THEMES AND TRENDS IN INFORMATION SCIENCE

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CHAPTER NINE

INFORMATION RESOURCES AND THE ONLINE ENVIRONMENT IN THE 21ST CENTURY

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Introduction

The online environment as a trademark of the 21st century has changed every facet of life as we know it, in communications, trade and investment, politics, fashion, banking, education, etc., this is even more apparent in the profession that deals with information gathering, packaging and disseminating –Information Science. Prior to the advent of the ICT, the library was viewed to be a storehouse of knowledge and information. Information on its own is intangible but for it to be utilised at all, it can only be communicated through a medium which in this instance is the resource. Therefore, information resources of heterogeneous formats are what researchers, leaders, students and other information consumers actively seek. Information resources are inevitable in library operations as they enable the library to fulfill its objectives of meeting the information need of users. It is the source from which people receive ideas, meaningful messages, enlightenment and directions that will help them to accomplish tasks, take informed decisions and solve problems. These resources are ever present in the online environment all though mostly in a different format from the commonly known. Greenstein (2012), in her book stated that this is actually one of the core skills needed in the 21st century, which is applying and integrating information and communication technologies in education. Supported by Geisinger (2016), who enumerated four types of 21st Century Skills which include collaborative problem solving, complex problem solving, creativity, digital and information literacy. It is clear that digital and information literacy is one of the fundamental aspects that users really need to master. These 21st century skills will help to create Malaysian students who are balanced, resilient, inquisitive, principled, informed, caring, patriotic, as well as effective thinkers, communicators, and team players (Khairil & Mokshein, 2018). The above postulation applies to citizens from other countries. The 21st century is the millennium of information. It is also seen as the era of the explosion of information output and information sources. It is known as the beginning of the 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 (Emezie and Nwaohiri, nd). In view of the above, this chapter is poised to examine classes of information resources, furnish a conceptual explanation of the

Internet, its applications and services, then round up with a view on how the online environment has developed Information Science.

Information Resources: An Overview

Information is the key component of modern society and almost each and everything is based on information and depends upon its resources. The means through which information or message is communicated to its pre-determined target is usually referred to as the information resource. Information resources are carriers of information or messages. They are the media through which information is conveyed, channeled and transmitted. Information resource is one of the significant processes of communication. Without information resources, not only is communication of information almost impossible, but also, transmission, storage, preservation and future use of the information is also, almost impossible. Lack of information resource impliedly suggests non- existence of information (Bello, 2015). Simply put, Information resources can be defined as any material capable of conveying information and ideas, imaginative or factual which can be organised for use (Ezekwe & Muokebe, 2012). Information resources could also be referred to as materials containing verified accounts of existing knowledge. Information Resources are one of the essentials that must be present in a library/ information center. The strength of a library lies in her information resources. According to Ahiauzu, Kubo and Igben (2007) cited in Nwabueze and Ntogo-Sanghanen (2017), information resources are interpreted to mean only those resources that have been acquired and processed for use. Ntui and Utuk, (2008) cited in Akai, (2014), postulated that information resources are materials consulted for aid and for information on a given topic, theme, event, date, figure, place and word. In their view, Elaturoti and Oniyide (2003) also identified information resources as those print and non-print materials that are selected specifically and organized for implementing the educational programme at all levels of education. Okpeke and Odunlade (2014) corroborated the above views when they opined that information resources can be described as including any information in electronic, audio visual or physical form, or any hardware or software that makes possible the storage and use of information.

