

Open Sources Library Software Usage and Performance of Higher Education Institutions

Abdulmalik Bappah Mahmood

Department of Library, Federal College of Education, Yola, Nigeria

Abstract: The introduction of digital technology has accelerated the library's subscription to online resources including e-journals, e-books, and reference management software in higher education institutions. The open source library software in particular has deepened the availability of electronic resources and extends the boundaries of academic research. The aim of this study is to investigate in impact of open source library software usage on the overall performance of higher education institutions. A cross sectional research design was used and data was collected from 252 respondents. The data was analysed with SPSS carrying out correlation and regression analysis. Result of the study indicates that, high level usage of open source library software has significant impact on the performance of Higher education institutions. This indicates that adoption of open source library software tends to beneficial and impact positively on the performance of both students and faculties in higher education institutions in developing countries as it would help in designing education policies and programmes. It is therefore recommended that more resources should be provided for ICT infrastructure and skilled manpower for the implementation and use of Open Source Library Software among guarantee appropriate Librarians.

Keywords: Library, Open source, Software, Higher education Institutions

I. INTRODUCTION

Higher education plays a significant role in developing a knowledge economy in a country. In the past decades, higher education Institutions were able to achieved academic development and research steadiness, notwithstanding the lack of facilities and management experiences (Bray and Major, 2011). In the past, the lack of recent educational materials and online resources decelerated scholars' scientific research. However, in the 1990s, technology has rapidly changed the world, with both paid and open source digital library resources to support scientific research in various fields. The advent of digital technology has fast-tracked the library's subscription to e-journals, e-books, cataloging and reference management. These online database resources deepen the availability of electronic resources and extend the boundaries of academic research. Access to electronic resources has a greater impact on students' performance in particular and HEIs' performance in general.

The unrestricted and open library software plays substantial role of most progressive countries of Europe. This is since access and accomplishment of this software are achieved with slight fund via the Open Source Software Initiative. The introduction and development of Open Source Software in the

present age, has made the switch from "traditional" to "technology based" library services which provides room for more effective service provision very easy and cost effective thus, libraries in industrialized countries are now accommodating them in their technical services, digitization processes, and general library content organization. A study conducted by Gance, Kerr and Reid (2004) on the degree of use of OSS by Tertiary Education Institutions TEIs in Australia, New Zealand and UK discovered that all the TEIs who responded to the survey were already using OSS in their services provision. In the same way, Open source software's are extensively being accepted across the globe, particularly in western countries, in developing countries misconceptions about OSS plays a negative role in its awareness and uptake level.

In Nigeria, academic institutions ran into one problem of the other owing to the incorrect choice of library software and this reveal that most librarians in Nigerian Federal colleges of Education Libraries have limited consciousness on the obtainability of the changing unhindered open source library software. In addition, there is no substantial utilization of open source software in their libraries. This feat is until now to be reached in many other developing nations like Africa as exposed from communication with colleagues during five dissimilar conferences and workshops attended in Nigeria between May and November, 2010. These discovered that Librarians know very petite communicating and about obtainability of the changing OSS as well as their uses (Blessing, 2012).

This study was designed to assess the impact of open source library software on the performance of Higher education institutions located in the north eastern Nigeria. The bottom line was to institute the existing benefits of open source software through establishing scientific findings existing in other parts of the world. The study offers details of benefits of open source library software as its impacted on the performance of higher education institutions sat this would help both students and academics improve their performance. Findings from the study would serve as a guide for planning of on adoption of free and open source software to bridge the gap created by inadequate funding among federal colleges of education in Nigeria. It may also provide new knowledge on priority areas for uptake of open source in Nigeria.

II. LITERATURE REVIEW

Open source library in HEIs

Libraries have been around for some time but never to the extent at which they are presently. Peace studies archives from Goshen, Earlham, and Manchester Colleges have taken steps to place all their information in a digital library. They are organized and can be located effortlessly. These projects are principally used to digitize information but also to amass into one source (Next-Gen Libraries). Additionally, there are many different programs that can be used to develop digital libraries. Below are a few examples of systems that are popular when considering open source libraries as an option for storing information.

