THE FOURTH INDUSTRIAL REVOLUTION AND LIBRARY SERVICES: OPPORTUNITIES AND CHALLENGES FOR LIBRARIES

EMENARI, BEATRICE CHIDIEBERE
Alex Ekwueme Library
Federal Polytechnic Oko, Anambra state
okwuchi2010@gmail.com

EZEJIOFOR, VICTORIA OBIANUJU
Prof. Festus Aghagbo Nwako Library
Nnamdi Azikiwe University, Awka

OKPARA, CHUKWUDI CLEMENT
Department of Library and Information Science
Nnamdi Azikiwe University, Awka

ABSTRACT
The objective of this paper is to analyze the opportunities and challenges of the 4th Industrial Revolution for libraries in their delivery of library services. The method used for this paper is theoretical procedures/process of research. From the literatures that were x-rayed, the observations found were that the 4th Industrial Revolution era has brought imminent changes to the globe and her individual economies, and it is evidenced that the libraries are the worst hit. This is because they provide useful and up to date information and library services to a wide range of users even in remote areas. The 4th IR has however exposed the deficiencies of most countries and her libraries in achieving this mandate of her knowledge reservoir – the libraries. Poor library funding, inadequate ICT policies and lack of retraining of library staff will make it hard for most libraries to shift to this new innovative era. However, there are general propositions on how to handle the disruptive changes that the 4th IR has brought but the specific description for the library to adopt to these changes are still unexplained. In this regard, this paper will discuss the opportunities of the 4th Industrial Revolution for libraries in their delivery of library services; and the challenges of the 4th Industrial Revolution for libraries in their delivery of library services. The paper concludes on the need for libraries to adopt and adapt to the realities of the 4th IR towards providing effective and efficient library services since they are an integral part of the society that surrounds it. The recommendations were that there should be adequate funding for the libraries to procure useful and relevant 4th IR facilities; and library staff needs to be provided with current training on the use and functionality of the 4th IR facilities to enable improve on their library service delivery

Keywords: 4th Industrial Revolution (4th IR), Libraries, Library services, Library staff

Introduction
        All over the globe, libraries have been acknowledged as institutions that support the information needs of individuals who require specific piece of information for their occupational, educational, personal development. Libraries are dedicated to providing free and equitable access to information for kinds both in written, electronic or audiovisual form. According to Krolak (2005) libraries assist its users in finding, using and interpreting appropriate information that opens up opportunities for lifelong learning, literacy enhancement, informed citizenship, recreation, creative imagination, individual research, critical thinking,

and ultimately, empowerment in an increasingly complex world. These feats are achieved by the ability of the library to provide relevant library services to suit the patrons' needs

Library services are services a library provides to its patrons. These services are centered on user services such are: user education (orientation/instruction), inter-library loan/connection, abstracting and indexing services, bibliographical services, reference services, and circulation services. Other library services are photocopying services; compilation of reading list and bibliographies; and publishing (Ifidon, 2008). However, these library services as provided by libraries to her patrons can be provided in a faster and efficient way with the advent of new technologies, most especially the Fourth Industrial Revolution (4IR)

The Fourth Industrial Revolution is a way of describing the blurring of boundaries between the physical, digital, and biological worlds. It's a fusion of advances in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing, and other technologies (Devon, 2018). The Fourth Industrial Revolution (or Industry 4.0) is the ongoing automation of traditional manufacturing and industrial practices, using modern smart technology. Large-scale machine-to-machine communication (M2M) and the internet of things (IoT) are integrated for increased automation, improved communication and self-monitoring, and production of smart machines that can analyze and diagnose issues without the need for human intervention (*Mike, 2019*). It's the collective force behind many products and services that are fast becoming indispensable to modern life.

