

Chapter 12

Open Access Initiatives and its Implications on Research Transformations

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ABSTRACT

The Open Access initiative enhances innovative forms of scholarly inquiry and aids the impactful communication by transforming the way research output is disseminated and published. Prime objective of OA initiative is to improve wide accessibility and promotes visibility of research outputs without geographical barriers. This chapter investigates open access initiatives and the principles behind OA. It identifies the characteristics of OA and types of OA publishing business models. Moreover, the chapter discusses the growth of OA in Africa and examines the current trend in OA journals. Also, the chapter identifies various roles played by stakeholders towards adoption and use of OA for research transformation. This chapter examines different benefits and challenges faced by organizations, libraries, publishers, and researchers towards OA adoption and use for the research advancement. Recommendations on how to improve research outputs' visibility using OA were highlighted. Conclusion and suggestion for further research are provided.

INTRODUCTION

Nowadays, development of Internet Technology (IT) has brought transformations in the ways information is being access and share among the stakeholders. An Open Access initiative as a product of advanced Information and Communication Technology improves access to information and enhances wide visibility of research outputs. The OA initiative as an agent of research transformation provides access, wide dissemination of research information for free on the Web, brings benefits to researchers, their institutions, funders and the generality of the society. This chapter covers open access initiatives and its implications on research transformations.

BACKGROUND

With the current trends in the world publication, transformative actions from a moderately small number of global research-intensive institutions would be needed to drive a permanent and large-scale transformation, but the involvement of institutions from every geographical location and academic setting are essential for creating a truly open and just information environment. Yet the truth is that modern knowledge-based societies benefit from an efficient system for transferring research output from the basic research process to the community. Innovation reinforces wealth creation in all aspects of economies and the dissemination of open access knowledge from research benefits the scientific and cultural life of any literacy society.

OA empowered with unlimited access to accessible findings, and the opportunity to collaborate, share and build on these, will speed up the research process, drive innovation, yield development, arouse new discoveries and drive scientific inquiry forward, to the advantage of society. Sustainable development in the 21st Century is founded on access to information and knowledge using OA initiatives. Gideon (2008) reiterated that in a world of inequality, the OA initiative seeks to provide people all over the world with equal access to knowledge and information irrespective of their geographical location. The concept of OA arrived in response to the restrictive access to knowledge in scholarly and scientific journals imposed by commercial publishing houses via subscription fees, license fees or pay-per-view fees which could be described as serial crisis in academic libraries.

The concept of OA developed during 1991 due to the insight of the need to facilitate scholarly communication. OA to scholarly communication is regarded as a mechanism to tackle rising journal prices, and as a means of averting rising limited access to the growing volume of scholarly works. Sanjeeva and Powdwal (2017) stressed that reasons for a move to OA is the opinion that publicly funded research by rights should be more accessible to the public taxpayers. Also, digital divide between developing and advanced world should be lessen, that access to research outputs by and in the developing world should be greatly enhanced. In addition, that researcher at poorly funded institutional libraries will have increased access to the scholarly work.

OA has various definitions from different groups advocating the concept. The Budapest OA Initiative (BOAI) defined the concept in relation to journal literature as follows:

[the] free availability on the public internet, permitting any users to download, read, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without legal, financial or technical barriers other

than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited (BOAI, 2002).

Similarly, Suber (2010a) opined that OA literature is online, digital, free of charge, and free of most copyright and licensing restrictions.

The Berlin Statement on OA to Knowledge in the Sciences and Humanities restates an obvious truth to the effect that the *mission of disseminating knowledge is only half complete if the information is not made widely accessible and readily available to society.*

The dissemination of knowledge through academic and scholarly research journals, as well as the use of the same by scholars and members of the academic community is not new. Before the arrival of the internet, the academic community relied heavily on research articles in offline journals published by many commercial publishing houses and made available to libraries that chose to subscribe to the journals. Only a small number of libraries in the developing world could afford such journal subscriptions. This has led to crisis in scholarly communications that informed the arrival of OA that meant to reform the present system. OA has evolved two systems for delivering research articles.

Research is defined as a systematic effort of human to gain new knowledge through intellectual investigation of matter. Generally, scientific research involves identifying a phenomenon, formulation of hypotheses and questions, gathering data through a scientific process and analysing the data to solve a problem identified. Research community has been facing unparalleled changes, largely driven by technological growths accompanied by changes in research habits and scholarly communications.

Research based organisations are grappling with fund shortage on one hand and on the other hand the research output, citation metrics and visibility are becoming more and more significant in the scholarly community either to get grants from funding agencies or for further research. Currently, one of the most important metric for the researchers was publication in journals. Researchers published their work in toll-accessed based journals and book chapter contribution. Many a times scholars did not have access to their own work and the library could not afford to subscribe to highly priced journals or books from vendors and publishers. According to Ifeanyi (2011), the poor visibility of scholarly publications in Africa has resulted in the call for a way of fashioning out a proper method of disseminating scholarly research in developing countries, particularly Nigeria so as to balance the global information equation and improve the visibility and impact of research outputs. This ugly condition calls for urgent attention to tackle issues of serial crisis and poor visibility of research output that led to the emergency of OA initiatives. The next section deals with history of OA initiatives.

