moment Correlation Coefficient (PPMC) was used to determine the relationship between VRS and service delivery. The coefficient of determination (r^2) was computed to assess the proportion of variance in service delivery explained by VRS. Correlation strength was interpreted using standard benchmarks: 0.00–0.20 = very low; 0.21–0.40 = low; 0.41–0.60 = moderate; 0.61 0.80 = high; 0.81–1.00 = very high. The null hypothesis was tested using the t-test for significance of correlation at the 0.05 level. The decision rule was to reject the null hypothesis if $p \leq 0.05$.

Ethical principles were strictly observed. Participation was voluntary and confidentiality of responses was assured. Data were used exclusively for academic purposes, and no personal identifiers were recorded.

Data Analyses and Presentation

Table 1: Availability of Virtual Reference Services in Public Libraries in South-East Nigeria

S/N	Items on Virtual Reference Services Availability	A	NA	Mean	Decision
1	Dedicated virtual reference desk/digital helpdesk	12	5	1.7	A
2	Library website with real-time chat/Ask-a-Librarian	14	50	1.22	NA
3	Email-based reference inquiry service	59	5	1.92	A
4	Social media–based reference	55	9	1.86	A
5	Video-conferencing tools (Zoom, Google Meet)	23	41	1.36	NA
6	ILMS with online query function	13	51	1.20	NA
7	FAQ/Knowledge base section	37	27	1.58	A
8	Online appointment scheduling	6	58	1.09	NA
9	Virtual instruction/information literacy tutorials	5	59	1.08	NA
10	Staff training on virtual reference delivery	13	51	1.02	NA
Grand Mean				**1.42**	**NA**

Mean based on a 2-point scale: Available = 2, Not Available = 1. Criterion Mean = 1.50.

The result in Table 1 shows overall grand mean of 1.42 (criterion mean = 1.50) which indicates that Virtual Reference Services are generally limited. Email-based

reference (M = 1.92) and social media platforms (M = 1.86) were the most available tools, suggesting reliance on low-cost and widely accessible communication channels. In contrast, real-time chat platforms (M = 1.22), video-conferencing tools (M = 1.36), ILMS-integrated query systems (M = 1.20), online appointment scheduling (M = 1.09), and virtual information literacy tutorials (M = 1.08) were largely unavailable. These findings indicate that VRS adoption in the region remains predominantly asynchronous and informal rather than structured and technologically integrated.

Research Question Two: What is the relationship between Virtual Reference Services and the services of public libraries in South-East, Nigeria?

Table 2: The Coefficient of Correlation between Virtual Reference Services and the services of public libraries in South-East, Nigeria?

Variable	n	r	r^2	Remark
VRS				
	64	0.792	0.627	Positive
Serv.				

The result in Table 2, revealed a strong positive association between VRS and public library service delivery (r = 0.792, p < 0.05). The coefficient of determination (r^2 = 0.627) suggests that approximately 62.7% of the variance in reported service delivery scores is statistically associated with variation in VRS scores.

Testing of Hypotheses

Hypothesis: There is no significant relationship between virtual reference services and the services of public libraries in south-east, Nigeria.

Table 3: Summary t-values Table for Testing Hypothesis One

t_{Cal}	df	t_{Crit}	p	Decision
7.347	62	1.998	0.000	Reject H_{04}

The t-test for significance of correlation confirmed that the relationship is statistically significant (t = 7.347, df = 62, p = 0.000), leading to rejection of the null hypothesis. This indicates that VRS adoption is significantly associated with improved service delivery results in the sampled libraries.

Discussion of Findings

The findings reveal that VRS availability in public libraries in South-East Nigeria is generally limited, with a grand mean of 1.42 below the criterion mean of 1.50. This indicates that VRS provision remains concentrated on basic and asynchronous communication channels rather than integrated and interactive platforms. The finding is consistent with Ilesanmi (2024),

who found that email and library websites were the most prominent virtual media used by librarians in private universities in Southern Nigeria, while several other virtual methods were underutilized. However, the present findings indicate even more limited availability of interactive VRS platforms, particularly real-time chat and video conferencing. This contrasts with Radford et al. (2022), whose study of academic libraries in the United States found widespread availability of chat and email reference and reported increased adoption of virtual consultations and video chat during the COVID-19 period. The findings also partly correspond with Tsang and Chiu (2022), who found WhatsApp to be a preferred VRS because of its convenience and immediacy, while awareness of some platforms such as Zoom remained limited. Similarly, Mariano (2024) reported that librarians' VRS implementation was affected by limited specialized training and the need for institutional financial support. Thus, the present findings suggest that public libraries in South-East, Nigeria are adopting VRS incrementally, beginning with accessible communication technologies such as email and social media, while more sophisticated, interactive and instructional services remain underdeveloped. The pattern points to the importance of strengthening technological infrastructure, staff competencies, training and institutional support for broader VRS integration.

