TRENDS IN INFORMATION TECHNOLOGY AND LIBRARIES IN THE 21ST CENTURY

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ABSTRACT

The 21st century is the millennium of information, which is also seen as the era of explosion of information output and information sources, and libraries play important roles as sources of valuable records, which help to meet the information needs of the society. In this era, libraries are gradually equipped with state of the art Information Technology (IT) resources in order to facilitate information acquisition, access and dissemination to resources domiciled in remote repositories which were hitherto not possible. Therefore, the trends in information technology and libraries in the 21st century in meeting the scholarly needs of their patrons cannot be overemphasized. This paper discusses the historical development of information technology, definitions of information technology and libraries, the 21st century library and the emerging trends in library services. It aims at the trends in which information technology and libraries are taken in meeting the information needs of its clientele, and also examine the factors to be considered in setting up fully functional IT compliant libraries, which including availability of space, technical know-how, trained IT manpower, funding, and maintenance culture. It also looks at the challenges faced which include: inadequate resources and unavailability of adequate training for the users and poor funding of libraries. It outlines a number of factors that could affect the full implementation of IT services in libraries and therefore recommends adequate training of library staff on the use of these emerging information technology trends and adequate funding of library operations, among others.

Keywords: Information technology, Information dissemination, Libraries, 21st Century, IT resources

Introduction

There is no doubt that information plays a vital role in human life, has drastically increased since the mid-21st century due to social progress and dynamic development in science and technology. The pace of change brought by the emerging technologies in information exerted a considerable effect on the way people live, work, and plays worldwide. It is obvious that this emerging trend in technology is challenging the traditional process of teaching, learning, and the way education is managed. Thus, Information Technology (IT), as an important area of study in its own right, is having a major impact across all curriculum areas in our institutions and libraries as well (Fagbe, Amanze, Oladipo, Oyenuga & Adetunji, 2015).

According to Onuoha and Obialor (2015), IT has transformed the whole world into a global village with a global economy, which is increasingly dependent on the creative management and distribution of information. Over the past decades the world has been experiencing significant changes in which the need to acquire, utilize and share knowledge has become increasingly essential. Haris (2016) notes that the 21st century technology might have advantage for business, industries, government, academic institutions and library as well. Library has improved its facilities and services for not being just the keeper for books. Changing landscape on how activities or operations been done give some impact to the organisation outcomes and targets. This will be the challenge for some organisation in order to stay relevant. Libraries as the custodian of information and resources really need to be parallel with the development of technology today.

Historical Development of Information Technology

IT could never have happened without the development of natural language programming. Early programming language involved a series of codes, which were numbers. Early computer programmes usually came from a Mathematics background. The concept of IT jobs, as distinct from computing jobs, first emerged in the early seventies (Vintage College, 2021). According to Computer Tech Support Newsletter (2016), IT has been around for a long, long time. Basically as long as people have been around! Humans have always been quick to adapt technologies for better and faster communication. It noted that there are four main ages that divide up the history of IT, which are pre-mechanical, mechanical, electro-mechanical and electronic but only the latest age (electronic) and some of the electromechanical age really affects us today.

It continued that pre-mechanical which is the earliest age of technology can be defined as the time between 3000 B.C. and 1450 A.D. When humans first started communicating, they would try to use language to make simple pictures – *petroglyphs* to tell a story, map their terrain, or keep accounts such as how many animals one owned. The mechanical age was the second age, which is when we first start to see connections between our current technology and its ancestors. It can be seen as the time between 1450 and 1840 and a lot of new technologies were developed in this era due to an explosion of interest in computation and information, such as slide ruler. The next age was the electromechanical age which heralded the beginnings of telecommunications as we know it today. It can be defined roughly as the time between 1840 and 1940.

Several revolutionary technologies were invented in this period such as the Morse code, telephone, radio, among others. The fourth age was electronic era machines, which used electronic switches, in the form of vacuum tubes, instead of the electromechanical relays seen in the previous era. In principle the electronic switches would be more reliable, since they would have no moving parts that would wear out, but the technology was still new at that time and the tubes were comparable to relays in reliability. The major benefit of electronic switches was that they could 'open' and 'close' thousands of times faster than relays. Electronic Numerical Integrator and Computer (ENIAC) was the first electronic general-purpose computer.