HISTORY OF OPEN ACCESS INITIATIVES

There are many corresponding initiatives around Europe that support OA in various forms, but these are yet to be connected to a collective goal. The disjointed drive indicates that this is a timely moment to develop an international transformation programme to support and exploit on the different efforts being made to create an OA environment. The expression ‘OA’ was first used by the Budapest OA Initiative- BOAI (Budapest OA Initiative, 2002). The BOAI is a public statement of principles relating to OA literature, which was launched by Open Society Foundations in February 14, 2002. BOAI arose from a conference organised in Budapest by the Open Society Institute (OSI) on December 1–2, 2001 to support OA at the

period tagged Free Online Scholarship. It was a small gathering of individuals that were known as one of the main defining events of OA movement. Similarly, in the following year, there was a declarative statement named Bethesda Statement which is an international statement that came out in April, 2003 in Maryland USA, which defines the concept of OA and then supports that concept. With the drive of initiating discussions on how to provide OA publishing to the primary scientific literature in the area of biomedical research. Furthermore, another statement was issued on OA and access to knowledge labeled Berlin Declaration which is an international statement on OA and access to knowledge. It arisen from a conference on OA hosted in the Harnack House in Berlin, Germany by the Max Planck Society in 2003.

On the occasion of the 10th anniversary of the initiative, it was reiterated in 2012 and supplemented with a set of solid suggestions for achieving the new goal that within the next ten years, OA will become the default method for distributing new peer-reviewed research in every field and country. OA has special features that promotes easy access and wide visibility of research outputs.

CHARACTERISTICS OF OPEN ACCESS

Access to scholarly publications in the 21st Century has been greatly enriched with the arrival of OA initiatives the world over. This development has immensely contributed to the growth of scholarly communication system. OA initiatives brought about OA publishing that gives opportunity of wide visibility of scholarly works to information users and researchers. This has brought transformation in research especially in promotion of wide access to research outputs. OA has various characteristics. According to Suber (2010) and Jain (2012), OA features could be summarized as follows:

1. Unrestricted access: OA materials can be freely used by anyone: users have free access to use the materials without any barrier. Many users of information accessed materials online free of charge without prior knowledge of OA initiatives. This is possible when users by accident gain access to both subscribed and free access content while searching for information on the Internet (Dulle, 2010).
2. OA provides access to the available materials online including research findings using Internet as a podium. Most times full text materials are available and accessible by information users via Internet.
3. OA is free availability of scholarly publication: The OA scholar work is free for access without any barrier.
4. It is free of copyright and licensing restrictions: authors and users are free from any legal issue and permission right of use.

The various characteristics discussed are common to the two strategies of OA (green and gold) that will be discussed in the next section.

PRINCIPLES BEHIND OPEN ACCESS INITIATIVES

OA initiatives comprise of two strategies. One of them, known as the gold road/route, encourages the scholarly publishing in OA journals. The other, called green road/route, aims to develop digital OA repositories from which the publications, or papers accepted for publication, are alternately distributed.

Both strategies have been strengthened through the establishment of OA platform. OA initiatives are based on principle.

The Budapest definition of OA is not elaborate enough because certain concepts were left out. As a result, Bethesda declaration identified two (2) strategies to OA policy which are OA journal (Gold route) and OA archive (Green route). These are the two main basic strategies that can be used to achieve free access and wide visibility of research findings.

Open Access Journal (Gold Route)

This is a process of making articles published in a journal freely and permanently available online or a channel of delivering OA principle of free access to scholarly content using Internet as a platform for the online access. OA journals are scholarly journals that are available online to the users without any barrier of either cost, legal/copyright other than those attached condition from gaining access to Internet. OA journal could be referred to as gold route. Therefore, OA journals are journals which are freely available online worldwide and do not rely upon the traditional subscription based business model to generate revenue. This is synonymous with OA journal publishing which is a model of scholarly work that makes journal articles accessible to the public by means of the internet without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself (Margoni & Peter, 2016). Transformative journals will assist in promotion of access and visibility of research findings.

Open Access Self-archiving (Green Route)

OA self-archiving is often used as a synonym for OA green route. OA green route could be defined as all freely accessible copies of articles either preprint or post print that exists on various locations in the web. OA Archives (OAAs) are electronic repositories of submitted materials that may include published articles either post-print or pre-print articles, dissertations, theses and any other materials that authors or institutions believe that it can be available to the public without financial or legal barrier. There are four types of OA Archive (OAR).

1. Discipline/Subject OA archive: it is an OA archive or OA repository that captures, stores, preserves and provides access to the digital contents of a particular field of study or particular subject
2. Personal/Individual repository: it is an OA archive or OA repository that captures, stores, preserves and provides access to the digital content of individual collections.
3. Departmental/Institutional repository: it is an OA archive or OA repository that captures, stores preserves and provides access to the digital scholarly contents of members of department or institution.
4. Institutional Repositories (IRs) are now becoming a part of the technical infrastructure in research demanding institutions and a favoured option for providing OA to research finding. Foster and Gibbons (2005) defined an institutional repository as an electronic system that captures, preserves and provides access to the digital work products of a community. An OA repository could be defined as a storage and retrieval system where published research outputs and other scholarly works would be stored and made available for full, open and free access by the research community and the generality of the society. OA institutional repositories are designed to expose the details of their contents to web search engines.

CHARACTERISTICS OF INSTITUTIONAL REPOSITORIES (IRS)

According to Crow (2002) and Ware (2004), IR has the following characteristics:

- (1) Institutional Repository (IR) supports the process of scholarly communication in collecting, storing and disseminating the scholarly content. Here authors and researchers can deposit scholarly materials in IRs, subject to copyright, with the host institution providing the infrastructure that supports materials which must be properly organized, archived and disseminated;
- (2) IR is an institutionally defined and it captures only the intellectual property of the host institution such as purely scholarly publications, or administrative, teaching and research materials, both published and unpublished; It is open and interoperable and the primary goal is to disseminate the institution's intellectual output; and
- (3) It is cumulative and perpetual and this carries with it a long term obligation on the host institution to preserve IR content.

