

INTEGRATION OF EMERGING TECHNOLOGIES IN SCHOOL LIBRARY MEDIA CENTRE PROGRAMME

Oyewo, R. O. and Akintonde S. S.

College Library, Oyo State College of Agriculture and Technology, Igboora, Oyo State

Abstract

The advent of technology has brought changes to the school library media centre programmes with the availability of varied technologies, which are purported to ease the business of information service provision. Bringing along the opportunities for a more effective library routine and bringing the library closer to the users with the emerging landscape of web 2.0/ librarian 2.0 technologies. Also, with recent developments in emerging technologies such as Artificial Intelligence, and Robots, it seems no longer extraordinary to think that we will be soon living in the world with many robots. While the term, 'a robot' conjures up the image of a humanoid machine, a robot can take many forms ranging from a drone, an autonomous vehicle, to a therapeutic baby seal-bot. But what counts as a robot, and what kind of robots should we expect to see at libraries? AI has made it possible to make a robot intelligent and autonomous in performing tasks not only mechanical but also cognitive, such as driving, natural language processing, translation, and face recognition. The capability of AI-powered robots far exceeds that of other simpler and less sophisticated machines. How we will be interacting with these robots once they came to be in the world with us is an interesting question. Humans have a strong tendency to anthropomorphize creatures and objects they interact with, many of which are less complex than a robot. This suggests that we will be quite susceptible to projecting motives, emotions, and other human traits onto robots. For this reason, the adoption of robots raises unique concerns regarding their safety, morality, their impact on social relationships and norms, and their potentials to be used as a means for manipulation and deception. This paper discusses the kind of emerging technologies we may come to see at the school libraries in the near future, what kind of human-robot interactions may take place at libraries, and what type of human-robot relationship may facilitate or impede a library robot's involvement in our information-seeking activities.

Keywords: Artificial intelligence; Emerging technologies; Robots; School library media centre; School library media specialist.

Introduction

Technology has brought a great revolution into every sector of human endeavours and the school library media centre is not excluded. Therefore, the introduction of technologies into the school library media centres has brought a paradigm shift in the programmes and activities of the school library media centres. The information seeking process now transcends the simple librarian-user relationship of question and answer to involve a whole new, more complex process of advisory, search, retrieval and delivery. Most of the functions and services that school library media specialist used to provide manually can be provided now using various technologies that can help to do things better and faster.

School libraries are mainly entrusted with a host of predetermined tasks like acquiring, organising, preserving, retrieving and disseminating information to the users within the school community. From

ancient times to the present Internet age, the primary objective of the library has always been this (Gopinath, *et al.*, 2001). However, towards the beginning of the 21st century, there has been a phenomenal paradigm shift in the rendering of the library and information services. The implication of the influence of emerging technologies of school library media centre is visible and its impact on library and information services cannot be under-estimated. Available literature (Sridhar, 1999; Igun, 2006) as well as observations across the world attests to this assertion.

In today's world, school library media centre programmes are being transformed from their manual operations to new ways with the use of technologies. Technology and communication tools are employed in rendering services to the patrons through appropriate channels for access to information with a cluster of technologies referred to as emerging technologies. These emerging technologies have the ability to compliment, reinforce, and enhance educational

accomplishments for the benefits of all. (Esew and Ikyembe 2013). The resultant effect of this development has been the emergence of technology-mediated services in school library media centres. Thus has become the basis for electronic or digital libraries (Youngok, 2006). Also, school library programmes are assuming a different dimension in philosophy and model. The trend worldwide has proved that information provision and delivery had shifted from the traditional models to technology-mediated formats. Traditional collections are giving way to, if not total but at least hybrid collections. This change in structure is not without its attendant challenges as electronic and digital libraries come along with their peculiar characteristics despite sharing the same purpose of preserving, organising and distributing information resources as in the case of traditional libraries (youngok, 2006).

In a similar vein, Mwamba (2002), noted that in the case of Nigeria, there is a shift in focus of the school library media centre programme from library-centred to information-centred; from the library as an Institution to the library as an information provider, and to the school library media specialist as a skilled information specialist functioning in all-related information environments, which require the use of a new method mediated by technologies for the enhancement of information access and delivery not physically contained within the four walls of the library but from library networking for information provision to area networking for all types of information resources provided. It is a known fact that the mental, social and economic development of the individual depends on the individual's access to information through reading which enhances productive approach to improving one's knowledge and understanding.

