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The Role of Academic Libraries in Enhancing Workflow in African Universities

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***Abstract*—An academic library may be beautifully designed but with little impact on the research output of its users. This study identified these gaps with reference to African libraries. Researchers, irrespective of their area of interest, have a common research workflow which defines the entire research process. Information and Communication Technologies (ICT) tools can be embedded at every level of the workflow creating an enabling research environment to ease research process and better output. Academic librarians, as part of their role in supporting teaching, learning and research, are expected to introduce, advocate and create awareness and offer support services on available relevant products and services that can be embedded at every level of the research workflow. This study identified new products and services and suggested how they can be embedded through the research process. The study concluded that embedding these new products and services in research workflow will improve the quality of researches emanating from Africa and ultimately improve our research visibility globally.**

Keywords-academic library; research librarian; research; researchers' workflow; information needs; products and services; social media

I. INTRODUCTION

Academic staffs of any institution, aside the obligation of teaching and interacting with students and fellow staff members, are faced with the obligation of prioritizing research. As such an obvious distinction is made between teaching, research and administration. Research in every institution sets a hallmark for development and increasing the visibility of such institution and its global ranking. This also has personal benefits to individual staff members in areas of career development and contribution to the community, building a reputation in the field and becoming an authority in that field. A researcher's place in an institution therefore can be seen as relevant and highly important.

Academic libraries have major role to play in providing valuable assistance to the research community. The librarian to keep up with these responsibilities should strive to be part of the research community in the institution and not only with the undergraduates or other users' information need, thereby making him/her a *research librarian.*

A research librarian is expected to have trainings and specialized knowledge of his/her patrons' fields of practice, such as where the researchers feel free to conduct their searches (venue), time they prefer to work and other related interest. He should also become familiar with the researchers' interest such as the journals he/she likes to publish, the social media platforms he uses, collaborative efforts amongst others. Research librarians should be committed to building up a strong research community by providing expertise in the organisation and description of information, be engaged in providing knowledge on long-term preservation and expert searching, project inception and grant seeking opportunities.

Several definitions by different experts indicate that research is a systematic approach towards investigating a particular area of interest undertaken to discover facts and knowledge towards solving a need. Every researcher's need vary in relation to the particular area of interest. However, there is a common ground for most researchers and that is the research process or what is often referred to as the researcher's workflow.

The workflow is the description of the entire research process from identifying the need, to building up ideas towards solving the need, and disseminating the knowledge gathered. Librarians should be aware of the growing demand for information and must acquire advanced information literacy skills combined with technological or digital literacy. Meeting up with such roles will get the research librarian familiar with his researcher's workflow as he gets involved in each step of their research process. This approach will mandate the research librarian to constantly find new products and services that can be embedded in their workflow.

The research librarian is therefore faced with so many responsibilities if he/she wants to remain relevant in the ever changing technological age. He must strive to go with the changing time by constantly introducing new products and services that will assist researchers. Not only introducing the new products but must ensure that these products and services are embedded in each step of the researchers workflow by providing timely and targeted research support services.

This paper sets out to discover new products or services that can be introduced and embedded in a researcher's

workflow while considering its sustainability, advantages and limitations.

II. CONCEPTUAL FRAMEWORK

A. Products

Product is anything that can be offered to a market for sale or consumption and must satisfy the needs of a particular people at a particular period. Product can be viewed from different perspectives, different context and environment. Krishnan and Ulrich [1] defined products in four perspectives. In marketing perspective, product is seen as a bundle of attributes; it is an artifact resulting from an organization process in organizational view point, while engineering view product as a complex assembly of interacting components; product is a sequence of development and/or production process steps from an operational management view.

According to [2], products can be core, tangible or augmented products. Core products represent the meaning and convey its existence which includes the key benefits expected by the customer. Kotler and Keller [3] demonstrated that, product has four stages of life cycle which starts from a process of introduction, growth, maturity and decline. Products can be introduced to the market through major innovations, product improvements, products additions and repositioned products. Products have characteristics which include features, styling, Quality, brand name and packaging [2] and [3]. All these definitions give a different representation of what product means to different people and disciplines. The library however has a different perspective from the one mentioned above.