A few research universities in Nigeria have established, or are partway to establishing IR services with the aim to enhance the visibility and provide wide access to research outputs generated within that university. The development of the IR services is related to the OA movement in Nigeria, which seeks to make valued research outputs openly available by encouraging academics to place their publications into repositories for easy access and wide visibility.

OA model is a way to reduce costs and increase access as attested by Jones et al. (2006) that IRs has a greater potential than other types of information resources for disseminating research. Similarly, Bauer (2005) pointed out that IRs can gather and give access to a wide range of grey resources, i.e., material not in a journal article format, such as theses, datasets, presentations, archive documents and images. Abiraz, Noorhidawati and Kiran (2010) reported that large numbers of institutions essentially hold multidisciplinary subjects in OpenDOAR. Similarly, Biswas and Mukhopadhyay (2013) stressed that most of the institutions are multidisciplinary in nature and cover different subjects to their repositories. On the contrary, few repositories hold specialized subjects like Health, Medicine, Mathematics, Physics, Statistics, and Technology for example, African Digital Health Library in University of Ibadan.

Universities in Nigeria that are listed in Open Directory of OA Repositories (OpenDOAR) are shown in Table 1.

Table 1 shows that Dspace is the most used software by institutional repositories in Nigeria. DSpace is one of the foremost software used by repositories especially in academic environments, non-profit, and commercial organizations building open digital repositories. This might be due to huge benefits accrued from its usage. It is free and easy to install out of the box and completely customizable to fit the needs of any organization. DSpace preserves and enables unlimited access to all types of digital content including text, images, moving images, mpegs and data sets. Several studies (Ali, Jan & Amin, 2013; Ganie, Jan, Lone & Nisa, 2014; Lone & Sheikh, 2016) have established that most of the repositories preferred DSpace and Eprints software in the field of Library and Information Science (LIS) worldwide. This is followed by Eprints, Digital Commons DLibra, OPUS and a few numbers of repositories using other software. The growth in software used in repositories by institutions would bring research transformation by increasing citation impact.

Open Access Initiatives and its Implications on Research Transformations

Table 1. Nigerian universities with intuitional repositories listed in OpenDOAR (Source: University of Nottingham (2015). Directory of OA Repository)

S/N	Universities	URL	Content	Software
1	Covenant University, Otta	http://theses.covenantuniversity.edu.ng/ http://eprints.covenantuniversity.edu.ng/	Articles, E-theses	E-prints
2	Ahmadu Bello University, Nigeria	http://kubanni.abu.edu.ng:8080/jspui	Conferences, Theses	D-space
3	Federal University Tech., Akure	http://dspace.futa.edu.ng:8080/jspui/	Articles; References;	D-space
4	University of Jos	http://dspace.unijos.edu.ng/	References, conferences, Learning objects	D-space
5	University of Nigeria	http://unn.edu.ng/chart/repo	Articles; Theses	Open registry
6	Federal University Ndufu-Alike Ikwo	http://dspace.funai.edu.ng/xmlui/	Articles; Theses	D-space
7	Landmark University	http://eprints.lmu.edu.ng/	Articles; Theses	E-prints
8	University of Ibadan	http://ir.library.ui.edu.ng/handle/123456789/3	Articles; Theses	D-space
89	Federal University, Oye Ekiti	http://www.repository.fuoye.edu.ng/	Articles; Theses	D-space
910	University of Ilorin	http://uilspace.unilorin.edu.ng:8080/jspui/	Articles; Theses	D-space
111	University of Lagos	http://repository.unilag.edu.ng:8080/xmlui/	Articles; Theses	D-Space
112	Fountain University, Osogbo	https://library.fuo.edu.ng/fuo-institutional-repository/	Past questions, journals, staff publications	D-space
13	Federal University Kogi State	http://repository.fulokoja.edu.ng/	Theses, Journals dissertations,	D-space
14	Federal University Dutsinma, Katsina State	http://dspace.fudutsinma.edu.ng/jspui/	Theses, Journals. dissertations, book chapter,	D-space
15	Federal University Ekiti State	http://repository.fuoye.edu.ng/	Theses, Journals .dissertations, book chapter,	D-space
16	Ebonyi State University	http://ir.ebsu.edu.ng:8080/	Theses, Journals, dissertations, book chapter,	D-space
17	Afe Babalola University, Ekiti	http://eprints.abuad.edu.ng/	Theses, Journals, dissertations, book chapter,	E-prints
18	American University of Nigeria	http://digitallibrary.aun.edu.ng:8080/	Theses, Journals dissertations, book chapter,	D-space
19	University of Port Harcourt	https://www.uniport.edu.ng/resources/library/librepository.html	Theses, Journals, dissertations, book chapter	D-space
20	African Digital Health Institution	http://adhui.com.ui.edu.ng/	Theses, dissertations,	D-space

