# STRATEGIES FOR MANAGING SCHOLARLY CONTENT AT UNIVERSITIES IN KENYA

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## ABSTRACT

This study investigated strategies employed by universities in Kenya for managing scholarly content. The study was underpinned by the Conversation Theory and the Knowledge Management Process Model and was based on the post-positivist paradigm. A survey was conducted within a multiple case study design. The population of the study consisted of academic staff, postgraduate students, university librarians and representatives of university research units from six universities in Kenya. Self-administered questionnaires were used to

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collect data from academic staff and postgraduate students while key informants were interviewed. The results revealed that while the respondents generated theses, journal articles and conference papers, the majority did not participate in knowledge generation in the period from 2010 to 2014. The results further revealed that most respondents documented research procedures, backed up information, and used printouts to preserve scholarly content; however, they hardly used digital archives and university servers. The results suggested heavy reliance on modern technology-enabled communication techniques and face-to-face interactions for communication amongst scholars, whereas institutional repositories (IRs) were hardly used. The results revealed inadequate institutional support for research and scholarly communication including funding, material and physical infrastructure, mentorship, and information and communications technology (ICT) facilities. The study concluded that strategies for managing scholarly content at universities in Kenya are weak, impacting negatively on the quality, quantity and visibility of scholarly content; and that a policy framework encompassing the different facets of managing scholarly content is necessary. The study recommended developing specific strategies and policies to enhance scholarly content management; institutionalising mentorship programmes; increasing funding to strengthen universities' research capacity; and strengthening research niches.

**Keywords:** scholarly communication, scholarly content management, institutional repositories, universities, research productivity, Kenya

# 1. INTRODUCTION

Within living memory, scientists have been communicating and exchanging their ideas, thoughts, hypotheses and scientific results (Ball 2011, 1). Scientific progress depends on the effectiveness of scholarly communication which allows ideas to be formulated, results to be compared and improvements to be made (Warden 2010). According to the Association of Research Libraries (2014), scholarly communication is the system through which research and other scholarly writings are created; evaluated for quality; disseminated to the scholarly community; and preserved for future use. The development of today's scholarly communication has progressed from the oral discourses of the ancient Greek scholars, to the printed periodicals and books made possible by Gutenberg's printing press, and on to the digital scientific communications modes available to modern scholars (Ball 2011, 4–6).

The term 'scholarly content' implies formally published scholarly literature, in particular journal articles and conference proceedings (Research Information Network 2011, 5); editorial documents and doctoral dissertations (Royster 2007, 27–29); and the contents of institutional repositories (IRs) including any work generated by the institution's students, faculty, non-faculty researchers and staff. This may include pre-prints and other works-in-progress, peer-reviewed articles,

monographs, teaching materials, datasets, conference papers, dissertations and grey literature (Johnson 2002, 3–4). Scholarly content also includes research data which may be digital manifestations of literature (including text, sound, still images, moving images, models, games, or simulations) and forms of data and databases that generally require the assistance of computational machinery and software in order to be useful. These include: various types of laboratory data, including spectrographic, genomic sequencing and electron microscopy data; observational data, such as remote sensing, geospatial and socioeconomic data; as well as other forms of data either generated or compiled by humans or machines (Uhlir and Cohen in Borgman 2012, 1061).

The global proliferation of scholarly content from both universities and research institutes implies that strategies for its management need to be carefully considered to enable the communities both inside and outside these institutions to benefit from the knowledge generated.

## 1.1. Scholarly content management practices around the world

Scholarly communication around the globe is characterised by practices that are common in some fields but specific to others. Across most scientific fields, journals are the best known and most available records of on-going research within a field. Journals publish research articles, field or laboratory work notes, and book reviews; use either in-house editorial or outside peer reviews; and cater to scholars in a specific field or discipline. The impact of a journal article is often measured by its frequency of citations by other scholarly sources over a given period (Shaw 2009, 42). In some areas of the humanities, monographs are the preferred avenue for scholarly communication, while in others, such as philosophy, monographs play a secondary role. In business, journal articles are the main outlet for research results, whereas monographs and conference proceedings are of secondary importance (Thorin 2003). In fields like computer science and engineering, peer-reviewed conference proceedings have become the primary channel of research communication (Shamir 2010). Some disciplines rely more on invisible colleges rather than published journal articles to exchange research ideas and monitor progress in their fields of research (Carey 2011). The use of monographs and peer-reviewed journal articles for promotion and tenure is the most well-known practice in universities around the world (Harley et al. 2010; Miller, Taylor and Bedeian 2011).

Scholarly communication has been drastically altered by the Internet and Web 2.0 tools, such as social media. With modern advancements in technology, new forms of communication have gained importance while at the same time creating new structures of information and publication that include listservs, weblogs (‘blogs’), wikis, collective encyclopaedias (such as Wikipedia, wikisearch), Twitter, and many more. More generally, the Web 2.0 technologies not only allow for more informal

forms of scholarly communication, but also make possible new pathways into the abundant quantities of information in general and scholarly information in particular (Schmiede 2009, 625).

Open access (OA) is yet another strategy that has been explored since the late 1990s to facilitate access to limited scholarly content due in part to the budgets of many institutions being insufficient to sustain rising journal subscription rates (Yiotis 2005, 157). OA literature is defined by two essential properties. First, it is free of charge to everyone. Second, the copyright holder has consented in advance to unrestricted reading, downloading, copying, sharing, storing, printing, searching, linking and crawling of the content (Suber 2003). Examples of OA initiatives include Europe's Open Access Infrastructure for Research in Europe (OpenAIRE) (Manghi et al. 2012, para. 12), and Africa's SABINET Full Open Access Journal Collection that currently comprises 46 South African journals (SABINET 2013). Related to OA collections are institutional repositories (IRs), which are digital collections capturing and preserving the intellectual output of a single or multi-university community. Usually IRs adopt OA principles which facilitate free and unlimited access to the content (Crow 2002). They are one of the fastest growing elements of the digital library genre due to their potential to reform the current system of scholarly communication and their role in advancing the OA movement. Many academic libraries, especially in research universities, have invested human and technical resources to build IRs that will foster access to the intellectual, cultural and administrative output of their institutions. The hope is to gain enhanced access to faculty research and increased visibility of research generated within the university (Jantz and Wilson 2008, 187). OA and IRs are expected to cut costs and provide opportunity for long-term preservation of scholarly works for participating institutions (Corrado 2005).

