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SERVICES FOR SCIENCE AND EDUCATION

The Level of Awareness, Knowledge and Perception of Linked Data by Library and Information Science Professionals in Nigeria

Okoroma, Francisca Nwakaego
Kenneth Dike Library, University of Ibadan, Nigeria

ABSTRACT

The internet is the most compelling capacity building tool, as it exposes various forms of human knowledge. This has resulted into an overwhelming use of the search engines by digital generation in their social, education and research activities. Surprisingly, only a very little fraction of libraries' digital collections are available on search engine results. Linked Data (LD) is an emerging set of standards and technologies that can potentially enable information systems such as libraries to publish their highly treasured wealth of knowledge, and interlink their hidden data on the web for better global accessibility. Linked Data having been presented as the future for library and information data management has triggered many institutions to experiment with it, and to learn more about the technology. Although technical challenges are paramount obstacles to the spread of LD across libraries, but the biggest issue can be attributed to lack of awareness on its potentials. This research focused on investigating the level of awareness, knowledge and perception of linked data by library and information science (LIS) professionals in Nigeria. The study made use of Survey research design, consisting of structured and open ended questions, distributed to LIS professionals in Nigeria. A total of 71 LIS professionals that spread across 17 institutions in Nigeria formed the participants for the study. The study portrays that LIS professionals in Nigeria perceive LD technology as a welcome innovative idea to facilitate records accessibility, and further move librarianship in Nigeria to the global best practices. But there is a drastic low level of knowledge on the subject of LD amongst the professionals, which is an impediment to the speedy implementation. To this effect, every institution in Nigeria needs to escalate discussions and trainings on the subject of Linked Data in order to foster the development of this powerful tool in shaping libraries collections' management.

Keywords: Linked Data, Level of Awareness, Perception, Library Professionals, Nigeria.

INTRODUCTION

The Semantic Web, also known as Web 3.0 or Web of Data originated from the popular World Wide Web and Web 2.0. Semantic web (SW) is an extension of the World Wide Web, whereby information is provided with well-defined meaning, with the benefit of a better cooperation between humans and machines. Linked Data conveys the practice and methods to actualize the SW version. Linked Data (LD) aims at enhancing and bring logic to the traditional web instead of creating another kind of web. Therefore, if SW is the goal, LD is the means to achieve it. (Bizer et al., 2009).The key principle of linked data is to publish structured data on the Web so that digitized materials including catalogue data can be accessed through the web search engines.

This is achieved by using Resource Description Framework and then interlinking the data items from different external data sources in order to produce a single global web of data. In doing so, the interlinked datasets can be reused, hence their relationships can be understood by both human and machine.

Tallerås (2013) collaborated that LD is an advanced version of the web, which enables relationships to be established not only between documents, but also between the elements and data, within documents. Van Hoolan and Verborgh (2014) opined that it was the frustration of having a web made exclusively of human-readable content that led to the development of the SW idea. The author described the Semantic web as an ambition to establish links between data across various domains, and to make machines capable of operating with these links. Linked Data aims to achieve the goal of the Semantic Web through the provision of a set of standards, data publishing models and methods that bring consistency, interoperability and shareability to unorganised and unidentifiable data on the web (Shiri & Davoodi, 2016). Linked Data is potentially a powerful concept and tool in shaping a new collections' data experience. Linked Data uses Uniform Resource Identifiers (URIs) as globally unique identifiers for any kind of resource, for authority control in traditional librarianship, to designate works, places, people, events, subjects, and other objects or concepts of interest.

Smith-Yoshimura (2020) argued that the concepts on how libraries engage in metadata cataloging will change with the use of linked data. This is necessary as the current MARC standards are not in compliance with LD principles. Paquet and Ray (2020) collaborated that for the library cataloging community, linked data is about pushing forward together, creating a group of data savvy catalogers who are engaged in making and enriching graphs of bibliographic data. It is obvious that the process is collaborative. She noted that the current work that is being carried out with reconceptualisation of bibliographic metadata as regards linked data concepts; is that it is important to think about description beyond the traditional format of MARC for bibliographic entities and to focus on community, context and entity qualities.

Ullah, Khusro, Ullah and Naeem (2018) in their overview of the state of linked and open data within the field of cataloging, identified the need for increase in conversation and collaborative efforts amongst professionals and catalogers outside of LAMs, as a means of advancing the development of a linked data environment for libraries with cross-domain learning and exchange and recognition of a global cataloging landscape. Collaborative effort will not only enhance brainstorming to solve LD related problems, and exchange of ideals and skills but it will in no small measure eliminate unnecessary duplication of efforts. Because Linked Data allows for the layering of commonly shared data about books and materials with library-specific information, such as location and availability, librarians won't have to repeatedly create the same data. With LD Catalogers will be able to channel their effort on their domain of local expertise, instead of re-creating existing descriptions that have already been established by others. There are so many other benefits to the deployment of Linked Data principles.