RESEARCH TRANSFORMATION AND ITS IMPACT

Research impact is the degree to which research findings are seen, noticed, read, built upon, used, cited and applied by other researchers/scholars. To achieve the high research impact, adoption and use of OA initiatives is the answer. Chan (2004) reiterated that many authors of scholarly content wish their papers to

be widely disseminated, read, cited and built upon to increase scientific knowledge and research impact. According to Swan and Brown (2005), OA has the potential to improve research impact that was based on increasing the usage of research papers through the provision of information access to users at free of charge and also increasing awareness by being indexed in OA services. Many studies have proved that articles made available through OA are cited more than that of toll-accessed versions (Sanchez-Tarrago & Fernandez-Molina, 2009). For example, Antelman (2006) reported that the relative increase in citation for OA articles ranged from 45% in philosophy, 51% in electrical engineering, 85% in political science and 91% in mathematics disciplines. Similarly, several studies (Brody, 2006; Hajjem, Harnad & Gingras, 2005) findings showed that OA articles received between 25-250% more citations than articles that are not freely accessible via the Internet. Gargouri, et al. (2010) noted that the OA benefit over toll-accessed versions of paper was due to quality benefit, from the users self-selecting what to cite and use, free by OA from the constraints of selective accessibility to subscribers only. OA provides enabling conditions to facilitate research transformation and equally serves as a catalyst to research outputs.

OPEN ACCESS AS A FACILITATOR FOR RESEARCH TRANSFORMATION

With the adoption and use of OA initiatives by scholarly communities, the time for flow of information is faster than that of toll-accessed articles thereby; increase the speed of dissemination of research content. Research content dissemination is the rate at which an article of a publication is available to the user after its development and this can be aided by adoption and use of OA initiatives. The amount of time between acceptance of an article and its publication is an essential aspect in the scholarly publication process. The approach used in traditional publishing gives room for delay in processing of manuscripts from author to publisher. Hence, create a communication gap between author and publisher due to “snail movement” in the postal system. Dulle (2010) noted that the delay in publishing may increase the chances for the research to be out-of-date when published or that a competing research group may publish similar results before the originator of the research. One of the benefits of publishing in OA journals is that they serve as motivators for the author to have the results of their findings accessible at the soonest time possible. According to Ifeanyi (2011) the poor visibility of scholarly publications in Africa has resulted in the call for a way of fashioning out a proper method of disseminating scholarly research in developing countries, particularly Nigeria so as to balance the global information equation and improve the visibility and impact of Nigerian research outputs. Therefore, adoption of OA initiatives assisted tremendously in promoting easy accessibility and wide visibility of research outputs that brought research transformation.

IMPLICATION OF OPEN ACCESS ON TEACHING, LEARNING AND RESEARCH

The researchers’ outputs need to be visible and accessible to scholarly community and society at large for the purpose of decision taking and policy formulation. The only initiative that can enhance free access and wide visibility without any constraint except cost of provision of Internet is OA initiative. OA assists academics to have access to current and relevant materials for teaching, learning and research. With the provision of access to current scholarly work, researchers will not only re-invent the work but will build upon what others researchers have done hence, improve research work citations. With OA, researchers

can read and build on the findings of others without restriction. Even the best research is ineffectual, if others aren't able to read and build on it. Academics create, share and allow their teaching resources not only to be used but be amended, improved and transformed (Mahony et al., 2012).

The adoption and use of OA initiatives are very beneficial to students' educational achievements in terms of outcomes and excellent academic performance. When students use OA publications, they will find information quickly and efficiently to complete their assignment, do their research and improve students' academic performance. Stakeholders have various roles to play for OA developments.

STAKEHOLDERS' ROLES TOWARDS OPEN ACCESS DEVELOPMENT FOR RESEARCH TRANSFORMATION

There are different stakeholders that play important roles towards OA development for the research transformation. Among the stakeholders are the following with their various roles:

Library's Role

The prime objective of any library is to provide access to information that serves as a key to effective scholarly communication. Library as one of major stakeholders in OA has numerous roles to play as supported by Crow (2002) who restated the role of library towards OA institutional repositories as follows:

1. Academic libraries retain responsibility for managing and archiving traditionally published printing materials
2. Library budget should incorporate programs that support faculty's OA publishing activities.

Libraries played a vital role in setting up and managing OA especially repositories and this is widely admitted and acknowledged. According to Suber (2007) the following could be done by librarians to promote OA:

1. Ensure scholars at their institutions know how to find OA journals and archives in their disciplines and set up tools to permit them to access them (e.g., by including the journals listed in the DOAJ in their catalogues).
2. Establish institutional/departmental repositories.
3. Assist faculty archive their research papers (old and new) within the repository, digitizing older papers when necessary.
4. Assist OA journals to be launched at their institutions and become known to other libraries, indexing services, potential funders, and potential readers.
5. Involve with funding bodies and University/Institute administrators to create the awareness on OA matters.

Similarly, Kassahun and Nsala (2015) stated that many librarians have shown their support for OA by signing on to OA initiatives petitions and also taking the initiative in academic publishing. In addition, Cryer (2011) observed that academic libraries have taken it to be their responsibilities and have paved a path in the expansion of the OA movement by various activities: including creating of records for OA

journals in their public catalogues and e-journals. Also, collaborating and the lists with their institutions to establish institutional repositories.

Publisher's Role

Online publishers are expected to do the under listed activities towards promotion of OA

1. Organized seminars and workshops for new members to discuss issue related to OA
2. Provision of free online full-text edition of their publications
3. Assist reader to have free access to online articles
4. Divert substantial amount of money realized from subscription based journals to OA journal
5. Offers forum for bringing together the community of OA journal publishers and give support for active participation.

Authors/Researchers' Role

The role of author and researcher towards OA development cannot be over-emphasized. The goal of authors is to communicate their scholarly work (all papers in all fields, interconnected and accessible from any researcher's desk worldwide) to information users.