## 2. THEORETICAL FRAMEWORK

The study utilised the Conversation Theory and the Knowledge Management Process Model as theoretical lenses. The Conversation Theory was advanced by Gordon Pask in 1976 and is aimed at explaining cognition and how people learn. The core of the theory is that people learn and create knowledge through conversation. Different actors in diverse communities establish meaning, seek agreement and thus create knowledge (Lankes, Silverstein and Nicholson 2007, 18). Moreover, the theory posits that conversation is central to exchanging information; making our positions known; and persuading and motivating others (Klemm 2002, 1). Stylianou (2012) argues that within science, lies the art of communication. The scholarly output of conversation includes books, journal articles, videos, presentations and other information products that document, expand or keep the conversation going (Deitering 2011, 168, 170; Pask in Lankes et al. 2007).

The Knowledge Management Process Model formulated by Botha, Kourie and Snyman (2008) comprises three knowledge processes that facilitate use of knowledge, namely: knowledge creation and sensing; knowledge sharing and dissemination; and knowledge organisation. Knowledge management maintains that knowledge created through various organisational processes should be systematically leveraged for it to be useful to the stakeholders. Proper management of knowledge improves efficiency, responsiveness, competency and innovation among its users. Significantly, the model operationalises knowledge management within the modern technology environment in which organisations find themselves.

## 3. PROBLEM STATEMENT

In terms of contribution to the global scholarly debate, Teferra (2004, 159) asserts that Africa lies at the periphery of the knowledge market. Statistics on scientific knowledge production show that the entire African continent contributes approximately 0.13 per cent of the scholarly publications on the web and international bibliographic databases (Ubogu 2001, 250; Worldmapper 2006). In Africa, the major centres of knowledge creation and scholarly communication are universities. However, most African universities have been reeling from problems that reduce their scholarly productivity and visibility including: diminishing or total lack of research funding; escalating student enrolment; poor emoluments and low salaries for researchers and faculty; brain drain; and lack of appropriate resources such as laboratories, equipment, journals and access to online databases (Ondari-Okemwa 2007).

Kenya often does not perform well in the academic global ranking of universities. The Cybermetrics Lab 2013 ranking web of universities, for example, revealed that the University of Nairobi was ranked first in Kenya but was positioned 1 326th in the world rankings and 10th in Sub-Saharan Africa. Kenyatta University was second in Kenya, 17th in Sub-Saharan Africa and ranked 1 706th globally. This contrasts with South African universities, such as Stellenbosch University (ranked 1st in Africa and 400th in the world); the University of Cape Town (ranked 2nd in Africa and 456th in the world); and the University of KwaZulu-Natal (ranked 5th in Africa and 686th in the world) (Cybermetrics Lab 2013). Aguillo, Ortega and Fernandez (2008, 234), argue that it is now accepted that web data will continue to be used in evaluating universities and research centres and to this end, lack of web visibility for non-participants will lead to an academic digital divide.

In spite of several initiatives at global and regional levels to improve the visibility of Africa's scholarly content, such as theses and dissertations, most universities in Kenya have failed to participate actively in these initiatives, which include the Database of African Theses and Dissertations (DATAD) a project of the Association of African Universities based in Ghana (Association of African Universities 2014); and the local Kenya Information Preservation Society (KIPS) (Ratanya 2010, 17–

18). Uptake of other initiatives for scholarly content management, such as OA and IRs, is limited to a few institutions, such as Strathmore University; Jomo Kenyatta University of Agriculture and Technology; University of Nairobi; Dedan Kimathi University of Technology; and Pwani University (OpenDoar 2014).

It would seem, therefore, that the majority of Kenya's scholarly output is not being managed adequately to enhance visibility and access. This output therefore remains unread and un-cited both on the continent and internationally.

Scholarly communication is a multi-faceted domain with multiple actors (Thorin 2003; Western Libraries 2013). Management of the entire process of scholarly communication (from developing research ideas; conducting research; communicating informally with other scholars and scientists; preparing, shaping and communicating formal research results to colleagues; and the final distribution of the research results in print or electronically) determines the quantity and quality of research productivity of scholars and their institutions. The low visibility of Kenya's research output, and its poor ranking in the global systems, indicates that the scholarly communication in the various universities has not been effectively managed.

The study investigated the strategies for the management of scholarly content at universities in Kenya with a view to recommending practical and policy actions needed to improve the visibility of and access to scholarly content.

## 4. MAJOR RESEARCH QUESTION

The study investigated the question: 'What strategies are used by universities in Kenya in managing their scholarly content?' The study addressed the following subsidiary research questions:

1. What kinds of scholarly content are generated in universities in Kenya?
2. How is the scholarly content generated and/or acquired in universities in Kenya preserved and archived for current and future use?
3. To what extent do existing institutional facilities in the universities support scholars' research and communication needs?

## 5. METHODOLOGY

The study was based on the post-positivist paradigm combining quantitative and qualitative approaches (Edmonds and Kennedy 2013, 146). The study employed the multiple case study design where selected universities were explored in-depth and in real-time (Creswell 2003, 15). Within the case study a survey research design was applied utilising questionnaires to collect data from academic staff and students (master's and PhD). Postgraduate diploma students were excluded because they are less involved in research.

Six of the 31 universities in Kenya were purposively selected. The criterion for selecting the universities involved in the study was the top ranked universities in Kenya according to the 2013 ranking web of universities (Cybermetrics Lab 2013).