Overview of Information Technology and Libraries

The application of IT in library and Information centers has developed in the western countries since the 1940's. In the 1960's the use of IT has been started in the developing countries and that too is in different stages. The rapid development of Information and communication technology has made a special impact on the method of information acquisition, processing, storing & dissemination of information. The invention of the Internet has brought a major change in the scenario of library and information services. Due to this impact of IT, it has created challenges and opportunities for the

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information professional around the world (Lisbnetwork, 2018).

IT no doubt has changed the function of the library. University libraries are using the information technology to increase the efficiency and effectiveness of their day to day library work and services. Acquisition, cataloguing, circulation or binding are the works connected with library services and these activities cover the administrative services, technical services, reader services, and special services. According to Kumar (2017), these types of services can be managed with the help of integrated library automation software and the influence of IT can be seen in the following readers' services; selective dissemination and information (SDI) services, online searching, web-based indexes and databases, online public access catalogue (OPAC) to Web OPAC), digital reference service, electronic document delivery, electronic clipping services and internet bases services.

Uddin and Hasan (2012), state that the computer is now an essential equipment of the libraries for information acquisition, processing, management and dissemination. It is indisputable that no research and advance studies can successfully be carried out without using appropriate information resources/materials. Most libraries and information centers provide such service with varying degrees of effectiveness and efficiency. Integrated information infrastructure links library systems, computer based data centers with academic, special and public libraries. IT is the use of computer system and telecommunications equipment in information handling, consisting of electronic processing using the computer, transmission of information using telecommunication equipment and dissemination of information multimedia.

A vast number of different means of organizing information have been devised and exploited since the earliest times. With the vast output of new information and ever-increasing degree of specialization in all areas of human knowledge, heavy demands are being placed on library information storage and retrieval systems, which can be scarcely met by the traditional methods except with the use of IT devices. The improvements and changes in computing and telecommunications and the integration of the two fields have had a huge role to play in the methods of information processing and dissemination in academic libraries; thus improving the quality of use to which such libraries are put (Fagbe, Amanze, Oladipo, Oyenuga & Adetunji, 2015).

Information Technology Trends in the 21st Century Library

According to Emezie and Nwaohiri (2013), the 21st century is the millennium of information, the era of explosion of information output, and information sources. It is also known as the beginning of knowledge age. New patterns of work and new business practices have developed as a result; new kinds of work with new and different skills are required. In this century, the meaning of knowledge has changed and knowledge is no longer what is stored in the minds of experts, represented in books and classified in disciplines. It is now thought of as being like a form of energy, as a system of networks and flows-something that does things or makes things happen. In the 21st century library, the emergence of information technology has redefined the library role. Print materials are no longer sufficient to store information. CD ROM databases, electronic document delivery, automated cataloguing, circulation systems and online information retrieval (OPAC) have become the order of the day.

When the issue of technological advancement is discussed in library in relation to library services, there is a relative expectation of new innovation of library services and management. Library can start to apply new features in providing information and knowledge services to its users. For example, few years back, the library website might not be so interesting enough to users. Nowadays, the rapid growth of information based engine could be attached to websites, giving a great look and feel. Users feel it is more friendly and easy to navigate. Other technology such as RFID, automated

checkout systems and online databases are among the good innovation in helping the library to cater for its users in the 21st century (Haris, 2016).

In the 21st century, the new technology of cloud computing is giving benefit to library. It is the system that is using a network of remote servers placed on the Internet, where information on the website is stored in a remote location. Library easily can store their website contents in the cloud system and the administration of the website can be done remotely anywhere at any time. Another new implementation on the technology is the e-book service at the airport. The Kuala Lumpur International Airport launches new library that offers free e-books to travellers. This smart facility operates through the use of Bluetooth beacon signals which work on the principles of geo-fencing micro-location technology. It communicates with passengers' smartphone application, allowing them to access a special virtual library of e-books.

Ostrow (1998) cited in Eguavoen (2011) admits that the advent of the Internet, digitization and the ability to access library and research materials from remote locations have also created dramatic changes by the end of the 20th century. Barathi, Loganathan and Rajan (2017) explain that the use of digital or virtual library is among the trending issues in information service delivery. They further defined the a virtual or digital library as a collection of library resources in electronic/digital format at various locations, which can be accessed and used with great ease using computer information technologies for the purpose of teaching, study, research, learning, leisure, and decision-making.

New era librarians and information professionals should be able to manage the Digital Information System as this encompass the overall competencies (knowledge, know-how, skills and attitudes) necessary to create, store, analyze, organize, retrieve and disseminate digital information (text, images, sounds) in digital libraries or any type of information. Byamugisha (2010) adds that the patrons' expectations for a distance service delivery across library services have increased; patrons have come to expect a wide variety of automated push and/ or pull services from libraries and from a distance.