Klaus Schwab, founder and executive chairman of the Geneva-based WEF, published a book in 2016 titled "The Fourth Industrial Revolution" and coined the term at the Davos meeting that year. Schwab argued a technological revolution is underway "that is blurring the lines between the physical, digital and biological spheres." Schwab also stated that these technological changes are drastically altering how individuals, companies and governments operate, ultimately leading to a societal transformation similar to previous industrial revolutions (Schulze, 2019). Fourth Industrial Revolution (4IR) has presented a combination of technologies which are changing the way we live, work and interact. Some best examples of the 4IR are self-driving cars, online shopping, drone delivery services, GPS systems which gives fastest route to a destination, voice-activated virtual assistants, personalized Netflix recommendations, facial ID recognition and digital health-care sensors among others. These have great improvement on general life activities as educational activities, banking, business and library services are changing their patterns of services.

According to Lewis (2004) as derived from Buckland, Gorman and Gorman (1992), and cited in Muhammad and Rabiahtul (2018), libraries have encountered three phases of development over the last half-century. The phases are:
i. Firstly, the emergence of automation system in the libraries where paper began to be used less. It started in late 1960s with Machine-Readable Cataloging (MARC) development process which was widely discussed among professional librarians until 1990's when libraries have Online Public Access Catalog (OPAC), and audio-visual media system as well as web-based indexes replacing the printed predecessors.
ii. Secondly, electronic libraries' dominance that began in early 1990s with the development of CD-ROMs, full-text databases, the Internet, and the Web. During this era, some of the established technology used since 1960s were getting disrupted. For instance, analogue audio-visual record that was being stored in cassette tapes have started to be replaced and the media information became more easily available and cheaper on the Internet.
iii. Thirdly, the advancement of new technology that were rapidly used to complete more complex tasks. The new tools were created to provide powerful features to process data, text, sound and images and can be easily sent to distant collaborators. The new technology is also capable to do analysis of large sets of numeric data on the computer screen.

But with the advent of 4IR which is mostly focused on artificial intelligence and use of robotic technology, it will affect library services and her marketing values. It will present the libraries with opportunities as changing agents of 4IR to get itself and her library services updated. It will also present challenges of employment of librarians as most library staff that provides library services will be redundant or they will be replaced with automated machines that will provide library services in the fastest and cheaper way. According to Abid (2019) librarians around the globe are frightening that Fourth Industrial revolutions will badly affect their jobs and unemployment will be increasing in alarming rates. Notwithstanding the imminent opportunities and challenges that the Fourth Industrial Revolution (4IR) will have on various tasks of library operations on how they offer library services to their clients, there is the need for the libraries and her librarians to beef up their ICT competency in line with current realities. These are the thrust of this paper

Fourth Industrial Revolution (4IR) Defined

Fourth Industrial Revolution refers to how technologies like artificial intelligence, autonomous vehicles and the internet of things are merging with humans' physical lives. The term Industry 4.0 stands for the fourth industrial revolution defined as a new level of organization and control over the entire value chain of products. It is aimed at the increasingly requirements of individual customers (Vaidya et al., 2018). Fourth Industrial Revolution (4IR) is characterized by a fusion of technologies that is "blurring the lines between the physical, digital, and biological spheres" (Schwab, 2016:1). This revolution creates new opportunities; developing countries can leapfrog stages of development and align with developed markets by embracing the use of emerging technologies such as Artificial Intelligence (AI), big data analytics and blockchain (Manda & Dhaou, 2019).

Shwab cited in Anealka (2018) provides an example that helps to understand how the industrial revolutions changed across time. During the 1st IR, water and steam were used to mechanize production. During the 2nd IR, electric power was used to create mass production. During the 3rd IR, electronics and information technology were used to automate production. The 4th IR is beyond an enhancement of the 3rd IR, in which the advancement of new technologies blurs the lines between the physical, digital and biological worlds. The new technologies evolve at exponential pace and there is no historical precedent that marked the beginning of the evolution, hence being called disruptive technologies. These advancements are led by the emergence of artificial intelligence, robotics, the internet of things, autonomous vehicles, bio and nanotechnology, 3-D printing, material science, quantum computing and energy storage (Diwan, 2017).

