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Breaking the Ice of Research Output through Repository System for Nigerian Research Institutes using Web Technology

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Abstract*:*
This work is on the development of a web based research outputrepository system with a view to addressing the problems of poor preservation and dissemination of research outputs emanating from research institutions and validated research outputs from tertiary institutions in Nigeria. System development life cycle methodology was adopted in designing and implementing the web based research output repository system.Application programs written and tested in isolation worked properly when integrated into the total system to provide a user friendly environment. A web based research output knowledge repository (ROKR) system is an online system that serves as a centralized storage for research outputs emanating from research and tertiary institutions in Nigeria. It facilitates easy retrieval of research information by end users, gives an update on research outputs for the continuation of past research works and promotes collaboration of research interest among researchers. It therefore provides a single pool which is instrumental in creating awareness, increasing accessibility and visibility of research outputs.

Keywords*: Research output,Research Institutes, Knowledge Repository, ROKR, knowledge exploration*

1. Introduction

Pelosi, Sandifer and Sekaran (2001) view "research as the process of finding solutions to a problem after a thorough study and analysis of thesituation and data". For centuries, institutional libraries and scholarly publishing was the conventional model adopted in preserving and disseminating knowledge from academic and research institutions.Whereas institutional libraries housed research outputs in the form of grey literatures, thus playing a greater role in terms of preservation than dissemination, scholarly publishing played a much greater role in terms of dissemination through scholarly journals (Christian, 2008). In this age of information and communication technology (ICT), the use of the Internet has become the norm and the world-wide web has now established itself as one of the fastest growing technologies in the computer world. There are about 110 universities, 103 polytechnics and about 40 research institutes carrying out researches in various disciplines in Nigeria, examples are The Nigerian institute of medical research (Medicine), National cereals research institute (Agriculture), Nigerian institute of social and economic research (Social science), University of Ibadan. Research outputs from research institutes and validated research outputs from tertiary institutions in Nigeria are still poorly preserved and disseminated, despite the presence of the internet.These research output most times are kept in form of prints (manual) covered by dust in various libraries of such institutions. Most of these institutions have websites that are static, non functional and non interactive with little or no relevant research information that can be deduced from such sites. There is also no centralized online repository where research works can easily be accessed at the click of the mouse leading to searching of each institution's website for information.

Unavailability of a dynamic centralized repository has consequently led to low awareness of research outputs by people, as well as the researches being carried out. Validated research works from tertiary institutions are also not commonly known.These research findings die at the institutional level as those who need to benefit and apply the knowledge are unable to access them. Also collaborative research among these research and tertiary institutions is often rareresulting to duplication of effort.

Sequel to this observation, this work develops a web based research repository systemwith a view to addressing the observed issues. The Research output repository system is a form of Knowledge Repository in Knowledge Management. It is capable of serving as a centralized storage to research outputs emanating from research institutions and validated research works from tertiary institutions, facilitating easy retrieval of research information by end users through a multiple search options, giving an update on research outputs for the continuation of past research work and promoting collaboration of research interest among researchers in Nigeria and other developing countries. A repository is like a growing organism which accumulates with universities and research institutes which have the mandate to continuously produce knowledge through teaching, learning and research (Ezeani&Ezema, 2011).

This paper is divided into five sections. Section 1 introduces the paper, section 2 discusses related literature, section 3 discusses the research output repository system design, section 4 is on results and the paper is concluded in section 5.

2. Related Literature

2.1. Theoretical background

"Knowledge is information combined with experience,context, interpretation and reflection" (Davenport, 1998). Also, knowledge is defined as facts with its attributed meaning, where meaning is a function of an observation, learning, experience, and understanding of a reality in a particular situation or context at a specific period of time by an individual (Oladejo et. al, 2009). Knowledge is classified into two types, explicit and tacit. Tacit knowledge represents internalized knowledge that an individual may not be consciously aware of, such as how he or she accomplishes particular tasks. On the other hand, explicit knowledgerepresents knowledge that the individual holds consciously in mental focus, in a form that can easily be communicated to others (Alavi&Leidner, 2001).

"Knowledge management is a process of identifying, capturing, and leveraging the collective knowledge in an organization to help the organization compete" (Von, 1998). According to Davenport and Prusak (1997), most knowledge management projects have one of three aims: (1) to make knowledge visible and show the role of knowledge in an organization, mainly through maps, yellow pages, and hypertext tools; (2) to develop a knowledge-intensive culture by encouraging and aggregating behaviors such as knowledge sharing (as opposed to hoarding) and proactively seeking and offering knowledge; (3) to build a knowledge infrastructure- not only a technical system, but a web of connections among people given space, time, tools, and encouragement to collaborate.