The following roles are expected to played by researchers and authors

1. Authors and researchers should create intellectual content and make it available to OA publishers
2. Authors and researchers should adopt author-pay OA model by paying bills involved in publishing. This will enable readers to enjoy free access to OA publications.
3. Authors and researchers make their articles freely accessible and available online through their institutional/ organizational repository
4. Authors and researchers at time engage in editorial work for free in order to promote good quality OA publications to readers.
5. Authors and researchers make provision for readers to copy, distribute, disseminate and preserved knowledge

For lecturers and academics, the concept of 'publish or perish' has come to strap their sustenance and promotion within the academic environment to the volume of their research findings and published works. On the part of the graduate students, the nature of their academic studies requires that they be actively engaged in research activities either in partial fulfillment of the requirements for the degree being sought or as part of terminal thesis or dissertation. In the light of these requirements on the part of both lecturers and students, it is to be expected that the volume of research outputs originating from academic institutions and addressing local issues in any country especially Nigeria will be accessible without any constraint using OA initiatives.

Role of Organisations

The major agent that drives and enhances various policies that promotes OA movement is organization. Organizations can be categorized into two: Government and Non-government organisations. Both

Open Access Initiatives and its Implications on Research Transformations

governmental and non-governmental organisations have made immensely contributions towards dramatic growth of OA. According to Berlin Declaration, the expected roles of organisations towards OA development are stated as:

1. Developing means and ways to evaluate online journals and OA contributions in order to maintain the standard of quality assurance and good scientific practice;
2. Encouragement of researchers and grant recipients to publish their scholarly work according to the principle of OA paradigm;
3. Encouragement of holders of cultural heritage to support OA by providing their resources on the Internet for wider access and visibility;
4. Advocating acceptance and recognition of OA publications for promotion and tenure elongation for academic staff.

International Federation of Library Association (IFLA) as an example of organization has been working with global organizations such as United Nations (UN), United Nations Educational Scientific and Cultural Organization (UNESCO), World Health Organization (WHO), World Summit on the Information Society (WSIS), World Intellectual Property Organization (WIPO) and several others in advocating and promoting OA publicly funded research. The stakeholders use various types of OA publishing models to minimize the researcher's constraints and improve access to research findings.

TYPES OF OA PUBLISHING MODELS

Author Pay Open Access

These are hybrid journals and subscription for publications is made by authors. The payment of the fee makes the article available in OA. It is a very prominent form of OA model, found especially in the medical sciences, is based on charging authors fees. Of all the different funding models available to OA journals, the “author pays” model is considered to compete with traditional subscription model. It is unique in providing the journal with source of income outside grant or sponsorship. The author pay fee after submission of manuscript and acceptance fees could be paid together or journal may charge acceptance fee only. This model adopted by both commercial and not for profit OA publishers. These fees could be covered by the author through research grants or with department conference funding or, in some cases, through the purchase of institutional or national membership to the journal. For example, BioMed Central.

Subsidized Open Access

The journal management receives various subsidies from scholarly societies, foundations, university departments and government agencies to provide for journal cost. This form of OA model does not charge any fees to authors or readers but regularly run on largely volunteer efforts or with some type of non-monetary compensation offered by universities. This is done to promote access to research findings. For example, First Monday. In this model, the library subscribed, continues to get the required access rights and secures the right to publish in OA for its patrons.

Dual-Mode Open Access

This model encourages management of journals to adopt both toll-accessed and free access versions. With this model, journal management preferred to maintain both print and non-print publications, with their deep interest in switching to free OA model later. Journals adopted this model have started publishing an online open-access version and also maintained toll-accessed version to offset the costs of a print type of the publications. This approach attempts to flaw the logic of subscriptions by demanding additional OA services. For example, Journal of Postgraduate Medicine. This mode of OA provides a good entry point for a systematic redeployment of licensing costs (subscriptions) to publication costs.

Partial Open Access

This model adopts both subscription and free access. Here, OA journals are provided free to authors and readers of the online version only. For printed paper version, subscription payment are made before accessed. Hence, access to paper version is restricted to subscribers only. Partial OA is to offer free access to some of the contents of the journal while restricting the rest to subscribed users. A journal's decision to adopt this model can be based on several reasons. It could be for economic reason, since journal income from the subscription to paper version may be used to pay part of publishing cost. For example, Spanish Journal of Neurocirugia and Lancet adopted such model.

Delay Open Access

This type of OA model provides OA journal free access to content after the period of embargo after they must have made certain amount of money. Here, OA to content only is provided after several months have passed since the original publication has been toll-accessed. It is a compromise that guarantees the journal's sustainability and allows the profit to be invented in knowledge promotion activities. The method attempts to crack the logic of subscriptions by demanding additional OA services based on current sales volumes. Many medical journals have adopted this model. For example, New England Journal of Medicine.

Per Capital Open Access

This is a special OA journal that provides free access for countries with very low per capital income i.e countries with scarce financial resources. This is done to promote wide access to research and guarantee a broad readership. For example, HNARI use such OA model.

Home Page Open Access

The model allows researchers to make their work freely available on the Internet. This is done at their personal homepages or on pages provided by their institution. This model makes provision for authors that deposited their works with the university free of charge. This is done to encourage the researchers to do more of research and as well as promoting OA policy. University of Ilorin, Nigeria offers this service free. Home page OA differs from institutional repositories and e-Print servers in that the later offer a global indexing system.

