Library and Information Science from the Perspective of Information Communication Technology (ICT) in the 21st Century

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Abstract

This paper discusses the evolution of library and information science from the perspective of information communication technology (ICT) in the 21st century. It sheds light on the development of a modern and technologically adequate library as a universal solution to the information needs of the 21st library users who exhibit much dexterity in using new technologies. Technology has changed the expectations of library patrons; people today expect to be able to find and access information from wherever they are. The emergence of ICT in library has opened up new ways of accumulating, regulating and disseminating information. This paper provided an in-depth knowledge on Radio Frequency Identification (RFID), a new generation of Auto Identification and Data collection technology which allows identification of large number of tagged objects like books, using radio waves. The Unified Theory of Acceptance and Use of Technology (UTAUT) served as the theoretical basis of this paper.

Keywords: *Library and Information Science, Radio Frequency Identification, Auto Identification, Data collection technology, Radio waves*

1.0 Introduction

It is a known fact that libraries have witnessed a significant evolution in the recent years. This evolution which can be traced to the integration of information and communication technology (ICT) in the field of education and other aspects of human endeavors, the impact of ICT on various fields of law, banking, medicine and engineering over the recent years has been enormous (Gholami, et al., 2018). Liu and Briggs (2015) suggest that, ICT has played a number of roles in education such as

developing the peculiar citizens required in an information society. Technology was initially embraced by libraries because it allowed bibliographic, financial and other records to be kept, managed and retrieved by both library staff and patrons. Uzwyshyn (2017) posits that, the addition of information communication technology using the Internet and intranets adds the obvious advantages to that of the technology available using computers and CD-ROMs as it allows for the seamless sharing and dissemination of information both locally and world-wide. The traditional methods of information dissemination have given way to electronic means of communication. While the developments and application of ICT in library operations have improved and facilitated the dissemination of information and access, it has equally provided new roles in information provision, dissemination and transfer. According to Bhoi (2017), the 21st century library serve as a gateway to knowledge and a stable provision of basic condition for lifelong learning, in which decisions are capable of being made independently, in terms of individual and societal development. Abdekhoda, Ahmadi, Dehnad, Noruzi, and Gohari, (2016) affirm that, the emergence of modern library advances in ICT has opened up new ways of accumulating, regulating and disseminating scientific and technical information. Research and academic libraries have already changed their routine tasks by using effective and efficient information communication technologies to intensify and integrate their electronic resources and services. Many have attributed the advent of ICT as potential threat to eliminate the importance of the library, its resources, personnel and patronage. However, Bejalwar (2018) maintains that, the Internet has radically altered the way people interact with information and redefined the library's place in academia and the society at large. The increased availability of digital information has caused students to find alternative means of study and research with the aid of laptops and cell phones. Digital technology has reduced the importance and usage of libraries in developing countries. Nevertheless, the advent of ICT is a boost to the library services since librarians are harnessing the potentials of ICT to reach out to the teeming library users. ICT made knowledge construction in electronic format possible; ICT made electronic approaches and file transfer possible, thus; increasing the level of digital learning Bhoi (2017).

1.1 The Concept of Information Science

The amount of published material on the history of information science remains small, but there has been significant growth with some

important publications. The first known usage of the word Information Science was in 1955. Information Science has origins in the common stock of human knowledge while information analysis has been carried out by scholars at least as early as the time of the Abyssinian Empire with the emergence of cultural depositories, what is today known as libraries and archives. Institutionally, information science emerged in the 19th century along with many other social science disciplines. An early definition of Information science (going back to 1968, the year when the American Documentation Institute renamed itself as the American Society for Information Science and Technology) states:

"Information science is a discipline that investigates the properties and behaviour of information, the forces governing the flow of information, and the means of processing information for optimum accessibility and usability. It is concerned with the body of knowledge relating to the origination, collection, organization, storage, retrieval, interpretation, transmission, transformation, and utilization of information. This includes the investigation of information representations in both natural and artificial systems, the use of codes for efficient message transmission, and the study of information processing devices and techniques such as computers and their programming systems. It is an interdisciplinary science derived from and related to such fields as mathematics, logic, linguistics, psychology, computer technology, operations research, the graphic arts, communications, library science, management, and other similar fields".