The first open source library automation software system, Koha, was developed in 1999 and released in 2000. Koha began in New Zealand when a library needed to replace its older proprietary automation system with one that could properly handle the year 2000 (Koha Library Software Community, 2011). Until this time library systems were proprietary, but the Koha developers decided upon an open source model. Koha has been in active development since then, and has grown to be one of the leading FOSS ILs.

Evergreen started in Georgia in 2006 and has quickly grown to become one of the leading contenders in this market (Chepesuik, 1997). Evergreen has experienced a recent burst of development, which will be detailed shortly. OPALS is one of the leading ILs in school libraries, besting proprietary systems in user satisfaction (Breeding & Yelton, 2011). Other FOSS ILs include PMB, Gnuteca, NewGenLib, OpenBiblio, Emilda and PHPMyLibrary. These have achieved varying degrees of adoption, functionality, and community strength. Some are most appropriate for specific types of libraries (academic, international, etc.). Depending on a library's environment and particular needs, these other systems may be a step behind the leaders, Evergreen and Koha. Kuali OLE was in early development as of December 2011. It is an extensible LMS for academic and research libraries that will be an "enterprise-ready, community source software package to manage and provide access not only to items in their collections but also to licensed and local digital content" (Kuali Foundation, 2011).

African countries have recognized the importance of OSS in development. In February 2003, a foundation called Free Software and Open Source Foundation for Africa (FOSSFA) was launched in Geneva, Switzerland, whose vision is to promote the use of FOSS and the FOSS model in African development (Edward, 2008). The FOSSFA foundation and Linux signed an agreement in December 2009 to work together in the promotion of OSS in Africa (Nwakanma, 2009). Among the African states, South Africa has been on the frontline in the official implementation of OSS as a strategy within the public sector (Laszlo, 2007). The South African government acknowledges that OSS is a viable alternative for proprietary software and this is evident by the

approval of the OSS policy by the cabinet (Mtsweni and Biermann, 2008). They further state that one of the salient points in the policy provides that government departments should adopt and implement OSS unless proprietary software is demonstrated to be superior to OSS. In South Africa, expenditure for proprietary software licenses amounted to R6 billion annually which is channeled to foreign companies such as Microsoft (Gopalakrishnan, 2006). Several years after the government policy was passed not much had been achieved (Archibald, 2007).

Ghana is a country that has widely embraced technology, but in terms of OSS adoption the country is lagging behind with Microsoft windows operating system taking the lead at 84.7% and Linux at 11.9% (Amega-Selorm & Awotwi, 2010). According to them some of the reasons given for the lead in the Microsoft operating system are; the Microsoft windows comes pre-installed in the computer, ease of use, availability of applications and availability of technical support. They cited absence of OSS adoption and procurement policy as a major adoption challenge of the software in the Government.

The adoption of OSS in Nigeria has been having the same challenges faced in other parts of the African continent with most computer users over relying on proprietary software (Adeyemo, 2005). He notes that the government has a role to play in promoting the use of OSS by assisting with Open source Research and Development, Education and Training.

A report on the status of OSS adoption in 2005 revealed that there was little use of OSS in most African countries both in the government and in the private sector (Bridges, 2005). The Bridges organization also noted that an overwhelming majority of countries did not have policy on OSS. In most countries such as Uganda, Kenya, Benin, Burkina Faso, Cameroon, Ethiopia, Ghana among others there were some initiatives that were supporting the use of OSS, particularly in training institutions and universities (Graham, 2017). The report also indicated that in Nigeria the government was investigating OSS as an alternative to proprietary systems in government departments although sources indicated that the situation was being complicated by a generous Microsoft for software.