The result in Table 2 reveals a strong positive and statistically significant association between virtual reference services (VRS) and public library service delivery ($r = 0.792$, $p < 0.05$). The coefficient of determination ($r^2 = 0.627$) indicates that approximately 62.7% of the variance in reported service delivery scores is statistically associated with variation in VRS scores. This suggests that libraries with greater availability or utilization of VRS tend to report better levels of service delivery. The strength of the relationship underscores the relevance of digitally mediated reference services in extending access to library assistance beyond conventional face-to-face interactions.

The finding is consistent with Tsang and Chiu (2022), who found that VRS, particularly WhatsApp, provided students with convenient and immediate assistance and supported different stages of their learning and information-seeking activities. Their findings demonstrate that virtual reference can extend the accessibility and responsiveness of library services, which supports the positive association observed in the present study. Similarly, Guo et al. (2022) found significant relationships between dimensions of WhatsApp reference service and users' perceptions of

the service. Their study showed that information control and the library's relational/service dimension were strongly associated with satisfaction, demonstrating the importance of responsiveness, accessibility and staff interaction in digitally mediated reference services.

The present finding is also supported by Kampa and Gouda (2023), whose analysis of 1,472 virtual reference queries at a university library showed that users actively sought assistance through VRS for research articles, database access and off-campus access. Further support comes from Radford, Costello and Montague (2022), who documented substantial changes in academic libraries' virtual reference provision during the COVID-19 period, including increased use of virtual consultations and video-based services. Their findings demonstrate how virtual reference became an important mechanism for maintaining library-user interaction when conventional physical services were disrupted. However, their study differs from the present study because it examined changes in VRS provision during a specific disruption and focused on academic libraries in the United States, whereas the present study examines the relationship between VRS and service delivery in public libraries in South-East Nigeria.

Furthermore, the evidence indicates a consistent relationship between VRS and users' access to, interaction with and experience of library services. The present correlation of $r = 0.792$ provides particularly strong empirical evidence of this association within the study context. Nevertheless, the result should not be interpreted as evidence that VRS alone causes 62.7% of service delivery outcomes. The r^2 statistic indicates the proportion of variance statistically associated with the two measured variables; other factors such as ICT infrastructure, staff competence, funding, internet connectivity, collection quality and institutional support may also contribute to public library service delivery. Thus, the finding suggests that strengthening VRS may be an important component of improving public library service delivery, but it should form part of a broader strategy for digital service development.

The t-test for the significance of the correlation confirmed that the observed relationship between VRS and public library service delivery was statistically significant ($t = 7.347$, $df = 62$, $p < 0.001$). The null hypothesis was therefore rejected, indicating that the positive relationship between VRS and service delivery was unlikely to have occurred by sampling error alone. This finding suggests that variations in the availability or utilization of VRS are significantly associated with variations in public library service delivery among the

sampled libraries. The finding is consistent with Tsang and Chiu (2022), who found that VRS provided users with convenient and immediate assistance and supported information seeking and learning activities. Their findings demonstrate the contribution of virtual reference to users' access to library assistance, which provides support for the significant relationship observed in the present study. Similarly, Ilesanmi (2024) found that librarians in Southern Nigerian private universities used various virtual methods, particularly library websites, email and social media, to deliver library services, although several methods remained underutilized. This supports the present finding that digitally mediated services are relevant to contemporary library service delivery. In addition, Adewole-Odeshi and Ezechukwu (2023) reported that adoption of mobile reference services significantly predicted digital library service delivery among university libraries in South-South Nigeria, further supporting the relationship between digitally mediated reference services and library service delivery.

These findings suggest that VRS constitutes an important component of contemporary library service delivery by extending access to reference assistance beyond the physical library environment. However, the statistically significant relationship should not be interpreted as proof that VRS independently causes improved service delivery. Other factors, including ICT infrastructure, staff competence, internet connectivity, funding, institutional support and the quality of library resources, may also influence service delivery outcomes. The present finding therefore establishes a statistically significant association between VRS and public library service delivery within the study context.

Conclusion

This study examined the relationship between virtual reference services and public library service delivery in South-East Nigeria. Findings revealed that although the availability of VRS is generally low, there exists a very high and statistically significant positive relationship between VRS and overall service delivery. This demonstrates that virtual reference services are not merely supplementary tools but critical drivers of efficiency, accessibility, responsiveness, and user satisfaction. The rejection of the null hypothesis confirms that strengthening virtual reference capacity can substantially enhance public library performance in the region. Therefore, systematic investment in digital infrastructure, staff training, and policy reform is essential for positioning public libraries as resilient and responsive information hubs in the digital era.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. State governments and library boards in South-East Nigeria should prioritize investment in stable internet connectivity, reliable power supply, functional Integrated Library Management Systems (ILMS), and real-time chat platforms. Public libraries should develop formal digital service policies that integrate VRS into core service mandates. Establishing structured online appointment systems, FAQs, and virtual literacy tutorials will improve responsiveness, outreach, and sustainability.
2. Regular training workshops should be organized to enhance librarians' competencies in virtual reference tools, AI-enabled platforms, and multi-channel communication systems.
3. Libraries should actively promote available virtual services through social media campaigns, community outreach, and partnerships with educational institutions to maximize utilization and enhance public visibility.

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