**Emerging Technologies and Tools for Digital Reference Services in The Information Age**

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**Abstract**

*Digital Reference Services (DRS) are highly essential in our modern society due to emerging trends with the existing web 2.0 and social media tools. These are mediums of providing real-time personal assistance to users via web-based interactive software in order to satisfy the information need of users where the software allows for instant messaging and also allows collaborative browsing between the librarian and the user. DRS holds a lot of potential to change how people find and use reference services. Libraries can reach users who might not normally visit a desk by adding interactive help to their online information services. The major transformation witnessed in libraries and reference services is continuously developing as the library itself. This study shed light on the rising trend in DRS. This study employs a qualitative research approach to investigate how emerging technologies and tools for DRS could be a driving force in rendering effective services to the users, while inferences were drawn from other related studies. Findings from the literature reviewed maintained that DRS are significantly influencing the delivery of high-quality modern reference services. The findings provide practical implications for guiding users as well as reference librarians in reaching compromise on how to negotiate reference queries with emerging technologies either in a synchronous or asynchronous manner. DRS have become one of the key areas in libraries where emerging technologies are fully utilized. It was found that technologies such as Facebook, WhatsApp, Twitter, Instagram, Blogs, Videoconferencing, electronic mail and so on are found to be the most commonly emerging technologies and tools used for DRS. The study aims at discussing the benefits of DRS, digital reference and tools, rising trends in DRS, the use of digital libraries in the information age and challenges of DRS.*

**Keyword:** Emerging Technology, Digital Reference Services, Information Age, Web 2.

**Introduction**

Libraries are known to be hubs for the collection and organization of information materials or information resources. Magazines, newspapers, maps, movies, compact discs and DVDs, online databases, and other print, electronic, and multimedia resources are among these resources. The collection that the library holds no longer indicates its position; it takes a long time to include flawless online access to information resources. Modern libraries are increasingly being reimagined as places where anyone can get unlimited access to information in a variety of formats and from a variety of sources. Libraries are broadening administrations past the actual walls of a structure, by making information resources and materials open through electronic means and by demonstrating the help of custodians in exploring and examining extremely a lot of data with various computerized devices.

Reference can be regarded as a significant source which can be referred to in the quest for knowledge search. Reference is defined as consultative materials which are capable of providing a satisfying gap in information needs. In other terms, it is an authority that can be consulted as a reference, also a source that is capable to satisfy users’ queries through reference sources.

In this context there must be a machine put in place to ascertain the respective needs of users of information. In actualizing this, a personnel or protocol can be established to carry out reference services by a Reference Librarian. A Reference Librarian is an information professional that is capable of attending to users queries and can be consulted whenever a user sees a gap in his information needs. They are information professional that can be referred to in providing a solution to user’s queries.

The digital reference (DR) takes place when a query is received electronically and responded to electronically (Bertot, McClure & Ryan, 2000). It is a mechanism by which people can submit their queries and receive answers from a library staff member through electronic means (not in person or over the phone) such as e-mail, chat, web forms, etc (Janes, Carter & Memmott, 1999).

DRS are important components in library study. Personal user assistance via web technology is an art. Its main goals are to respond quickly and thoroughly to questions from users, convert potential users into regulars, help clients in web-based remote access and save clients’ waiting hours when searching for information. Others are to foster versatile connections among the clients and the Reference Librarian, improve the quality of the reference service and the delivery of electronic library resources to both users and researchers. DRS are known to have been solidly established in libraries in recent years, and as online communication has become predominant in the profitmaking sphere, libraries are continually facing challenges in assessing new and emerging technologies that will decide their possibility for improving users’ access to DRS.

Digital reference is a question-and-answer service that connects users with subject matter experts via the Internet. In addition to answering the questions, the experts direct the users to other online and printed information sources. It has been stated that digital reference is “a mechanism by which people can submit their questions and have them answered by a library staff member through some electronic means e.g. e-mail, chat etc. not in person or over the phone” (Mishra & Singh, 2013).

The global information society has been transformed by developments in telecommunications and information technology. New strategies have empowered quick redesign of information, data and information into the computerized structure. The storage, organization, access, retrieval, and dissemination of documents and information have undergone significant transformations. These advances have furthermore brought about the difference in strategies followed by the libraries which currently must be more creative and client situated. With the growth of their digital and electronic collections, libraries are changing. The development of hybrid and virtual libraries necessitates the acquisition of new competencies and skills by librarians. As users' requirements shift in tandem with technological advancements, so does the relationship that the reference librarian has with their clients. Libraries provide users with complete assistance, training, and access to trustworthy information resources made possible by all available technologies. E-mail, image processing, online databases, and electronic journals are all methods by which information is now distributed electronically.