Library Linked Data Incubator Group (2011) reported that Linked Data approach offers significant advantages over current practices for creating and delivering library data while

providing a natural extension to the collaborative sharing models historically employed by libraries. Linked Data supports multilingual functionality for data and user services, such as the labeling of concepts identified by language-agnostic URIs. Again, the use of shared identifiers will allow for joining together descriptions for resources which are outside their domain environment, those across all cultural heritage datasets, and even from the Web at large.

Despite the numerous gains attached to LD, there is quit a slow rate of adoption across the globe, especially in African nations. This may not be unconnected with the various issues contending with LD implementation. Yoshimura (2018) reported that the three most significant Linked Data barriers were: "steep learning curve," "inconsistency in legacy data," and "selecting appropriate ontologies".

The pilot project's results (OCLC, survey 2018) suggest that solutions for mapping and describing existing bibliographic data into linked data are still in the developmental and progressive stage. The Authors stressed that removing data ambiguities related to entity definitions and descriptions is an ongoing area of research. The process of transitioning data into a different framework while achieving a semantic structure that maintains meaning and context from previous locally defined metadata requires a combination of skilled personnel and the use of computer-based tools and technology.

Warraich and Rorissa (2018) in their study found that the most challenging task in LD is to design Linked Data tools that match with the workflows and skills of information professionals. While Saleem and Warraich (2018) supported the findings of this study by identifing the technical, legal and conceptual challenges faced by libraries in the implementation of Linked Data technologies. To this end library and information science professional need to rise up to address and overcome these obstacles in order to facilitate the adoption rate of LD across board.

LaPolla's (2013) explored the potential of Semantic Web technology application to the library catalog and librarians' levels of understanding to the key concepts and attitudes regarding Linked Data. The study identified the barriers to implementing Linked Data, such as financial scarcity and lack of Semantic Web best practices. Its target population is library cataloguers from the United States.Other problems of LD in libraries are: Ownership problem, Software issues, Tools and facilities, lack of documented procedural activities for LD implementation, inadequate resources and the problem of selection of appropriate ontology. (Paquet and Ray, 2020).

Literature exposed a dearth of relevant literature on Linked Data and libraries in developing countries, especially in Nigeria, and research in these regions is very crucial due to developing nations have some peculiar characteristics which defer from advanced nations in term of level of automation, personnel skills, along with cultural barriers. Other research reports added that there is a crucial need for additional investigations towards advancing the use of linked data and linked open data as LD is not yet a household term for all in the Library and Information Science field. (Myntti, 2013, Smith-Yoshimura, 2018 and Neatrour, 2019). That means that the general lack of awareness among LIS Professionals is an obstacle that needs to be overcome.

With a low level of knowledge on a particular subject, perception on that subject will be blurred while implementation will continue to be elusive. This research seeks to investigate the level of awareness, knowledge and the perception of Linked Data technology adoption by library and information professionals in Nigeria.

Objectives

The general objective of this study is to find out the level of awareness, knowledge and perception of LD by library and information professionals in Nigeria.

Research Questions are:

1. What is the level of awareness of Linked Data by Library and Information Professionals in Nigeria?
2. What is the level of knowledge on the principles and benefits of Linked Data by Library and Information Professionals in Nigeria
3. What is the perception of Linked Data by Library and Information Professionals in Nigeria

METHODOLOGY

The study made use of Survey research design. Questionnaire instrument consisting of structured and open-ended questions was distributed to LIS professionals.

A total of 71 LIS professionals which spread across 17 institutions in Nigeria formed the participants for the study. The study adopted a high breed survey method for data collection. Both paper and online survey tools were deployed, as each augmented the response rate. Finally, the data was reported using simple frequencies and percentage.

FINDINGS

The research findings consist of the analysis of respondents' demographic details, and other data from the structured and open-ended questionnaire that helped to answer the research questions.

These are divided into four sections, A, B, C, and D. Section A, presents the Demographic representation of the respondents, Section B represents the level of Awareness of the respondents on Linked Data, Section C dealt with their level of Knowledge on Linked Data, while Section D expresses the respondent's perception on Linked Data.