For present day libraries to remain relevant in the changing world, they must not only have books, but also stock variety of information resources which may be in print and non-print sources. These information resources are government publications, rare books, textbooks, fictions, encyclopedias, dictionaries, geographies, maps, atlases, journals, microform, microfilm, periodicals, DVD, RAM, CD-ROM, computer, cassettes, painting, videos, floppy disk, compact disks, pamphlets, television and many more. While to Bitagi and Ozioko (2015), the concept of information resources refers to all the library materials or facilities which the librarians rely upon to provide information services that meet with the information needs of the agricultural scientists which were the focus of their research. Information resources include those that are classified into print, such as journals, textbooks, technical reports, theses and dissertations and non-print, which include computer satellite operations, internet, databases and all related electronic gadgets that store or provide information that satisfy the information needs of agricultural scientists.

whereas to Chima and Nwokwocha, (2013) the term 'resource' means a source of supply, usually in large quantity. A person is said to be 'resourceful' when he or she is capable of handling difficult situations. Generally, resources are aids to the researcher. They are those materials, strategies, manipulations, apparatuses or consultations that help the researcher to enhance research and development. Information resources, therefore, include all forms of information carriers that can be used to promote and encourage effective research activities and developmental projects.

A Library does not exist if there is no information resource. As observed by Nwalo (2000), availability of relevant information materials (or resources) is the hallmark of a Library. They are the essence of a Library (Oyelude, 2004). They are the hubs of other Library services (Khan, 2009). They represent the intellectual, artistic, musical and other outputs of people, living or dead (Adeoye & Popoola, 2011). Information resources, according to the learned authors, can be looked at from two broad categories: print and non-print. Print information resource: include books, serials, pamphlets, maps and atlases, while non-print include: Audio-visual resources, electronic resources. These resources are not created just for fun. Most of them contain life-dependent information. They carry information which is inevitable for the survival of an individual as well as a nation. Basically, it can be said that information resources are simply those materials that contain information. For the purpose of this paper, however, information resources can be perceived as a medium wherein information is expressed in a systematic, logical presentation which would make for easy assimilation. Traditionally, Information resources are categorized into two classes.

Classes of Information Resources

Print Information Resources: Description and Types

Print information resources are materials containing information presented in a printed format. Here the imprint and/or symbols in the document can be read with the human eyes, without any need for any form of assistance, whether electronic or otherwise. According to Ojedokun, (2007), print resources are the oldest of the modern formats. He alleged that they are one of the most current and user friendly formats for storing and accessing information. Books otherwise called monographs and periodicals comprise the main type of print information resources. The information contained here is written (printed). Types of printed information resources include books, journals, news magazines, newspapers, newsletters, dictionaries, government publications and pamphlets.

Quality standards of printed materials are controlled through a system of checks and balances imposed by peer review, editors, publishers, and librarians, all of whom manage and control access to printed information. This assures that published materials have been through some form of critical review and evaluation, preventing informal, poorly designed. difficult-to-use and otherwise problematic materials from getting into the hands of users.

In academic and other research libraries, most books and periodicals are a product of the scholarly communication system. This system ensures that authors present information in an orderly and logical manner appropriate to the topic.

Printed information in books and periodicals follow established linear formats for logical and effective organization of ideas. It is safe to opine that materials in printed form are stable. Once in print, information remains fixed for all time. New editions and revisions often are published, but these are separate and distinct physical entities that can be placed side by side with the originals.

Non-print Information Resources: Description and Types

In this 21st century, most information resources do not originate in print only format but also in non-print format; another name for this class of information resource is non-book or non-paper based resource. They could also be referred to as multimedia. In other words, these information resources are not paper printed. They use both sound and pictures to show real life situations. The multimedia are information bearing media, but it is not presented in the conventional book format, usually the non-print information resource is used to refer to information resources that are not in book form or printed on a tangible material such as paper which can be held by hand, but are capable of appealing to one or more of the sense organs of man. The types of non-print materials include the internet, microform, email, audio material, realia, models, slides, etc.

The Online Environment – Internet: Conceptual Explanation

One of the basic features of this 21st century is the online environment wherein people with the technical expertise can through a workstation connected to the internet link easily into a network service, system and information which were previously either not accessible or not known. The Internet has been severally described as an ubiquitous infrastructure that has evolved from being a technology for connecting people and places to a technology connecting things. The Internet is the product of a marriage between the technology perfected by the United States of America's Department of Defense ARPANET and the National Science Foundation (NSF). In 1984, NSF established national supercomputer centres to provide high speed computing for research purposes at major research sites, including several Universities. These supercomputer centres could perform some of the most advanced research in the world (Rubin 2000).