In West Africa, specifically Nigeria, experience has shown that very many libraries run into one problem or the other due to the wrong choice of library software. For instance, some of the first generation universities in Nigeria started with TINLIB software but they could not continue due to some technical difficulties, maintenance problem, poor revision policy and the prohibitive cost of processing and maintaining it. Adogbeji and Onohwapor (2007) revealed that Kenneth Dike library of University of Ibadan, Nigeria had earlier used TINLIB software and could not continue. Also, University of Ilorin also started with TINLIB and later shifted to Alice software. The University of Lagos was equally affected in the wrong choice of library software. This university started with TINLIB and later shifted to a modified version of TINLIB

called Graphical Library Automation System (GLAS). When the latter software could not adequately sustain the library operations, the library then opted for Millennium software in 2012. The purpose of opting for Millennium software was because it is web-based. The Vice – Chancellor of University of Lagos reported this to Nigerian University Commission. However, this same software is characterized by its own technical difficulties and inadequacies. Therefore, the reports highlighted above coupled with the experiences Nigerian libraries faced in the wrong choice of library software called for this research.

Qualities of Good Library Software

Literature Helmreich (2011), Hiong (2005); Bridge (2013) and Randhawa (2011) recognized the qualities of a good Open Source Software as follow:

Open source software is normally obtained at zero cost wanting no licensing fees. Unlike proprietary software open software invite no maintenance fees. The solitary expenditures are for media, training, support and documentation, if requested. Managing the open software is simple, since once the software is obtained it can be install as numerous times and friendly to as many environment and locations needed. It is free count, free track, and free monitor for license compliance. The cost of getting the hardware for open source is less, compared to the other hardware (Mercie, 2015).

To this end, the researcher believed that, open source solutions are stylishly compact and portable and less expensive. Open source applications and services can often scale significantly. Multiple options for load balancing, gathering, and open source applications, such as database and email, give organizations the ability to scale up for new growth or consolidate to do more with less.

Support is available for open source-often superior to proprietary solutions. First, open source support is easily available and accessible through the online community via the Internet. Secondly, many tech companies are now supporting open source with free online and multiple levels of paid support. Using a non-free invention with non-open formats in a tremendously integrated manner is highly annoying, and this is a reality for most of all ICT managers. In addition to ongoing license fees, there is lack of manageability and the inability to customize software to meet specific needs, refers to as the “lock in” (Dole, 2000). Using open source software liberated one from lock in into using a particular vendor’s system. Open source simply is a declaration of freedom of choice and use. According to Randhawa (2011), specific open source technologies such as CIM (Common Information Model) and WBEM (Web Based Enterprise Management) provide the competence to integrate or consolidate server, service, application, and workstation management for influential administration. Through open source software one is capable of integrating, consolidating sever, service and workstation management for powerful administration.

Security and dependability is one of the quality expected of software, open software in this regard is one of the reliable and secured software. The level of this dependability and security attached to it can be captured from Helmreich (2011). According to him, “the time until a security vulnerability in open source software is fixed (36 days) is significantly shorter than the time that elapses until a commercial product gets fixed (82 days)”. Though, report from the same source indicate that open source software is as secure as commercial software, but more secure than internally developed (Helmreich, 2011). According to Hiong (2005):

A technological product can only be as protected and as reliable to the extent that the necessary care was taken to properly install and maintain the product. A poorly maintained product offers little security, irrespective of the software development model used to create the product, or the rigor to which the software was tested. Instantaneously, the standardization around a platform can simplify and accelerate the security updating processes.

In this regard, one would agree with Helmreich (2011), who stated that, open software can naturally be more secure than proprietary software, but it is no automatism, because as he indicated, security entails an active community that offers and distributes fixes for security vulnerabilities.

In short, open source software can be beneficial to librarians, to users, and to the higher institutions of learning.

Awareness of Open Source Library Software among Librarians

Awareness of open source library software among librarians in most higher academic institutions in Nigeria remains a challenge (Abba, 2014). Awareness is supreme for librarian to effective and efficient use of electronic resources comprising open source library software. Nevertheless, there are few studies on librarians’ awareness towards open source library software. In a survey research carried out by Blessing (2012) on “*awareness, availability and utilization of open source software in Nigerian libraries*” with the main objective of finding the level of awareness, degree of use, challenges and forecasts of the use of open source software in Nigerian libraries, it was exposed that most librarians in Nigeria have limited awareness on the obtainability of the changing Open Source Software and do not meaningfully exploit them in their libraries. As Blessing (2012) research indicates, of the 42 libraries involved in the study, only 7 are presently using CD/ISIS whereas 5 others use KOHA. In the survey, it was found that there are certain inhibitors which contributed to the absence of awareness. These inhibitors include the management which does not see the use of the software in those sections as something important ; other inhibitors include the fear for service support problems, and unavailability of Internet access in the libraries to enable downloading of software.