Section A: The Demographic Characteristics of Respondents (N=71)

Table 1: Distribution of Respondents by Institution

Name of Institution	Frequency	Percentage
Alvan Ikoku Fed. College of Education Owerri	**42**	**59.2%**
Imo State University Owerri	**5**	**7.0%**
Adekunjo Olalekan	**1**	**1.4%**
Adeniran Ogunsanya College of Education	**1**	**1.4%**
Adeyemi Federal University of Education	**1**	**1.4%**
Federal Polytechnic, Ayede, Oyo State	**1**	**1.4%**
Federal University of Agriculture Abeokuta	**1**	**1.4%**
Federal University of Technology Owerri	**4**	**5.6%**
Ladoke Akintola University of technology, Ogbomoso	**1**	**1.4%**
Lagos state University of Education Oto Ijanikin Lagos State	**1**	**1.4%**
Mountain top University	**1**	**1.4%**
Nails Lagos	**1**	**1.4%**
Olabisi Olabanjo University	**1**	**1.4%**
Oyo State Library board	**1**	**1.4%**
University of Ibadan	**7**	**9.9%**
Uni, Dutse	**1**	**1.4%**
University of Lagos	**1**	**1.4%**
Total	**71**	**100**

From table 1 above, 71 responses were received for the study which spread across 17 higher institutions in Nigeria. The majority, 13 universities participated in the study, followed by 2 Colleges of Education and 1Polytechnic and State Library respectively. The majority, 42(59.2%) of the respondents were from Alvan Ikoku Federal college of Education Owerri, followed by the University of Ibadan and Imo State University, Owerri that had 7(9.9%) and 5(7.0%) participants respectively. Others are Federal University of technology Owerri with 4(5.6%) participants, while the rest of the respondents from the remaining Universities have 1(1.4%) respondent each.

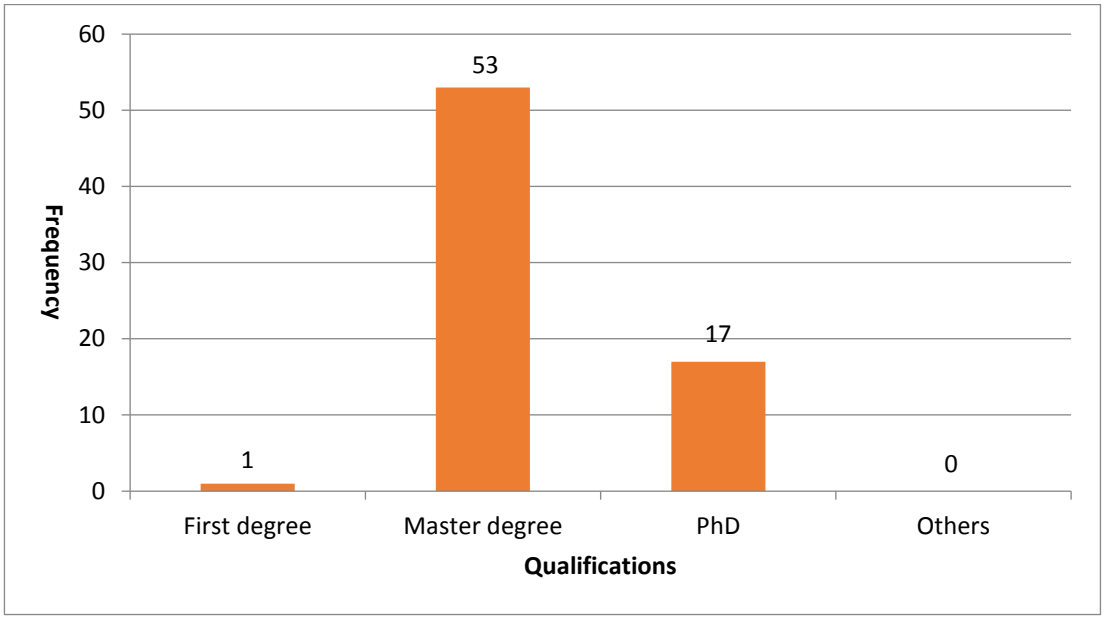


Figure 1: Respondents by Educational Qualification

Figure 1 indicates that most of the participants 53(74.6%) of the respondents have Master's degree as their highest Educational Qualification while 17(23.9%) of them have PhD, and only 1(1.4%) person has First degree.

Section B presents answers to **Research questions 1:** What is the level of awareness of Linked Data by Library and Information Professionals in Nigeria?