The Internet has become a universal publishing, distribution, real-time communications and broadcasting medium. It can also be used to gather information from users and the World Wide Web which is seen as a mainstay of the Internet. IT Encyclopedia (2001) in the same vein defines Internet as an essentially whole bunch of computers connected together by wires which they can talk over. Ezomo (2006) asserts that the Internet is the gateway to libraries and information centers to enter the electronic information era and provides information generated by different organizations, institutes, research centers, and individuals all over the world. The Internet is also conceived as a rich, multi-layered, complex, ever-changing textual environment. Indeed, the Internet provides several opportunities for the academia in research, lecturing or teaching. It is machinery for information dissemination and a medium for collaborative interaction between individuals and their computers without

regard for geographic limitation of space and this occurs in real time. Information is created on the Internet which ranges from simple e-mail messages to sophisticated 'documents' (sites) incorporating sound, images and words. Massaquoi (2006) also confirms that 84 percent of journal articles and 97 percent of completed research work is now available on the Internet. He adds that making use of the Internet helps in conducting research, publishing articles and exchanging ideas. Similarly, (University Libraries, 2003) as cited by Yusuf (2006) contends that the Internet provides wide range opportunities for easy access of relevant and current literature, wide range of instruments, online opportunity for validation of instrument, a simulation of an ongoing research, and so on. (Shehu, Urhefe & Promise, 2015).

The Internet is an abbreviation for Interconnected Network. It is not a single network, but a collection of computers worldwide through a system of connections that uses the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide. In support of the above premise, Boyd (n.d) explains that the Internet is a global collection of computer networks that are linked together by devices called routers and use a common set of protocols for data transmission known as TCP/IP (transmission control protocol / Internet protocol). He concludes by stating that the primary purpose of the Internet is to facilitate the sharing of information.

Adesanya (2002), lending his voice opines that the internet is a collection of computer networks that connects million of computers around the world. It is known as the "Information Super Highway". It is increasingly becoming the solution to many information problems, information exchange, gathering and marketing. Gbaje (2002) conceptualized the Internet as the network of networks linking millions of computers together; and that it had the ability and capability to provide adequate, current, and timely services to information seekers wherever they are; while Ikegwuiro, (2017) harps on the fact that the Internet helps the user to perform a range of positive practical applications such as ability to conduct research, perform business transactions and access international libraries.

The emergence of the Internet is a radical movement that has completely revolutionized the information and communication world. The invention of the telegraph, telephone, radio, and computer set the stage for this unprecedented integration of capabilities, in other words, a swift and direct paradigm shift from the analogue skill set of digital competency. The Internet can be viewed as a world-wide broadcasting capability, a mechanism for information dissemination, and a medium for collaboration and interaction between individuals and their computers without regard for geographic location. The Internet represents one of the most successful examples of the benefits of sustained investment and commitment to research and development of information infrastructure.

The Internet is a term applied to an electronic network that permits access to thousands of computer networks. The use of the internet has grown quickly in the last few years and available in over one hundred countries (World Almanac, 1999). According to data reported from the Emerging Technologies Research Group, nearly three quarters of Internet users consider the internet indispensable, and 60 per cent of those who use the internet for business purposes use it daily (Emerging Technologies

Research Group, 1997). There is an additional 55 million adults who indicated either that they intend to begin using the internet in the next year or that they would like to learn more about it. This suggested that the number of U.S users is likely to grow substantially in the near future (Emerging Technologies Research Group 1997). The same can be said about the rest of the world as all age groups daily latches on to the innumerable potentials of the internet. The Internet, often called the net, began as a collection of text-only documents intended for scientists, universities, and some parts of government. But the development and rapid growth of the World Wide Web (also known as the Web) transformed the presentation of information on the Net. The Web is a worldwide system of interconnected computer files linked to one another on the Net. It enables the use of multimedia – which includes photographs, moving pictures, and sound as well as text. The Web consists of millions of web sites, collections of information at specific electronic addresses. Web Sites in turn contain Web pages that hold multimedia or text-only information. Web Sites and their pages reside in computers connected to the internet (The World Book Encyclopedia, 2008).