Sampling was guided by the table for determining sample size in Saunders et al. (2012, 266) based on a 5 per cent error margin. Convenience sampling was used to select members of the academic staff and graduate students from each university who would participate in the study, and sample sizes were calculated based on the population of each university. Academic staff and postgraduate students were considered pertinent to this study since they are the main actors in creating and consuming scholarly content. Purposive sampling was used to obtain information from the population of librarians who were the university librarians for the universities while the research office populations were the representatives of research departments for the universities. These were considered key informants for the current study since they are directly involved with facilitating and managing research and scholarly communication at the different universities. A census was conducted on the university librarians and representatives of research unit thus including all twelve individuals.

Self-administered questionnaires and interviews were used to collect quantitative data. The Cronbach's alpha was calculated for individual questions in the questionnaire to determine their internal validity. Personal interviews were used to collect qualitative data from the University Librarians and the research office representatives. The data collection instruments were piloted to verify their usefulness and performance in the actual data collection.

The data from interviews was analysed qualitatively using derived themes and presented thematically. The data from the questionnaires was analysed using IBM SPSS Statistics software to generate descriptive and inferential statistics. This data was presented using tables, graphs and charts.

# 6. RESULTS

## 6.1. Types of scholarly content generated in universities in Kenya

In response to the question: 'What types of scholarly content have you generated or participated in generating?', the study found that 12 types of scholarly content were generated by both academic staff and postgraduate students in the universities (see Table 1). The question was a multiple response type and revealed that most respondents generated more than one type of scholarly content.

**Table 1:** Types of scholarly content generated in the universities

| Scholarly content generated | Academic staff | | | Students | | |
|---|---|---|---|---|---|---|
| | Responses | | % of cases | Responses | | % of cases |
| | N | % | | N | % | |
| Preprints | 34 | 3.7 | 13.7 | 48 | 6.1 | 17.3 |
| Journal article | 159 | 17.5 | 64.1 | 117 | 14.8 | 42.1 |
| Working paper | 70 | 7.7 | 28.2 | 78 | 9.9 | 28.1 |
| Technical report | 53 | 5.8 | 21.4 | 65 | 8.2 | 23.4 |
| Book chapter | 68 | 7.5 | 27.4 | 32 | 4.1 | 11.5 |
| Book | 41 | 4.5 | 16.5 | 41 | 5.2 | 14.7 |
| Book review | 66 | 7.3 | 26.6 | 47 | 5.9 | 16.9 |
| Thesis | 188 | 20.7 | 75.8 | 160 | 20.3 | 57.6 |
| Conference paper | 163 | 18.0 | 65.7 | 100 | 12.7 | 36.0 |
| Datasets | 28 | 3.1 | 1.3 | 39 | 4.9 | 14.0 |
| Software | 22 | 2.4 | 8.9 | 34 | 4.3 | 12.2 |
| Multimedia | 16 | 1.8 | 6.5 | 29 | 3.7 | 10.4 |
| Total | 908 | 100 | 366.1 | 790 | 100 | 284.2 |

*(N = 273 for academic staff; N = 332 for students; Multiple responses possible)*
*Cronbach's alpha: Academic staff's items: 0.78; Students' items: 0.71*
**Source:** *Computed from survey data, 2014*

The Cronbach's alpha values were relatively high (0.78 and 0.71 for items in the academic staff's and students' questionnaires, respectively) suggesting a high inter-item reliability. On average, each academic staff member generated about four types (366.1/100) of scholarly content compared to a student's three (284.2/100). This suggested that scholarly content generation by academic staff is greater than that of postgraduate students. The scholarly content generated by academic staff was mostly theses (possibly both as authors or supervisors), followed by journal articles, conference papers, working papers, and technical reports. On the other hand, postgraduate students generated mainly theses, followed by conference papers, journal articles, working papers and book chapters. The least generated type of content by academic staff was multimedia, book chapters, and software. In contrast, postgraduate students generated more multimedia, software and datasets.

## 6.2. Preservation and archiving of scholarly content

This section was aimed at gaining insight into preservation and archiving of scholarly content generated in universities to ensure its immediate and long-term accessibility. The research question was: 'How is the scholarly content generated and/or acquired in universities in Kenya preserved and archived for current and future use?'

### 6.2.1. Knowledge of data curation

The respondents were asked to assess their knowledge of data curation through the question: 'How much do you know about data curation?' Table 2 shows the results.

**Table 2:** Knowledge about data curation

| Respondent type | Curation knowledge | Frequency | Percentage |
|---|---|---|---|
| Academic staff | Nothing at all | 50 | 18.9 |
| | Know a little | 99 | 37.5 |
| | Know quite a lot | 52 | 19.7 |
| | Know a lot | 63 | 23.9 |
| | **Total** | **264** | **100** |
| Postgraduate students | Nothing at all | 79 | 24.5 |
| | Know a little | 102 | 31.7 |
| | Know quite a lot | 98 | 30.4 |
| | Know a lot | 43 | 13.4 |
| | **Total** | **322** | **100** |

*(N = 264 for academic staff; N = 322 for postgraduate students)*
**Source:** *Computed from survey data, 2014*

The results showed that 56.2 per cent of students and 56.4 per cent of staff knew a little or nothing at all about data curation, while 43.6 per cent of staff and 43.8 per cent of students knew quite a lot or a lot about the topic.

A Chi-square ($\chi^2$) cross tabulation was computed to determine if knowledge about data curation was dependent upon the university or department (see Table 3).

