

Populating Institutional Repositories in Nigeria using Research Data: Challenges and Prospects

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Abstract

Institutional Repositories (IR) are the storehouse of knowledge and intellectual outputs emanating from a research institution. The contents vary from journal articles, conference proceedings, inaugural lectures, theses and dissertations, and research data (datasets). Research data is any information that has been collected, observed, generated or created to validate original research findings. This study explored the prospects and challenges of depositing research data in the IR focusing on university libraries in the five federal universities of technology in Nigeria namely: Federal University of Technology Minna (FUTMIN), Federal University of Technology Owerri (FUTO), Federal University of Technology Akure (FUTA), ModibboAdama University of Technology Yola (MAUTECH), and the Abubakar Tafawa Balewa University Bauchi (ATBU). Four (4) research questions were formulated while qualitative data was collected from the five University Librarians using interview guide. Thematic analysis was used to analyse the data and findings revealed that four FUTs have an existing IR although there is low upload of research data on the repository. Librarians have the required skills to offer research data management services, even though the service is yet to be deployed to researchers in the university community. Recommendations include the need for continuous advocacy by the library on research data management and policy formulation by the university management to encourage the need for depositing research data in the Institutional Repository.

Keywords: FUTs, research data, research data management, institutional repository, library, Nigeria.

Introduction

An Institutional Repository (IR) is an archive for collecting, preserving, and disseminating digital copies of the intellectual output of an institution, particularly a research institution. According to Lisbdnetwork (2022), an institutional repository can be seen as a library, an

archive, a museum, or even a warehouse that stores an organization's records or artefacts for use and safekeeping. In recent years, IR has taken on a more specific, but still evolving meaning that refers to the storage and preservation of an organization's digital information or knowledge assets. An institutional repository is a powerful vehicle for hosting and sharing accumulated knowledge, showcasing a university's accomplishments in academic research, and earning peer recognition.

Institutional repositories, usually managed by a university's library, are where the research work of faculty members can be collected and collated for future reference and dissemination. Prakash (2018) describes an institutional repository as an online archive of the intellectual output created by the faculty and researchers of an institution to enhance visibility and promote free access to the research at a single interface. The repository may either contain all the subjects of the study of an institution or it may be subject-specific, depending on the capacity and interest of the institution.

Researchers and the broader academic community, as well as the general public in some cases, can benefit from the research of others. A repository makes it easier to fulfil one of the core missions of any serious researcher and every research university i.e. to share knowledge gained and discoveries made. With access to an up-to-date, comprehensive research repository, valuable information on experiment results, gathered data, and specialist analysis can all be found, used and built upon (ExLibris, 2021).

The institutional repository plays a critical role in research information management, as well as supporting compliance with open access policies and funder requirements. Institutional repositories were created to collect, preserve, and make available the academic institution's scientific output (Konstantinos & Ekaterini, 2022).

They are information systems capable of capturing, preserving and providing access to the intellectual output produced by the members of an institution. Within the specific context of academia, institutional repositories may help raise the prestige of their parent institution since it manages and preserves relevant informational items that would otherwise remain scattered, unattended or inaccessible.

Some of the main objectives for having an institutional repository are to provide open access to institutional research output by self-archiving in an open access repository; to create global visibility for an institution's scholarly research; and to store and preserve other institutional digital assets, including unpublished or otherwise easily lost materials (grey literature) such as theses, working papers or technical reports, as well as research data (datasets).

Despite the numerous benefits of institutional repositories, studies have shown the low content and poor patronage of the IR for safe keeping intellectual outputs emanating from the host institutions. Furthermore, research data (datasets) are rarely submitted to the IR for long-term preservation and reuse. This study focused on the five federal universities of technology in Nigeria namely- Federal University of Technology, Minna; Federal University of Technology, Owerri; Federal University of Technology, Akure; Abubakar

Tafawa Balewa University, Bauchi; and ModibboAdama University of Technology, Yola; with specific reference to the status and content of institutional repositories in those institutions. To understand this, the following research questions was formulated:

1. How many federal universities of technology in Nigeria own an institutional repository?
2. What intellectual contents are uploaded on the institutional repository?
3. Do librarians possess the skills required to manage research data on the institutional repository?
4. What are the challenges and prospects of implementing research data management services and institutional repositories?