The 21st century is not without changes that are meant to put the school library media centre programme on a new pedestal. In his opinion, Hayes (1998) noted that school library media centres must 'move from resource centred, institutionalised and physically bound to network based'. Becoming a network based library however, has a lot of technological implications; the single prominent factor being information technology (Sridar 1989, 1995.1997, and 1999). Furthermore, literature affirmed that the change in the nature and roles of the school library media centre vis-a-vis the digital environment has equally brought about the need for development and acquisition of new skills and competencies (Yongok, 2006).

It is worthy of mention that library and information services are key actors in providing unhindered access

to essential resources for economic and cultural advancement. In doing so, they contribute effectively to the development and maintenance of intellectual freedom, safeguarding democratic values and universal civil rights. They encourage social inclusion, by striving to serve all those in their user communities regardless of age, gender, economic or employment status, literacy or technical skills, cultural or ethnic origin, religious or political beliefs, sexual orientation or physical and mental ability. The communities they serve may be geographically based or, increasingly, linked only by technology and shared internet (IFLA, 2003). The import of this new attitude of information creation, access, retrieval, storage and availability for use is a major transformation towards creating information and knowledge-based society for the good of all.

Speedy information procurement and dissemination are of predominant importance among all the activities that can be expected from the school library media centre in the 21st century. In order to accomplish this task, proper acquisition, processing, organisation and dissemination procedures should be adopted. Manual procedures in school library media centres have been overtaken by mechanised or automated systems in the past few decades. Resource sharing has evolved to gain maximum utilisation of available limited resources and to minimise the rising costs of the maintenance, development and administration of systems (Seneviratne and Amaraweera, 2002). Alluding to the foregoing, Mahmood *et al.* (2008) averred that modern information technology has changed the shape of school librarianship in this era. With the utilisation of computer and communication technologies (ICTs), today's libraries are providing services that may not have been imagined some years before.

According to Okiy (2010), school library media centres play major roles in the educational attainment of students since they provide information resources and facilities needed for their teaching, learning and other co-curricula activities. The central place of the school library media centres in the process of teaching and learning of students has resulted over the years in the necessity for school library media centres to continue to evolve and move with the times so that they can deliver on the requirements of the school library media centres in meeting the academic needs of the students in schools. This need has resulted, over the years, in the school library media centres in Nigeria displaying different stages of development in the application and integration of technology in their service delivery with the aim of providing speedy and up-to-date information for their users.

School library media centres worldwide are digitising materials and offering full-text documents or images to clientele via their local area network, websites and Compact Disc Read Only Memory (CD-ROM). With the development and extensive application of information technologies and networks, it is universally recognised that digitisation of library materials is cost effective and the booming development in organising, storing, preserving, retrieving, sharing, disseminating and ensuring effective usage of information such that schools now depend on a robust library programme of digital technology (Alhaji, 2007). It is equally worthy to note that the impact of technology on library services provision can be approached in different ways. There is no single concept of offering library services through the use of technology as many different types can be envisaged including automation, computerisation, digital library, e-library, virtual library, web 2.0 among others. Consequently, its impact on the library routines should not only affect the traditional library objective of users' satisfaction but also the use of technology by the school library media specialists for personal development, confidence and self-esteem. In addition, Tennant (2003) also opines that to be effective, school library media specialists must constantly learn and retool to be versed in web technology. However, it has been observed that most school library media specialists in Nigeria still struggle with manual library operations method.

History of technology application in Nigerian school libraries

The ability to use computers effectively has become an essential part of everyone's education. Skills such as bookkeeping, clerical and administrative work, stocktaking, and so forth, now constitute a set of computerised practices that form the core technology skills package including, spreadsheets, word processors, and databases. The demand for technology literacy is increasing in Nigeria, because employees realise that computers and other technology facilities can enhance efficiency. On the other hand, employees have also realised that computers can be a threat to their jobs, and the only way to enhance job security is to become computer literate. Technology application and use could prove beneficial in improving Nigeria's educational system and giving students a better access to education.

The intangible benefits of technology application such as computer literacy, electronic reference services, internet searches, online database searches and CD-ROM searches can generally improve library routines.