SECTION B: The level of Awareness of the respondents on Linked Data Technology

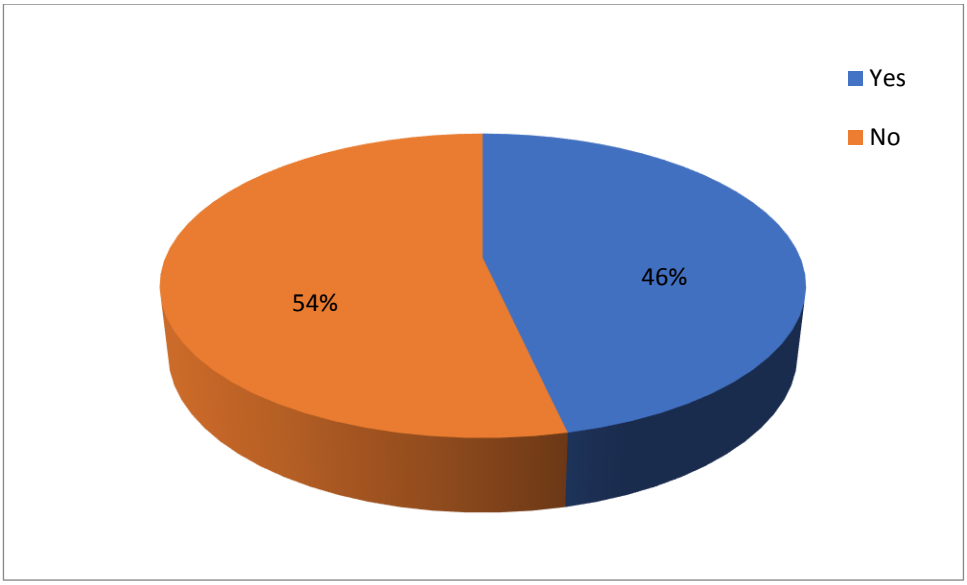


Figure 2: Aware of Linked Data Technology

Figure 2 shows that more than average of the respondents 38(53.5%) were not aware of Linked Data technology while 33(46.5%) were aware. That shows that many of Library and Information Professionals in Nigeria are not aware of Linked Data technology.

Table 2: How Respondents Learnt about LD

How did you learn about Linked Data?	Frequency	Percentage
Internet browsing	21	83.1%
From various knowledge of internet users	1	1.4%
I have written and published about LD in Libraries	1	1.4%
In a workshop	3	4.2%
In conference	1	1.4%
Reading	1	1.4%
Research	1	1.4%
School and interaction	1	1.4%
Through workshop/seminar organized by the institution	1	1.4%
Twitter	1	1.4%
Cat and class	1	1.4%

According to table 2, 21 out of the 33 persons that were aware of LD, learnt about it through their person efforts, by browsing on the internet. Three people affirmed they learnt about LD from a workshop they attended, while the other medium through which the rest of the respondents learnt about LD are: Conference attendance, Cataloguing and Classification workshop, Personal reading, Research activities, during lecture at School, and interaction with other colleagues. Again, some others learnt about the subject through seminars organized by the institution and Twitter. Interestingly one respondent reported that he had written and published work on LD in Libraries.

Distribution of Respondents by the Level of Awareness of LD

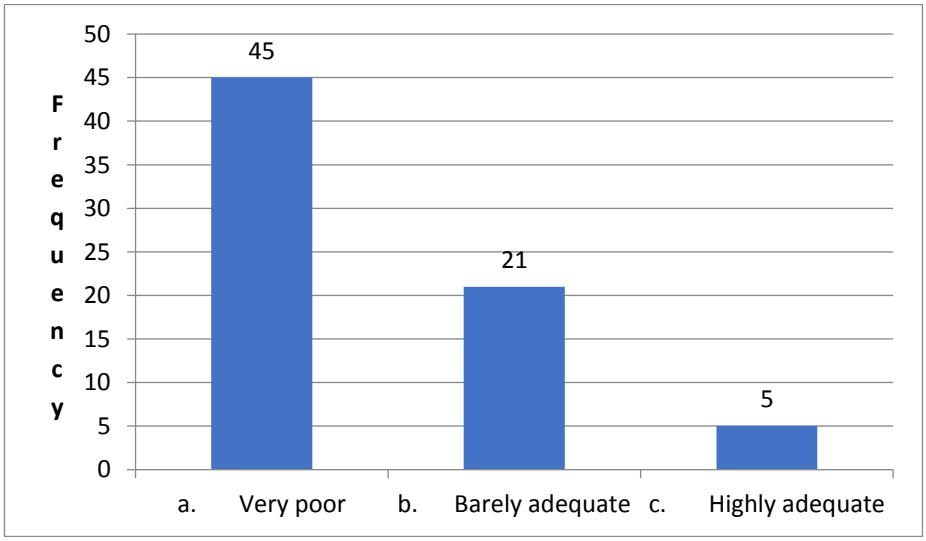


Figure 3: Rating the respondents' level of awareness of Linked Data?

According to figure 3, most of the respondents, 45(63.4%) rated their level of awareness of LD to be very poor, 21(29.6%) revealed that it is barely adequate and only 5(7%) of them rated it highly adequate. This shows that amongst scholars in Nigeria only a very minute fraction are well informed about LD.

Section C presents answers to Research question 2: What is the level of knowledge on the principles and benefits of Linked Data by Library and Information Professionals in Nigeria?

Section C: The Level of Knowledge on LD (including the objectives, potentials, benefits and challenges) by Library and Information Professionals in Nigeria.