Knowledge Management captures and organizes knowledge from knowledge repository. Thus, organizations generate value from knowledge repository for their intellectual and knowledge based assets.An organization's knowledge is systematically captured, organized and categorized through a computerized system called knowledge repository. According to Dieng et al (1999), knowledge repository is being referred to as a database commonly called "corporate memory or organizational memory", that is, a structured set of knowledge related to the firm experience in a

given domain.For the context of research institutes, knowledge on research outputs could be acquired, validated, codified and stored in a repository with the aim that it will be useful to researchers and the public. Consequently, this approach would allow researchers to share their knowledge and also to reuse codified (explicit) knowledge.

2.2. Review of RelatedWork

2.2.1. Scivee

SciVee was named by combining the words "science" and "video". Launched in 2007, the primary goal of SciVee was to create a website for scientists and researchers to enable them to promote their work and collaborate, since according to Phil Bourne, co-founder of SciVee, "the text-only world of scholarly publishing no longer suffices in the age of the Internet video and social media." (Meredith, 2010) With its inherent "do-it-yourself" service, researchers can integrate a video commentary with their scientific publication, which will "enliven their Web presence" and "satisfy their audience's need for dynamic content" (Meredith, 2010).SciVeeis a website where researchers, students and educators can upload and share their published scientific articles (including posters and slides) and integrate them into a video called a "PubCast", which allows authors to discuss and highlight the important points of their published articles (displayed next to the video) while relevant text or figures synchronously appear (Fink & Bourne, 2007). This innovation in scientific and scholarly communications enhances knowledge discovery and collaboration. SciVee makes the process of creating and consuming scientific literature more enjoyable and accessible. Video content ranges from dense and highly technical explanations of scientific publications to elementary school level science. Unregistered users can watch the videos and use the provided embed code to vlog to videos into external websites, while registered users are permitted to upload an unlimited number of videos, synchronize scientific documents, add commentary to the site, create public profiles, and join or create communities. SciVee is privately owned and accept all research works without restrictions. Registration is free and provides access to a full social networking service that allows registered members to interact with other members through private messaging, blogging, and open community discussions.Researchers from social sciences, law, education, and artdisciplines are not the primary audience for the website.

2.2.2. Mendeley

According to Jason (2009), Mendeley is a desktop and web program for managing and sharing research papers, discovering research data and collaborating online. Created in 2007 in London, Mendeley draws its name from the biologist Gregor Mendel and thechemist Dmitri Mendeleyev whose research looked at cross pollination of plant traits and the prediction of undiscovered chemical elements.It combines Mendeley Desktop, a PDF and reference management application (available for Windows, Mac and Linux) with Mendeley Web, an online social network for researchers (Henning and Reichelt, 2008).Mendeley requires the user to store all basic citation data on its servers - storing copies of documents is at the user's discretion. Upon registration, Mendeley provides the user with 1 GB of free web storage space, which is upgradeable at a cost. It is concerned with the most popular discipline(biological sciences) alone. The web importer allows the importing of webpages andarticlesfromacademicdatabasessuchasISI,EBSCO,andJSTOR,amongothers,although it takes "snapshots" of article pages, rather than importing full citation or folder information.

3. Methodology for Research Output Knowledge Repository System

The System Development Life Cycle methodology was adopted in this work. Existing systems investigated, analyzed and evaluated through interviews and questionnaire techniques reveal that research outputs are preserved manually and disseminated isolatedly by research and tertiary institutions through workshops, seminars, conferences, television documentaries, journals and

periodicals produced by such institutions. Only few institutions having soft copies of works with their ICT/computer departments. With the existing methods, so much energy and time is dissipated in going through paper works. Secondary data obtained from journals, internet and the various institutions websites show that most institutions have static, non interactive websites with little or no relevant research information.

3.1. Use case model for research output Knowledge repository system

The use case diagram in figure 1 is a graphical representation that describes a sequence of interactions between the actors (who is using the research repository), and the research repository system. Use case diagram was used to gather the requirements of the research output repository system. These requirements are mostly design requirements. The use case diagram shows the description of the activities the research output repository system must carry out.