2.0 The Innovation of ICT in Library and Information Science in the 21st Century

According to Khan and Bhatti (2017), there is no doubt that technology has had a lasting impact on libraries. Once thought to be going the way of traditional bookstores, libraries have rebounded and are thriving in a technology fueled world. With the help of innovation, re-imagination and vision, libraries are embracing new technologies while creating dynamic community centers filled with activities. They are no longer a house of dusty books and card files; they are centers of research and creativity. Bejalwar (2018), purports that, so many public library systems across countries have increased both computers for use inside the library as well as mobile and online access to e-books, audio books, research databases and archives. In 2010, nearly 300 million Americans used library services including onsite computers and onsite Wi-Fi to check out books, to attend workshops, and to consult with reference librarians. Libraries are now hubs of technology with over 85 percent

offering wireless internet services, and many offering state-of-the-art computers for use. But technology available to patrons does not stop there. Surveys show that currently 12 percent of academic libraries have pre-loaded E-reading devices in circulation that patrons can check out. Another 26 percent of academic libraries are considering adding this service. The digital age has produced challenges for both libraries and librarians; the sheer volume of information available in e-books, databases, archives and other digital materials has spurred innovation in the organization, management and distribution of library resources. For some time, some believed that just as bookstores and libraries were becoming irrelevant, that librarians would too. However, this is far from the truth. Search engines do provide a plethora of information, quickly and easily, but there is no guarantee of the quality of the information.

2.1 E-Learning as a 21st Century Innovation in Library and Information Science

Emerging technologies have had a significant impact on educational technology (Gholami, et al., 2018). E-learning can be defined as a technological infrastructure with applications and software that manage courses and users (Lippincott, 2015). New developments in E-learning include: people-centered learning (as opposed to content-centered learning; a bottom up learning approach (encouraging student input in courseware creation); dynamic content publishing (creation of blogs encouraging students to publish, comment and interact making it a form of social networking; and, folksonomy (students have the ability to organize content according to their preferences which enables quick access to learning resources). E-learning makes use of software that can be referred to as a "Learning Management System (LMS). Furthermore, E-learning provides support for traditional learning in the classroom, as well as provision of platform for information resources to be shared. Although it is not the domain of the academic library, there are copyright considerations when sharing resources on such a platform (Asseo, 2016).

Gomes and Mazzilly (2016), posit that, E-learning tends to draw attention to the fact that learning is only one of several elements of education. Thus, E-learning covers a wide range of services by focusing on course content and covering a whole range of other educational services. E-learning offers more flexible ways of learning which further promotes the adoption and use of mobile technologies. It is thus very common to find higher education institutions that implement various projects of making ICTs available in order to take advantage of E-learning's capabilities both in terms of initial training as well as in the

context of post-graduate activities. The extent to which e-learning assists or replaces other learning and teaching approaches is variably ranging on a continuum from none to fully online distance learning. A variety of descriptive terms have been employed to categorize the extent to which technology is used. For example, 'hybrid learning' or 'blended learning' may refer to classroom aids and laptops, or may refer to approaches in which traditional classroom time is reduced but not eliminated, and is replaced with some online learning. E-learning may either be:

* Synchronous
* Asynchronous

2.1.1 Synchronous

Synchronous learning refers to the exchange of ideas and information with one or more participants during the same period. Examples are face-to-face discussion, online real-time live teacher instruction and feedback, Skype conversations, and chat rooms or virtual classrooms where everyone is online and working collaboratively at the same time. Since students are working collaboratively, synchronized learning helps students create an open mind because they have to listen and learn from their peers. Synchronized learning fosters online awareness and improves many students' writing skills.