B. Library Products

Librarians view information as a product just like other products. According to [4], products also include informational, digital goods and library possessions. Library products also have initial stage of emergence, growth stage, maturity and the decline stage. Products may include all the materials that academic library possess, digital goods and informational goods. Therefore cataloguing, indexes, collections, display, Information Technology (IT) services may be identified as library products. These products undergo life cycle just like other products do. Some products like social media in libraries are at introduction stage, others like library management system, institutional repositories are at the growth stage, catalogue are at the maturity stage and products like card cataloguing are at the decline stage, although this will depend on the specific library [5]. The concept of product life cycle illustrates the need for library products to be reviewed, rearranged, redesigned, repackaged, renamed or even removed from library so as to meet the current needs of library users [2] and [6]. Hence, library products whether core, tangible or augmented must be constantly evaluated to sustain its relevance in the digital age.

C. Library Services

Innovations in the provision of services have greatly improved library services to users. A service is a system of supplying a public need such as communication or utilities. With vast growth of information platforms, libraries have reinvented their services with the aim of reaching out to many users through modern technologies such as databases and online journals, websites, Facebook and library specific applications like the mobile library applications.

In the academic environment, the researcher identifies the library as a safe haven where it does not only serve as a storehouse of knowledge but also a place where effective research can be conducted, services rendered impact on their scholarly activities, development of curriculum and intellectual preservation. This is made possible when libraries assist researchers and academia in their research activities through provision of good information services like recent databases and journals, updating the library website with relevant information, and adopting new technologies such as Facebook, Google applications, Twitter, Mendeley, and YouTube.

III. RESEARCHERS INFORMATION NEEDS AND WORKFLOW

Research has greatly evolved due to increasing amount of data involved and new capabilities and technology coming into the library daily. As this shift is evident, librarians' role also changes. Libraries in every institution must stay up to date with the current technologies and be involved in continuous personal training and retraining. Emphasis has been placed on the value of research output and wide impact of research findings, thus the need for information by existing researchers and upcoming researchers. Information is a resource that is naturally needed in all human endeavors. Suffice to say that information is indispensable in human life. Academic libraries are wholly designed for the purpose of rendering information services that promote research, learning and innovations. According to [7], services demanded by library users are not static, and user's needs are dynamic thus, requiring different services at different times. Therefore, libraries and information scientists require constant training and evaluation of their skills in order to obtain new capabilities to handle researchers changing needs.

Researchers' need vary in relation to the subject fields or particular area of interest. However there is a common ground for most researchers and that is the research process or what is often referred to as the researchers' workflow.

Pienaar and van Deventer [8] developed a research cycle, presented in Figure 1, and indicated that it was developed on the grounds of the researchers' input on how they are doing research. This research cycle will be adopted for this study. The cycle will provide an insight into the processes involved in a researcher's workflow and how the new services and products can be embedded into it.

IV. UNDERSTANDING THE GENERIC RESEARCH PROCESS

The workflow of a typical researcher follows the above cycle irrespective of his/her area of interest or research field.

A. Identification of a Research Area

This often is the starting point and a prerequisite to every researcher. There are vast forms of literature available on information platforms hence making it difficult to know which source to consult. Researchers want to make their searches easier using narrow searches, retrieve the relevant information effectively and timely. Nonetheless, they adopt various styles to identify sources. Several studies suggest

that researchers view Google as the easiest and fastest platform as such there is heavy dependence on Google. This is due to its ease of use while using it with word-searching capability and wider scope of retrieval of data. Searches often produce unexpected information in addition to what is expected. However, [9] opine that researchers also make use of other sources such as informal advice from colleagues to identify information sources. Pienaar and van Deventer [8] refers to it as personal networks or face to face interaction.

Researchers also make a point of staying updated with the information and reports being published by government publications or documents. Through these sources, researchers are able to identify a problem or a need. Nowadays the social media also serves as another source of identifying research problems for instance news on a virus outbreak which goes viral on a social media, a researcher may develop interest in that field and develop a statement of problem. In such ways, researchers find areas to concentrate and carry out a research and by that providing a solution.

B. Literature Review and Indexing

Reviewing literature is a research activity. This is usually knowledge-based contribution on a particular subject, focusing on areas of interest that relates to problems discovered, highlighting influential conceptual or empirical studies. It requires effective and comprehensive activities to help reduce on time spent looking for information, maximize the quality and appropriateness of results, clarify the scope of research topic and assist in identifying experts and influential researchers in field of interest. Researchers have to be guided on what literature to consult by using a variety of resources to cover a range of media such as journal titles, books, thesis, conference papers, e-print and reports. This involves guiding on how to search for available materials using keywords, Boolean operators thus keeping systematic and accurate records using Endnote, Zotero and Mendeley.