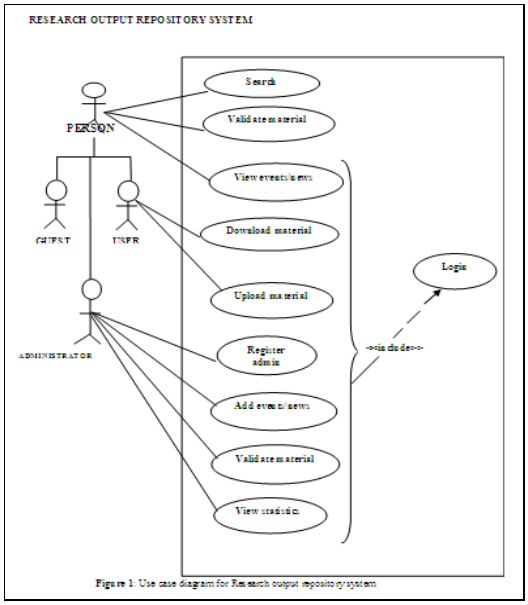

Figure 1

- **ACTORS:** An actor is external to a system, interacts with the system and has goals and responsibilities to satisfy in interacting with the system. The actors of the system are guest, user and administrator.
- **USE CASES:** Use cases of this research output repository system are: search, view material, view events/news, download material, upload material, register administrator, add events/news, validate material and view statistics.

The use case diagram describes the system functions from the perspective of the person who initiates system activities: guest, user, and administrator. The guest to the web based research output repository system can be anybody and does not have to log in to interact with the system the guest can perform the following functions: view materials on the page, view events/news and search for items in the repository. The user can be students, researchers, entrepreneurs, organizations, and whosoever that needs to register to login to interact fully with the system. A user can view events/news, search for materials, upload and download materials. Materials uploaded by users will be validated by the administrator who can register other administrators, other functions include: adding, editing and viewing events/news, uploading and downloading materials and also have access to statistics of activities in the repository this include number of research institutes and their works. Security requires passwords for users to login. An administrator has full access to other user accounts and can change all account settings

3.2. Research output Knowledge Repository system (ROKRS) Architecture

The Architecture of Research Output Knowledge Repository System (ROKRS) is shown in figure 2.This transforms the requirements statements from the requirements analysis phase into design specifications for construction.The researchers apply their intellectual prowess in the investigation of matters to give an output. The research outputs from various research institutes and supervised and validated research work from tertiary institutions are captured and preserved by uploading the research works which can be in different formats such as text, pdf, audio etc in a Knowledge repository that serves as a harmonized memory for easy exploitation by researchers. Students, researchers, entrepreneurs and organizations interested in research can access and retrieve research information through search via the web portal.

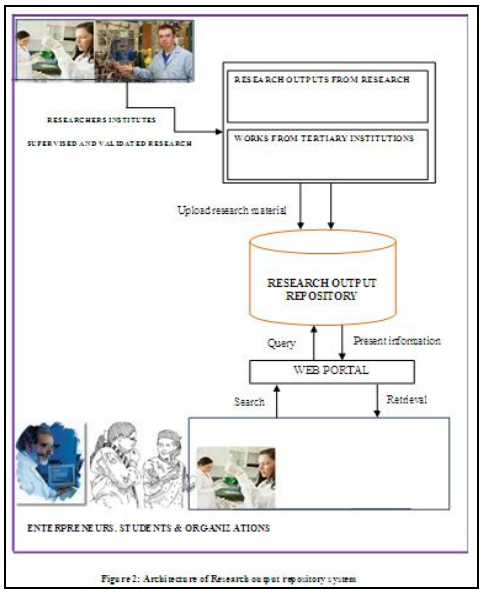

Figure 2

4. Results and Discussions

The Research output Knowledge repository system (RORKS) is a web-based application developed using MySQL and Hypertext Preprocessor (PHP) for the backend and macromedia dream weaver for designing the front end. The combination of database (Mysql) and server side scripting language enabled the creation of dynamic web pages in which the content varies based on the interpretation of the script being run on the web page. Application programs written and tested in isolation worked properly when finally integrated into the total system to provide a user friendly environment that makes the system to be capable of acquiring research works in different format such as text, audio, pdf, multimedia files. The system was also simulated with a prototype from various research institutions to validate the objectives of this work.