In the history of Library and Information Science, significant breakthroughs include the discovery of computers and telecommunications technologies. Online and real-time reference services are one way that librarians are assisting patrons in the emerging virtual communities at the moment. This way, the user does not have to go to the library to get help from the reference librarian. Because they all encompass all forms of electronic means, the terms "Remote reference," "Live reference," "Virtual reference," "Digital reference," "Online reference," and "Electronic reference" are frequently used to refer to services that are similar to one another. Emerging Technologies’ application in libraries have given birth to many new technologies with which libraries have been transformed. Emerging technologies have affected libraries by providing Housekeeping Operations; Web-based Services such as Web. 2.0, etc; Intelligent Return and Sorter Services; Web OPAC; Networking of Libraries and Library Security Systems.

Within the field of librarianship, the concept of digital reference is developing into its own subfield. The provision of a real-time reference service, efforts to collaborate among networks of libraries and organizations, and the development of quality and technical standards are among the recent issues that have come to light in practice and research. Many library users now depend on the Internet for information and a minimal number of them approach libraries reference desks for assistance. DRS, also known as online reference services, have been developed in response to this requirement by libraries and other organizations (Tenopir, 2001; McGlamery & Coffman, 2000). Digital reference benefits have been recognized by many libraries and organizations for their services that work together. Using the Internet and other technologies, member libraries of some regional library consortia can share reference questions with one another.

Mechanical progression in this present reality has achieved many changes to libraries and their administration conveyances. By shifting from in-person interactions to digital ones, many libraries are attempting to enhance their services. In this day and age, when information is at an all-time high, many people get their information from the internet, but fewer people go to the reference desks for help. Because of this, Reference Librarians need to figure out how to close the gap. With the help of the telephone and other tools, new technologies make it possible for reference services to conduct online transactions and respond immediately to questions about references.

**Statement of the Problem**

The trend in reference services is the adoption of emerging technologies in effective service delivery, due to the revolution of DRS in rendering personal assistance to users. This has led users to face increasingly diverse reference services which could be synchronous or asynchronous. This has become a problem for some users because there is a need for them to interact with sources and services remotely which could provide answers to their queries irrespective of their locations. The traditional methods of reference services are gradually giving way to a contemporary system known as DRS and is more appreciable than the services traditional reference service could provide. Users with reference queries need to embrace the emerging technologies and tools for DRS as they could provide a combination of digitally delivered sources with learning support and services. The use of digital reference tools could help users to have access to updated services and offer diverse ways of interacting with different sources which could reduce the time spent accessing information using traditional methods.

In the rapidly moving world of the information age, emerging technologies have introduced different ways of providing DRS to users. The application of web-based services with the use of Web 2.0 in reference services has created the potential for interaction among users and reference librarians in a digital-based medium. The use of social networking tools such as Facebook, WhatsApp, LinkedIn, Instagram, Web form (e-mail), Voice over Internet Protocol (VoIP), YouTube, Flicker, Twitter, Blogs, Chats, Instant Messaging, Skype, and so on has created a new phase in reference services. With these changes in the reference environment, libraries could be forced to determine more versatile approaches to rendering effective services in order to remain relevant in reference service provision. It seems that digital reference isa virtual service, eagerly rendered assistance which raises the library's value hence, has strong points that are free from the limitation of place and time in comparison with traditional reference services. Utilizing an efficient and effective reference service to ensure users' satisfaction is a successful strategy for increasing resource utilization. The optimal chances and enhanced flexibility DRS provide, it could be observed that some reference users do not leverage the opportunities made available by emerging technologies and tools. It is to this end that this study sets out to examine the potential of emerging technologies and tools in rendering effective DRS to seekers of information.

**Literature review**

This section presents a review of the relevant literature that is significant to this study.

**Overview and Benefits of DRS**

DRS has become a universal feature of libraries in the twenty-first century (Oyewole & Oladepo, 2017). A network of intermediaries, expertise, and resources that are made available to a user seeking answers in an online or networked environment is referred to as DRS. An electronic reference happens when an inquiry is gotten electronically and answered electronically (Bertot, McClure & Ryan, 2000). Janes, Carter & Memmott (1999), fostered their own meaning of computerized reference as a system by which individuals can present their inquiries and have them responded to by a library staff part through a few electronic means (email, visit, Web structures, and so forth.) not in that frame of mind via telephone. Digital reference is defined by Lankes (1998) as Internet-based question-and-answer services that connect users with specialists in a particular field or skill.