**Table 3:** Extent of knowledge about data curation in each university

| University | Nothing at all | A little | Quite a lot | A lot | Total |
|---|---|---|---|---|---|
| University A | 44 (15.8%) | 100 (35.8%) | 70 (25.1%) | 65 (23.3%) | 279 (100%) |
| University B | 15 (27.8%) | 25 (46.3%) | 7 (13.0%) | 7 (13.0%) | 54 (100%) |
| University C | 31 (28.7%) | 26 (24.1%) | 34 (31.5%) | 17 (15.7%) | 108 (100%) |
| University D | 24 (34.3%) | 24 (34.3%) | 16 (22.9%) | 6 (8.6%) | 70 (100%) |

| University | Nothing at all | A little | Quite a lot | A lot | Total |
|---|---|---|---|---|---|
| University E | 6 (31.6%) | 8 (42.1%) | 5 (26.3%) | 0 (0%) | 19 (100%) |
| University F | 9 (16.1%) | 18 (32.1%) | 18 (32.1%) | 11 (19.6%) | 56 (100%) |
| **Total** | **129 (22.0%)** | **201 (34.3%)** | **150 (25.6%)** | **106 (18.1%)** | **586 (100%)** |

*(N = 586)*
**Source:** *Computed from survey data, 2014*

There was a statistically significant influence of university on the knowledge about data curation, $\chi^2$ (15) = 38.91, $p$ = 0.001. University B and University E had the highest number of academic staff and postgraduate students with either little or no knowledge about data curation (University B: 40; 74%; University E: 14; 74%), followed by University D (48; 69%), University C (57; 53%), and University A (144; 52%). Only University F had more respondents who knew either quite a lot or a lot (29; 52%) compared to those who knew a little or nothing (27; 48%). These findings were corroborated through interviews which revealed that the librarians at most of the institutions had little or no knowledge of this concept. This was the case at University B, University D, and University A. Only the librarians at University F, University E and University C could describe the concept 'data curation' with confidence and discuss some of the initiatives they are already undertaking in this regard. At University E, the IR is currently used for preservation of all digital information considered important especially research information. Policy requires researchers to deposit their outputs in the IR, thus assuring its availability. At University C, a librarian has been assigned to work with the university management to digitise records at the administration block to ensure long term accessibility of such records. The lack of knowledge about data curation in most universities could be attributed to lack of awareness about current techniques of data preservation. The librarians confirmed that data curation was hardly discussed in their universities or departments.

### 6.2.2. Backup and storage of research information

Respondents were required to assess their practices during and after research. The results in Table 4 indicate that the respondents were conscious about long-term accessibility of research information.

**Table 4:** Respondents' methods of backup

| Research activity | Respondent type | Backup of research information | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Strongly disagree | | Disagree | | Agree | | Strongly agree | |
| | | Fq | % | Fq | % | Fq | % | Fq | % |
| I document research procedures | Academic staff | 7 | 2.7 | 13 | 4.9 | 150 | 57.0 | 93 | 35.4 |
| | Student | 12 | 3.8 | 39 | 12.5 | 175 | 56.1 | 86 | 27.6 |
| I back-up information | Academic staff | 7 | 2.6 | 7 | 2.6 | 127 | 47.4 | 127 | 47.4 |
| | Student | 4 | 1.2 | 13 | 4.0 | 133 | 40.1 | 177 | 54.1 |
| I move files to newer computers | Academic staff | 9 | 3.4 | 31 | 11.7 | 115 | 43.2 | 111 | 41.7 |
| | Student | 33 | 10.2 | 55 | 17.0 | 150 | 46.3 | 86 | 26.5 |
| I print hard copies | Academic staff | 17 | 6.3 | 31 | 11.6 | 119 | 44.4 | 101 | 37.7 |
| | Student | 33 | 10.2 | 39 | 12.0 | 147 | 45.2 | 106 | 32.6 |
| I review files in order to keep or destroy | Academic staff | 10 | 3.7 | 20 | 7.5 | 145 | 54.1 | 93 | 34.7 |
| | Student | 17 | 5.3 | 57 | 17.8 | 141 | 43.9 | 106 | 33.0 |

**Key:** *Fq = frequency (Percentages quoted in the text were obtained by summing up percentages in the columns of agree and strongly agree.)*
*(N = 273 for academic staff; N = 332 for students)*
*Cronbach's alpha: Academic staff's items: 0.74; Students' items: 0.74*
**Source:** *Computed from survey data, 2014*

The majority of the respondents document their research procedures, back-up information, move files to newer computers and print hard copies of files they would like to keep. The Cronbach's alpha value for this question was 0.74 for both academic staff and students, suggesting a high inter-item reliability.

### 6.2.3. Mode of preserving scholarly content

The respondents were asked to state their preferred mode of preserving scholarly content. The study found that academic staff and students use nine modes for preserving scholarly content (see Table 5).

**Table 5:** Mode of preserving scholarly content

| Mode of preserving scholarly content | Academic staff | | | Students | | |
|---|---|---|---|---|---|---|
| | Responses | | % of cases | Responses | | % of cases |
| | N | % | | N | % | |
| Computer at work | 150 | 19.1 | 56.2 | 120 | 14.4 | 36.9 |
| University server | 36 | 4.6 | 13.5 | 40 | 4.8 | 12.3 |
| University digital archive | 36 | 4.6 | 13.5 | 22 | 2.6 | 6.8 |
| External web server | 66 | 8.4 | 24.7 | 65 | 7.8 | 20.0 |
| Hard copy | 97 | 12.3 | 36.3 | 156 | 18.7 | 48.0 |
| Portable storage | 173 | 22.0 | 64.8 | 209 | 25.1 | 64.3 |
| Computer at home | 178 | 22.6 | 66.7 | 193 | 23.1 | 59.4 |
| Discipline's digital archive | 35 | 4.4 | 13.1 | 29 | 3.5 | 8.9 |
| My blog | 16 | 2.0 | 6.0 | 0 | 0.0 | 0.0 |
| **Total** | **787** | **100** | **294.8** | **834** | **100** | **256.6** |

*(N = 273 for academic staff; N = 332 for students; Multiple responses possible)*
*Cronbach's alpha: Academic staff's items: 0.69; Students' items: 0.71*
**Source:** *Computed from survey data, 2014*

The major modes of scholarly preservation were home computers, portable storage, computer at work and hard copies. The least common modes of preservation were blogs, discipline's digital archive, university's digital archive and university servers. Comparatively, slightly more academic staff (150; 19%) than students (120; 14%) preserved their scholarly content in computers at work and university's digital archives (36; 5% academic staff; 22; 3% students). On the other hand, more students (156; 19%) maintained their scholarly content in hard copies than academic staff (97; 12%), and more students (209; 25%) than academic staff (173; 22%) used portable storage. Inter-item reliability as measured by the Cronbach's alpha was relatively high (0.69 and 0.71, for academic staff's and students' items, respectively), which showed a high internal consistency.