The knowledge economy depends as much on the knowledge distribution power of the system as on its knowledge production power. This openness to knowledge will provide the impetus for the accelerated growth of knowledge societies Raju (2013). Openness means unhindered access to information and knowledge. The free flow of information is a major component to bridging the knowledge gaps between privileged and under-privileged communities Raju (2013).

Creaser et al. (2010) looked into the awareness of scholarly authors toward open access repositories and the factors that motivate their use of institutional repositories. Their main intention was to establish the extent to which these authors were aware of open access. The research found that there was a good understanding and appreciation of the open access in general by over two thirds of survey respondents but the understanding of scholars from different disciplinary backgrounds differed. However, the authors reported concerns over copyright infringement and unwillingness to place outputs where other content had not been peer reviewed among the respondents.

Dulle and Minishi-Majanja (2010) explored the awareness, usage and perspectives of open access repositories among Tanzanian researchers. They also revealed more use of open access outlets in accessing scholarly content than in dissemination of research findings. They were of the opinion that addressing issues relating to researchers' self-efficacy, fears and misconceptions, ICT infrastructure, researchers' information search and publishing skills, and policies would enhance the adoption of repositories among Tanzanian researchers.

Their study differed from the current one in that these authors only addressed researchers' awareness and use but did not consider researchers' skills and training useful for accessing and disseminating research including skills to self-archive research information. This would definitely require specialized support from the librarians. This was the essence of the study.

Vlachaki and Urquhart (2010) explored the impact of open access initiatives on biomedical research scientific publishing and scholarly communication in Greece. They used a longitudinal approach and employed bibliometrics, questionnaire surveys and interviews. They examined knowledge, awareness and attitudes towards open access. The researchers used a bibliographic survey with the intention of detecting Greek biomedical journals in five world-wide sources. Their sample comprised of 70 biomedical researchers. A response rate 88.5% was achieved. Their finding was that awareness of open access among Greek biomedical scientists low (58 %).

The researchers limited themselves to Greek-language journals indexed in various OAJs. In contrast to the studies of Vlachaki and Urquhart (2010), which used scholars in universities the subjects in this study were biomedical researchers only. Furthermore, this study used a small sample

of 70 and only drawn from one field (medical). Another distinct feature was the use of interviews for this study unlike the current that used questionnaires.

Anuradha, Gopakumar, and Baradol (2011) examined the awareness of the availability of free open access resources via the internet. The analysis revealed that the Internet was the most preferred source of information by the academic community. Results also revealed unawareness of the freely available resources. It was not clear how many students participated in this study or the method used in arriving at the sample for both the students and academic staff. The study pointed out that the librarians ought to play a role in imparting awareness and developing skills through information literacy sessions. As a collaborative support of academic staff, library staff needs to initiate appropriate user education programs to sensitize academic staff researchers on the existence of OA resources. It was necessary to establish the sources of information for academic staff including the library.

Emojorho, Ivwhigregweta and Onoriode (2012) studied the awareness of Open Access Scholarly Publication among members of the teaching fraternity drawn from the University of Benin in Edo State, Nigeria. They used a descriptive research design. Seventy (70) academic staff were the subjects of their study. The subjects were randomly selected in the University of Benin Main Library. They used a structured questionnaire, Open Access and Scholarly Publishing Questionnaire (OASPQ) to collect data. They used simple frequency counts and simple percentages for data analysis. Their study found that the respondents were aware of open access scholarly publication. Most of the respondents learnt about OA from their colleagues. The respondents cited increased impact and free online access were some of the advantages of open access while unavailability of internet facilities were some of the constraints reported. The authors suggested that the university library needed to intensify its efforts in the creation of awareness of both open access journals and institutional repository. This study and the current used a similar design and statistics for purposes of data analysis. However, the authors did not come clear on the total population from which they drew their sample nor indicate whether they employed qualitative, quantitative or a combination of both approaches.