Open Access E-Print Archive

The journal management allows authors to display a copy of their work published in their journal (either pre-print or post print materials), in an OA e-print archives or institutional repositories. An e-print archive can be structured around a discipline; Open source software is accessible for setting up e-print archives that can index the contents following the principles set by the Open Archives Initiative. The e-print services such as the physics e-print archives arXiv first subject repository set up by Paul Ginsparg and the PubMedCentral (PMC). Another example is the institutional repository for the Universidad Nacional de Colombia uses MIT's D-Space software and arxiv.org. (e-print archive)

Open Access Indexing

OA indexing is a great source for finding publications that would otherwise only be found through commercial databases. In this model, articles themselves may not be open source. There are many indexes that are providing access to article metadata, so that researchers can at least know of article's existence. For example, Science Direct journal.

Open Access Cooperative

This involves coming together of publishers/institutions with mutual understanding or same cooperating ideas to promote wider free access to bibliographic information of such scholarly publication. This model can be formed among publishers, libraries, like scholarly societies, as they work together to safeguard free OA to bibliographic information. For example, abstracts are provided as services rendered by government for the publishers as an advertising tool, often with links to pay-per-view for the full text of articles most efficient form of knowledge dissemination. Member of institutions such as libraries, scholarly association contribute to support of OA journals. Example of such scholarly association is German Academic Publishers.

Open Access Freemium

The centre for open electronic publishing is a French initiative for OA publishing in social sciences and humanities developed a new economic model in 2011 that was based on "freemium" for its full OA journals and books series. The prime objectives address two issues: improve their economical soundness and increase visibility of scholarly publications in libraries. Freemium as the portmanteau word indicates, combines "free" access to some services with licensing of other "premium" ones. Libraries subscribing to Open Edition Freemium offer their users the possibility to download pdf and electronic publication files of articles and books without quota and without digital right management (DRM) of the journals and book series that have adopted OA freemium model. This model preserves OA to information together with the marketing of premium services (Mounier, 2011).

THE GROWTH OF OPEN ACCESS IN AFRICA

The growth of OA institutional digital repositories has been very remarkable in developed countries as well as some developing countries like Brazil, India and South Africa (Christian, 2008). The contribution towards repositories by countries showed that United States is the leading country with the largest number of repositories (500) followed by United Kingdom (256) Japan (217), Germany (202), Africa(155), Spain(127), France(122), Italy(117), and Brazil(97) respectively(Ali, Lone & Mushtaq, 2018; Bashir, Aasif & Zahoor, 2019). Yet, not much had been heard in African countries (Nigeria inclusive). For instance, there are 19 active Institutional Digital Repositories in South Africa, 6 each in Egypt and Kenya and Nigeria has 5 (Directory of Open Access Repository, 2013).

The Directory of Open Access Journals (DOAJ) indexes 38 out of 41 OA journals from Nigeria. The 3 OA journals were unsuccessfully registered to be part of DOAJ, or they are rejected from DOAJ because they could not meet the requirements. Most of these acclaimed OA journals are not fully adopted OA publishing because out of 38 indexed OA journals, 29 of these Nigerian journals charge authors, 3 are charging conditionally and only 6 are free of charge (UNESCO, 2015a). As at 14th of June, 2014, Nigeria was not part of the ten countries that publish the highest portion of OA journals (UNESCO, 2015b). Nigeria with an estimated population of 150 million has 129 universities, 63 colleges of education, 75 polytechnics and 100 research and allied institutions host the highest number of institutions compared to any country in Africa (Bola, 2013). As at 2017, Nigeria tops the list of journals listed in the Africa Journals Online (AJOL) with 221 journal titles followed by South Africa with 96. Out of the 221 Nigerian journals listed in AJOL, only 70 are OA journals (Oguche, 2018). In addition, in 2017, there are 30 active IRs in South Africa, 20 in Nigeria, 15 in Kenya and Ghana has 3 (Directory of Open Access Repositories Official Website (DOAR), 2017). Adewole-Odesi and Ezechukwu (2020) carried out an analytical study of OA institutional repositories in Nigerian universities. The findings revealed that the highest number of institutional repositories constituting 11 (44%) were developed by Nigerian institutions between 2014 and 2016; followed by 9(36%) between 2017 and 2019.

As at December 2019, only 20 universities in Nigeria were registered with DOAR (See Table 1). Nigeria took 47th position with other countries that had the highest output of OA journals. In spite of slow adoption and use of OA publishing, there are huge benefits accrued to stakeholders.

BENEFITS OF OPEN ACCESS INITIATIVES TO STAKEHOLDERS

The OA will continue to record progress and wider acceptance because of its increase in availability, usability and visibility of research findings. Suber (2004) and Jain (2012) clearly spelled out opportunities accrued from OA to various stakeholders:

Readers and Scholars: Researchers especially from developing countries benefit from the OA initiative as enumerated

1. Readers gain free access to OA literature without barrier and scholars enjoy access to scholarly publications they need for their research.
2. With the adoption and use of OA by readers and scholars, it increases access convenience, visibility and retrieval power.
3. Readers and scholars gain 24/7 access to OA publications.

Open Access Initiatives and its Implications on Research Transformations

4. Readers and scholars can read and easily build on research findings of others.
5. OA provides quick proliferation of research findings that enliven and inspire others researchers
6. Easy access to research material from all fields serves as incentive for interdisciplinary and multidisciplinary research activities.

Societies

1. OA provides opportunity to taxpayers to have access to the results of their investment especially scientific and medical research paid for with public funds.