Feathers and Sturges (2003) posited that the internet is a meta network, or network of networks, which links up a global agglomeration of computer resources for public access. According to them, it began as an academic and research network, financially supported by the U.S government, but its phenomenal growth has brought in private and business users in great numbers. Interactions between computers on the internet typically use the client/server model. The server is the computer system that contains information or resources such as Web, electronic mail, databases, software files, chat channels, etc. The authors further revealed that the number of internet users was estimated at 195 million in September 1999, with predictions of over 300 million by 2005. These users access the internet via commercial Internet Service Providers (ISPs). According to Okoye (2004) internet increases external contacts, makes recent information available, encourages experiments and facilitates interaction between people and machines.

Ojedokun (2007) surmises that the internet was created in the academic environment and is defined as a network connecting many computer networks. Since its creation, it has grown to become a commercial and popular medium. The original uses of the internet were to send messages electronically (electronic mail or e-mail); send documents or files to colleagues in other places (file transfer, using ftp or file transfer protocol); act as information host and allow for group discussions online (bulletin boards and newsgroups) and to access computers in other locations that is; remote computer access (telnet), however the use has expanded to include finding information (that is, navigating) on the internet sites using the world wide web (WWW) through a graphical user interface, such as Microsoft Windows operating system.

Nnadozie (2014) reiterates that the internet is in reality, an international network of computers which are physically separated. The individual computer units that form the network share data, usually by means of telecommunication links. The internet facilitates data exchange by allowing users of the interconnected computers of all types and sizes to communicate in real time. It also enhances access to digitized library collection through the online catalogue and electronic databases. There is no

doubt that the internet is a vital source of billions and trillions of assorted information that serves different purposes.

Akai (2014) surmises that the internet also called the net, is a worldwide collection of networks that link millions of people and institutions. Each network provides resources that add to the abundance of goods, services and information, accessed via the net. In conclusion, the Internet is a widely used research tool, providing society with access to global information and instant communication. The Internet is described as a technology which has gained more popularity in many countries around the world (Kumah, 2015).

Thus, the Internet is roundly seen as a vital tool that will certainly propel University education to greater heights as the world moves further into the knowledge-based economy. The present day reality has ensured that Universities worldwide invest so much funds on Internet access because it reduces the time between the production, utilization and sometimes preservation of knowledge; improves co-operation and exchange of ideas with fellow researchers in sister institutions, other regions or countries, furthers the sharing of information; and promotes multidisciplinary research on a larger level.

Applications and Services on the Internet

Karnouskous, Daras, Muller, Man-Sze Li and Schaffers (2014) asserted that applications are software systems perceived and utilized by their intended users to carry out a specific task. Applications are what users are actually using in their working environments and their daily lives, therefore applications are the medium that enables them to interact with the rapidly advancing technologies. This implies that we should view users' needs and aspirations as a point of departure for developing and introducing advanced applications. It is extremely important, to pay attention to the openness of the process of developing, testing and validating applications and to ensure the involvement of users in that process. Applications evolve as they depend on the capabilities provided by several real systems. For example, the end-user devices, they run on as well as virtual resources they utilize, e.g., for mashup applications are depending on the distributed services that provide the functionalities needed by these applications.

Internet services are the various services that are available in the Internet. In order to connect to the Internet, you need to use an Internet service. Internet services provide a way for data to be transferred from Internet servers to your computer. Internet services are the resources available in the net. These electronic resources include: e-mail, chat groups, file Transfer Protocol, gopher, Telnet, chat and instant messaging, discussion group, and World Wide Web. Internet services are a major source by which library and information centres can effectively provide information services to its increasing population of users in this rapidly growing environment of information explosion and availability. In the developed countries, and even some developing countries like Nigeria, Internet services are being used extensively for service delivery (Ikegwuiro, 2017).