Stanton and Liew (2012) examined doctoral students' awareness of and attitudes to open access forms of publication. A sequential exploratory design was used. Mixed-methods approach consisting of qualitative semi-structured interviews and quantitative self-completion questionnaire was adopted. They interviewed eight doctoral students enrolled in a range of disciplines in Massey University, New Zealand who were purposively selected. Data collected formed the basis for the quantitative self-completion web survey which involved 251 students. From 901 doctoral students 251 took part in the survey, a response rate of 28% was obtained. Both qualitative and quantitative data were collected. Qualitative data were analyzed thematically. NVivo 8 was used to sort,

store and analyze the interview transcripts by theme while survey responses were analyzed using Survey Monkey's online toolkit and Excel.

These researchers found that awareness of open access and repository 41 archiving was still low but respondents supported the concept of open access. Only two of the eight interview participants could describe the concept of open access. Reported also was the fact that deeper knowledge of IRs was lacking among the respondents. While respondent lacked in-depth knowledge of IRs, they still preferred a voluntary system of self- archiving their work in an institutional repository as opposed to the compulsory system. This involves knowledge about various protocols, file formats, security measures, metadata as well as preservation strategies. In order to improve on academics' self-archiving, there is need for knowledge of the above-mentioned issues. That calls for extra support from specialized librarians. Their study has established the extent to which the librarians were aware of these self-archiving related requirements in order to assist academic staff in self-archiving.

Darvish (2014) investigated faculty members' awareness on open access at Çankaya University, Turkey. They conducted using a survey and quantitative analysis was used. Their population was 115 faculty members out of which 41 members responded. The study found that the University's faculty members were well-informed of the concept of open access. This study, besides being conducted in Turkey only limited itself to awareness of the concept of OA while the current was conducted in Kenya and also extended its scope to awareness of other aspects of OA. This study also used only quantitative current study uses both qualitative and quantitative approaches. The author failed to clearly show how the respondents were selected. These research findings point to the fact of awareness of OA concept amongst the subjects engaged in the research but most of these studies did not look at awareness of specific aspects of OA. Besides, no such studies have been done in Kenya.

III. METHODOLOGY

Research Design

This study adopted a cross-sectional descriptive survey research design. This is considered suitable since the variables under study were measured as they logically occur without being manipulated or controlled. This is in view of the philosophical orientation adopted for the study since it was concerned with investigations in what, when and how much of a phenomenon at one point in. A cross - sectional descriptive survey offers the opportunity to collect the data across different firms and test their relationship. It gives the researcher the opportunity to capture a population's characteristics and test the hypotheses quantitatively with respect to time period over which data was collected across various institutions. Cross sectional survey is suitable for capturing data at one point in time.

Data collection

A total of 285 questionnaires were distributed to the staff and students in three federal colleges of education located in Yola, Gombe and Poteskum all in the northeastern part of Nigeria. Out of 285, 252 usable questionnaires were considered after having done the data screening due to missing values, resulting into a response rate of 88.89%.

Data Analysis

In order to find answer to the research questions, correlation and regression analysis were carried out. This is done in order to measure the relationship between the independent variable which is Open source library software and the dependent variable, HEI's Performance.

IV. RESULT AND DISCUSSION

Response Rate

The targeted sample size was 285 from the three selected Federal Colleges of Education libraries. The study utilized all the librarians (285) both professional and paraprofessional. Those who filled and returned questionnaires were 252 respondents making a response rate of 88.89%. According to Mugenda and Mugenda (1999), a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent. This means that the response rate for this study which was recognized to be 88.89% was excellent and therefore enough for data analysis and interpretation.