Students and Teachers

1. Teachers and their students have access to the current research outputs throughout the world. This will improve their performance in teaching, learning and training.

Libraries

With less funding available to libraries in developing countries to cater for subscription charges for research and academic journals, the benefit of OA cannot be over-emphasized. Some of the benefits of OA to libraries are discussed:

1. OA solves issue of pricing and permission crisis (serial crisis) for libraries.
2. OA enable libraries to help faculty to increase their audience and citation impact and thereby raised university research profile. Hence, it's resulted in good webometric ranking.
3. OA improves library services to users especially Selective Dissemination of Information (SDI & Current Awareness service (CAS).

Institutions

1. Provides opportunity to gather and preserve its scientific findings and disseminates it through its repository.
2. Opportunity for indexing and tracking the research output of the institution from international search engines on the internet.
3. Opportunity to track the number of visits and use and collects data and indicators that can be used in institutional planning, and the search for sources of funding etc.
4. Provides opportunities for the use and re-use of the institution's output for scientific purposes (CVs, publications, excellence reports, indicators, institutional websites, personal websites).
5. Strengthens international communication and collaboration channels and the institution's international profile

Despite series of benefits accrued to adoption and use of OA, research institutions and academic in several developing countries like Nigeria are still struggling to overcome various challenges in an attempt to make their research findings openly accessible.

CHALLENGES FACING OPEN ACCESS ADOPTION AND USE TOWARD RESEARCH TRANSFORMATION

The arrival of Internet technology has provided research institutions and academic with a very high level of visibility on the web. As a result, learning, teaching and research are abounding to enjoy wide access and more visibility of research findings in the global society. This would be possible as a result of adequate facilitating conditions like regular power supply, Internet and OA policy development that promote OA adoption (Finch, 2012). However, there are challenges militating against adoption and use of OA for research transformation. Challenges are the barriers that forestall effective and efficiency utilization of OA.

Research community has been facing unprecedented changes, largely driven by technological developments accompanied by changes in research customs and scholarly communications. Research Institutes are grappling with fund shortage on one hand and on the other hand the poorly accessible research output and citation metrics. Hence, research findings' visibilities are becoming more and more important in the scientific community to get grants from funding agencies. Till recent times, one of the most important metric for the researchers was publication in journals. Researchers published their work in subscription based journals and also served on several editorial and peer review committees. However, many a times they did not have access to their own work and the library could not afford to subscribe the same. This was one of the drawbacks of the traditional scholarly publishing model. In spite of enormous benefits of OA, there are still challenges facing adoption and use of OA as discussed.

1. **Insufficient Awareness of OA Publishing:** Many of scholars and researchers are not well informed about OA initiatives that yielded to OA publishing. A well informed about OA may lead to the adequate adoption or usage. The benefits of OA are achievable provided the users have adequate knowledge of the OA concept. Few journal publishers that are aware of OA are trying to shy away from it because of their commercial interest. For instant, with the huge benefits of OA institutional digital repository abounds, this can be achieved only, if stakeholders involved are fully aware of its benefits. Christian (2008) stressed that there is empirical evidence that the knowledge of OA institutional digital repository is very low among the major stakeholders including lecturers, researchers, librarians and students.
2. **Language Barrier:** Language barrier has been an issue in Africa countries. Most countries in Africa continent have many tribes with various languages and different official language apart from English. Two languages are mainly use for publication of online literature and OA materials are majorly written in English. For instant, Kenya as a country has 42 tribes with different dialects and Nigeria with about 371 tribes has 521 languages.
3. **Resistance to Change:** Change is inevitable and is permanent. Many researchers, scholars, librarians, readers and authors resisted the change that followed Information and Communication Technologies (ICTs) revolution in the present e-world era. OA publishing can only achieve its prime objective of wide access and visibility using ICTs and its products as platform.
4. **Dearth of Information and Communication Technology (ICT) Infrastructure:** The alternative ways of sharing their research outputs was derived from the benefits of ICTS product (Internet) that serves as platform for OA movement. Taking opportunity from benefits that technology offered, the scholars, scientists and researchers have responded to this by working out OA adoption. However, research community has been facing unparalleled changes, mostly driven by technological devel-

opments accompanied by changes in research habits and scholarly communications. According to Christian (2008), the major problem that is militating against the takeoff of OA institutional digital repository in Nigerian libraries is the dearth of ICT infrastructure and facilities. This is an ugly confirmation of a similar complaint several years ago by Afullo (2000) that Nigeria was rated among the lowest in Africa in telecommunication infrastructure and not much is expected of academic libraries in Nigeria, though the situation seems to have improved overtime. In addition, the institutional repository requires necessary technological skills; however, such technological skill is either totally absent in some institution libraries or inadequate (Okoye & Ejikeme, 2011).