The librarians at University E and University C confirmed that at these institutions, it was a requirement that scholars deposit all their journal articles in the IRs. University F had implemented the IR policy and was creating awareness among scholars. University A was in the process of creating awareness about the IR as a vehicle for preservation and access of scholarly content among academic staff and students. However, university librarians revealed that people are still not comfortable with depositing material in the IRs. According to one of the librarians, 'Someone will tell you: "Sorry, you are not going to put my document there, I don't

care what the policy says; you cannot have that document!"' The librarians attributed this reluctance and apathy to lack of awareness and distrust of the intentions of the IR with regard to scholars' output. Another librarian commented: 'The only challenges we face as a library is the fact that our researchers are not aware of the importance of the IR ... sometimes they complain about the fact that their work might be plagiarized,' indicating that the concerns raised by Kenyan researchers about acceptance and use of the IR are similar to scholars from other parts of the world (Krevit and Crays 2007; Rowlands and Nicholas 2005).

## 6.3. Institutional support available to enhance scholarly communication of Kenyan scholars

This section presents results on the institutional support available for scholarly communication. The study addressed the research question: 'To what extent do existing institutional facilities in the universities support scholars' research and communication needs?'

### 6.3.1. Institutional ICT infrastructure

The study required respondents to comment on the ability of the existing information and communications technology (ICT) infrastructure in their institutions to support their efforts in accessing and disseminating research output. Most of the respondents (73; 42%) noted that the infrastructure could not effectively support research activities. Those who found the infrastructure good were (54; 31%) and medium (47; 27%) respectively (see Table 6).

**Table 6:** Institutional ICT infrastructure ability to support research

| Theme | Frequency | Percentage |
|---|---|---|
| Extremely low | 73 | 41.95 |
| Medium | 47 | 27.01 |
| Good | 54 | 31.04 |
| **Total** | **174** | **100** |

*(N = 174)*
**Source:** *Computed from survey data, 2014*

The respondents who found the ICT infrastructure support poor complained that sometimes it did not work, the internet was too slow or the infrastructure was lacking. Those who reported good ICT support said it was easy to access the internet and international journals.

### 6.3.2. Institutional support available to facilitate research and scholarly communication needs of Kenyan scholars

The study required respondents to indicate the extent of support they received from their university in the last five academic years (2010–2014) to facilitate their research and communication needs. The results indicated that apart from receiving alerts about new grant opportunities and accessing library resources (considered as sufficient by 147; 57% and 156; 62%, academic staff, respectively) academic staff considered support as inadequate or non-existent (see Table 7).

**Table 7:** Academic staff's assessment of the support they have received from their institution

| Activity | Amount of help received from institution | | | | | |
|---|---|---|---|---|---|---|
| | None | | Insufficient | | Sufficient | |
| | Fq | % | Fq | % | Fq | % |
| Funds to attend professional meetings | 93 | 36.5 | 81 | 31.8 | 81 | 31.8 |
| Alerts about new grant opportunities | 36 | 14.1 | 73 | 28.5 | 147 | 57.4 |
| Time at job to perform research tasks | 46 | 18.3 | 98 | 38.9 | 108 | 42.9 |
| Sabbaticals | 101 | 40.7 | 67 | 27.0 | 80 | 32.3 |
| Improvement to office space and facilities | 65 | 25.9 | 99 | 39.4 | 87 | 34.7 |
| Computer purchase or upgrade | 73 | 29.1 | 93 | 37.1 | 85 | 33.9 |
| Mentorship | 59 | 23.8 | 91 | 36.7 | 98 | 39.5 |
| Staff support (research assistants, clerical) | 100 | 39.8 | 65 | 25.9 | 86 | 34.3 |
| Workshops/training on academic research | 33 | 12.9 | 103 | 40.4 | 119 | 46.7 |
| Workshops/training on financial management and administration | 59 | 23.8 | 90 | 36.3 | 99 | 39.9 |
| Library resources e.g. e-journals and books | 14 | 5.5 | 83 | 32.8 | 156 | 61.7 |
| Help to locate potential research or publication collaborators | 64 | 25.7 | 99 | 39.8 | 86 | 34.5 |
| Collaborative management of research documents and data | 51 | 20.5 | 117 | 47.0 | 81 | 32.5 |
| Tools for analysis of large data | 71 | 27.8 | 102 | 40.0 | 82 | 32.2 |
| Training of information handling skills | 42 | 16.5 | 105 | 41.3 | 107 | 42.1 |
| Help to disseminate and publish research | 68 | 26.9 | 94 | 37.2 | 91 | 36.0 |
| Advice on protecting intellectual property rights | 43 | 17.4 | 83 | 33.6 | 121 | 49.0 |

**Key:** *Fq = frequency*
*(N = 273 for academic staff)*
*Cronbach's alpha: 0.92*
**Source:** *Computed from survey data, 2014*

The postgraduate students were asked to indicate the extent of institutional/ departmental support they had received since they enrolled for studies. Most postgraduate students felt that library resources (215; 69%) and computer laboratories were sufficient (164; 53%) (see Table 8). However, they felt that other types of support were insufficient or non-existent.