Table 1: Response rate

Questionnaires	Frequency	Percent (%)
Response	252	88.89%
Non-response	33	11.11%
Total	285	100.00%

Source: Field data, (2017)

Validity and Reliability of Instrument

To establish validity, the research instrument was given to two experts who were experienced in the awareness and uptake of open source library software in federal colleges of education in north-east Nigeria to assess the relevance of each item in the instrument in relation to the objectives. The same were rated on the scale of 1 (very relevant) to 4 (not very relevant). Validity was determined by use of content validity index (CVI). CVI was obtained by adding up the items rated 3 and 4 by the experts and dividing this sum by the total number of items in the questionnaire. A CVI of 0.747 was obtained. Oso and Onen (2009), state that a validity coefficient of at least 0.70 is acceptable as a valid research hence the adoption of the research instrument as valid for this study.

Table 2: Reliability Result

Construct	Cronbach's Alpha	Items
Low level	.71	4
Medium level	.73	3
High level	.75	5
HEI Performance	.72	4

Source: Field data, (2017)

A higher value shows a more dependable generated scale. Cooper & Schindler (2008) indicated 0.7 to be an acceptable reliability coefficient. The study involved questionnaires from 7 respondents, who were selected to participate in the pilot study. Since, the alpha coefficients were all greater than 0.7, a conclusion was drawn that the instruments had an acceptable reliability coefficient and were appropriate for the study.

Table 3: Correlation Matrix

Variables	1	2	3	4
HEI Performance	1			
Low Level Usage	.128	1		
Medium Level Usage	.279*	.326*	1	
Higher Level Usage	.349*	.387*	.296**	1
Note: $P < 0.05$				

Source: SPSS Output

Table 3 contained the result of correlation analysis of the dependent and independent variables. The result indicates a positive correlation between HEI performance and each of the independent variables. Specifically, there is positive correlation between lower level usage and HEI performance as indicated by $r = 0.128$. Also, the result indicates a positive correlation between medium level usage and HEI performance as shown by $r = 0.279$. Finally, the result shows that higher level usage and HEI performance has positive correlation with $r = 0.349$. Hence there is significant correlation between open source library software usage and HEI performance.

Table 4: Regression Results

Variables	HEI Performance		
	Beta	t-value	Sig.
Low Level Usage	.128	-6.205	.053
Medium Level Usage	.279**	8.501	.000
Higher Level Usage	.349**	10.077	.000
F - Value			218.899
R ²			.788
Adjusted R ²			.786
Durbin Watson			1.540
Note: $P < 0.05$			

Source: SPSS Output

Result of multiple regression analysis is shown in table 4. The multiple regressions of the three factors of open source library software usage with the HEI performance registered highly significant F- ratios. The R² value of 0.788 indicates how HEI performance was explained and accounted for by open source library software usage. The Durbin-Watson value is within the acceptable range of 1.5 to 2.5 (Durbin & Watson, 1950), indicating that there is no significant autocorrelation in the residuals.

The analysis reveals that higher and medium level open source library software usage has significant positive influence on on performance of HEIs with beta values of 0.349 and 0.279 respectively. However, lower level usage shows a positive but insignificant effect on HEI performance with beta value of 0.128. Therefore, this indicates that HEIs that adopts open source library software will have significant improvement in their performance.

V. CONCLUSION AND RECOMMENDATIONS

The present study investigates the impact of open source library software usage on the performance of higher educational institutions (HEIs) of Nigeria. The findings of the study demonstrate that higher usage of open source library software has a significant positive effect on the performance of HEIs as well positively influences the satisfaction of staff and students of these institutions.

It is worth noting that academic libraries only constitute one segment among many types of libraries which includes Public, School, Special or National libraries. Comparative and analytical studies of open source software in different libraries, as well as different types of open source software in relation to adoption, benefits and its impact on the performance of both students and faculties of higher education institutions in developing countries would help in designing policies and programmes. It would monitor the different sectors and avenues of open source adoption and implementation which may help librarians to make informed choices in terms of the adoption and implementation of open source software.

However, more research work is needed in the area of building a trust between open source service providers and consumers and focus on issues of data security and data privacy which may enhances efficiency and acceptability open source software. Also, libraries ought to employ skilled manpower for the implementation and use of Open Source Library Software among guarantee appropriate Librarians. They should create awareness about open source library software, there benefits to users, staff and the academic community as a whole. Finally, management should make provision for sponsorship for library staff to attend conferences, seminars and workshops on librarianship and ICT.