Literature Review

Institutional repository has similar features and characteristics which sometimes make them distinct from a database or just a storage system. Gibbons (2004) identifies the five core features of an Institutional Repository:

1. It is institutionally defined- unlike a subject repository; the Institutional Repository captures only the intellectual output of the host institution.
2. Content may be purely scholarly or may comprise administrative, teaching and research materials, both published and unpublished.
3. It is cumulative and perpetual. Once items are submitted, they should not be withdrawn. This carries with it a long-term obligation on the host institution to preserve Institutional Repository content.
4. It is open and interoperable; a primary goal of an Institutional Repository is to disseminate the institution's intellectual output. Therefore, it is easily accessible from any part of the world.
5. it contributes to the process of scholarly communication since an institutional repository can be used in collecting, storing and disseminating information.

Information Resources found in Institutional Repositories

An Institutional Repository may contain a variety of material produced by the researchers of the institution like:

1. Preprint of articles or research reports submitted for publishing the text of journal articles accepted for publication.
2. Revised text of published work with comments from academic readers.
3. Conference papers.
4. Teaching materials.
5. Undergraduate student projects.
6. Masterstudents' projects.
7. Doctoral theses and dissertations.
8. Database resulting from research projects.
9. Committee papers, administrative papers.
10. Computer software and work of art.
11. Photographs and video recordings.
12. Research data (datasets).

One important research-related information resource that is often missing in institutional repositories, and is the focus of this study is research data or datasets underlying researches conducted in academic institutions.

Research Data

Research data are sources or materials created or collated by a researcher to conduct a research project. They can be **digital or non-digital**. Research data is any information that has been collected, observed, generated or created to validate original research findings (University College London, 2015). Research data comes in many different formats and is gathered using a wide variety of methodologies.

Research data may be in any of these forms:

- documents, spreadsheets
- laboratory notebooks, field notebooks, diaries
- questionnaires, transcripts, codebooks
- audiotapes, videotapes
- photographs, films
- test responses
- slides, artefacts, specimens, samples
- collections of digital outputs
- data files
- database contents (video, audio, text, images)
- models, algorithms, scripts
- contents of an application (input, output, logfiles for analysis software, simulation software, schemas)
- methodologies and workflows
- standard operating procedures and protocols

Types of Research Data

Chrisantus (2022) highlights that research data may be grouped into four main types based on methods of collection- observational, experimental, simulation, and derived.

Observational Data

Observational data are captured through observation of a behaviour or activity. It is collected using methods such as human observation, open-ended surveys, or the use of an instrument or sensor to monitor and record information. Because observational data are captured in real-time, it would be very difficult or impossible to re-create if lost. An example of observational data can be, a researcher stopping random people on the street to ask how many children they have, then taking this data and using it to decide if there should be more schools in that area.

Experimental Data

Experimental data are collected through active intervention by the researcher to produce and measure change or to create a difference when a variable is altered. Experimental data typically allows the researcher to determine a causal relationship and is projectable to a larger population. This type of data is often reproducible, but it often can be expensive to do so. An example of experimental data is a researcher providing availability and accessibility of library materials to a group of students while another control group is denied such access. By the end of the semester, the control group may show no improvement in academic performance, while the group that was granted access to available resources in the library will perform considerably better.

Simulation Data

Simulation data are generated by imitating the operation of a real-world process or system over time using computer test models. For example, to predict weather conditions, economic models, chemical reactions, or seismic activity. This method is used to try to determine what would, or could, happen under certain conditions. The test model used is often as, or even more, important than the data generated from the simulation. Another example of simulation data can be seen in the dummy crash tests automobile companies carry out on their vehicles to ascertain the level of damage a crash would inflict on an occupant of the vehicle and how best to circumvent damage.