In addition, Kadiri (2004) stated that automation of library would address the problem of manual processing of materials with shortcomings of filling and typing errors, retrieval errors, time consumption and drudgery. He stated further that the advantages of library automation include less drudgery, easy generation of records, space conservation, improvement of information services, and easy retrieval among others.

Developing countries like Nigeria, in the 1960s, faced a number of problems with regard to the digitisation process based on old technology (Microfilm and Microfiche). Some of these problems then include the high costs of materials, limited choice available in one location, difficulty in accessing materials and problems of space and time. Despite the laudable initiatives by the Nigerian Government and international bodies, coupled with the interest shown by libraries, the anticipated digitisation process and digital library technological transformation of school library media centres appears to be very slow and faces serious challenges (Alhaji, 2007). In this regard, Onatola and Oduwale (2006) suggested certain initiatives for an effective digital library, some of which are to: support the traditional library by the provision of a complete package of collections, services, and infrastructure; ensure the quality, stability, and relevance of its collections; ensure fast-moving and proactive steps in order to respond to the ever changing possibilities and challenges of digital information; closely examine user needs and provide customised service to the immediate community it serves; offer essential tools and resources to facilitate class preparation, study and research; promote local collections while ensuring access to resources from around the world; assist students to identify high quality information in an age where digital information is readily available everywhere as well fortify and reinforce the traditional library as the shared intellectual centre and advance the primary mission of the schools, among others.

The Federal Ministry of Education that supervises and disburses fund to all the federal unity schools in Nigeria made giant stride by initiating projects aimed at computerising federal schools across the country. Efforts at computerising federal unity schools have taken different approaches and dimensions. Some of the projects are the SchoolNet, CISCO and e-Library projects launched in federal unity schools across Nigeria.

School library media specialists and technology

The changing information landscape and highly technological environment of the 21st-century

schools has significantly redefined the role of the school library media specialists. As technology has become a crucial element of teaching and learning, school library media specialists, as information specialists and educators, have the potentials to lead through technology integration. As a result, school library media specialists are continually directed by theorists and researchers in this area (Everhart and Dresang 2006; Hanson-Baldauf and Hughes-Hassell 2009; McCracken 2001; Shannon 2002) to assume a leadership role in integrating technology in schools. When defining the responsibilities of the school library media specialists, the professional standards and guidelines that define and guide practice for school library media specialists (AASL 2007; ALA and AASL 2010; ISTE 2010; NBPTS, 2010) all mention the role of leadership, especially in the area of technology integration. Yet the broad and general nature of these standards and guidelines offers little practical guidance for practising school library media specialists, who need more clarification and role definition, along with explicit techniques or strategies for enacting the leadership role.

Technology is transforming not only access to information, but also the skills needed to interact with and use it, as well. Effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyse and synthesise the information, and present it professionally (ISTE 2008). Technology integration is the seamless infusion of technology as resource to enhance the learning in the content areas. School library media specialists have a vital role to play in integrating technology to help students develop 21st century skills to enable them to use technology as a tool for learning and ensure they are prepared to succeed and participate in a digital society. This increasing reliance on technology to interact with and use information has moved information literacy to the forefront in education, and presented the opportunity for school library media specialists to enact a leadership role within their schools through technology integration (Asselin, 2005; Hanson-Baldauf and Hughes-Hassell 2009; Hughes-Hassell and Hanson-Baldauf, 2008; ISTE 2010). Yet, despite the valuable contributions which school library media specialists can make in implementing technology integration initiatives, they remain an untapped resource, due to the indefinite nature of this role.

Technology application has become an important subject for all information providers such as the school

library media specialists. This is because of its relevance and applications to tasks in libraries and information centres (Igben and Akobo, 2007). Consequently, school library media specialists in Nigeria are confronted with the challenges of establishing and sustaining technologies involved. Hence, school library media specialists in Nigeria may need to embrace these tools and learn creative ways to use them in the business of information service delivery. Moreover, in the face of dwindling funds available for library operations, school library media specialists are now exploring the web 2.0 landscape. The advents of social media concepts and tools have brought in a massive change in the process of library services. To bridge the gap between the user and the information many school library media specialists and integrated library systems use these exciting tools. Invariably, the place of the physical library as the central source for the dissemination of all information resources is changing and moving towards electronic, digital and virtual library. It is almost inevitable that school library media specialists must learn the use of these tools to be able to keep their ever growing digital natives users. It is interesting to note here that some school library media centres have started to use these tools to interact with their users on real time. In fact, given the present economic scenario in Nigeria, where library budgets have been constantly on the decline, the social media have become a means for serving users in a more specialised, interactive, and value-added way without incurring undue expenses. These media are used mostly to provide current and up-to-date information to clients, provide links to other open source library resources, give information about new arrivals in the case of books through the use of RSS selected dissemination of information through newsgroup.