REFERENCES

- [1] Abba, K. (2014). Automation in Nigerian university libraries: mirage or reality. *Information and Knowledge Management*, 4(4), 1-6.
- [2] Akitomide, O. A. (2016) "A Study of Nigerian Librarians' Attitude to Open Source Software". *Library Philosophy and Practice (e-journal)*. Paper 1356.
- [3] Akpa, A. (2011) *Knowledge Creation Process, Concepts and Applications in Social Research*. Makurdi: Aboki Publishers.
- [4] Akpojotor, Lucky O. (2016) "Awareness and Usage of Electronic Information Resources Among Postgraduate Students Of Library And Information Science In Southern Nigeria" *Library Philosophy And Practice (E-Journal)*. Paper 1408.
- [5] Andhawa, S. (2011) Open Source Software and Libraries.(Accessed Online: from http://eprints.rclis.org/13172/1/Open_Source_Software_and_Librarie_s.pdf).
- [6] Årdal, C., Alstadsæter, A. and Røttingen, J. (2011) Common characteristics of open source software development and applicability for drug discovery: a systematic review. *Health Research Policy and Systems*. 9:36
- [7] Ashikuzzaman, M. (2016) Library Automation: The Concept. (Accessed Online: from <http://www.lisbdnet.com/library-automation-concept/>).
- [8] Baro, E. E. and Eze, M. E. (2015) "Colleges of Education Librarians in Nigeria: An Investigation into the Self-Perception of ICT-Related Information Literacy Skills". *Communications in Information Literacy*. Volume 9, Issue 2.
- [9] Berlin Declaration on Open Access. (2003, October 22). *oa.mpg.de*. Retrieved February 10, 2017, from Berlin Declaration on Open Access: <http://oa.mpg.de/openaccess-berlin/berlindeclaration.html>
- [10] Bethesda Statement on open Access. (2003, June 20). *earlham.edu*. Retrieved February 10, 2017, from Bethesda Statement on open Access: <http://www.earlham.edu/~peters/fos/bethesda.htm>
- [11] Bless, C. and Higson-Smith, Q. (1995) *Fundamentals of Social Research Methods: An African Perspective*. Cape Town, Credo Press.
- [12] Blessing, U. N. (2012) "Awareness, Availability and Utilization of Open Source Software in Nigerian Libraries: The Way Forward". *International Research Journal of Library, Information and Archival Studies* Vol. 1(1). January. Pp. 001-009,
- [13] Bod, N. (2009) "Introspection and Self-Awareness Theory in Psychology: Definition & Examples". (Accessed Online: from <http://study.com/academy/lesson/introspection-and-self-awareness-theory-in-psychology-definition-examples.html>).
- [14] Borgatti, S. P. (1999) Elements of Research. (Accessed Online: from <http://www.analytictech.com/mb313/elements.htm> on 11/2/2017).
- [15] Brian, R. (2017) The Reference Portal. SKMATIC Industries.(Accessed Online: from <http://skmatic.com/projects/portal.php>).
- [16] Bridge, R. (2013) "Open source software – The advantages & disadvantages". (Accessed Online: from <http://entrepreneurhandbook.co.uk/open-source-software/> 20/2017).
- [17] Business Dictionary (n.d.) "Assumptions".(Accessed Online: from <http://www.businessdictionary.com/definition/assumptions.html> on 11/2/2017).
- [18] Business Dictionary (n.d.) "Software".(Accessed Online: from <http://www.businessdictionary.com/definition/software.html> on 19/2/2017).
- [19] Center for Survey Research (n.d.) "Digital Library Federation Survey Digital Library Policies, Organizations, and Practices".(Accessed Online: from <https://old.diglib.org/roles/survey1a.htm>).
- [20] Chemezie Patrick Uzuegbu and Faustinus U. McAlbert (2012) "Digital Librarians and the Challenges of Open Access to Knowledge: The Michael Okpara University of Agriculture (MOUAAU) Library Experience". *Library Philosophy and Practice (e-journal)*. Paper No. 740. (Accessed Online: from <http://www.diglib.org/roles/survey1a.htm>).