Library Services

Library services are procedures and operations of maintaining, developing and supporting library collection behind the scene such as acquisition, cataloguing, classification, inter library loan, document delivery and serial systems. According to Mayega (nd) library services can be divided into two categories: library public user services and library technical user services. Library public user services refer to circulation, bibliographic instructions, distance learning, government documentation, reference and special collection. According to Madu and Adeniran (2005) library services also includes digital services that provide a wide range of information in all the areas of knowledge to users in an online format. They are computerized services a library provides to its patrons. These digital online services are online user education, online abstracting and indexing services, online bibliographical services, online reference services, online information services and circulation services, internet services, e-mail, internet connectivity, and CD-ROM searching. These services enable users to gain access to library products and resources (Agim & Ebobo, 2020). Anyoagu (2007) also asserts that these library services support the user's accessibility of information from both physical and virtual resources which includes current awareness services; selective dissemination of information; document delivery services; repackaging services; facsimile services; binding services and referral services.

2

Opportunities of Fourth Industrial Revolution (4IR) on libraries and library services

The Fourth Industrial Revolution (4IR) has been noted to have great impact on libraries and the library services they offer. In this regard, there is the need for massive funding and support to the library, librarians and library support staffs to be trained in line with current realities. This training and skills provided will enable them participate collectively and get prepared with comprehensive action strategies to stabilize any disruptions towards libraries while entering the 4th IR era. With the transformation that has taken place in libraries due to the Fourth Industrial Revolution (4IR), librarians will be better positioned to attend to the diverse information need of their users in a faster and more efficient way. The librarians in libraries will be skilled to properly handle disruptive changes that may occur within their mandate delivery. There are other opportunities that will be provided to libraries in their library service delivery through the course of the Fourth Industrial Revolution (4IR). They are as follows:

i. ***Reshaping the attitudes of librarians***: In this Fourth Industrial Revolution (4IR), librarians will be motivated to improve on their attitudes and behavior in the delivery of their services. Also, the advent of the Fourth Industrial Revolution (4IR) will enhance the library's' personality, leadership styles, management cultures, and management systems. The librarians will also need to adjust to the current realities and be more attentive to acquiring skills that will make them perform better. The mission of most libraries will change as a result of the application of new methods in service delivery. In this regard, the staff will adjust and take alignment with the new library missions parallel with the rising demands of the users. Changing library staff's mindset is strenuous for any library in order to embed the 4th IR's working trends. The library management should try to influence and install new attitudes on the staff in line with their new policy for the application of the 4th IR's system

ii. ***Promoting new organization structure***: The 4th IR's application will require a new structure in the library. Most department and units that perform similar functions will be merged and this will provide a new role and direction for the new department. This will alter the existing organizational structure to capture the new roles and innovations that the 4th IR has bring to the table. This new structure will open up innovative approach for libraries to deliver more detailed and enhanced library services to users. Such new organizational structure for libraries as a result of the 4th IR application according to Morgan (2014) can be the holacratic structure which brings new form of governance and motivates staff to participate in decision-making and be more innovative. The flatarchies structure is another structure in libraries which is apparent in terms of the running of Strategic Program in Research Support Service (SPiRESS) program, corporate programs and other types of ad hoc programs (Ahmat, et al, 2016). The flatarchies structure is especially good for those departments dedicated to innovation and new product development. In this regard, the libraries should also consider moving out of the classic culture in organizational behavior.

iii. Change in Environment: For libraries applying the 4th IR programme, it will present them with a new digital environment that is more enhanced with sufficient capacity to deliver their mandate in a time and more conducive environment. The 4th IR will present a new library environment with no physical books thereby creating sufficient space for users and library staff to own and use the library's ICT tools to access materials. The environmental changes according to Cadle, Paul and Turner (2010) will also be analysed in terms of the PESTLE (Political, Economic, Social, Technological, Legal, Environmental) analysis tool which provides the external context leading to an assessment of opportunities and threats; whereas the internal context can be determined by a review of strengths, and weaknesses.