Some of the services offered by the Internet are: the world wide web or the web and e-mail. Boyd, (n.d) lending his voice remarks that the WWW is a collection of Internet sites that can be accessed by using a hypertext interface. Hypertext documents on the web contain links to other documents located anywhere on the web. By clicking on a link, you are immediately taken to another file or site to access relevant materials. The interesting thing about Hypertext links is that the links might take you to related material on another computer located anywhere in the world, rather than just to a file on your local hard drive.

National institute of open schooling (2012) recently listed out areas where the internet could be applied to include: Communication, Job searches, Finding books and study material, Health and medicine, Travel, Entertainment, Shopping, Stock market updates, Research and Business use of internet: The different ways by which internet can be used for business are: Information about the product can be provided online to the customer, Provide market information to the business eg Stock Market, It help business to recruit talented people, help in locating suppliers of the product, Feedback and reviews about companies product, Eliminate middle men and have a direct contact with customer, Providing information to the investor by providing the companies' background and financial information on web site.

The following constitute service of the Internet:

- **Communication**: Email is an important communications service available on the Internet. Pictures, documents and other files are sent as email attachments. Emails can be copied to multiple email addresses. Internet telephony is another common communications service made possible by the creation of the Internet. VoIP stands for Voice-over-Internet Protocol, referring to the protocol that underlies all Internet communication.
- **Data Transfer**: File sharing is an example of transferring large amounts of data across the Internet. A computer file can be emailed to customers, colleagues and friends as an attachment. It can be uploaded to a website or file transfer protocol (FTP) server for easy download by others. Some of the examples of file sharing are:-
- **Information**: Many people use the terms Internet and World Wide Web, or just the Web, interchangeably, but the two terms are not synonymous. The World Wide Web is a global set of documents, images and other resources, logically interrelated by hyperlinks and referenced with Uniform Resource Identifiers (URIs). Hypertext Transfer Protocol (HTTP) is the main access protocol of the World Wide Web, but it is only one of the hundreds of communication protocols used on the Internet. The Internet is interconnection of a large number of heterogeneous computer networks all over the world that can share information back and forth. These interconnected networks, exchange information by using same standards and protocols.

The World Wide Web is described as a graphical client-server information system which uses hypertext to organise, connect and present information and services throughout the internet. The World Wide Web simply called the web is one

of the widely used applications of the internet. Even though, it was never originally designed to be a mass information storage and retrieval system, it has also become the leading information retrieval service of the internet. The internet has been able to solve one of the critical problems in network resource use: topic access. It gives users access to varieties of documents that are connected to each other by means of hypertext or hypermedia links also called hyperlinks.

The web allows one to access most types of information on the Internet through a browser. One of the main features of the web is the ability to quickly link to other related information. The web contains information beyond plain text, including sounds, images, and videos. The important thing to do when using information on the Internet is to know how to evaluate it! The widespread availability and utilization of the online information resources through Web browsers (such as Netscape) have enabled librarians to take advantage of the capacity of the Internet to serve as a virtual reference desk, providing access to countless information resources worldwide. The notion of a virtual reference collection, available at the click of a mouse, is undeniably seductive, particularly for students and libraries with limited physical collections. Upon closer examination, however, using the Web to provide accurate and effective information service is a complicated proposition. Technical considerations aside, attempt at gaining intellectual control and achieving precision, recall over an ever expanding universe of text, image, and sound, can quickly prove daunting. Not only does utilization of the Web presupposes appropriate hardware, software, and searching skills, but Web sites are notoriously unreliable and frequently lack authority. Nonetheless, the Web has the potential to provide information far beyond that which is available in the library's collection, and librarians as well as students can't afford to ignore its capabilities (Mole, 2017).

Boyd, (n.d) reiterated that the WWW is a collection of Internet sites that can be accessed by using a hypertext interface. Hypertext documents on the web contain links to other documents located anywhere on the web. By clicking on a link, you are immediately taken to another file or site to access relevant materials. The interesting thing about Hypertext links is that the links might take you to related material on another computer located anywhere in the world, rather than just to a file on your local hard drive.