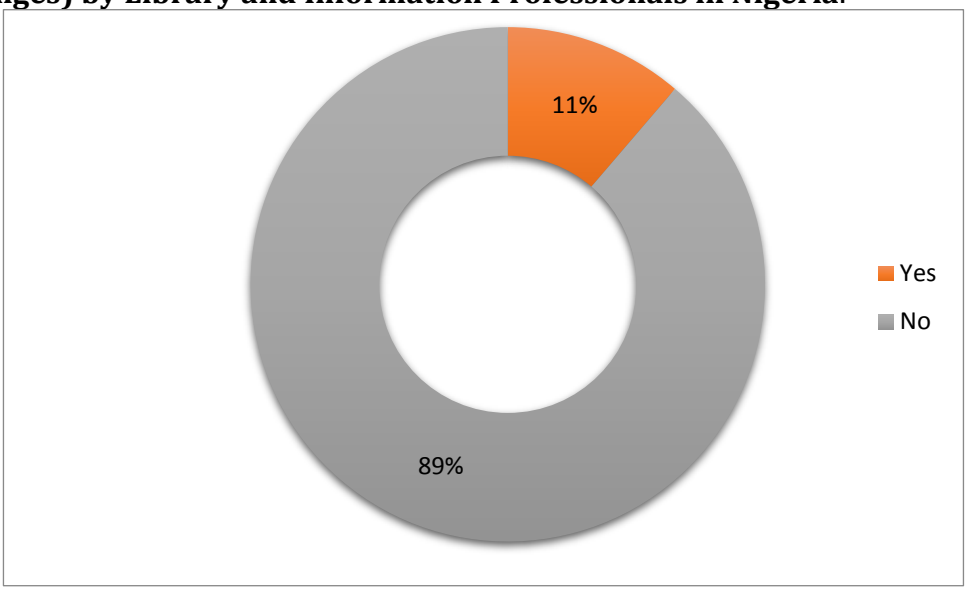


Figure 4: Respondents' in-depth knowledge on the subject of Linked Data?

From the figure 4, majority 63(88.7%) of the respondents said they do not have in-depth knowledge on the subject of Linked Data while a few of them 8(11.3%) affirmed to have an in-depth knowledge on Linked data.

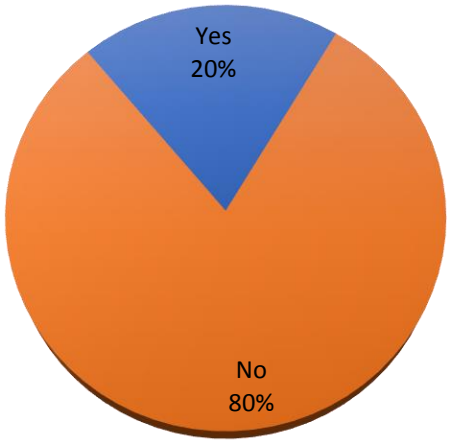


Figure 5: Level of Knowledge on the potentials of LD adoption to Libraries?

Figure 5 expresses that most of the respondents 57(80.3%) were not aware of the potentials of LD adoption by Libraries while only 14(19.7%) were aware.

Figure 6 reveals respondents' level of knowledge on the Aims/Objectives of Linked Data model

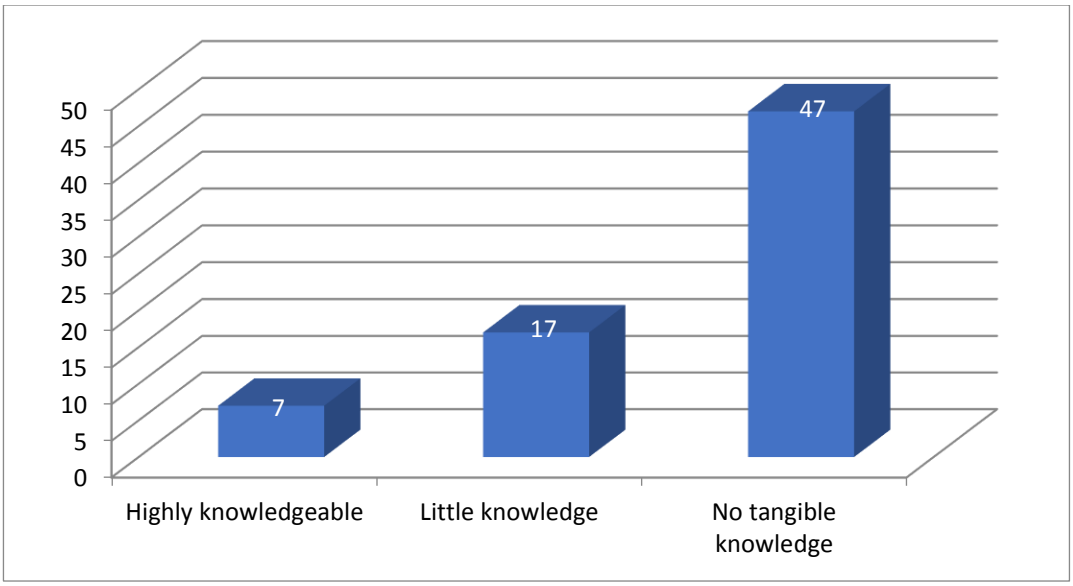


Figure 6: Level knowledge on the Aims/objectives of LD

Figure 6 shows that 47(66.2%) of the respondents have no tangible knowledge on the aims and objectives of linked data model, while 17(23.9%) of them opined that they had just a little knowledge on the aims and objectives, and only 7(9.9%) are highly knowledgeable on the subject matter.