iv. Enhanced utilization of new technology: The application of 4th IR programmes in libraries will open up space for libraries to acquire new tools and technological system to deliver updated library services to her clients. The existing ICT tools and gadgets will be upgraded to meet up with the new automation and digitization facilities and processes in the library. Some of the new technology that will be available in the library will be the intelligent system, Makerspace, context-aware technology, Open Source, Big Data, Cloud Service, Augmented Reality, State-of-the-art Display, and Librarian 4.0 (Noh, 2015). These technologies will provide library staff an innovative ability to work on mobile, thus enabling them to engage more with their users or customers. In this view, libraries will be made to select the best of subscribing hardware and

software. According Tucker and Kimbrell (2013), the library should avoid bringing in the technology tools that are:

a. Underutilized and undervalued technologically,

b. Difficult on technical glitches,

c. Focused on being placed more on quantity as opposed to quality,

d. Making the library staff having difficulty in keeping up with the technology and having to spend instructional time familiarizing themselves with that technology,

e. Minimizing library business efficiency and increase maintenance cost, and

f. Poor in performance, with loose security, less ownership and high limitations.

v. Redesigning new library services: The opportunities that come with the use of the 4th IR facilities will enable libraries redesign new library services for her clients. Some of the obsolete library services will be dropped and new ones will be created with new methods of accessing them in a more convenient way. It is very crucial for 4th IR libraries to regularly examine the suitability and compatibility of her library services which must be in line with the users' demand. 4th IR libraries needs to keep updating their strategies new service framework such as Osterwalder (2010) Business Model Canvas (BMC), which is a tool that helps to visualize, map, discuss, design and invent new business strategies. The Osterwalder's BMC uses nine building blocks of elements; customer segments, value proposition, channels, customer relationships, revenue streams, key activities, key partnerships, and cost structure.

vi. Restructuring of library mandate: an opportunity that is availed for 4th IR libraries is the ability to restructure her service mandate. This will enable libraries have a blend of recipes to guide staff as well as customers through a specific structured process that produces a specific service or product for customers. This restructure plan will improve corporate governance and strategic management, promote the core business of libraries and create the primary value stream for enhanced marketing of library services, and as well support the core library administration processes such as accounting, recruitment, and technical support. In view of the 4th IR, libraries are advised to restructure her mandate by removing any outdated and manual processes that slow down the efficiency of service delivery to customers. It is time to deploy high automation capabilities in any process levels (Chang and Huynh, 2016; Noh, 2015).

vii. Enhancing the job descriptions and roles of library staff. a key advantage and opportunity of 4th IR libraries is the improvement of job descriptions and roles of the staff. For support staff, the manual routine tasks are would be replaced by robots; which brings about less work on those outdated manual tasks. New retraining programmes for staff with the introduction of new skill sets will emerge with multitask jobs that work with the robots (Ahmat & Hanipah, 2018). For professional librarians, there is a pressure to equip oneself with multiple new skills and knowledge. Librarians will be forced to merge new technical as well as professional competencies derived from various professional talents such as data scientist talent capacities, digital content developer talent capabilities, digital user advisor talent capabilities, and community engagement and outreach officer talent capabilities (Ahmat & Hanipah, 2018). For the library leaders, there is a need to develop new enlightenment perspectives about handling library issues within 4th IR era. For instance, there is a need of high intelligence capability to develop succession plans to encounter any types of unseen challenges that may threaten library's main roles in term of providing information services for its community, a role that could be taken over by other parties. There are also concerns on leadership 'righteous' play roles especially on empathy, vision, communication, flexibility, delegation, and integrity (Miska & Mendenhall, 2018)

viii. Instituting Effective ICT policies: In most countries, there are poor ICT policies. The Fourth Industrial Revolution (4IR) will improve their urge to enhance their ICT policy that will give room for fast broadband and network**.** This will be a big plus for libraries as this new technology will increase her broadband penetration that is hindering transformation to the so-called smart society driven by digital connectivity, advanced technology, skills, knowledge, and innovation to institute economic and social development (Manda & Backhouse, 2016b).

ix. Promotion of e-skills: In this era of Fourth Industrial Revolution (4IR), e-skills are highly required by libraries and librarians to meet up with the changing demands of users in the digital world. The 4th IR will provide opportunities to acquire e-skills, innovative systems, and knowledge communities provide the

much-needed intellectual guidance in the development and implementation of smart and digital initiatives (Abdoullaev, 2011; Scholl & Scholl, 2014). To this end, libraries and library staff will be innovative to possess e-readiness (e-skills and e-literacy) to enable them be more viable and efficient in their library service delivery. These skills will influence the libraries' ability to fully deliver on her mandate