According to Kolawole and Igwe (2012), the DRS is an online library service in which computer-mediated communications are used in the reference transaction. This kind of reference work moves reference services from the actual reference desk to a "virtual" reference desk, where customers can communicate with them from their homes, workplaces, or anywhere else. Also, Kolawole and Igwe (2012) state that there are many synonymous terms with the same meaning related to and interchangeably used as DRS, and they include: electronic reference, online reference, real-time reference, e-reference, live reference, asynchronous and reference, web conference/ reference, chat reference, online information Services, instant message reference, electronics reference and virtual reference.

Oyewole & Oladepo (2017), explained that digital service is made up of four components. The parts are - the client, the data required, the apparatuses for finding the data and the reference curator. The development of software that was able to provide both synchronous and asynchronous services and the widespread use of the internet are two examples of the many factors that contributed to the development of digital reference. Although electronic, digital, and virtual references are relatively new, customers' demands for access to information at any time and from any location have quickly made them popular (Chandwani, 2000).

E-library and e-assets are turning into things to address in library and data practice. In a nutshell, according to Kumar's (2008) suggestions, libraries, particularly academic libraries, must adapt to the e-environment. According to Omekwu and Echezona (2008), the world is living in virtual realities, and the library services are in cyberspace and do not depend on hours of operation in order for the university library to be where its patrons are. According to Ajogboye (2010), patrons of academic libraries now anticipate receiving what they require at any time and from any location.

Users now have access to databases that provide access to millions of journal articles as well as the internet, which contains the holdings of even more libraries and a limitless variety of information from both formal and informal sources. Reference librarians also provide access to the Internet. According to Ifijeh and Isiakpona (2013), this indicates that needed information can now be identified, accessed, and delivered in the shortest amount of time possible with very little effort on the part of the client and the librarian. In addition, patrons do not need to physically visit the library to send queries and receive responses from the reference librarian.

**Digital references and tools**

Traditional methods still prevail in academic libraries for managing, processing and disseminating information prior to the use of cutting-edge technology. Customary library processes and organizing in any case, could never again fulfil and answer quickly enough to a climate that is as of now immersed by innovation, thus it becomes basic to take on web-based person-to-person communication devices to convey library administrations.

According to Oyewole and Oladepo (2017), digitals tools include social media services (like Facebook, and WhatsApp), web forms, e-mail reference, Online chat reference, Telephone, Video chat/conference like Skype, Ask a Librarian through library websites, SMS/Text messages and Digital reference robot.

**Emerging technology for reference services**

A new trend in traditional reference services is DRS. A portion of the rising pattern in computerized reference administrations incorporates email and web structures, text-based visit administrations, web-camera-based administrations, ask-a-custodian administrations, advanced robots, and cooperative administrations. There are basically three types of virtual reference service models: nonconcurrent exchange, simultaneous exchanges and cooperative organizations. Asynchronous transactions, like e-mail-based, web-based, Ask-a-Service, virtual reference desk (VRD), question point, online pathfinders, etc., have a delay between the question and answer. Simultaneous exchanges happen in (constant) with a quick reaction to the question, for example, in talk-based administrations, video conferencing or webcam administrations, computerized reference robots, and continuous reference Administrations (Live Ref, all day, everyday Ref).

Simultaneous Reference Administration is a method of administration where clients and benefactors impart in a constant reaction without actual presence with any computerized devices like a PC, Tablet, PC or PDA. Synchronous Reference can take many forms, including instant messaging, video conferencing, VoIP, reference chat, and so on. Regarding collaborative networks, numerous organizations and libraries have recognized the advantages of utilizing collaborative services to provide DRS. Using the internet and other technologies, member libraries of some regional library consortia can share reference questions with one another. The Cooperative Reference Administration (CRA) worked by the Library of Congress, is a worldwide organization of libraries, consortia, and historical centres, task help that utilizes an assistance work area framework to course questions and to suitable establishments in view of the part profile.