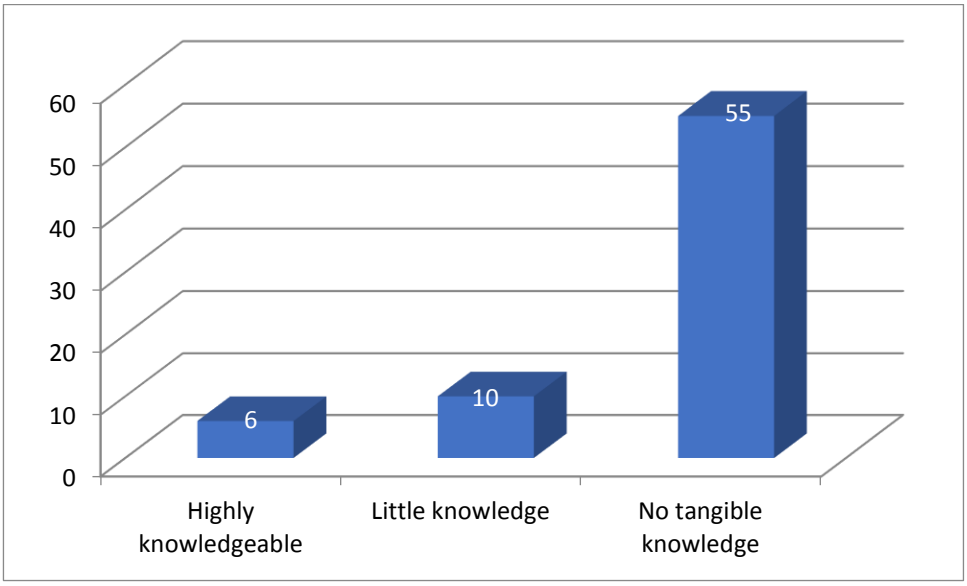


Figure 7: Benefits of LD

Similar to figure 6, figure 7 reveals that the majority 55(77.5%) had no tangible knowledge on the benefits of linked data model, while 9(12.7%) opined they had little knowledge and very few 7(9.9%) acknowledge that they were highly knowledgeable on the benefits of LD.

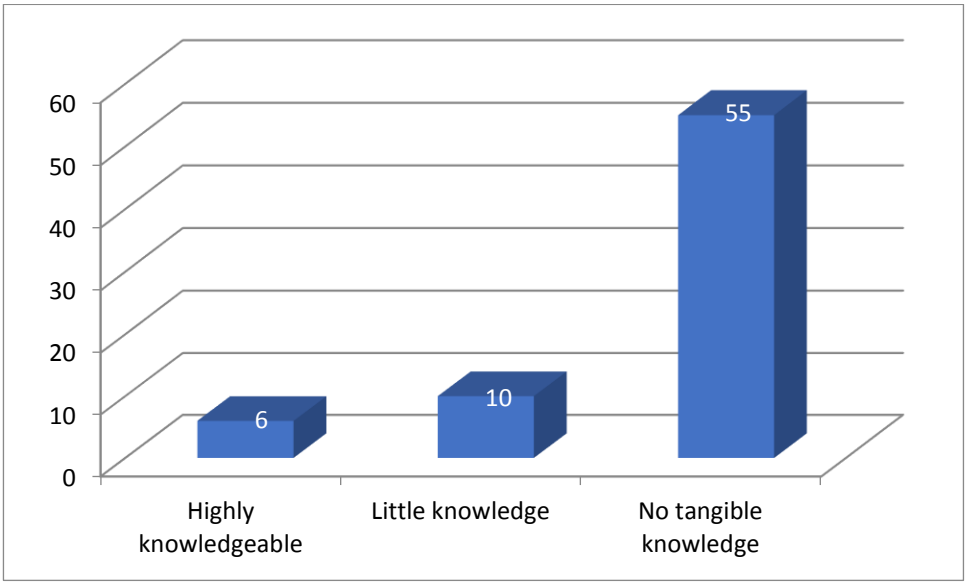


Figure 8: Level of knowledge on the challenges of LD

From the figure 8, 55(77.5%) of the respondents accepted that they had no tangible knowledge on the level of challenges of linked data model, while 10(14.1%) and 6(8.5%) said they had little knowledge and high level of knowledgeable on the challenges of linked data model respectively. It could be deduced that amongst Library and Information Professionals in Nigeria, the level of knowledge on the subject of LD is very low.