2.1.2 Asynchronous

Asynchronous learning may use technologies such as email, blogs, wikis, and discussion boards, as well as web-supported textbooks, hypertext documents, audio video courses, and social networking using web 2.0. At the professional educational level, training may include virtual operating rooms. Asynchronous learning is beneficial for students who have health problems or who have child care responsibilities. They have the opportunity to complete their work in a low stress environment and within a more flexible time frame. In asynchronous online courses, students proceed at their own pace. If they need to listen to a lecture for a second time, or think about a question for a while, they may do so without fearing that they will hold back the rest of the class. Through online courses, students can earn their diplomas more quickly, or repeat failed courses without the embarrassment of being in a class with younger students. Students have access to an incredible variety of enrichment courses in online learning, and can participate in college courses, internships, sports, or work and still graduate with their class.

2.2 The Concept of Massive Open Online Courses (MOOCs)

According to Cosgrave and Kosturski (2016), one of the rising trends in modern higher education institutions worldwide is massive open online courses (MOOCs). These are courses which make use of "electronic distance learning technologies" like the Internet, tablets, smartphones and other mobile devices to provide a virtual classroom that accommodates "a virtually unlimited number of students all simultaneously taking a course via online modality, who pay little or nothing for the course, and may earn no traditional formal credit. Although these courses offer no formal credit, in theory they can enhance enrolment in formal university programmes. In essence, students may find the content of MOOCs so engaging that they enroll in a formal learning environment. However, by the virtue of the fact that MOOCs is essentially free, many students find it very fascinating. However copyright materials are basically available for an open and online environment. Considering the fact that, in standard university courses, the use of proprietary materials is allowed without the instructor having to gain special permission. (Pietersen, 2015).

According to Gomes and Mazzilly (2016), a good example of MOOCs is 'Coursera', which is one of the most widely known MOOC platforms, it has more than 2.9 million registered users and there are more than 328 courses available. In contrast to the traditional courses of distance learning, the MOOCs are open, that is, they guarantee free access to people who have Internet and "there is no criteria for the selection of students, except when it is indicates that there is need for specific prior knowledge. Based on this broad scope, the MOOCs are entitled massive, reaching a large number of people. In the MOOCs environments, learning is characterized by interaction with microstructures (micro-content, micro-lectures and micro-formats), leading to another current phenomenon, that of "Micro-learning".

Gomes and Mazzilly (2016), assert that, in addition to traditional teaching materials such as videos, readings and problem sets, MOOCs have helped to build a community for students and faculty forums. Correspondingly, other examples MOOCs platform include: Academic Room, EDX, Erasmus EU's and WiredAcademic. Although there are several definitions for the same concept, they have three points in common:

* Free: anyone can sign up for free;
* Scale: it supports a large number of participants (large scale courses);

* Simplicity: you only need a teacher to coordinate all the information found on the respective network.

However, Gomes and Mazzilly (2016), purport that, MOOCs are based on two aspects; the Pedagogy aspect and the technological aspect. These two aspects would be briefly discussed below:

2.2.1 The Pedagogical Aspect of MOOCs

There are several pedagogical perspectives and learning theories that can be considered in designing and interacting with MOOCs. These theoretical perspectives are grouped into three main theoretical or philosophical schools: behaviorism, cognitivism and constructivism. Seemingly, there are different conceptual frameworks for describing the relationships between learning theories, pedagogical strategies, instructional designs, as well as mobile technologies. MOOCs in general, do not change the fundamental process of learning. However, quality teaching requires the development of a nuanced understanding of the complex relationships between 'technology, content, and pedagogy' and using this understanding to develop appropriate, context-specific strategies and representations. Productive technology integration in teaching needs to consider all three issues not in isolation, but rather in the complex relationships within the system defined by the three key elements. Moreover, no application of technology to learning and teaching is universally good. Instead, the best approach is to analyze the nature of the curriculum, students, and teachers in order to select the appropriate tools, applications, media and environments.