In addition, indexing helps locate information. This facilitates access to huge amounts of information online that is highly cross-referenced, providing variety of documents. Contextual factors such as frequency of access, relevance task of an individual and date of last use have shown to be important in classifying, organizing and accessing information from individual point of view.

C. Sharing, Discussion and Collaboration

With caution, researchers want to share ideas, discuss and network with colleagues. Although sharing and exchanging information of many kinds is central to the ethos of science and as such, individual researchers wish to choose what to share, with whom and what, nonetheless, collaboration is necessary as the recent tools develop for measuring impact such as *altmetrics.com* and PLOS article level metrics are developed to capture wider impact of the research lifecycle and activities such as number of downloads, number of readers, discussion and comments in social media like Facebook, tweets, blogs etc. They measure the quantity of attention received i.e. the more people talking about an article, the higher the score and the quality of that attention. Each platform on social media has different weight depending on the use of scholars. This emphasizes the need for familiarizing oneself with these tools and more emphasis on networking and collaboration for all researchers.

D. Writing Proposals and Reports

Reports are written for a variety of reasons. This can be either informative, persuasion or both. Information reports include employee evaluations while persuasive reports usually fall in the categories of problem or solution base. A proposal is primarily a sophisticated piece that seeks to define problems or opportunities that provide strategies. Proposal writing needs the knowledge of writing and organization skills, i.e. ability of a researcher to organize his thoughts in paragraphs and have them concise and straight to the point. Librarians can play a role in helping researchers with this activity by offering new products and services like Microsoft Word, Google documents and other writing and editing software.

E. Identification of Funding Sources

Researchers work with the hope that their work will reach their desired audience and in process make impact. However the issue of where to publish becomes a factor that will see that their work gets to the right target. As such libraries should be involved in finding or identifying funding sources which may assist in funding publications on high impact journals.

F. Project Management and the Research Work Flow

Researchers have a need to manage, manipulate, disseminate and preserve their information. Kroll and Forsman [9] found that researchers find it difficult managing data. This leads to disorganization and loosing important data which may be useful to them. Research data gathered, be it through qualitative or quantitative means, is a core activity in research life cycle and a substantial amount of researcher's time is devoted to effectively manage that data and bringing it into structure as findings for presentation and dissemination. Therefore, there is need to manage such data. Researchers need to collaborate using platforms that allows for effective data management and supports transparency, timely sharing and accurate means of preservation.

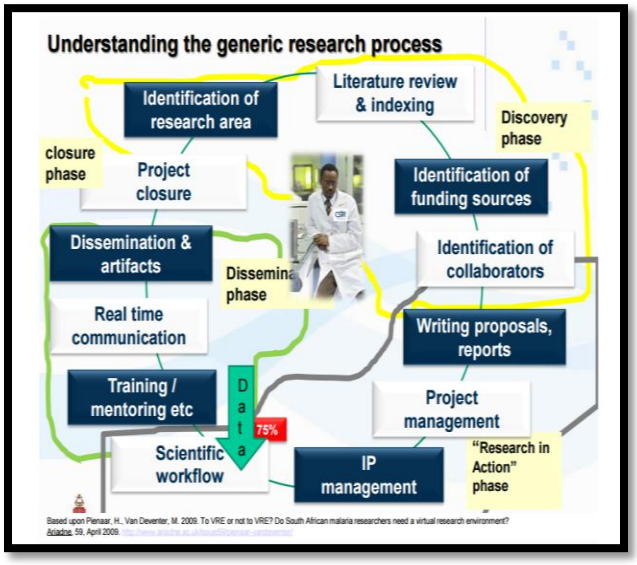

Figure 1. Research cycle

G. Dissemination and Artifacts

The results of a piece of research, be it through writing thesis, journal articles, conference paper, report on performance, research report or blog are clearly a major part of research cycle. A chief concern of researchers is where to publish as there are factors to consider such as speed, audience and peer system. Research assessment processes make heavy use of publication counts especially journal articles. These public activities have strong institutional and professional incentives in building reputations, securing promotion, incentives for other kinds of communication and sharing of research findings. Although several findings suggest low awareness of an institutional repository[10] which may serve as a good platform to disseminate research especially for young researcher such as graduates who may consider it a starting point. As such, researchers require assurances that their work will get sufficient audience and be accessible to many. Libraries role in achieving this is paramount as they are chiefly the knowledge hub of any institution who may be in charge of the repositories. With assurances of large audience, good management and preservation, the institutional repository may improve dissemination of research results.