Derived/Compiled Data

Derived data involves using existing data points, often from different data sources, to create new data through some sort of transformation, such as an arithmetic formula or aggregation. For example, combining area and population data from the Twin Cities metro area to create population density data. While this type of data can usually be replaced if lost, it may be very time-consuming (and possibly expensive) to do so.

Benefits of Populating Institutional Repositories with Research Data

Libraries are in the business of enriching their collections with current information resources, therefore, populating the institutional repositories with research data will be a welcome development in promoting quality research and research outputs in academic institutions. It will also form part of the content that the IR can be populated thereby reducing the challenge of low contents in IRs especially in Nigeria. The following are some of the benefits of storing research data in institutional repositories:

Curbing research repetitions: Institutional repositories need to contain research data alongside other information materials as it would prevent researchers from repeating a survey that has just been recently carried out by other researchers on that same study or group. This would not just save time, money and effort but also ensure that research on a particular variable is not repeated.

Reducing stress in going through psychometric processes of research instruments: Populating institutional repositories with research data helps researchers in reducing or completely avoiding the psychometric process of determining the statistical method to use in data analysis, the combination of prior information with measured data, a measurement

obtained from special experiments, visualization of statistical outcomes etc. Researchers might not need to worry about all of that if such data already exist in the institutional repository, they could just access those research data and reuse the data for their research work.

Preservation and ease of access: Preservation of research data ensures the longevity of and continued access to your data. Repositories allow for the storage and easy retrieval of many types of institutional information and research data. If repositories are populated with research data, it will ensure continuous and unlimited access to such research data. Researchers can access those research data years later while surveying a similar field or subject. Repositories offer institutions the opportunity to organize and maintain all of their scholarly documents in one location which is accessible to everyone in the University community as well as the global community.

To Improve on an existing research study: A researcher might decide to work on already existing research, especially when the findings of such research are now considered obsolete. If the raw research data of the previous research study was stored alongside the main work, the new researcher can easily build on that and collect new data to publish an updated version of the study. This might be harder or even impossible to accomplish if the research data of the previous work is not stored in the institutional repository, as the new researcher may have to start the work from scratch, and might not be able to fully determine all components used by the previous researcher.

Combating falsification of research results published in scholarly work: By storing research data alongside the main project work in institutional repositories, we can prevent falsified research results from being published, as the work can easily be reviewed using the research data provided. Discrepancies and errors can be easily identified when the research data of a scholarly work is compared with the main work.

Research Data Management (RDM) Stakeholders

Pinefield *et al.* (2014) gave the following as stakeholders involved in any successful data management process:

- i. Primary researchers (faculty staff, graduate students, research assistants)
 - design the study
 - specify what data will be collected
 - determine how to analyse data
 - draw conclusions from these analyses
- ii. Institutions (Universities and Research Institutes)
 - set internal data management policies
 - provide data management resources like data management training kit, data management plans support.
- iii. Library (Librarians)
 - curate data

- ensure the long-term preservation of data
 - provide access to data
 - gives training and advisory support to researchers on data management
 - work with institutional repositories to ensure data is useful over time.
 - In conjunction with primary researchers, they determine and decide access restrictions to data including those ordered by the institutions, funding agencies as well as copyright and intellectual property concerns.
- iv. Research Office
- Inform researchers on latest requirements of funding agencies
 - Provide information on data management plans
 - Guide researchers on grant proposal writing and research best practises.
- v. Information Technology Service (ITS) Unit
- responsible for storage space allocation
 - ensuring security of the repository
 - offer technical IT support

The varieties of stakeholders suggest the need for proper data management throughout the research lifecycle. This requires communication and corporation between these various groups.