Emerging technologies for school library media programmes

In the light of the explosion of emerging technologies, the role of school library media centres and school library media specialists has been transformed radically. With the ever increasing incorporation of technology tools in schools, the role of the school library media specialists added technology integrationist to the role of an information specialist. The most recent library standards, *Standards for the 21st Century Learner* (AASL, 2007) continues to emphasise the development of literacy skills. By working collaboratively with classroom teachers as instructional partners, school library media specialists provide instruction through lessons that model the integration of multiple literacy requirements including

information literacy, media literacy, visual literacy, and technology literacy into current and emerging technologies to create learning opportunities in new and engaging ways (AASL, 2009). Technology is prevalent throughout today's schools and it is a crucial tool in 21st century learning that is infused with multiple literacy requirements. The AASL developed the expectations and standards that describe the multiple roles of the school library media specialists. In the AASL's (2009) most recent revision of the mission of the school library program, school library media specialists are directed to empower students to be critical thinkers, enthusiastic readers, skillful researchers, and ethical users of information.

Meanwhile, it seems as if school library media specialists are now at a crossroads in their instructional roles. Today, the school library media specialists' roles are being divided. As technology resources have rapidly expanded, instructional technology specialist positions were added to schools, with the role of supporting teachers' effective integration of technology into lessons, providing training on new technologies, making recommendations for purchases, and contributing to planning for a division of technology policies and processes (Sugar and Holloman, 2009). The addition of the instructional technology specialist created a change in technology integration that has impacted the role of the school library media specialists by creating a gray area in regard to overlapping responsibilities (Johnston, 2013).

When computers were first introduced into schools, the computer labs were located in the library. The school library media specialists were the educators tasked to maintain them. As information sources became digitised, more of the school library media specialists' time was focused on rapidly expanding information resources and instructional technology specialist positions were added. Now, when instructional technology specialists describe their work as collaborating with teachers and sharing effective computer media and technology methods, they describe a role that was originally the responsibility of the school library media specialists (Nguyen, 2007). Separating technology integration responsibilities from the school library media specialists' roles may demote the school library media specialists back to the keeper of the books. In 1999, Eisenberg and Lowe described school library media specialists, technology teachers, and administrators as working in isolation and fighting for turf and control. This is unfortunate because a collaborative relationship between an instructional technology

specialist and a school library media specialist provides benefits to the students. Collaboration opens an avenue to combine the knowledge and experience of two unique members of the teaching staff to support classroom teachers and students to make learning highly engaging through the integration of technology and information literacy skills into content curriculum.

Combining the efforts of the school library media specialist and the instructional technology specialist to work together will benefit the students. Researchers have found that although, these days, students have grown up with access to technology, they are not experienced in using technology for academics (Ausband, 2006). In addition, research continues to show that technology is not being effectively integrated into classroom instruction. Lack of knowledge in using technology in student-centered instruction is a concern, along with teachers' attitudes and confidence in using technology (Buckenmeyer, 2010; Ertmer & Ottenbreit-Leftwich, 2010; Ryan and Bagley, 2015). This leaves a large need for support in integrating technology into teaching and learning and the importance of technology integration leadership. A Radical Change creating an instructional partnership will realise another Radical Change in the school library media specialists' roles.

In a study on enablers and barriers to school library media specialists' role in technology integration in their schools, Johnston (2012) identified a competitive relationship with the instructional technology specialist as the most often mentioned relationship barrier preventing the school library media specialists from participation in a leadership role in instructional technology integration. In the same study, a collaborative relationship between the instructional technology specialist and the school library media specialist was identified as an enabler to school library media specialists' technology integration role (Johnston, 2012b). While the barriers outweigh the enablers in this research, the finding of positive enablers support the idea that a collaborative relationship between instructional technology specialists and school library media specialists is possible and would benefit students and staff.