Challenges of Fourth Industrial Revolution (4IR) on libraries and library services

For the effective delivery of library services, libraries have been faced with myriad of challenges with respect to adapting to the technologies of the Fourth Industrial Revolution (4IR). The 4IR has opened new ways of proving information services worldwide to clients and innovative ways to speed up information access. Below are the challenges that the Fourth Industrial Revolution (4IR) will bring to libraries in offering library services to her patrons

i. Lack of e-skills of librarians: At present, most librarians in libraries are not ICT literates. They lack basic electronic skills (e-skills) in the use of modern technology which comes with application of innovative gadgets. Skills challenges identified include skills mismatches and skills redundancy due to the changing nature of jobs as a result of advances in technology and manufacturing techniques (World Economic Forum, 2016). Most of these librarians prefer to align and continue with the traditional method of providing service delivery which they are used to. Low e-readiness levels in developing countries like South Africa have been cited as a hindrance in the transformation towards smart societies (Manda & Backhouse, 2016b).

ii. Poor funding for library development: funding is very critical to the adaptation of Fourth Industrial Revolution (4IR) system for libraries. Inadequate funding for libraries to acquire new technologies and automate their library services will hamper their switch to the 4IR systems. Digitization and automation which are part of the innovation from the Fourth Industrial Revolution (4IR) are very expensive to install and maintain as well as the procurement of other system software that will drive the process. Poor funding to libraries will affect their process of using the 4IR systems in delivering library services

iii. Poor patronage in use of library: With the advent of the Fourth Industrial Revolution (4IR), information explosion will be very high. Here, information will be easily accessed and acquired with such fast and innovative techniques. In this regard, the library may have low patrons since they can independently access and acquire information.

iv. Poor user skills in accessing library services: With artificial intelligence (AI) becoming increasingly more sophisticated and useful, library users must have the skills required to access basic information they need. With poor skills and training in use of ICT and other new gadgets, user access to information and library services will be affected

v. Training of library staff and librarians: With the new wave of Fourth Industrial Revolution (4IR), library staff will need to be well equipped with information and competency of how to implement, manage and work with the new technology, and with one another in ensuring efficient service delivery of information to library patrons. Providing staff with new training will not only enhance the providing library services but also facilitate library management task. Regrettably, most librarians have not been provided with re-training programmes for the last 5-10 years.

vi. Potential job losses: The increased use of technology in the 4th industrial revolution has renewed fears of massive job losses in libraries. This is because most library staff will be redundant. This new wave of Fourth Industrial Revolution (4IR) will have a significant impact on jobs, ranging from significant job creation to job displacement, and from heightened labour productivity to widening skills gaps (World Economic Forum, 2016).

vii. Infrastructure challenges: Most countries are still backwards in terms of her technological and infrastructure development. Zhou, Liu & Zhou (2016) identified such challenges surrounding the introduction of new technologies such as analytics, development of networks and smart devices. These technological and infrastructure challenge will affect libraries in their library service delivery

viii. Poor ICT infrastructure: In developing countries, there are evidence of poor ICT infrastructure and this is thus one of the major challenges likely to confront their bid to implement industry 4.0 in the country. There are issues with low broadband penetration in developing countries compared to developed economies that are considered leaders in broadband and other ICT infrastructure (United Nations, 2014; International

Telecommunication Union, 2015). These will affect the libraries in their adapting to these new technologies for library service delivery

ix. Security and privacy: Security and data privacy issues have arguably become one of the most significant concerns in the 4th industrial revolution where technology has become a driver (Waidner & Kasper, cited in Manda & Dhaou, 2019). Integration of systems in the 4th industrial revolution requires the development of new security and protection mechanisms for the faster and more flexible collaborative value networks and smart production systems. The increased use of data analytics is also likely going to bring new challenges when it comes to issues of data privacy and protection (Waidner & Kasper, cited in Manda & Dhaou, 2019). Moreover, privacy and security concerns in technology bring with it trust issues in the "smart" era (Manda & Backhouse, 2016a).