Section D presents answers to Research question 3: What is the perception of Linked Data by Library and Information Professionals in Nigeria?

Section D: The perception of library and information Science Professionals in Nigeria on Linked Data Technology.

Table 3: Extent of perception and belief on Linked Data Technology

Item	SA	A	D	SD	N	Remark
I like the idea of Linked Data in Libraries	20 (28.2)	47 (66.2)	4(5.6)			**Agree**
I am aware that libraries are moving away from MARC to LD model	9 (12.7)	57 (80.3)	3 (4.2)	1 (1.4)	1 (1.4**)**	**Agree**
I am interested in discussions on the subject of Linked Data	34 (47.9)	32 (45.1)	5 (7.0)			**Agree**
I am interested in attending programs: conferences /Workshops on the topic of Linked Data standards	23 (32.4)	44 (62)	3(4.2)	1 (1.4)		**Agree**
I believe that Linked Data technology:						
Holds many great values for libraries and their resource management/access	21 (29.6)	26 (36.6)	22(31)	2 (2.8)		**Agree**
Will soon become the global standard for creating library metadata and records	22 (31)	44 (62)	5 (7.0)			**Agree**
Will soon become a standard model for information resources management in Libraries	14 (19.7)	30 (42.3)	5(7.0)	18 (25.4)	4 (5.6)	**Agree**
Can facilitate navigation between the traditional onlinetools to access library resourceson the broader web environment	29 (40.8)	30 (42.3)	5 (7.0)	5 (7.0)	2 (2.8)	**Agree**
Adds little or no value to information resources management in libraries and library services	1 (1.4)	8 (11.3)	16(22.5	26(36.6)	20 (28.1)	**Disagree**
Is too complex to implement in libraries	5 (7.0)	3 (4.2)	20(28.2	35(49.3)	8 (11.3)	**Disagree**

Table 3 shows the breakdown of the perception of library and information science professionals in Nigeria on Linked data technology. The majority 67(94.4%) agreed that they like the idea of linked data in libraries and 66(93%) of them indicated they are aware that libraries are moving away from MARC to LD model. Also, 66(93.0%) affirmed they are interested in the discussions on the subject of linked data while 47(66.2%) respondents believe that linked data technology holds many great values for libraries and their resource management/access, and 24(33.8%) disagreed to this effect. As regards believing that linked data technology will soon become the global standard for creating library metadata and records, 66(93.0%) agreed while 5(7.0%) disagreed. From the table, 44(62%) agreed that linked date technology will soon become a standard model for information resources management in libraries while 59(83.1%) believe that linked data technology can facilitate navigation between the traditional online tools to access library resources on the broader web environment. Also, more respondents 42(59.1%) disagreed to the belief that linked data technology adds little or no value to information resources management in libraries and library services, and 55(77.5%) of the respondents disagreed to the belief that linked data technology

is too complex to implement in libraries, while few people 8(11.2%) agreed to this effect and 8(11.3%) were neutral. This shows that majority of LIS practitioners in Nigeria are positive and interested in the adoption of LD, though some are pessimistic about the adoption of LD, they feel that the procedure for its implementation is too complex and rigorous as well as financial intensive, therefore do not believe in the potential values that LD will deliver to libraries.

Table 4: Comments of Respondents on their Perception about LD technology adoption in Nigeria

Comments	Frequency	Percentage
It is a nice innovative development in library.	1	1.4%
Collection of data (information) will be easily accessible if documented properly.	18	25.4%
In terms of state of lecturer, records will be accessible and faster.	1	1.4%
It is a new development in the libraries system. Most lecturers are not aware of it.	1	1.4%
It is a welcomed development and will help libraries development and will add more relevance to our operation.	3	4.2%
It is very slow, many libraries are not yet MARC compliance	2	2.8%
It will add value to information resources management and library services in general	1	1.4%
It will be a good experience	1	1.4%
It will be a good innovation if all our high institutions adopt it in their libraries	1	1.4%
It will further move librarianship in Nigeria to global best practices if adopted	1	1.4%
It is a good step in the right direction	1	1.4%
Libraries should embrace LD for global access	1	1.4%
It is Needed and necessary	1	1.4%
No idea	1	1.4%
The issue of power disruption	1	1.4%

Table 4 shows the respondents expression (through the open-ended questions) on their perception about LD technology adoption in Nigeria. Eighteen persons made known that LD will make the collection of data (information) to be easily accessible if documented properly. Again, 3 respondents stated that it is a welcomed development, that it will help libraries' development as well as add more relevance to library operations. On the other hand, 2 persons considered adoption rate of LD to be very slow that many libraries in Nigeria are presently not yet MARC compliance how much more moving from MARC to BIBFRAME and LD adoption.