The school library media specialists and the instructional technology specialist each has their own contributions to make through a collaborative relationship, both with technology skills and their individual specialties. There is commonality between the standards of the school library media specialists and instructional technology specialist, their leadership roles, technology skills, and instructional knowledge, providing the opportunity for them to

combine in a partnership to support and enhance the school learning community. Each brings special skills to a collaborative partnership, the school library media specialists as an expert on information literacy and the technology integration specialist as a technology expert. Eisenberg and Lowe suggested the development of an Information & Technology team that would work together to create a true integration of information, library, and instructional technology services, resources and roles (1999). By looking at the current roles of the school library media specialist and the information technology specialist, how this integration can be supported by the specialisations and commonalities each bring, a collaborative partnership will become apparent.

Emerging technology is a term generally used to describe a new technology, but it may also refer to the continuing development of an existing technology. It includes a variety of technologies such as educational technology, information technology, nanotechnology, biotechnology, cognitive science, psychotechnology, robotics, and artificial intelligence. Of recent, the emerging technologies include, big data, artificial intelligence, blockchain, Virtual and augmented reality and 3D printer. These technologies are bound to change the landscape of the school library media programmes. With recent rapid developments in machine learning, a subfield of artificial intelligence (AI), it is no longer extraordinary to think that we will be soon be living in the world with many robots around us.

When loosely used, the term, 'robot,' may refer to anything that can be programmed to move, no matter how simple it is. Sometimes, even software designed to automate tasks is called a robot. But in most cases in which we refer to something as a 'robot,' we want to distinguish it from a piece of software or a typical machine. George Bekey proposes an intuitive and reasonable working definition of a robot. He defines a robot as a machine, situated in the world, that senses, thinks, and acts. This means that a robot must have the capability to take in sensory input from the surroundings, process it for a cognitive task, and act upon the physical world. This requires a robot to be equipped with sensors, some cognitive capability to process the input from the environment and to determine the response or an action, and actuators, which allow it to physically act upon the environment. In this definition, it is not necessary for a robot to take a human form. But a robot must be embodied, able to sense the surroundings, and act on the physical world. Consequently, a piece of software cannot be a robot. Nor does a machine that lacks the sensing capability, a certain level of cognitive processing capability, or

the ability to perform its tasks autonomously up to a certain degree.

Artificial intelligence has made it possible to make a robot intelligent and autonomous in performing tasks not only mechanical but also cognitive. Such cognitive tasks include driving, natural language processing, translation, and face recognition. The capability of AI-powered robots far exceeds that of other simpler and less sophisticated machines. Unlike humans and some other living beings, robots do not have consciousness, desire, or motives. Their intelligence comes from a program, not from internal mental states. But humans have a strong tendency to anthropomorphise a variety of objects they interact with, many of which are less complex than a robot. This suggests that we will be quite susceptible to projecting motives, emotions, and other human traits onto robots. As such, the adoption of robots raises interesting and unique concerns regarding their safety, morality, the robot's impact on social relationships and norms, and their potentials to be used as a means for manipulation and deception.

Robots are not new in libraries in developed countries but are just about finding their ways into libraries in Nigeria. Many large libraries implemented a robotic system that stores and retrieves books, media, and other types of library materials. *AuRoSS*, an autonomous robotic shelf scanning system developed in Singapore, self-navigates through libraries at night, scans RFID tags in books, and produces reports on missing and out-of sequence books. Some libraries also started acquiring and providing access to robots. Westport Public Library provides robot training classes for its two Nao robots. Also, Chicago Public Library lends *Finch* robots, so that library users learn how to program them. San Diego Public Library held a Robot Day event to educate the public about the impact of robots on society and formed a weekly Robotics Club, where people can learn and practice building robots. There are now many more libraries that offer a robotics program or support a robotics club. These efforts nicely align with libraries' interests in providing more support and outreach in STEM education and can fit well in a library makerspace.