**Table 8:** Postgraduates' assessment of the support they have received from their institution

| Activity | Amount of help received from institution | | | | | |
|---|---|---|---|---|---|---|
| | None | | Insufficient | | Sufficient | |
| | Fq | % | Fq | % | Fq | % |
| Funds to attend professional meetings | 178 | 59.5 | 76 | 25.4 | 45 | 15.1 |
| Improvement to office space and facilities | 74 | 23.9 | 104 | 33.5 | 132 | 42.6 |
| Computer lab | 20 | 6.5 | 126 | 40.6 | 164 | 52.9 |
| Mentorship (informal or formal) | 50 | 17.0 | 118 | 40.1 | 126 | 42.9 |
| Workshops/training on academic research | 53 | 17.5 | 115 | 38.0 | 135 | 44.6 |
| Student supplies and equipment grants | 128 | 42.4 | 112 | 37.1 | 62 | 20.5 |
| Library resources e.g. e-journals and books | 7 | 2.2 | 92 | 29.3 | 215 | 68.5 |

**Key:** *Fq = frequency*
*(N = 332 for postgraduate students)*
*Cronbach's alpha: 0.80*
**Source:** *Computed from survey data, 2014*

The Cronbach's alpha value for this question was 0.80 for items in the students' questionnaires. This suggested a high internal reliability of the test items. All the interviewees acknowledged that institutional funding for research activities to scholars was insufficient since sources were limited. Some of the funding was from internal sources while a large chunk was obtained through collaborations with external bodies to fund research and make local research output visible globally. These funding bodies included the National Council for Science, Technology and Innovation (NACOSTI) run by the Kenyan government to fund local scientists and innovators. Other funding partners are German Academic Exchange Service (DAAD), Ericson, Samsung, Ford Foundation, Clinton Health Access Initiative, USAID, Safaricom, International Development Research Centre (IDRC), Hewlett Packard, Bill and Melinda Gates Foundation. Scholars accessed funding from these organisations based on the merit of research proposals and the competition was therefore very high for the limited resources.

Another director of research opined that if the Kenyan government paid more attention to research and provided more funding, then levels of research output in

the institutions would rise. Specifically, the director suggested that the government needed to establish centres of excellence in different disciplines within the different universities and also invest resources for these centres. This would raise the quality and quantity of research in the different disciplines. As one director of research observed:

> It is a big disadvantage when our local universities are ranked together with Harvard, MIT or Stanford! These are well-established universities, and their governments have invested very heavily in them. You cannot compare African universities with the western world universities. Last year I went to Technical University of Berlin … I actually was shocked; those people are in another world! There is one item of equipment they were using for bio-prospecting research which we were interested in … it costs 500,000 Euros, just 1! So then you come to University F, for example, we have a small HPLC of 44,000 Euros worth! It cannot compare! For them you just need a small sample, put it through that equipment it does all the analysis including structural elucidation so you get all the results you want ... so within 6 hours, work which would have been done for 6 months is completed! So the only thing that is required is interpretation ... you interpret ... you publish ... period! Therefore, while we are struggling here, people are just getting results in 6 hours ... so there is a very big disparity in comparing universities in the developed world and those in developing countries particularly in Kenya.

The director of research at University D observed that although scholars in local universities are expected to do a lot of research and produce tangible outputs, which would put them on comparable levels with other countries, this has not been possible. According to this director, pressure for university education in Kenya is very high, and scholars are therefore more engaged in teaching than in research owing to high student numbers and few teaching staff. As a result, academic staff are overstretched and find it very difficult to put aside the requisite 20 per cent of their time for research. Because of the pressure of work, local scholars find it difficult to put in the required effort to access funding for research, which is very expensive. The Director pointed out the need to roll out more PhDs to equip the universities with teaching staff and therefore reduce the academic staff-student ratio to allow teaching staff to have more time to spend on research.

Interviews with the representatives of the research offices confirmed that the research offices coordinate research activities in the universities. They educate the scholars on different issues in research and publication including assisting scholars to appreciate the importance of research for societal development; writing fundable research and innovation proposals; seeking funding for research; copyright and protection of intellectual property; writing articles for publication; and understanding different publication modes such as OA. They also seek and facilitate collaborations between their scholars and private and public companies. Such collaborations usually yielded funding and networking opportunities for researchers after which the universities played an intermediary role between the parties involved. In some of the universities, the research offices arranged for payment of author fees for scholars

to publish their articles in peer-reviewed journals. The interviews revealed that all the universities surveyed had research policies that guided the research departments in their activities in support of research as well as the researchers themselves in conducting research and communicating their research output.

Challenges faced by the research offices related to administering the limited funding from internal and external sources; the poor research culture among Kenyan scholars whereby the majority of them only preferred to teach and not engage in research. One director of research commented:

> There are people who just want to come and teach 2–3 hours and go home … give them all the opportunities, provide the funds … they are not interested! So, when you look at the number of academic staff who are active in research compared to the total, it's about 20%, which to me is bad!

Some of the surveyed institutions were actively involved in changing this mind-set by incentivising researchers and creating awareness of the important role they could play in research as well as collaborations for research.

The interviews also revealed that the universities had increasingly invested in ICT to ensure that students and staff communicated effectively with their peers and accessed research output produced outside their institutions. In all the universities surveyed, students and staff were provided with computers and related accessories in offices and laboratories, which although insufficient, met some of their needs. To reduce the gap in the student: computer ratio, most universities were encouraging their students to buy their own laptops and in some universities, it was now a policy for students to buy personal laptops. The institutions had also invested in internet connectivity with most of them providing wireless hotspots in several places within the universities where users could access the internet.