Emerging Information Technology Trends in Library Services

Emerging technologies provide librarians with a unique opportunity to substantially enhance user centered services and to facilitate and promote collaboration between libraries and their users. Emerging technologies provide opportunities for library professionals in identifying, collecting, organizing, customizing and delivering information products and services in a range of formats and varieties to the user community both on demand and anticipation at physical and virtual environments in real time. Though library is independent of technology given the fact that every library activity designed or built with active participation and feedback of its user community qualifies to the concept of library but emerging technologies can help libraries to create collaborative and participative environment that is necessary to deliver user-centric library services and to create new resources and build-upon existing ones using collective intelligence of 6 users (Ayo-Olafare, 2020).

Adams, Cummins, Davis, Freeman, Giesinger, Ananthanarayanan, Langley and Wolfson (2017) state that in today's digital age, new technological trends in libraries have changed the way librarians and users access information. In a recent survey conducted by Adams et al (2017), 77% of Americans from 16 and older believe that the library should have free access to computers and the Internet. It is being rated as a very important service just after borrowing book services, noting five library technologies every library and information professionals should adopt, to include maker space, user-focused interfaces, digital displays, cloud technologies and sign-in technology.

Librarians are now clearing space to make room for maker space. When a library has a maker space program, students are taking concepts learned in the classroom and applying them in real-world

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situations. In user-focused interfaces, technology that improves the user experience for library patrons will save librarians time to focus on their programmes. User-focused interfaces improve patrons' interactions by promoting engagement and more involvement from students and lecturers. The goal of these interfaces is to personalize interactions between the library system and patrons. Utilizing technology, like slideshow, to digitally space library books can help the library create multiple dynamic displays for a range of titles. It is an excellent way for students to see the items available in the library. Cloud hosting provides more reliability, better performance, and stronger security than local implementation. It can help libraries prepare for growth and the deployment of other cost-effective technologies. Single sign-on technology allows libraries to manage their users' login-in credentials from a centralized system. Educators save time with automatic account creation and updates.

According to Ayo-Olafare (2020), the emerging IT trends in library services can be seen in streaming media, podcasting, vodcasting, blogs, and social bookmarking services. As media is created, libraries will be responsible for archiving and providing access to them. Libraries can take advantage of podcasting and other consumer technologies as a deliver media of library's content and services. While podcasting is used for delivering audio files, vodcasting is used for delivering video content. Like podcast content, vodcasts content can be played either on a laptop or on personal media assistant device (PMA). Blogs can be used to initiate debates and interaction amongst users and staff. Moreover, library staff and user can be encouraged to use library blogs to get to know each other and interact at personal level. Social bookmarking being a method of storing, organizing, searching and managing bookmarks of web sites using descriptive metadata, libraries can make use of it using RSS feeds for subject disciplines or in areas of specialization relevant to them.

Innovative libraries are using digital tools to make services easier to use and access, inspire and inform, and help patrons learn new skills. Garland (2019), points out that the following emerging technologies are used by libraries for its services; digital maker labs, which are popping up in libraries all over the UK; coding clubs' technology, in which library users are taught how to make and use technology the way they want it. Libraries are working with writers and coders to create new interactive stories known as digital storytelling. It is where the reader can become immersed and attempts to control the narrative flow. Many libraries have started offering to their users the chance to play, learn and explore other places just by sitting in the comfort of their local library with virtual reality. Other emerging technologies mentioned by Garland (2019) are mobile apps, RFID technologies, cloud printing, robot technology and streaming services.

According to Princh Blogspot (2020), Nag and Nikam (2016), Gupta and Singh (2018), and Kaladhar and Rao (2018), technologies like digital storytelling, RFID, library bookmark application, big data, and Internet of Things (IoT) have been introduced into libraries recently. Hoy (2017) opines that the use of Blockchain for metadata and networking of libraries and in medicine will go a long way in improving information services. Other newly introduced technologies in libraries include augmented reality (AR), virtual reality (VR) (Oyelude, 2017; Pope, 2018), QR (quick response) barcode technology, gamification, enabled integrated library management system which also houses OPAC, social media applications and artificial intelligence (AI) (Sheik & Olugbenga, 2019); artificial intelligence, robotics (Odeyemi, 2019). Massis (2018), and Gul and Bano (2019) posit that ambient intelligence and data mining have currently been introduced into libraries making the libraries smarter, improving work capabilities of staff, satisfying customer needs, and bridging the information gap, a tremendous positive impact