It is important to note that here, the term, 'a robot,' is being quite liberally applied and does not follow a stricter definition, such as the one put forth by George Bekey, mentioned earlier. In such a case, anything that can be programmed to move may be called a robot, no matter how simple it is. With recent rapid developments in AI, they are likely to get equipped with more sophisticated sensors, actuators, and cognitive processing capability. This will allow them to act in a more autonomous and versatile manner in the near future. With this in mind, several areas of

school library media centres programmes where we may see the early adoption of robots are as follows:

- ^{1.} One of the most basic functions that a robot can perform in a school library media centre would be greeting library visitors and answering directional questions. One can easily imagine a small Nao or a Pepper robot being deployed for this purpose. The library of the University of Pretoria in South Africa has already a robot named 'Libby' playing this role.
2. The school library media centres' access services may be another area, in which robots may come in handy. AuRoSS, is developed to identify misfiled books in the library shelves. With more advanced robotic technology, robots like AuRoSS may soon be able to identify and re-shelve misfiled books into correct places.
3. Reference could be an area for robots in school library media centres. With enough data and the natural language processing capability, robots will be able to answer simple reference questions. The Oklahoma University Libraries are experimenting with Alexa, a virtual assistant used in Amazon's smart speaker, to see if the library's reference service can be expanded through it.
4. Robots may be able to provide the basic readers' advisory service and point to the location of a book that a library user wants to check out. These services do not have to be delivered by a robot and can be provided as an application on a smartphone or a computer. But a robot has the potential to add more interaction to this service and perhaps to bring better user experience along with it.
5. For children's' librarians, a reading robot could be a useful assistant. There is already a reading robot developed for this purpose. 'Luka,' a small AI powered robot, can read aloud picture books put in front of it. Researchers at the University of Wisconsin-Madison in the United States also built a reading companion robot, named 'Minnie.' Minnie guides and interacts with middle school students and can react or make comments about the story that they are reading.

Now, with these kinds of robots in school library media centres, what kind of human-robot interactions may take place between library patrons and library robots? These robots are likely to play the role of an assistant and a companion that help library users with

accomplishing a variety of tasks. For this reason, the relationship between those robots and library patrons is likely to be positive and friendly. In certain types of library robots, such as a reading companion robot or a reference service robot, a certain level of bonding between library patrons and those robots may facilitate the robot's intended use. If library patrons treat these robots strictly as a tool and interact with them only as such, that is likely to result in those robots' full capacity and function being under-utilised. A school library media centre is to be a space that is safe to all library users both mentally and physically, strives to provide the public with free and equal access to information, empowers people through knowledge, protects people's intellectual freedom, and helps them exercise their right to pursue information and knowledge privately without being monitored or surveilled by a third party. In order to help the school library media centre achieve this mission, library robots, particularly those that will be involved in library patrons' information-seeking activities, may be required to follow stricter guidelines than robots deployed in other areas are. But perhaps such stricter guidelines would be beneficial to all robots in general.

While there are some robots already being introduced to libraries, more sophisticated, versatile, and autonomous robots are likely to enter our homes, workplaces, and libraries as the AI technology advances. Neither our society nor libraries yet fully understand how the wide adoption of robots would affect us. But it is clear that as a new type of social agent, robots will generate a lot of interesting questions, which are perhaps more about us, humans, than robots.

Summary and conclusion

This article revealed that, with the recent development in emerging technologies, the methods of operation and activities of school library media centre would change over time. Hence school library media specialists as custodians of information must begin to acquire skills and capabilities that would make them relevant in the technology-mediated environment. Furthermore, looking at the current widespread diffusion and use of technology in modern societies, especially by the young – net generation – then it should be clear that technology would affect the business of information service provision today and in the future. In addition, as with many other knowledge-based activities in the modern societies, the use of technology organisationally has not yet fully matured in Nigeria. The opportunities in rendering effective

library services, using technology for knowledge sharing and scholarly communication is still at infancy. However, we can conclude that the technology landscape in the school library media programmes is still work in progress. In all, it would be difficult and maybe even impossible to imagine future information environments that are not supported, one way or another, by technologies. It should be noted that as the power of the emerging technologies increases, school library media centres would have the same capabilities as the industrialised world, but may not have the finance to support it.