H. Project Closure

This is often the most neglected but very important phase of the research process. This phase directly involves the research librarian closing the research process through describing, formatting, preserving, digitizing and ensuring that research data are alive and active whenever and however it is required. The research librarian must have embedded himself in the entire workflow collating and storing research data generated at every level of the workflow. This phase is informally referred to as the "clean-up process after a successful operation". Metadata schema must be used to describe, capture and store relevant re-usable research data. These metadata can be the Dublin core, use of digital object identifier (DOI) etc. which is eventually uploaded on the institutional repository or digitized and stored in an archive. Cloud services like software (SaaS), infrastructure (IaaS) or platform (PaaS), are usually employed at this stage of research workflow.

V. LIBRARIANS AND ICT SKILLS

In Africa, generally, there is a case of inadequate knowledge of technology in most libraries. This is also true for other continents like Asia. In Pakistan for instance,[11] findings suggest that library professionals in Karachi have only word office skills but lack advance knowledge to handle current technologies which are already settling in academic libraries. The author comments that they however have expertise in using Web Dewey, OPAC, and MARC records. In the same line of thought, [12] observed that the majority of libraries in selected universities in Nigeria did not have access to ICT facilities. Computers were utilized basically for technical activities such as cataloguing and for classification. The case is not any different from Tanzania, [13] recommended that librarians have a need to acquire knowledge in some practical IT courses such as computer programming in Visual Basic, JAVA, and networking. The situation in Uganda is not much different from that of Nigeria and Tanzania. Findings of [14]revealed that the training of librarians in Nigeria is inadequate, and needs radical restructuring to produce librarians suited to deliver modern service in digital library in a knowledge-based society.

Satpathy and Maharana [15] assessed the ICT skills of Library Information Science professionals in Engineering institution of Orisa in India. Their findings revealed that 43.47 % had knowledge in electronic data bases and automation software available at their institution but they had poor searching skills. Academic librarians need to get expertise in use of the Internet, networking, intranet, multimedia, imaging technology, and full text databases. This suggestion aligns with those of [16] who conducted a study on core competencies for academic reference librarians in Croatia and professional skill and competencies required for academic librarians in an electronic environment respectively.

VI. IDENTIFICATION OF NEW PRODUCTS AND SERVICES

The following are identified new products and services that can be embedded in researchers' workflow:

- **Wiki** - allows users to create, add, edit or delete content in collaboration with others.
- **Blog** - is a discussion or informational site published on the World Wide Web.
- **Facebook** - the most dominant personal social network in the world.
- **Twitter** - is an online social networking service that enables users to send and read short messages.
- **Workflow management system** - allows the researcher to customize word processor to fit their needs e.g. Google docs.
- **Library mobile website (app)** -for increasing the library presence on the internet and sharing information using the mobile version of the library website.
- **Altmetrics** - stands for 'alternative metrics' and is a way of measuring the impact of a scholarly article.
- **Google Scholar** - a citation profile created by Google for research impact analysis and online visibility.
- **Mendeley** - software that assist researchers to organize references.
- **Pinterest** - web and mobile application that operates a photo-sharing website.
- **ORCid** - unique researcher identifier designed to provide a transparent method for linking researchers and contributors to their activities and outputs.
- **LinkedIn** - a social media platform for researchers of like minds.
- **Academia.edu** - is a social networking website for sharing academic researches.
- **Every post** - allows users to post updates on the major social network from one place at one time.
- **Crowd booster** - improves online presence by linking social media, e.g. Facebook and Tweeter.
- **Hootsuite** - this is a platform which manages multiple social network.
- **Evernote** - advanced note taking application.