Anjili and Ahmed (2015) citing Henderson (1992) itemized the uses of the Internet to include:

i. Provision of speedy and easy access to information;
ii. Provision of remote access to users;
iii. Provision of access to unlimited information from different sources;
iv. Provision of up-to-date information;
v. Provision of information flexibility to be used by any individual according to his or her requirements;
vi. Simplification of many difficult or time consuming tasks to an extraordinary degree;
vii. Helping people to understand things better by allowing them to make models and test theories.

Online Information Resources

Online information resources can also be referred to as web-based resources; thus, the terms will be used interchangeably. Online information resources that can provide curriculum support to students for whom physical access to the library is difficult and time consuming (Tannery & Foust, 2002). Internet and online resources provide access to a variety of information ranging from primary to tertiary sources. However, the authenticity and value of some online information remain questionable. Therefore, quality awareness among the users is necessary for value-added information and research. Moreover, accessibility, format, style, and arrangement of the online information resources are different from the conventional sources. Hence, users are expected to adopt a critical approach to access and use the online sources (Kattimani, 2010).

The web allows access to most types of information on the Internet through a browser. One of the main features of the web is the ability to quickly link to other related information. Types of Online information resources include: e-journals, online library catalogues, bibliographic databases, preprints, proceedings, etc. The widespread availability and utilization of the online information resources through Web browsers is a powerful in the 21st century which has been rightfully described as the knowledge age. Online information resources are powerful teaching and learning tools in higher education; they are efficient for activating students and they provide tools for lifelong learning. Students having access to the Internet can find huge amounts of information, and also quite a lot of free software. By use of the Internet, teachers and students might communicate through e-mail, course home pages and virtual discussion groups; this also gives great opportunities for distance education. The use of information technologies in higher education might influence teachers' role. Students can find information themselves to a larger extent than before, although, they still need their teacher's supervision and coach in their learning process because most of the information found on the Internet was not peer viewed before entry (Mole, 2017).

Open educational resources (OER)

The term Open Educational Resources (OER) was first coined at UNESCO's 2002 Forum on Open Courseware and designates "teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. Open licensing is built within the existing framework of intellectual property rights as defined by relevant international conventions and respects the authorship of the work". In other words, open educational resources are teaching, learning and research resources that reside in the public domain that permits their free use or customization by others (Bissell, 2007). It is safe to conclude that OERs are sharable properties.

According to UNESCO, Open Educational Resources (OERs) are any educational materials that are in the public domain or introduced with an open license. It means that anyone can legally and freely copy, use, adapt and re-share them. OERs

range from textbooks to curricula, syllabi, lecture notes, assignments, tests, projects, audio, video and animation". OERs are information and software that are free to be downloaded and utilized for educational purposes (Jurado & Pettersson, n.d). It is of particular interest in developing countries if OER can be utilized to improve the quality of higher education and give more people the opportunity to receive a higher education while keeping the total cost for education down. Dike (2017) affirms that the term OER refers to education resources and other materials that have been designed for use in teaching and learning, that are openly available for use by educators and students, without the accompanying need to pay royalties or license fees. The main attribute of OER is the ability to use educational resources for free. Open educational resources are freely accessible, openly licensed text, media, and other digital assets that are useful for teaching, learning, and assessing as well as for research purposes. There is no universal usage of open file formats in OER. Open educational resources (OER) are educational materials or resources provided for teaching and learning that are available publicly for use, share and improve upon.

OER are teaching and learning materials that you may freely use and reuse at no cost, and without needing to ask permission. Unlike copyrights resources, OER have been authored or created by an individual or organization that chooses to retain few, if any, ownership rights. In some cases, that means you can download a resource and share it with colleagues and students. In other cases, you may be able to download a resource, edit it in some way, and then re-post it as a remixed work. To determine the available options to the user, OER often has a Creative Commons license or other permission to guide the user on how the material may be used, reused, adapted, and shared.