Conclusion

Libraries are an integral part of the society that surrounds it. Librarians need to recognize the changes that have already taken place in libraries, and to be aware of the ways in which broader societal change are affecting libraries and her library service delivery. In this view, libraries are to adapt to the realities of the 4th IR towards providing effective and efficient library services. They need to be funded properly so as to acquire the necessary 4th IR facilities and subscribing to any great artificial intelligence (AI) machines and high-end technologies in the libraries. These 4th IR facilities if procured for libraries, will make libraries to optimize their services at its highest level, and eventually makes it possible to produce inclusive impact for the users and patrons to recognize the libraries' contributions towards their personal, educational and occupational information needs. They need to realize the advantages of the mass delivery of library information services in the digital age and be more concerned about issues surrounding the application of 4th IR facilities in the library

Recommendations

In a view to outstand the challenges of 4th IR on the provision of library services by libraries, the followings are recommended:

i. There should be adequate funding for the libraries to procure useful and relevant 4th IR facilities

ii. Library staff needs to be provided with current training on the use and functionality of the 4th IR facilities to enable improve on their library service delivery

iii. Library management need to formulate new policies to deal with 4th IR challenges that would be taken as a guideline of best practices for the library in fulfilling her mandate

iv. It is also important for library staffs at any rank to create new attributes of skills and improvise themselves by learning new knowledge with a determination at changing the working styles that meet the 4th IR trends.

v. There is the need for motivation of library staff to enable them shift easily to the new trend of 4th IR in providing their services to their clients

REFERENCES

Abdoullaev, A. (2011). *Keynote:" A Smart World: A Development Model for Intelligent Cities".* In The 11th IEEE International Conference on Computer and Information Technology (CIT). IEEE

Abid, H. (2019) Industrial revolution 4.0: implication to libraries and librarians. *Library Hi Tech News Vc Emerald Publishing Limited*, 0741-9058, DOI 10.1108/LHTN-05-2019-0033

Agim, E.C. & Ebobo, M.O. (2020). *Adoption of social media Tools for Effective Library Services During Covid 19.* A Paper Presented at the 3-day LITT Conference organized by the Information Technology Section of the Nigerian Library Association, held from 9th to 11th November, 2020

Ahmat, M.A & Hanipah, R.A.A, 2018. (2018). Preparing the libraries for the Fourth Industrial Revolution (4th IR). *Journal of Malaysian Librarians, 12*, p.53-64

Ahmat, Muhammad Akmal; Misaridin, Shahriza Fadly; Azmi, Noor Adilah; Muhammadan, Lizawati; Hassan Basri, Jamilah; Mohamed Ghazali, Musa; Ismail, Abd Halim; Mohd Napiah, Mohd Kamal; Che Jaafar, Cik Ramlah; Hussain, Husriati; Wan Jan, Noor Azlinda; Ahmad, Rosnani; Ismail, Mohd Ikhwan; Ghadzali, Mohd Pisol; Hj. Abd Rahim, Ali and Hj. Mohd Rashid, Mohd Nasir. (2016). *The Establishment of Strategic Program in Research Support Service (SPIRESS) in USM Library. In: Seminar Perpustakaan Islam Serantau Merekayasa Perkongsian Pintar ke Arah Perpustakaan Unggul*, 28-29 September 2016, Perpustakaan USIM, Bandar Baru Nilai, Nilai, Negeri Sembilan.

Anealka, A.H. (2018) Education 4.0 Made Simple: Ideas For Teaching. *International Journal of Education & Literacy Studies, 6* (3), p.92-98

Buckland, M. K.; Gorman, M. & Gorman, M. (1992). *Redesigning library services: a manifesto* (Vol. 19). Chicago, IL: American Library Association

Cadle, J.; Paul, D. & Turner, P. (2010). *Business analysis techniques: 72 essential tools for success.* BCS, The Chartered Institute.