## 7. DISCUSSION OF FINDINGS

The results revealed that both academic staff and postgraduate students generated 12 types of scholarly content. Of these, the most common were theses, journal articles and conference papers. This suggests that the majority of academic staff are concentrating on producing theses (either as supervisors or as students) with less attention paid to generating conference presentations; journal articles; books, book chapters or technical reports. This result may be explained by the large number of students to supervise; hence academic staff are mainly engaged with thesis work leaving little time for research that would result in production of other scholarly works. The result may also be linked to what other researchers have alluded to: that faculty the world over are increasingly expected to publish only in journals with high impact factors rather than in other forms of publishing (including books and book chapters) that do not attract impact factor rankings (Bagatin and Gontijo 2011; Johnstone 2007). Besides, publication of peer-reviewed journal articles has

long been rated as the most important element for tenure and promotion decisions in universities (Dennis et al. 2006; Gabbidon, Higgins and Martin 2011; Seipel 2003).

The study revealed that a sizeable quantity of scholarly content existed as grey literature, which is non-published, and non-peer reviewed such as theses, datasets, technical reports, working papers and multimedia. The results concur with Kanyengo (2009, 36) and Omekwu (2003, 132) who found that much of Africa's scholarly output is grey literature, and is difficult to track and acquire. In particular, Kanyengo (2009) observes that the number of papers presented at conferences and workshops are huge, and not well organised. More often such literature is usually found scattered in people's homes and offices, and more recently is self-published on the internet. Interviews with university librarians revealed that the libraries and their institutions in general have been unable to account for content produced in workshops, conferences, meetings, and learning sessions. The libraries depend on the scholars' goodwill to deposit this content with them as well as directives instructing creators to deposit the content with the library. Increasingly, universities in Kenya now have structures in place such as the IR to trace and capture grey literature. The IR model however faces challenges because most of the universities surveyed have not developed ways of convincing scholars to deposit all their outputs in these repositories.

The study results also confirmed that research and scholarly work conducted in universities in Kenya produces various forms of scholarly content. Journal articles, books and presentations between academic writers function as a continuous conversation that allows scholars to exchange, build on and generate new ideas (Deitering 2011). The Conversation Theory posits that conversations among peers in a given domain and within specific theoretical frameworks create new knowledge (Lankes, Silverstein and Nicholson 2007). According to Pask (1976), the basic conversation involves two parties (in this case two scientists) interested in answering a question by exchanging information. In the process, theories are exchanged and justified and the accompanying models and procedures are elaborated between the participants. According to Klemm (2002), these conversations are manifested in written or oral forms, digital or traditional formats, presented in public or private and as formal or informal communication. Essentially, the purpose of these conversations is to contribute towards learning and broader understanding of concepts, generating ideas and assisting in decision making (Klemm 2002). The Knowledge Management Process Model by Botha et al. (2008, 48) postulates that all knowledge creation, whether individual, team, community and organisation, is constructed from other knowledge gathered from classes and formal training, experts, seminars, social networking, literature or a combination of these. The study results suggest that new knowledge is created by interactions between scholars in the universities and from their participation in research, conferences, and interactions with scholarly literature.

The results revealed that although more than half of the respondents indicated that they had little or no knowledge of data curation, their activities with regard to preservation and archiving of scholarly content could be regarded as curative. A majority of the respondents indicated that they documented their research procedures, backed up information on computers by storing multiple copies of their files in different locations, moved files from older to newer computers and printed out hard copies of the files. The universities required students to deposit their theses in PDF format, an open file format currently used to guarantee long term availability and portability of the document across different computer platforms. These results suggest that both the universities and individual researchers were aware of the need to maintain the long-term accessibility of their research data and other information and took measures to guard against loss or inaccessibility of the information. The requirement for their students to submit theses in PDF format, complied with the National Information Standards Organization (2007, 37) recommendation that encourages authors to create born-digital content in specific formats that would facilitate long-term accessibility.

These results seem somewhat divergent with results from previous studies (Groenewald and Breytenbach 2011; Lord et al. 2004; Marshall, Bly and Brun-Cottan n.d.). Lord et al. (2004) reported on a study that examined the status at the time of the provision and future needs of curation of primary research data in the United Kingdom, within the e-Science context. Marshall et al. (2006) conducted a field study to examine the current state of personal digital archiving in practice. The participants in the study had each owned multiple computers, and other digital recording devices such as digital cameras, camera phones, digital video recorders, and CD or DVD burners. Groenewald and Breytenbach (2011) investigated the awareness about digital preservation and what must be done to preserve valuable original digital materials. The participants in the study were mostly from South Africa. These studies revealed that researchers and home computer users in general lacked knowledge, general awareness and consistent usage of preservation strategies and management of the digital objects they had created on their personal computers.

The results from the current study indicated instead that computer users were increasingly becoming aware of the need to undertake personal initiatives that would ensure that their digital data and information remained consistently accessible and available for their use in the long-term. Respondents used diverse preservation modes ranging from home and work-place computers, portable storage, university digital archives and servers, and traditional hard-copy printouts for back up purposes. As the Library of Congress (2013b, 3) argues, 'one of the still unfolding impacts of the computer age is that everyone now must be their own digital archivist'.

Concerning institutional support for research and communication among Kenyan scholars, the results revealed that the majority of respondents (73; 42%) felt that ICT infrastructure to support research was inadequate. They explained that

sometimes the internet was slow implying that the full benefits of improved internet connectivity as envisioned after completion of the African undersea cable projects was yet to be felt in the universities.

The results indicated that the majority of the respondents considered their institution's support for research insufficient or non-existent (tables 7 and 8). Funds to attend professional meetings, provision of office space and facilities, computer purchases or upgrades, mentorship, collaborative management of research documents and data, tools for analysis of large aggregations of data, and student supplies and equipment mini-grants were inadequate. Time available to conduct research was inadequate owing to the heavy teaching and supervision workload the scholars were faced with. Academic staff, however, considered alerts about new grant opportunities (147; 57%) and library resources (156; 62%) as sufficient whereas students (215; 69%) considered library resources to be sufficient.