- **EBSCOHost, Scopus, Science Direct** - these are databases which offer wide and variety of data in full text for researches in different field of study.
- **QR Code** - a machine-readable code consisting of an array of black and white squares, typically used for storing URLs or other information for reading by camera on a smartphone.
- **Beacons -** for guiding and directing users to an item or location of an item in the library using the Bluetooth technology.
- **Google drive** - is a cloud service that allows storage of files, also provides a platform for sharing, typing, editing documents including spreadsheets, presentations. May also serve as a good platform for collaboration between researchers.
- **Drop box** - file hosting service that store photos, docs, videos, and other files in cloud.
- **GIMP** – a manipulation software for digitized objects.
- **Adobe Acrobat** - a text manipulation software for digitized objects.
- **Hub Zero** - a Virtual Research Environment for research and collaboration.
- **Open Science Framework** - a Virtual Research Environment for research and collaboration.
- **Alfresco** - a Virtual Research Environment for research data management and collaboration.
- **Metadata Schema** - Dublin core, Digital Object identifier, Datacite, etc.

VII. EMBEDDING NEW PRODUCTS AND SERVICES IN RESEARCH WORKFLOW

Table I presents available products/services that can be embedded into the different stages in the research process.

A. *Advantages of Embedding New Products and Services in Workflow of Reserchers*

- It creates an easier research working environment for researchers.
- It saves time of researchers in deciding what product or service to embed at each level of research process.
- It helps identify possible ways of funding and disseminating research output even before the research is completed.
- It makes the whole research process interesting and engaging using various collaborative tools.

B. *Limitations of Embedding New Products and Services in Workflow of Researches*

- The new products and services is relative to the background of the researcher as what is new to a researcher from a developing country might not necessarily be new to those in advanced research world. However, it can be a stepping stone and a guide for researchers in general.
- Although these services require a stable internet access and power supply, there is however a mobile version of most of the products and services which can be accessed (with limited functionalities) via a mobile device.

TABLE I. INTEGRATING NEW PRODUCTS AND SERVICES IN RESEARCH WORKFLOW

Stage No.	Stage in Research Process	New Product/Services
1	Identification of research area	Personal networks; research groups, face-to-face; literature; government documents.
2	Literature review & indexing	Academic databases: Scopus, Science Direct; institutional repositories. Retrieval: Google Scholar, Browser favorites; Filing: manual; databases.
3	Identification of collaborators	Personal networks; VRE: HubZero, Open Science Framework.
4	Proposal writing	MS Word; Google Doc
5	Identification of funding sources	Personal networks (family and friends); funding agencies; government agencies; institutional support.
6	Project management	MS Project; Gantt chart.
7	Scientific workflow	Free analysis software; SPSS, Survey Monkey.
8	Training/mentoring etc.	Face-to-face; Wiki; blog.
9	Real time communication	E-mail; face-to-face; phone; instant messaging; wiki; web site; meetings.
10	Dissemination & artefacts	Google Scholar; blogs; wiki; exhibition; Facebook; Twitter; LinkedIn, QR codes.
11.	Project Closure	Metadata schema- Dublin core, digital object identifier; digitization, institutional repositories.

Adapted from (http://www.ariadne.ac.uk/issue59/pienaar-vandeventer)[17]

VIII. CONCLUSION

Researchers have the opportunity of using a wide range of emerging technologies which have profound impact on the nature of research and research workflow. However, use of some of these new technologies may not be as universal as might be envisioned but with regular training and keeping up to date with technologies there may be proper embedment of related technologies in the researcher's workflow. This is made easy by librarians embedding themselves in the research workflow of researchers getting fully involved in every step of the workflow, keeping real time contact with the researchers. It is however important to note that these newly introduced products and services can actually be sustained and thrived in an environment where not only the basic technological capacities are available but also the enthusiastic staff who are willing to welcome the new technologies, learn, utilize and teach them.

IX. RECOMMENDATIONS

This study recommends that research librarians should be:

- Committed to building up a strong research community by providing expertise in organisation and description of information through training of researchers and offering support services on latest products or services;

- Continuously update their ICT skills by attending conferences, participating in webinars, as well free online tutorials to keep abreast of latest research innovations relevant to their researchers' areas.
- Engaged in providing knowledge on long-term preservation and expert searching, project inception and grant seeking opportunities.
- Committed to providing pleasant and enabling research environment and a sensitive administration aimed at facilitating research.
- Be aware of the growing demand for information and must acquire advance information literacy skills combined with technological or digital literacy.

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