4.1. Research Output Tracks

Figure 3 shows the research output tracks' interface and it comes up when the system is launched. This research output tracks' interface allows guest to view events and news, view recent research works and previous works in the research output repository system. Research works can be in different formats: pdf, documents, audio, multimedia files.

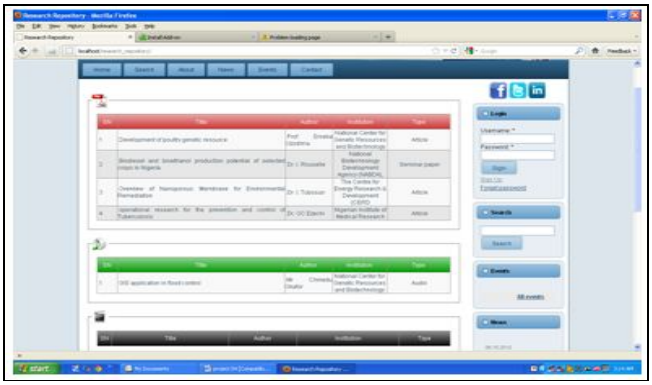

Figure 3: Research Output Tracks

The research output repository system serves as storage to research outputs as well as giving an update on research outputs for the continuation of past research work. It allows guest to have first-hand information about researches in the various institutions. These functional requirements are displayed by the research output tracks' interface in figure 3. Through the news and events menus displayed by this interface, tertiary and research institutions have opportunities to disseminate information about workshops and seminars for industries, entrepreneurs, small and medium scale industries.

4.2. Knowledge Acquisition Interface

Figure 4 shows the knowledge acquisition interface. Researchers and Institutions upload their various research materials- journals, conference articles etc. and other relevant information through the knowledge acquisition interface. Acquired uploaded research works are expected to be in specified formats. For access and full interaction with this interface, there must be authentication of all researchers' profiles through the sign-up page in order to get unique username and password to log in.

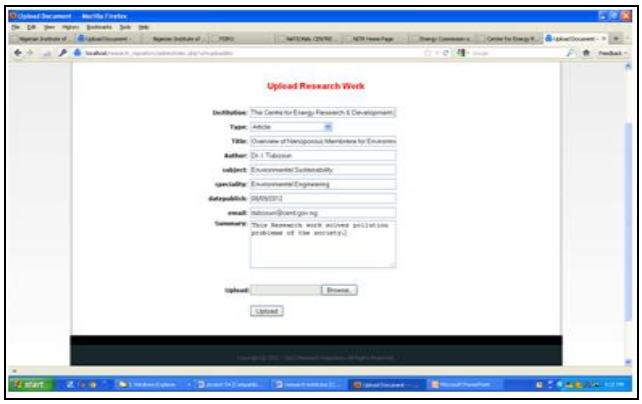

Figure 4: Knowledge Acquisition Interface

This interface allows for the acquisition of research materials. The uploaded materials are not immediately shown, they are either accepted or rejected by the administrator. The administrator is responsible for managing copyright, maintenance of the repository, ensuring quality and integrity of materials. Only the accepted research work will be available in the repository.

4.3. Knowledge Exploration Interface

Figure 5 shows the knowledge exploration interface**.**It facilitates easy search and retrieval of research knowledge by students, researchers, entrepreneurs and organizations.The research output can be explored through simple and advance search, thus speeding up resource discovery and directing the user to pertinent content.

Figure 5: Knowledge Exploration Interface

The advance search allows for combination of two or more search queries. For easy search and retrieval of research information, search can be based on single or multiple combinations of attributes of research article such as type of documents (conference proceedings, journals, article, seminar);research specialty (space technology, environmental engineering); research institutions and year of publication.

5. Conclusion

Universities and Research institutions in Nigeria serves as engines of economic growth because they are the major generators of research based data, information and knowledge. We designed and developed a web based research output knowledge repository system (ROKRS) that serves as a repository toall intellectual products from all disciplines such as education, medicine, social science, education created by research and tertiary institutions in Nigeria.Access to and exploitation of research outputs stands to generate greater impact by providing easier and quicker aids and grants for researches, easy communication with the researchers through the research institutes of such researchers by offering necessary suggestions, criticism and assistant in no time which can help to improve such research works and can also lead to collaboration with other researchers carrying out similar works resulting in greater synergy. Therefore the system revolutionizes the methods of preservation as well as communication of research outputs in tertiary and research institutions in Nigeria and other developing countries.

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