2.2.2 The Technological Aspect of MOOCs

MOOCs bind strongly to mobile technologies and this is particularly true of platforms and (or) virtual learning environments (VLE) which are used as a form of mediation to promote education. Among the technological aspects is the platform or the virtual learning environment. It is considered a VLE, because it is a collective environment that favors the interaction of the participating subjects, and aids in establishment of relationships for the users who use the interaction tools, focusing mainly on learning. VLE is a web space formed by the subjects and their interactions as well as forms of communication, which are established through a platform. This is understood to be a technological infrastructure composed of the features and graphical interface that make up the VLE and provides a set of tools and features for

the implementation of training actions at a distance, some of these features are highlighted below:

* Management of entries, trainees and training workshops;
* Provision of areas of downloadable content;
* Provision of areas of interactive content;
* Making of report, including through e-mail, discussion forums, chats, audio andvideo conferencing;
* Registration progress and assessment of trainees;
* Management of the study activities of the trainees;
* Creation of individual and group portfolios.
* More so, the MOOCs advanced systems is made up of:
* A browser-based interface for efficient document / info transfer;
* A database of learning document data;
* A powerful search engine;
* A flexible database connection, allowing connections to the management information system (students, courses and id data instructors);
* Tools for easy adaptation to different learning applications;
* (XML) authoring tools for the development and adaptation of e-learning materials, etc.

2.3 The E-Learning Systems Utilized in MOOCs

Nagel (2016), posits that, E-learning systems is the use of telecommunication technology to provide information related to education and training. Corresponding with the rapid evolution of mobile technologies, e-learning emerges as the epitome of modern education. The contributions of e-learning include the facilitation of interaction among learners-teachers-tutors, and/or between learners-learners, regardless of the barrier of time frame and space through the asynchronous and synchronous learning network model. Contemporarily, there are various systems to manage MOOCs, and the better known is e-learning systems. These systems contain many features, which compose a new education strategy, such as: text, animations, graphics, videos, forums, chats, quizzes, among others. Considerably, there are two methods that can be utilized in e-learning systems; 'asynchronous' and 'synchronous' (Nagel, 2016).

According to Gomes and Mazzilly (2016), synchronous e-learning, is facilitated by the media, such as forums, e-mail and mailing list support the working relationship between students and teachers Synchronous e-learning are facilitated by means such as video conferencing and chat, which has the potential to support learners in

developing learning communities and exchange of experiences. Students and teachers use synchronous e-learning as a manner of bringing participants, creating social ties and avoiding the frustration that the learner does not feel isolated. However, in order to designate e-learning systems, a wide range of terminologies are used: Learning Management System (LMS), Course Management System (CMS), Learning Content Management System (LCMS) or Management Learning Environment (MLE), Learning Support System(LSP), Virtual Learning Environment (VLE), Learning Platform (LP), and online learning platforms (OLP) (Gomes and Mazzilly, 2016).

According to Fielden and Middlehurst (2017), CMS and LMS are the most commonly terms, in the United Kingdom. LMS is more often associated with software for managing corporate training programs rather than courses in traditional education institutions. In the United Kingdom and many European countries, the terms VLE and MLE are also used frequently. VLEs assist the teacher in creating and delivering content; they monitor student participation, and assess their performance, while MLEs aid in developing a wider infrastructure of information systems in an organization that support and enable electronic learning. MLEs incorporate the VLE, together with other administrative processes and procedures, such as student records and management information systems, hence, creating a more holistic environment.

Gomes and Mazzilly (2016), maintain that, MOOCs have adopted VLEs quickly due to their low cost of deployment, offering free system licenses, despite the complexities and risks involved in creating a new education type. From the viewpoint of MOOCs planning, the initial selection of a VLE involves intertwined pedagogical, educational, administrative and technological issues intertwined, the interests of greatly diverse participants, and provides new dimensions to established online policies and procedures. One of the advantages of using a VLE is as a means of increasing the efficiency of teaching; for example, a VLE contains tools that allow the MOOCs to have a means to accomplish resource based learning on a large scale. It assists and facilitates the delivery of flexible courses, the identification and use of resources, communication and conferences, activities as well as assessments, and collaborative work management and student support.