References

- Adetimirin, A.E. (2012). ICT literacy among undergraduates in Nigerian universities. *Education Information Technology*, 17, 381–397.
- Adeyomoye, J. I., (2007) "An Assessment of the Impact of Nigerian Book Foundation (NBF) on the Development of Library Collections in Private University Libraries in South-West Geo-Political Zone of Nigeria" (2011). *Library Philosophy and Practice (e-journal)*. Paper 647. <http://digitalcommons.unl.edu/libphilprac/647>
- Ajayi, S.A., Shorunke, O.A. & Akinola, A.O. (2013) Factors influencing the use of ICT by library personnel in Osun and Oyo states, Nigeria. *The Information Technologist*. Vol. 10 No. 1.
- Ajibero, M. I. (2004). Current Trends in Technical Services. In *Computerization of Operations in the Information Age*. Proceedings of the Cataloguing, Classification and Indexing Section of Nigerian Library Association, 1-9
- Alhaji, I.U. (2007) Digitization of past question papers, dissertations and theses: A case study of 30 Nigerian university libraries, *The International Information & Library Review*, 39:3-4, 228-246
- American Association of School Librarians. (1960). *Standards for school library programs*. Chicago, IL: American Library Association.
- American Association of School Librarians. (2007). *Standards for the 21st century learner*. Chicago, IL: American Library Association.
- American Association of School Librarians. (2009). *Empowering learners: Guidelines for school library programs*. Chicago, IL: American Library Association.
- American Association of School Librarians & Association for Educational Communications and Technology. (1988). *Information power: Guidelines for school library media programs*. (1988). Chicago, IL: American Library Association; Washington, D.C.: Association for Educational Communications and Technology.
- American Association of School Librarians & Association for Educational Communications and Technology. (1998). *Information power: Building partnerships for learning*. Chicago, IL: American Library Association.
- American Library Association. (1989, January 10). *Presidential committee on information literacy: Final report*. Retrieved from <http://www.ala.org/acrl/publications/whitepapers/presidential>
- American Library Association and American Association of School Librarians (2010). *ALA/AASL Standards for Initial Preparation of School Librarians (2010)*. Chicago: American Library Association. Retrieved from <http://www.ala.org/aasl/education/caep>
- Ausban, L. T. (2006). Instructional technology specialists and curriculum work. *Journal of research on technology in education*, 39(1), 1–21.
- Branch-Mueller, J., & DeGroot, J. (2011). The power of Web 2.0: Teacher-librarians become school technology leaders. *School Libraries Worldwide*, 17(2), 25–41.
- Buckenmeyer, J. A. (2010). Beyond computers in the classroom: Factors related to technology adoption to enhance teaching and learning. *Contemporary Issues in Education Research*, 3(4), 27–35. Retrieved from ERIC (EJ1072605).
- Coffman, T., (2009). Getting to the heart of technology integration: Virginia's instructional technology resource teacher program. *Learning & Leading with Technology*, 36(7), 20–23. Retrieved from ERIC (EJ839144).
- Dresang, E. T. (1999). *Radical change: Books for youth in a digital age*. New York: H.W. Wilson.
- Eisenberg, M., & Lowe, C. (1999). Call to action: Getting serious about libraries and information in education. *Multimedia Schools*, 6(2), 1–5.
- Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255–284.
- Ekpenyong, G. (1997) Automating a large library in Nigeria: the story so far. *New Library World*, 98(3) 106–110.
- Gorman, M. (2000) *Our Enduring Values: Librarianship in the 21st Century*. Chicago: American Library Association.
- Hopkinson, A. (2009). Library Automation in Developing Countries: the last 25 years. *Information Development* 2009 25: 304-312
- Igben, M.J. and Akobo, D.I. (2007) State of Information and Communication Technology (ICT) in Libraries in Rivers State, Nigeria. *Afr. J. Lib & Inf. Sc.* Vol.17, No. 2 (2007)143-152
- Ilesanmi, T.C. (2013) Roles of the Librarian in a Research Library in the Digital Era: Challenges and the Way Forward, *New Review of Academic Librarianship*, 19:1, 5-14,
- Kadiri, J. A.(2004) Automation of an Academic Library: The Case of Federal College of Education (Special), Oyo Nigeria. *Nigerian Library and Information Science Review*, 22 (2) 57-62