**Challenges faced in the use of DRS**

In the information age, using electronic reference services (ERS) has not been without its difficulties. For instance, Heckman (n.d.), in his discussion of issues related to virtual reference services, revealed that undergraduates' difficulties in using ERS include a lack of basic keyboarding skills and the time required to type out even the most basic messages. In a similar vein, Duncan and Gerrard (2011) noted that respondents were not given ample opportunity to express their thoughts regarding the difficulties they encountered when utilizing ERS. The majority of the respondents showed that the data they got through the ERSwas helpful, then again, actually, they needed to stop on occasion because of PC mistakes, the disappointment of the innovation work, the lethargy of the program, and the impact of slow program and absence of information concerning the receipt of questions. Crow and Croxton (2014) additionally noticed that the difficulties that students looked at in the utilization of ERS included the opportunity to hang tight for reactions from email and talk. The majority of undergraduates did not appreciate having to wait for a response to their questions.

Likewise, Apotiade, Oyewole and Belau (2015) in their study on accessibility, availability and use of ERSs by college understudies in Ringers College, Ogun State, Nigeria analyzed the difficulties by the college students in the utilization of ERSs and figured out that the college understudies confronted a few difficulties in their utilization of ERSs. The majority of them, 186 (87.3%), acknowledged that the erratic supply of electricity was a challenge, and 162 (76%) acknowledged that they lacked ICT skills. According to the findings, 146 (68.6%) and 150 (70.4%), stated that inadequate financial resources and slow internet connectivity were additional barriers to the use of ERS. According to Apotiade, Oyewole, and Belau (2015), the majority of respondents cited the erratic nature of electricity, a lack of ICT skills, and slow internet connectivity as some of the obstacles they encountered when utilizing the electronic reference service. This supports the findings of Dollah (2006), who investigated DRS in a few public academic libraries in Malaysia and discovered that respondents cited system instability and infrastructure as obstacles. In addition, Duncan and Gerrard (2011) revealed that the respondents' use of ERS was hindered by problems with the computer network, malfunctioning technology, and a slow browser.

**Appraisal of the reviewed literature**

The review of the literature revealed that ERS have not been well researched within the African continent and especially in the Nigerian context. This dearth of studies could be a result of the infrastructural challenges facing the country. Information needs as a concept has been sufficiently studied by different researchers in Nigeria, but the same cannot be said for self-efficacy in computer. In addition, from the review of the literature, it seems as if no study has captured the emerging technologies and tools for DRS in the information age. This is a gap in knowledge that this study intends to fill.

**Methodology**

This section described the systematic processes that were followed in the course of the study in order to achieve the aim of this paper. Methods and procedures that were employed in carrying out this study are discussed accordingly.

The explorative survey of literature search design and web search was used for this study on emerging technologies and tools for DRS in the information age. Salaria (2012) refers to this design as a method that is ardent to the gathering of information about prevailing conditions or situations for the purpose of exploring an area leading to further studies. The survey research approach was qualitative and basically depended on secondary sources.

The study focused on literature search and analysis as well as a web search of universities in the South-West geo-political Zone of Nigeria. The zone was selected as a result of the huge concentration of universities in the zone. Purposively, sixteen universities were chosen to participate in this study. The researchers assumed and selected the universities based on the premise that such universities were established for at least ten years or more, and they ought to have reference sections that are well-established and useful. The selection included five (5) federal universities (Federal University of Agriculture, Abeokuta: Obafemi Awolowo University, Ile-Ife; Federal University of Technology, Akure; University of Lagos, Yaba; University of Ibadan, Ibadan), four state universities (Olabisi Onabanjo University, Ago-Iwoye; Tai Solarin University of Education, Ijagun; Adekunle Ajasin University, Akungba; Lagos State University, Ojo) and seven private universities (Babcock University, Ilishan-Remo; Bells University, Ota; Covenant University, Ota; Crawford University, Igbesa; Lead City University, Ibadan; Bowen University, Iwo; Redeemers University, Ede).

The study made use of secondary source data. The secondary data were collected by visiting the library websites of the institutions selected. The websites were surfed and explored with respect to DRS, and social media used for reference services in the respective libraries. The qualitative data collected through secondary sources were analyzed using content analysis. The secondary sources include Thesis (unpublished) prints, electronic journals, electronic databases, and web resources. Content analysis was used to draw inferences from the data gathered through secondary sources. The results of the survey were presented in a descriptive format.