An AI lab has been built at Rhodes Island public library. Unstacked, a user-friendly application is being used at the Queensland State Library. It helps users to visualise information resources digitally (Princh Blogspot, 2020). In Bangladeshi libraries, RFID technology is now in use (Rahman & Islam, 2019). In Canada, a team of librarians from the International Islamic University in Malaysia have

developed an automated reference service program called R-StaRS for the University of Windsor (Ryu, 2019). Big data can facilitate library services by providing access to user mind otherwise called customer intelligence after user's consultation of large dataset storage. Augment reality applications like 'librARi' that allow library patrons search for books and discover related content is currently being used at Halton Libraries in the United Kingdom. The Hillsboro Public library in Oregon, United State of America has developed a self-service book borrowing and usage trend tracking device called Book-O-Mat. This helps them to make informed decision on patron's preferences for books (Princh Blogspot, 2020).

Challenges in Information Technology Trends in Libraries in the 21st Century

According to Fagbe, Amanze, Oladipo, Oyenuga and Adetunji (2015), there are some constraints to effective information technology availability and application in libraries, most especially, academic library. The constraints includes; lack of trained Information Technology (IT) Manpower, library staff and users negative attitude to change in technology, encountering technical problems in the course of usage, the conversion of analogue information into digital format and its storage capacity place a high demand on the bandwidth of the University, crashing of a computer due to virus, malware, hackers etc, can have a large negative effect of loss of data and exposure of information to non-users, lack of funds and maintenance culture. The above stated constraints are also factors that should be considered by libraries in setting up of fully functional IT complaint libraries.

Onuoha and Obialor (2015) state why IT has not moved more rapidly in libraries. Their reasons include; the impact of cost of implementing IT in libraries; lack of standards as a result of different standards being used by hardware manufacturers; lack of perceived market as publishers do not perceive a library market for new products based upon new technologies; content of disc in the sense that a 5 inch CD-ROM contains more than 500 megabytes, which is a lot of information, and publishers are having some difficulty determining logical groupings of information to assemble on a disc; library users are not yet ready to move from the printed page exclusively to electronic data; articles solely in electronic form are not yet perceived as valid contributions in the publish-or-perish cycle; the 1976 copyright law did not address emerging information technologies, and the library and publishing communities are attempting, with only some degree of success, to effect a compromise between the interests of the two groups. The copyright issue will become even more intense as full-text documents become increasingly available in electronic form; and lack of staff training due to the fact most library staff are not internet-friendly.

Other challenges that need to be examined and addressed for emerging technologies to be fully implemented in libraries, most especially in Nigeria include; inadequate technical staff, complexity of the technology interface, slow bandwidth and high cost of Internet services, lack of funding, insufficient power supply, amongst others.

Conclusion

Technology is changing the dominant form of recorded thought from print to electronic. That change, in turn, is irrevocably altering the ways in which people create, find, and process information. As a result, libraries must evolve their philosophies, missions, and processes. IT has not left any human activity untouched with its influence as its tools like computers and communication have added new dimension in information handling in libraries. New technologies supplement the older ones and form together with a complex of technologies, allowing for choosing a certain technology for a certain application from a broad variety of technologies. The emergence of IT has brought a paradigm shift for libraries, enhancing access, research and communication, thus becoming a very useful tool in libraries whose mission is to support teaching, learning and research. Libraries in the 21st century are

expected to exploit these opportunities to ensure that they are repositioned to be 21st century compliant and remain the hub of information provision, generation and dissemination.

Recommendations

In view of this, the following recommendations were made:

1. There should be adequate training of library staff on the use of the emerging information technology trends,
2. There should be adequate funding of library operations
3. A research to be carried out by library professionals and administrators to determine which of the emerging IT trends that play the most significant roles in transiting a paper based system to a fully automated IT driven library.
4. Training of librarians in the 21st century should be given priority because the success or failure of a library service depends on the calibre of staff.
5. Funds earmarked for library staff training and development in emerging IT trends should not be tampered with and should be released promptly when the need arises.
6. In the face of dwindling budgetary cuts, librarians in the 21st century should make personal efforts to improve their skills in order to defend their profession.
7. Computer literacy skills, metadata skills, information literacy skills etc should be acquired by library staff as these skills are needed to effectively serve library.

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