Other perceptions include the following: it is a nice innovative development in library as records will be accessible and faster, it will add value to information resources management and library services in general, it will further move librarianship in Nigeria to global best practices if adopted, it will be a good experience if libraries should embrace LD for global access,

it is needed and necessary, and it is a good step in the right direction. Finally, 1 person stated that power disruption is a challenge to its adoption.

DISCUSSION

The study portrays the state of awareness, level of knowledge and how LIS professionals in Nigeria perceive the adoption of Linked Data model for libraries. The findings revealed that most of the LIS professionals perceive that LD technology is a welcome innovative idea as records will be very fast in accessibility, as well as further move librarianship in Nigeria to the global best practices. The majority of LIS professionals in Nigeria are positive and interested in the adoption of LD technology; though some are pessimistic about the adoption of LD, they feel that the procedure for implementation is too rigorous and complex as well as financial intensive. While a few of them do not believe in the potential values that LD will deliver to libraries. This calls for a need to educate and orientate the mind set of LIS professionals towards the new model of bibliographic record management in libraries and the great potentials.

These findings are in harmony with literature, as Van Hoolan (2014) concurred that the complexity of the SW has slowed its expansion, particularly the expertise that it requires, with respect to publishing data and writing applications was initially too demanding for the majority of users.

The findings further revealed that less than average 33(46.5%) persons out of the 71 respondents have come across the term, and are aware of LD, while many are not aware of the new model. According to study, most of the respondents had no tangible knowledge on the objectives, potentials, benefits and challenges associated with the adoption of linked data model. For instance only 8 persons affirmed to have an in-depth knowledge on Linked data and 16 persons had just a tangible knowledgeable on the challenges of linked data model. Therefore amongst LIS professionals in Nigeria, the level of knowledge on the subject of LD is very low, as only a very minute fraction are informed about LD model. The poor knowledge on the principles and benefits of LD could be the reason why some professionals are bias about the adoption. This finding agrees with previous research findings e.g. Gillian Byrne and Lisa Goddard (2010) which stated that the concepts of linked data and the semantic web have not yet hit the consciousness of many librarians. Warraich (2018) collaborated that barriers do exist in the deployment of LD such as the general lack of awareness of basic Linked Data concepts and best practices for this emerging technology. Other researches stated that linked open data is not yet a household term for all in the Library and Information Science field. (Myntti & Cothran, 2013, Smith-Yoshimura 2018 and Neatrour & Myntti 2019).

To further advance the course of LD initiative, serious effort needs to be channeled to LD awareness and advocacy. As this is a key knob that drives every new project implementation.
The study exposes that most of the LIS practitioners who are aware of the term learnt about it through their personal efforts e.g. by browsing on the internet, Twitter handle, personal reading, and interaction with other colleagues. While some others learnt about LD through Conferences, seminars and workshop attendance, some of which were self sponsored and some were organized by their institutions. And the rest of the respondents learnt about LD during their lecture classes at school, and research activities. That means that there are discussions

and programmes presently activated on the topic in the nation, and LIS practitioners are already taking part in these activities. That is a point towards the right direction. However these activities need to be enhanced for many of the professionals to take active part. This collaborates Ullah, (2018) findings that there is need for increase in conversation and collaborative efforts amongst professionals and catalogers which is a means to advance the development of a linked data environment for libraries with cross-domain learning, and exchange and recognition of a global cataloging landscape.

To this effect, every institution in Nigeria needs to boost the conversation on LD by pioneering and funding appropriate programmes and trainings tailored towards the development of LD. Such will inadvertently augment the awareness, level of knowledge and positive perception of LIS practitioners on LD technology adoption. The content of the conferences, seminars and trainings should be such that will center on the potential benefits, successful experiences of some libraries that have previously implemented LD, as well as reveal answers to envisaged fears and challenges towards taking bold step in LD implementation. Again, LIS professionals need to leverage on these appropriate conferences, seminars and symposia.

It should be born in mind that without adequately and intentionally mobilizing the LIS professionals with sufficient skills, in-depth knowledge on the values, procedural activities and ways to overcome challenges in LD, the full adoption will still be a mirage. Interestingly, the study affirms that LIS professionals in Nigeria believe that linked data technology holds many great values for libraries and their resource management, and the model will facilitate navigation between the traditional online tools to access library resources on the broader web environment.

CONCLUSION

Though, most of LIS professions in Nigeria are yet to have any rudimentary knowledge on the subject of Linked Data, which is a basic factor for its adoption, successful implementation and sustenance. However, the professionals view LD as a tool that will make the collection of data in libraries very easily accessible if documented properly, as well as add more value to library operations, information resources management and library services in general.

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