**Findings from the secondary data from universities**

The use of social media for novel library services was looked at. It was discovered that academic libraries used social media to communicate with users the most, placing it first. The utilization of online entertainment for advertising libraries administrations came close to correspondence with clients and positioned second. It was also common practice to distribute news about library services via social media. The majority of university libraries did not use social media to provide reference services or to spread information about new books and programs that interested them. The use of social media to spread the news about library services, reference services, and new books was ranked third, fourth, and fifth, respectively.

The majority of library workers, according to the study, used Facebook, followed by Twitter. Despite the libraries' adoption of some social media services, it was revealed that some library staff members have not adopted any of them. It was discovered that the majority of library staff adopted Facebook and Twitter due to their widespread use by library patrons. Social media platforms like Blogs, YouTube, LinkedIn, Delicious, MySpace, Flickr, and others have been adopted by far fewer library staff members than Facebook alone.

One more discovery of the review shows that more custodians and supporters are becoming mindful of many administrations that could be given by the reference segments of college libraries utilizing Data Correspondence Innovation offices. Regarding the purposes of use, Ikpahindi (1999) asserts that ICT facilities have made research and education very simple. He stated that the use of ICT has eliminated the shivering, nightmare, and hours of fumbling through the card catalogue and reader guide to periodicals. The discoveries showed that the custodians and library clients determine a ton of advantages from their utilization of online entertainment offices in reference administrations.

This study's findings showed how important social media is to the delivery of services in academic libraries. Academic library staff use social media platforms like Facebook, Spritz, Pinterest, Twitter, Blog, Instagram, Goodreads, YouTube, LinkedIn, Delicious, MySpace, Tumblr, Hootsuite, and Flickr. However, the most popular website was found to be Facebook. The wide utilization of Facebook over other online entertainment destinations by the libraries could be represented by the fame it has garnered in Southwestern Nigeria (Okunlola, 2021). The argument made by researchers that having a Facebook presence usually gives librarians opportunities to learn more about the field could also have contributed to the site's popularity. According to Atulomah et al. (2011), Facebook is the social media platform that respondents use the most for work-related purposes. In a similar vein, according to Cook and Wiebrands (2010), Twitter was the social network that provided professional information the most.

Likewise, the outcome shows that the library staff utilize virtual entertainment to speak with their clients, as the arrangement of reference administrations, and scattering of data on new books and projects as well as news on library administrations to the clients. Academic librarians use social media for a variety of purposes, including general news, university news, library news and events, announcements of new books, databases and journals, research tools, suggestions, and reference services, among others, according to Linh (2008)'s findings. According to Hall (2011), the library staff primarily uses social media to communicate with patrons. They asserted that involving online entertainment for speaking with clients is one of the main motivations behind involving innovation in libraries.

**Conclusion**

This paper concludes that reference services are evolving based on the influx of emerging technologies. Literature showed that the traditional method of reference services is becoming less productive due to the effects of the influx of information and communication technologies in the libraries generally. It was also concluded that social media has transformed the way reference services are carried out. Social media platforms such as Facebook, WhatsApp, etcetera is now fully put to use in carrying out reference services while emerging technologies in carryout reference services will continue to be influential as far as the bottlenecks are cleared.

**Recommendations**

1. The study suggested that university libraries that have yet to provide ERS should do so as soon as possible, and those libraries that already provide these services should ensure that they do not become obsolete in order to ensure that DRS are readily available, accessible, and utilized.
2. Additionally, to guarantee that reference librarians offer the most recent DRS, the library's administration ought to coordinate intermittent workshops where specialists will be welcome to prepare the bookkeepers on the most proficient method to electronically deliver these services.
3. To support the utilization of ERS by the college understudies, current mindfulness administration should be done intermittently to advise the understudy local area regarding the accessible ERS and how they can get to them. This can be done with the traditional and electronic notice boards found in all departments and faculties.
4. The college's administration's obligation to raising supports that can be utilized to advance the power circumstance can address the issue of a lack or epileptic supply of electricity power. The graduated class can be contacted as other public lively people and associations. The situation will improve with the necessary funds for alternative supply of power sources including battery-powered inverters, solar, and power-generating sets.
5. On the university campus, free Wi-Fi services ought to be provided so that undergraduates can contact the reference librarian and access the Internet without having to spend a lot of money on data. This would help undergraduates save money. The people in charge of the connectivity to the Internet must also make certain that there is sufficient bandwidth to provide fast Internet service.
6. Also, the reference bookkeeper ought to rush to distinguish recent fads in ERSs, in order to consolidate them in help conveyance for the advantage of clients.

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