Chang, J. H. & Huynh, P. (2016). *ASEAN in Transformation the Future of Jobs at Risk of Automation*. International Labour Organization.

Devon M. (2018) *What Is the Fourth Industrial Revolution*? Accessed at https://www.salesforce.com/blog/2018/12/what-is-the-fourth-industrial-revolution-4IR.html

Diwan, P. (2017). *Is Education 4.0 an imperative for success of 4th Industrial Revolution*? Accessed from https://medium.com/@pdiwan/is-education-4-0-an-imperative-for-success-of-4th-industrial-revolution-50c31451e8a4

Ifidon, S.E. (2008). *African library management*. Lagos: Spectrum Books Limited

International Telecommunications Union (2015) *The state of broadband report*.[Online] Available from: www.broadbandcommission.org/documents/reports/bbannualreport2015.pdf (Accessed: 01/06/2015)

Krolak L (2005) The role of libraries in the creation of literate environments. Background paper Commissioned through the UNESCO Institute for Education (UIE). *EFA Global Monitoring Report, Literacy for Life,* ED/EFA/MRT/PI/50

Lewis, D. W. (2004). The innovator's dilemma: Disruptive change and academic libraries. *Library Administration & Management, 18*, 2:68-74

Madu, E.C. & Adeniran, T.N. (2005). *Information Technology. Uses and preservation of resources in libraries and information centre*. Ibadan: Evi-Coleman

Manda, I.M. & Dhaou, B.S. (2019). *Responding to the challenges and opportunities in the 4th Industrial revolution in developing countries*. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019), Melbourne, VIC, Australia, April 3-5, 2019, 10 pages. https://doi.org/10.1145/3326365.3326398

Manda, M. I. & Backhouse, J. (2016b). *Towards a "Smart Society" Through a Connected and Smart Citizenry in South Africa: A Review of the National Broadband Strategy and Policy*. In International Conference on Electronic Government and the Information Systems Perspective (pp.228-240). Springer International Publishing

Mayega, S. (nd) *Library Information Services in the Digital Age*

Mike M (2019) *"What is Industry 4.0? Everything you need to know"*. TechRadar. Retrieved 27 May 2020.

Miska, C. & Mendenhall, M. E. (2018). Responsible leadership: A mapping of extant research and future directions. *Journal of Business Ethics, 148*, 1: 117-134. doi: 10.1007/s10551-015-2999-0

Morgan, J. (2014). *The future of Work: Attract New Talent, Build Better Leaders, and Create a Competitive Organization*. John Wiley & Sons.

Noh, Y. (2015). Imagining library 4.0: Creating a model for future libraries. *The Journal of Academic Librarianship, 41*, 6: 786-797.

Scholl, H. J., & Scholl, M. C. (2014). *Smart governance: A roadmap for research and practice*. iConference 2014 Proceedings

Schulze E. (2019) *Everything you need to know about the Fourth Industrial Revolution*. Viewed at: https://www.cnbc.com/2019/01/16/fourth-industrial-revolution-explained-davos-2019.html

Shwab, K. (2016). *The Fourth Industrial Revolution: what it means, how to respond*. Accessed from https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond

Tucker, S. & Kimbrell, J. (2013). *The impact of web 2.0, web 3.0, and web 4.0 technologies used in distance education*. In: ICERI2013 Proceedings. pp. 6803-6809. IATED

United Nations (2014).*United Nations e-government global survey*. Online [Available from:http://unpan3.un.org/egovkb/en-us/Reports/UNE-Government-Survey-2014 .[Accessed : 01/05/2015

Vaidya, S., Ambad, P. & Bhosle, S. (2018), "Industry 4.0 – a glimpse", *Procedia Manufacturing, 20*, pp. 233-238.

World Economic Forum. (2016). *The future of jobs: employment, skills and workforce strategy for the fourth industrial revolution*. World Economic Forum, Geneva, Switzerland.

Zhou, K., Liu, T.& Zhou, L. (2015). *Industry 4.0: Towards future industrial opportunities and challenges.* In Fuzzy Systems and Knowledge Discovery (FSKD), 2015 12th International Conference on (pp. 2147-2152). IEEE