The interviews with librarians and research office representatives confirmed that their universities could not provide the various types of research and communication facilities in sufficient quantities due to insufficient funding available to them. Efforts to supplement funding were bearing fruit in universities such as University E, University C and University A which had established disciplinary research centres. The observation that only 20 per cent of academic staff are active in research despite availability of funding implies that in spite of the academics blaming their institutions for insufficient support, most of the scholars were not taking up the opportunities for research funding, preferring instead to teach. Boyer (in Schneider et al. 2009, 2) says that 'scholarship includes teaching, research, outreach or integration'. The small number of scholars estimated to be involved in research was an indicator of the overall poor research culture and low scholarly output levels at the institutions involved.

The results indicated that key challenges remain for universities in providing support for research and scholarly communication. The respondents observed that the global institutions of higher learning that local universities are being compared with are supported financially by their governments and private research partners and they can afford to conduct cutting-edge research and publish the results in a much shorter time. This implies that the resources that would support cutting edge research in universities in Kenya were not available, thus severely limiting the quality and quantity of research they could carry out.

Studies have linked public financial spending on Research and Development (R&D) to scholarly productivity and quality of research. Europa.eu (n.d., 1) defines R&D intensity (R&D expenditure as a percentage of GDP) as the 'extent of research and innovation activities undertaken in a given country in terms of resources input'. Halpenny et al. (2010) examined the geographic origin of publications in the highest impacting radiology journals and the link between percentage of gross domestic product (GDP) spent by a country on research and the output of radiology

publications. Their study established that the percentage of GDP spent on research was positively correlated with the number of publications in high-ranking radiology journals ($r = 0.603$; $P < .001$). Meo et al. (2013a) assessed among other things, the impact of GDP spending on R&D on the published research documents, citable documents, citations per document and H-index in environmental sciences in Middle East countries. They found that publication outcomes in research did not depend on a country's GDP but on what percentage of that GDP was spent on R&D. Middle East countries were found to spend US$0.63+/–0.28 of their GDP per capita on R&D. Similarly, Meo et al. (2013b) assessed the impact of GDP spending on R&D, the number of universities and scientific journals on research publications among Asian countries. They found that the yearly per capita spending on R&D was US$0.6+/–0.16. In contrast, most countries in Africa spend no more than 0.5 per cent of their GDP on R&D except South Africa whose expenditure is currently estimated at 1 per cent of its GDP (UNESCO Institute for Statistics 2012).

Bernanke (2011) opines that unlike the private market, governments can foster R&D through directly funding government research facilities, offering grants to university or private sector researchers, availing contracts for specific projects and through tax incentives. Several authors (Hall, Mairesse and Mohnen 2009; Zuniga and Wunsch-Vincent 2012) have shown that benefits from government investment in R&D arise through knowledge transfer, innovation resulting in new products and processes, business development through incubators, science parks and university spin-offs, employment opportunities, and training opportunities for scientists, managers and personnel. The Kenyan government would do well to increase GDP spending on R&D to benefit the universities, their researchers and society as a whole.

The study results add to several studies that have considered the role played by institutional resources and support on research productivity, as well as levels of satisfaction with such support by members of faculty. McGill and Settle (2012) in the United States found that faculty were not satisfied with their level of institutional support and that the three areas in which additional support was needed to increase their research productivity included staff support, release time, and funding for attending conferences. These sentiments were also echoed by Lynch et al. (2009) whose study of 300 members of the National Association of Social Workers (NASW) revealed that a high percentage of the social workers felt that institutional support was not evident. Mullan et al. (2011) found that in medical schools in sub-Saharan Africa, researchers faced challenges accessing research grants and had restricted time for research. Sawyerr (2004) observed that in Africa, research was underfunded, graduate study programmes were weak and poor management of existing research had impacted negatively on research capacity.

The study results revealed that despite dwindling financial resources and rising student numbers, the universities in Kenya surveyed have found ways of mitigating these challenges by providing electronic journals; increasing improvement in internet

connectivity; and deployment of such applications as IR and OA. The results suggest that the universities in Kenya surveyed have made visible strides in implementing strategies to manage the knowledge acquired and generated from both within and outside

## 8. CONCLUSIONS AND RECOMMENDATIONS

The study concludes that variety in publications, such as books, book chapters, book reviews, technical reports or working papers was not achieved, owing to work overload for academic staff, poor research culture, and inadequate institutional support for research and publication. University digital archives and servers were rarely used due to distrust, lack of awareness, fear of plagiarism and concerns about the use of the content therein. Self-archiving of content was therefore hardly undertaken. The concerns raised by Kenyan scholars were not unique, as similar studies conducted in other jurisdictions have arrived at the same conclusion (Davis and Connolly 2007; Krevit and Crays 2007). Although Kenyan scholars are aware of the importance of preservation of scholarly content, they prefer implementing fragmented preservation strategies at a personal level rather than collectively at departmental or institutional levels. Such strategies were not likely to contribute to the long-term preservation of institutional memory and therefore limited the visibility of local content. Selective and non-exhaustive collection development policies in academic libraries generally overlooked content generated by non-academics, and non-scholarly but valuable content that would preserve institutional memory. The majority of scholars were dissatisfied with institutional support provided by the universities for research in the form of funding, material and physical infrastructure, ICT facilities, mentorship programmes, student grants and data analysis and management tools. This was impacting negatively on the scholarly productivity of academic staff and postgraduate students.

The study recommends the formulation of appropriate policies that would guide preservation of scholarly content to enhance visibility and long-term access of scholarly content. Further, universities in Kenya should continue to seek funding partnerships that will facilitate increased research, innovation and entrepreneurship amongst their scholars. Universities must continually engage with government and other external agencies to provide more resource for research capacity development. In line with McGill and Settle (2012), in order to increase faculty research productivity, institutions and departments should pay more attention to funding additional staff support, such as research assistants; allow more release time for academic staff to concentrate more on research; and allocate travel funds to enable faculty to attend conferences.

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