- [21] Chepesuik, R. (1997). The future is here: America's libraries go digital. *American Libraries*, 2(1), 47-49.
- [22] Cleveland, G. (1998). *Digital Libraries: Definitions, issues and challenges*. New York: IFLA.
- [23] Computer Hope Dictionary (2017) "Software".(Accessed Online: from <http://www.computerhope.com/jargon/s/software.htm> on 19/2/2017).
- [24] Crossman, A. (2017) "Stratified Sampling Defined and Examples of Stratified Samples: A Brief Review of this Method". (Accessed Online: from <http://sociology.about.com/od/Types-of-Samples/a/Stratified-Sample.htm>).
- [25] Digital Library Foundation (1998) "A Working Definition of Digital Library [1998]".(Accessed Online: from <https://old.diglib.org/about/dldefinition.htm>).
- [26] Document on Teaching the Source Code (2011) "What is Source Code?".(Accessed online: from https://quaid.fedorapeople.org/TOS/Practical_Open_Source_Software/Exploration/html/snIntroduction_to_Free_and_Open_Source_Software/What_is_source_code.html on 21/2/2017).
- [27] Dole, W. A. (2000). Values for Librarians in the information age. *Library Management*, 21(6), 285-286.
- [28] DSpace Organization (n.d.) About Dspace. (Accessed Online: from <http://www.dspace.org/introducing>).
- [29] Fadehan, O. A. and Ali, H. (2010) "Educational Needs of Librarians in the Digital Environment: Case Studies of Selected Academic Libraries in Lagos State, Nigeria". *Library Philosophy and Practice (e-journal)*. Paper 476.
- [30] Free Software Foundation (2016) "What is Free Software?".(Accessed Online: from <http://www.gnu.org/philosophy/free-sw.html>).
- [31] Gale, T. (2008) "Self-Awareness Theory". *International Encyclopedia of the Social Sciences*.(Accessed Online: from <http://www.encyclopedia.com/social-sciences/applied-and-social-sciences-magazines/self-awareness-theory> on 11/2/2017).
- [32] Glance DG, Kerr J, Reid A (2004). Factors Affecting the Use of Open Source Software in Tertiary Education Institutions. www.myresearchspace.grs.uwa.edu.au/files/folders/20/download.asp x.
- [33] Graham, P. (2017). *Requirements for the digital research library*. Retrieved from aulnits: <http://aulnits.rutgers.edu/texts/DRC.html>
- [34] Hague, M. (2011) Sampling Methods in Social Research. (Accessed Online: From www.Grmgrlaranya.Com/Journals/Sampling%20methods%20in%20social%20... on December 29, 2016).
- [35] Helmreich, M. (2011) *Best Practices of Adopting Open Source Software in Closed Source Software Products*. A Thesis submitted to the Institute for InformatikProfessurfür Open Source Software Friedrich-Alexander-Universität Erlangen-Nürnberg.
- [36] Hiong, G. O. H. S. (2005) Open Source and Commercial Software: An In-Depth Analysis of the Issues. *Business Software Alliance*.(Accessed Online: from http://www.wipo.int/edocs/mdocs/copyright/en/wipo_ip_cm_07/wipo_ip_cm_07_www_82575.pdf on 21/2/2017).
- [37] Idiegbeyan-ose, J., Nkiko, C. and Osinulu, I. (2016) "Awareness and Perception of Plagiarism of Postgraduate Students in Selected Universities in Ogun State, Nigeria." *Library Philosophy and Practice (e-journal)*. Paper 1322.
- [38] Jensen, M. (2006) Open access: Lowering the costs of international bandwidth in Africa. APC Issue Papers.(Accessed Online: from http://www.researchictafrica.net/images/upload/open_access_EN.pdf).
- [39] Johnson, K. Trabelsi, H. and Tin, T. (N.D.) "Library Support For Online Learners: E-Resources, E-Services And The Human Factors". Chapter 14. *Theory and Practice of Online Learning*.(Access Online: from http://cde.athabasca.ca/online_book/ch14.html on 21/12/2016).