- International Society for Technology in Education (ISTE). (2015). *ISTE-CAEP standards for teacher educators*. Retrieved April 11, 2015, from <http://www.iste.org/standards/standards-inaction/caep>
- Johnston, M. P. (2012a). Connecting teacher librarians for technology integration leadership. *School Libraries Worldwide*, 18(1), 18–33.
- Johnston, M. P. (2012b). School librarians as technology integration leaders: Enablers and barriers to leadership enactment. *School Library Research*, 15, 1–33. Retrieved from <http://www.ala.org/aasl/slr/vol15>
- Johnston, M. P. (2013). School librarian + technology specialist = partnership for effective technology integration. *Knowledge Quest*, 42(1), 70–75. Retrieved from ERIC (EJ1040139).
- Langran, E. (2010). Technology resource teachers as school leaders. *Journal of Technology Integration In The Classroom*, 2(2), 163–179.
- Massey, S. A. (2009). Digital libraries in schools: The best practices of National Board Certified library media specialists (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Full Text. (3359753)
- Michie, J. S., Holton, B. A., & National Center for Education Statistics. (2005). *America's Public School Libraries: 1953–2000* (NCES 2005-324). U.S. Department of Education. National Center for Education Statistics. Washington, DC: U.S. Government Printing Office. Retrieved from ERIC (ED485535).
- Monteil-Overall, P. (2005). Toward a theory of collaboration for teachers and librarians. *School Library Media Research*, 5, 1–31. Retrieved from <http://www.ala.org/aasl/slmr/volume5>
- Monteil-Overall, P., & Jones, P. (2011). Teacher and school librarian collaboration: A preliminary report of teachers' perceptions about frequency and importance to student learning. *The Canadian Journal of Information and Library Science*, 35(1), 49–76.
- National Board for Professional Teaching Standards. (2012). *Library media standards: Second edition*. Retrieved from www.nbpts.org
- Nguyen, Thanh Truc T. (2007). *Technology tango: Perceptions of the roles of school technology coordinators and library media specialists* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Full Text. (3261808).
- Oldham, B., & Skorina, D. (2009). Librarians and instructional technologists collaborate: Working together for student success. *College & Research Libraries News*, 70(11), 634–637.
- Ryan, T., & Bagley, G. (2015). Nurturing the integration of technology in education. *Journal of Theory & Practice in Education (JTPE)*, 11(1), 33–50.
- Scholastic Research & Results. (2008). *School libraries work! Third edition*. Retrieved from MacArthur Foundation.
- Developing strong university libraries in Nigeria: A report. <http://www.webpages.uidaho.edu/wmbolin/1ppissueindex.htm> Accessed on 15.10.07.
- Mahmood, K., Khan, M.A. & Siddique, N. (2008) Volunteer Endeavors to Promote ICT in a Developing Country: the case of the Pakistan Library Automation Group. *Information Development* 2008 24: 135
- Ministry of Communications Technology (2012). *National information communication technology (ICT) policy draft*. Retrieved from http://techloy.com/wp-content/uploads/2012/01/National_ICT_Policy_DR_AFT_090112.pdf.
- Nok, G. (2006). The challenges of computerizing a University Library in Nigeria: The Case of Kashim Ibrahim Ibrahim Library, Admadu Bello University, Zaria. *Library Philosophy and Practice*, 8(2). Available: <http://digitalcommons.unl.edu/cgi=1078&context=libphilprac.pdf>
- Nwalo, K. (2008). Consortium Building for the Effectiveness and Sustainability of Academic and Research Library Services in the Information Age: Nigeria in Perspective. *Journal of Social & Cultural Studies*, 11(1), 9 – 16.
- Okiy, R. B. (2010) "Globalization and ICT in Academic Libraries in Nigeria: The Way Forward." *Library Philosophy and Practice (ejournal)*. Paper 501. Available at <http://digitalcommons.unl.edu/libphilprac/501>
- Onatola, A. & Oduwale, A. A. (2006) Planning and Organizing a 21st Century Digital Library in Nigeria, *Journal of Hospital Librarianship*, 6:1, 65–76,
- Seneviratne, G.P. & Amaraweera, J.A. (2002) Automation of Library Operations in Sri Lanka: a cost effective web-based solution. *Information Development*, 18: 111.
- Tennant, R. (2003). Strategies for Keeping Current Library Journal. 28 (15): 28. Available From: Thomson Gale database. Article No. 0363-0277.
- Udoh-Ilomechine, & Idiegbeyan-ose, J. (2011). Selection criteria for computer software and hardware: A case study of six university libraries in Nigeria. *Chinese Librarianship: an International Electronic Journal*, 32. available at : <http://www.iclc.us/cliej/cl32UI.pdf>
- Ugorji, P. O. (2002). Software Choice Parameters and Procedure for Cataloguing. In computerization of Library Operations in the Information Age. Proceedings of the Cataloguing, Classification and Indexing Section of Nigerian Library Association, 23-30