3.0 The 21st Century Librarian

According to Shukla and Sialai (2016), the development of ICTs and their adoption in library and information science has changed the nature

of collections; the needs of users; the library environment and the roles of the librarians. The old concept of book centered librarianship has been transformed to the user-centered librarianship. ICTs have paved path to new roles for librarians in the 21st century. The 21st century librarians have been transformed into creators, communicators, leaders, mentors, and lifelong learners as they monitor the trends in technology continuously to provide global information instantaneously to users through ICTs. Considerably, the web environment's, options of sources and format of information and flow of information has had great impact on 21st century librarians and the role of libraries as a whole.

Pietersen (2015), posits that, in the development of collection tools, techniques and approaches have increasingly entered in the field of library services globally. It forces to change the way modern librarians function in providing the information needs of the users. Seemingly, these new functions involve different personalities for librarians as well as different skills and knowledge. The focus is on the capability of drawing power together to initiate smooth communication, thus, integrating them within a digital environment and providing access to the stored information using mobile devices via wireless means, which are considered, fast, friendly and interactive.

According to Craig and Williams (2015), the mobilization of libraries with the facilitation of ICTs has posed various challenges before the 21st century librarians in the nature of collections, the information environment and the radical change in the expectations and needs of the users. In the digital environment, the 21st century librarian's competence lies in: speeding up access to information; speeding up spread of information; filtering material chosen by users; organizing user information sources in standardized keyword and classification schemes; and developing an expert vocabulary. However, Uzwyshyn (2017), opines that, before adapting to any changes in libraries, the 21st century librarians have to analyze the organizational conditions, to what extent both higher officials and team members are willing and prepared to accept these changes. When creating a new role within the digital library, the 21st century librarians must have the curiosity, adaptability, flexibility, confidence and ability to interact with users even outside the scope of library, a passion to educate, 'can-do' attitude with team oriented spirit, and ability to think globally.

Craig and Williams (2015), further maintain that, creativity is required to deal with the changes in collections, services, and users. The 21st century librarian will become an agent of accessibility and integration, linking users to a range of digital information available

through licensing agreements or other means. The 21st century librarians would be required to work on re-tooling library services in order to make them more useful for users to find, organize, and interact with in such a way that there would infinite potential for users' customization. These new types of services are a shift from "isolated information silos" to "interlinked computing platforms". Shukla and Sialai (2016), propose nine important factors which are key elements to achieve successful and sustained change by the modern librarians. They are: ensure readiness for change; plan for change; lead change; manage change; support change; deal with resistance to change; communicate effectively; follow through, evaluate, learn; and attend to the human factor.

The justification for 21st librarians to be a mix of old and new ones is derived from the need to organize documents and information in a hybrid environment. They identified six categories for basic skills: professional, marketing and promotion, evaluation, communication – negotiation – collaboration, censorship, and personal transferable skills. Furthermore, as new technologies come along, 21st librarians are required to experiment and try to find ways to utilize these new tools in their operations. Technological developments enabled networking, file storage and graphic user interfaces. This evolution has paved the way for serious thinking on the capabilities to compensate for reduced budgets. The 21st century librarians are required to adapt to the new mindset of users linking new technologies, information, and users. Therefore, it can be enunciated that, the library is at the forefront of information management in the academic environment, so it is natural that 21st century librarians have assumed roles as digital curators in the formal academic setting.