Methodology

This study used exploratory research design to identify the prospects and challenges of populating institutional repositories with research data. Five (5) university librarians across the five federal universities of technology in Nigeria namely: FUTMIN, FUT Akure, FUT Owerri, ATBU Bauchi, and MAUTECH Yola, were used for this study. Interview guide was used to gather qualitative data from the university librarians. All participants signed an informed consent form and responses were recorded and transcribed verbatim. Interviews were conducted in respondents' offices and took approximately 12-25 minutes per session. Data analysis was done using the Braun & Clarke (2006) thematic analysis approach. Findings from thematic analysis were used to answer the research questions that guided the study.

Results and Discussions

Research Question 1: How many federal universities of technology in Nigeria own an institutional repository?

FUTMIN, ATBU, FUTA, and FUTO all have an institutional repository except MAUTECH that are working to deploy theirs soon.

Research Question 2: What intellectual contents are uploaded on the institutional repository?

FUTA has a dedicated digital repository where research data are kept while ATBU is still working on creating a database for research data. Other university libraries are yet to record any research data submission. Other contents found on the IR are journal articles, inaugural lectures, conference papers, theses and dissertations.

Research Question 3: Do librarians possess the skills required to manage research data on the institutional repository?

Librarians are exposed to continuous professional development programs to cope with emerging trends in research data management and sharing. Most university libraries specifically ATBU, FUTA, FUTO and FUTMIN encourage this and such developmental programmes were organised both internally and externally and funded either by Tertiary Education Trust Fund (TETFund) or through international funding agencies that supports Continuous Professional Development (CPD) programmes. They however noted that such training programmes might not specifically be on research data management.

However, regarding librarians' ability to provide access to research data by means of standard metadata generation, librarians in FUTMIN, FUTO have the required skills; some of the librarians in FUTA; and none in ATBU and MAUTECH possess such skill at the moment .

Research Question 4: What are the prospects and possibilities of research data management and institutional repositories?

The following are identified challenges, prospects, and possibilities as derived from responses:

Challenges of Populating IR with Research Data

- The “file-drawer problem” of researchers and their inability to upload on the IR.
- Data stored on personal hard-drives or on media which are largely undocumented and prone to loss, theft, or mismanagement.
- Data creators not always aware of its potential value.
- Copyright and intellectual property rights issues.
- Lack of IR or poor management of available IR by the library and ITS units.
- Librarians' competency and willingness in terms of continuous advocacy and training.

Prospects and Possibilities of IR and RDM

The following are observable prospects for a successful research data management in federal universities of technology in Nigeria:

- The open access principles and increasing awareness of the benefits such as increased visibility and citations among researchers.
- Development of copyright statement around the use of IR in some universities- MAUTECH and FUTMIN are yet to have Intellectual Property Rights policy guiding the use of their institutional repository while other universities have one guiding them.
- Request for an online link to researchers' publications for promotions and related appraisals, same online link can be requested for the underlying research data (datasets) as well.
- Request from funders and international publishers on the need for incorporating research best practices to meet up with global standards for collaboration and sharing.

Conclusion and Recommendations

The benefits of preserving research data in the institutional repository cannot be over emphasized. It is time for librarians and information professionals to start the RDM conversations with researchers so that they can be aware and willing to use the IR for the benefits of the research community. Librarians should not relent on improving the advocacy for research data management and data literacy and its impact on research and development in Nigeria.

Library and university management should resuscitate efforts towards developing and sustaining the Institutional Repository (IR) and formulating policies that supports research data deposit on the IR.

Finally, whatever solution is deployed should be adequately funded to help in meeting its objectives. Provision of facilities which includes current and up-to-date institutional repository's software and hardware, continuous training and retraining on benefits of open access and open data and uploading same on institutional repository, consideration of staff welfare and professional development, synergy between the library and ITS unit and repositioning the library as a Hub within the university will all help to achieve an effective research data management in the universities.

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