Open Educational Resources are teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. The Hewlett Foundation defines open educational resources (OER), to be high-quality teaching, learning, and research materials that are free for people everywhere to use and reuse for different purposes. It could also be said to be those learning materials that can be freely downloaded, edited and shared. (Hewlett foundation, 2018). Creative Commons provides the licensing tools for permitting this free use and re-purposing; Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge. Hewlett considers the Creative Commons Attribution license to be the license of choice, allowing for maximal reuse and repurposing of copyrightable educational resources while still acknowledging the creative work of the developer. The term "open content" describes any copyrightable work (traditionally excluding software, which is described by other terms like "open source") that is licensed in a manner that provides users with free and perpetual permission to engage in the following 5R activities:

i. **Retain** — the right to make, own, and control copies of the content (e.g., download, duplicate, store, and manage)
ii. **Reuse** — the right to use the content in a wide range of ways (e.g., in a class, in a study group, on a website, in a video)
iii. **Revise** — the right to adapt, adjust, modify, or alter the content itself (e.g., translate the content into another language)
iv. **Remix** — the right to combine the original or revised content with other open content to create something new (e.g., incorporate the content into a mashup)
v. **Redistribute** — the right to share copies of the original content, your revisions, or your remixes with others (e.g., give a copy of the content to a friend).

From Hewlett's perspective, a long-term goal is for an OER to be openly licensed (under a Creative Commons attribution license that includes the 5R activities), as well as technologically accessible and can be edited using generally available tools, and designed with diverse learners in mind. Deviation from any of these characteristics reduces the relative 'openness' of an educational resource. (Bliss & Smith, n.d)

The term OER describes publicly accessible materials and resources for any user to use, re-mix, improve and redistribute under some licenses. The development and promotion of open educational resources are often motivated by a desire to provide an alternate or enhanced educational paradigm.

The Organization for Economic Co-operation and Development (OECD) defines OER as: "digitised materials offered freely and openly for educators, students, and self-learners to use and reuse for teaching, learning, and research. OER include learning content, software tools to develop, use, and distribute content, and implementation resources such as open licenses". By way of comparison, the Commonwealth of Learning (2017) "has adopted the widest definition of Open Educational Resources (OER) as 'materials offered freely and openly to use and adapt for teaching, learning, development and research'". The WikiEducator project suggests that OER refers "to educational resources (lesson plans, quizzes, syllabi, instructional modules, simulations, etc.) that are freely available for use, reuse, adaptation, and sharing'.

The above definitions expose some of the tensions that exist with OER:

i. **The nature of the resource:** Several of the definitions above limit the definition of OER to digital resources, while others consider that any educational resource can be included in the definition.
ii. **The source of the resource:** While some of the definitions require a resource to be produced with an explicit educational aim in mind, others broaden this to include any resource which may potentially be used for learning.
iii. **The Level of openness:** Most definitions require that a resource be placed in the public domain or under a fully open license. Others require only that free use to be granted for educational purposes, possibly excluding commercial uses.

These definitions also have common elements, namely they all:

- cover use and reuse, repurposing, and modification of the resources;
- include free use for educational purposes by teachers and learners
- encompass all types of digital media.

Given the diversity of users, creators and sponsors of open educational resources, it is not surprising to find a variety of use cases and requirements. For this reason, it may be as helpful to consider the differences between descriptions of open educational resources as it is to consider the descriptions themselves. One of several tensions in reaching a consensus description of OER (as found in the above definitions) is whether there should be explicit emphasis placed on specific technologies. For example, a video can be openly licensed and freely used without being a streaming video. A book can be openly licensed and freely used without being an electronic document. This technologically driven tension is deeply bound up with the discourse of open-source licensing.