5. **Epileptic Power Supply:** Electricity supply is a major problem in developing countries like Nigeria. This problem has made the development of projects such as adoption and use of OA publishing and usage of institutional digital repository in Nigeria much difficult and expensive. Internet that serves as platform for the use of OA requires power supply. According to Fatunde (2008), the erratic power supply is a major problem to the growth and operation of information and communication technology in Nigeria especial in scholarly community like universities.
6. **Digital Divide:** The wide gap between technology developed nations and poorly technology based developing countries could be referred to as digital divide. According to Bashorun et al. (2013b), the digital divide between technology rich and poor nations of the world has deprived African countries from full benefits of OA.
7. **Inhibiting Copyright Protection Regime:** Efforts of OA, aim to make the outputs of publicly funded research more widely accessible in digital formats. While these technological advances have made sharing and processing information easier, however, it does not change the fact that the information could be secured by Intellectual Property (IP) laws. Given the ease at which users can gain access to the digital information, the legal liability to provide access is far greater difficulty than the products of print in nature.
8. **Poor Funding of Research Institutions:** Research Institutes are contending with fund shortage on one hand and on the other hand the poorly visible research output, and citation metrics. Researchers published their work in subscription based journals and also served as peer review committees and as editorial members. Nevertheless, many times they did not have access to their own work and the library could not have enough money to subscribe to the same. According to Arunachalam (2003), the development of institutional repository in developing countries is capital intensive project than in developed countries. This is because academic and research institutions in advanced countries already have a well-established state-of-the-art ICT infrastructure to build on. Similarly, Saroj (2016) reported that the opportunity for faculty and researchers to publish in OA is scarce especially in the state government funded academic universities due to the lack of funding, technology awareness and skilled manpower. Several studies (Ivwhighrehweta, 2012; Ezema & Ugwu, 2013; Ridwan, 2015) reiterated lack of funding as an impediment to establishing IR in Nigeria.

Funding agencies across the globe like Wellcome Trust and National Institutes of Health (NIH) are now mandating research findings from grants given to them to be published in OA outlets. The NIH in the US asked all its grantees to provide OA to the results of NIH-sponsored research within 12 months of publication. The Wellcome Trust requires OA to Wellcome Trust-sponsored research within six months of publication. Similarly, Research Councils in the UK have a related policy. Major research institutions in China, Australia, France, Germany, Greece, Hungary, Switzerland, Italy, Norway, Portugal, the US, and the UK have dedicated themselves to provide unlimited access to their research output. One of the

organizations that were the first to embrace OA was Wellcome Trust that started mandating that all its sponsored research should be made OA from April 2005 (Finch, 2012). This was possible as a result of facilitating conditions like Internet, regular power supply and OA policy development that support adoption and use of OA (Finch, 2012).

SOLUTIONS AND RECOMMENDATIONS

Generally, the level of adoption and use of OA publishing in African countries is far from the realities. As noted by Enefu, Gbaje and Aduku (2015) that utilization of OA publishing by academics in Nigeria is slow. Be that as it may, the following are recommended as the way forward for the research transformation in era of OA initiatives:

Promoting OA Publishing Awareness Campaign: awareness campaign on benefits of OA should be organized by government establishments such as ministries of education, science & technology and information. Also, libraries, and universities management should embark on any program that would sensitize all stakeholders the need to adopt and utilize OA.

Provision for Language Translator Software: Nation with many tribes will have diverse languages. Most of these countries have official language and other indigenous languages. The official language could be English or French. Hence, there is need for the translator to convert research outputs written in native language to widely acceptable language. For instant, OA publications written in local language could be converted to either French to English language.

Attitudinal Change: People should develop positive changes towards ICT usage and comply with ICTs rules. For the effective utilization of OA, there is need by stakeholders to develop ICT skill such as surfing Internet and literacy skills.

Provision of Sufficient Information and Communication Technology Infrastructure: Universities, organisations, individuals and all levels of governments should acquire enough of modern technology equipment such as computer and upgrading of Internet connectivity for effective use of OA.

Provision of Alternative Source of Power Supply: Government, private organization and individual stakeholders should provide alternative source of power like solar energy, generating plant for steady supply of electricity and uninterrupted Internet connectivity.

License should be developed to facilitate OA: for example, PLOS applies the Creative Commons Attribution (CC BY) license to works we publish. This license was developed to promote OA—namely, free immediate access to, and unrestricted reuse of, original works of all types. With this license, authors agree to make articles legally available for reuse, without permission or fees, for virtually any purpose. Anyone may copy, distribute or reuse these articles, as long as the author and original source are properly cited.

FUTURE RESEARCH DIRECTION

The future research work should examine impact of OA business models on publishing system.

CONCLUSION

The development and consolidation of OA initiative has brought transformation in research outputs in the world especially in developed and developing countries particularly in Africa. OA has become a prerequisite to survive and thrive in research transformation. Key-in into OA initiatives relating to research promotion and its impact on the society, organizations and individuals is germane. A central element of the sustainability transformation of research outputs would be effective with the inclusion of OA initiatives. OA initiatives are a powerful driver that brought a new direction of change to scholarly works by facilitating free access to research outputs. Adoption of OA publishing has huge benefits such as promotion of research outputs emanating from researchers, improved visibility of research findings, increase citation, usage and assisting policy makers to access useful research findings for progressive decision making that could lead to huge economic development. With the attendant, huge benefits of OA initiatives would continue to flourish.

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KEY TERMS AND DEFINITIONS

Digital Divide: The wide gap between technology developed nations and poorly technology-based developing countries.

Library: An institution established to acquire, organize, preserve, and disseminate information from different sources in various format.

Open Access: The removal of major obstacles to accessing, sharing, re-using and promotion of visibility of the research outputs.

Open Access Initiative: An initiative that supports freely available and accessible scholarly work online without any forms of barriers.

Open Access Initiatives and its Implications on Research Transformations

Research: An organized and systematic human activity of finding answers to question using intellectual application.

Research Impact: The degree to which research findings are seen, noticed, read, used, built upon, cited and applied by other scholars.

Research Transformation: Is the revolutionary process of changing the research outputs for the enhancement of accessibility and visibility of research findings.