4.0 ICT-Integrated Library Services in the 21st Century

ICT has an enormous part to play in the library. Considerably, if librarians are to continue with their role as information professionals they are required to adopt the extensive use ICT in their various operations. However, the disregard of ICT in a particular library will result in stagnancy and gradual deterioration of operations and services in such library. As such, most libraries have been utilizing ICT in their services. These services are further discussed below:

4.1 Notification Service

With the use of ICT, libraries are enabled with the ability to notify their esteemed users about latest news, events and information via messages, posts, comments, and tweets on various social media sites. The

users can also get notified instantly with notice alerts such as, alerts on bringing new books to the notice of users for suggestion, intimation of arrival of indented documents by users, informing availability of reserved documents for collection, appraising about overdue books, outstanding fines, reminders to return library items, renew books, library circulars, e-journals subscribed, change in timings, information about important events, loan request etc. Such alert notifications can be generated automatically using integrated library management system/software. Considerably, messages can be sent to group of users simultaneously through the 'broadcast' option available in some social media sites. Therefore, the use of ICT in library services will prove to be effective and efficient for both librarians and library users.

4.2 User Instructions

This service is used to assist library users to be precise in their search for information, as it involves teaching users how to search for information in the library with the aid of mobile technologies. Considerably, libraries would have the ability to offer podcasts and videos on information literacy which would be accessible through devices like MP3 players. This service would serve as an orientation for new library users in other to get them acquainted with the research world, thereby, eliminating the difficulties encountered in the search for information resources. With this service, several library users would be endowed with the knowledge of how to go about issues pertaining to research in the library. Additionally, with the facilitation of social media in library services users would be enabled with the ability to engage with librarians, in such a way that, when a particular user tends to encounter difficulties in the process of utilizing library materials, such user can easily log on to the libraries' social media account and post his/her questions, and within a short timeframe get desirable feedback.

4.3 E-resources Service

Some publishers are already delivering e-books (both text and audio) that are accessible via ICTs. It offers access to a variety of databases and digital resources such as e-Books, e-Journals, Web databases, dissertations, audio books, streaming music, films, images and article databases which can be used on mobile devices. These collections can either be downloaded from the libraries' social media on the user's own mobile device or mobile devices borrowed from libraries with the collections already installed on them. A large collection of audio books both free-and subscription based services are available for

download and also transferable to mobile devices from ICTs in the library e.g. PCs, laptops and tablets. Libraries can make use of social media on mobile devices to upload photos and videos, thus promoting the exploitation of information resources, such that photos of new books can be uploaded so as to acquaint the users with such book, likewise live broadcast of conferences can be uploaded so as to keep the users who are unable to attend such conference 'in tune'. Furthermore, students are enabled to access the libraries' social media account 24/7, provided that there are internet terminals within the vicinity of the library.

4.4 Library Tour Service

Library tours are orientation programs that are quite significant in introducing new users to the libraries and also helping the remotely located users in different geographical locations to make their way to the library. However, virtual / audio library tours can be produced fairly quickly, inexpensively, and could reduce the amount of staff time spent helping new users to orient themselves in the library and explaining the facilities available. It can easily be provided via various ICTs. It serves as a tour guide for library user, thus, users can familiarize themselves with the environment of the library so as know where their needed information resource is based and to locate other essentials in the library such as the restrooms, the reprography space and various other administration offices.

4.5 Outreach Service

Librarians in their focus groups are actively using ICT for outreach, generally focused on two key objectives; promoting the work of the library as a whole and connecting with the broader library community. In terms of promoting research output, several librarians can utilize ICT to ensure that the work of their faculty is made available as widely as possible, both through using the libraries' own channels and also through research-focused services. With the use of ICT, libraries will be enabled with the capability of reaching out to other libraries and make enquires about new contents and new modes of operations, thus, fostering cooperation and collaboration within the sphere of the library association. Additionally, libraries can make outreach to schools and enlighten them about more innovative ways of engaging students in learning activities, thus, providing a means of enhancing the academic state of the students and further encourage them to adopt the use of ICT for learning and research purposes rather than the conventional usage (entertainment, playing games, chatting, hanging-out etc.).