In order for educational resources to be OER, they must have an open license. Many educational resources made available on the Internet are geared to allowing online access to digitised educational content, but the materials themselves are restrictively licensed. Thus, they are not OER. Often, this is not intentional. Most educators are not familiar with copyright law in their own jurisdictions. International law and national laws of nearly all nations, and certainly those who have signed onto the World Intellectual Property Organization (WIPO), restrict all content under strict copyright (unless the copyright owner specifically releases it under an open license). The Creative Commons license is the most widely used licensing frameworks internationally used for OER. (Wikipedia, 2018)

Online Environment and Development of Information Science

Information science is a field primarily concerned with the analysis, collection, classification, manipulation, storage, retrieval, movement, dissemination, and protection of information. Practitioners within and outside the field study application and usage of knowledge in establishments along with the interaction between people, organizations, and any existing information systems with the aim of creating, replacing, improving, or understanding information systems. Historically, information science is associated with computer science and technology.

The first known usage of the term "Information Science" was in 1955.- 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 that discipline that investigates the properties and behavior of information, the forces governing the flow of information, and the means of processing information for optimum accessibility and usability. It is concerned with that 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, management, and other similar fields. It has both a pure science component, which inquires into the subject without regard to its application, and an applied science component, which develops services and products." (Borko, 1968, p. 3).

Information science, in studying the collection, classification, manipulation, storage, retrieval and dissemination of information has origins in the common stock of human knowledge. 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. By the 19th century the first signs of information science emerged as separate and distinct from other sciences and social sciences but in conjunction with communication and computation.

By 1872, came increasing awareness of the potential of automatic devices for literature searching and information storage and retrieval. As these concepts grew in magnitude and potential, so did the variety of information science interests. By the 1960s and 70s, there was a move from batch processing to online modes, from mainframe to mini and microcomputers. Additionally, traditional boundaries among disciplines began to fade and many information science scholars joined with other programs. They further made themselves multidisciplinary by incorporating disciplines in the sciences, humanities and social sciences, as well as other professional programs, such as law and medicine in their curriculum. By the 1980s, large databases, such as user-oriented services such as Dialog and Compuserve were for the first time accessible by individuals from their personal computers. Today, information science largely examines technical bases, social consequences, and theoretical understanding of online databases, widespread use of databases in government, industry, and education, and the development of the Internet and World Wide Web. Dissemination has historically been interpreted as communication of information. With the advent of the internet this 21st century, and the explosion in popularity of communities operating in the online environment, social media has changed the information landscape in many respects, and creates both new modes of communication and new types of information, changing the interpretation of the definition of dissemination. The nature of social networks allows for faster diffusion of information than through organizational sources. The internet has changed the way we view, use, create, and store information, now it is time to re-evaluate the way we share and spread it.

Social media networks provide an open information environment for the mass of people who have limited time or access to traditional outlets of information diffusion, this is an "increasingly mobile and social world [that] demands...new types of information skills" Social media integration as an access point is a very useful and mutually beneficial tool for users and providers. All major news providers have visibility and an access point through networks such as Facebook and twitter maximizing their breadth of audience. Through social media people are directed to, or provided with, information by people they know. The ability to 'share, like, and

comment on content' increases the reach farther and wider than traditional media methods. People like to interact with information, they enjoy, including the people they know in their circle of knowledge. Sharing of information through social media has become so influential that publishers must "play nice" if they desire to succeed. Although, it is often mutually beneficial for publishers and Facebook to "share, promote and uncover new content to improve both user base experiences. The impact of popular opinion can spread in unimaginable ways. Social media allows interaction through simple to learn and access tools; It can be said that information is now within the reach of all who desire such.

Summary

This chapter examined the concept of information resources in both print and non-print formats, thereafter recourse was made to the web-based information resources otherwise known as online information resources. Research shows that online information resources are majorly sought for and utilised in the modern society because of the existence of educational content available everywhere, which can be modified and then re-disseminated. This is because these resources have many benefits to the users and do play pivotal roles in furnishing the information thirsty citizenry with quick information which can development of an information based society; Owing to the significance of utilising online and open educational resources, the Nigerian government should ensure funds are allocated timely in order to make for proper utilization of these resources for the development of society.

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