

# Conceptual framework for scholarly communication guidance by the academic library: The case of Kwame Nkrumah University of Science and Technology

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## Abstract

This article seeks to give academic librarians insight and guidelines into the provision of an effective scholarly communication guidance to doctoral students. The findings of the study showed that doctoral students had not received much training and guidance on research and scholarly communication practices from their supervisors and academic librarians. The study adopted a case study research design with Kwame Nkrumah University of Science and Technology (KNUST) as the research site and sequential explanatory mixed method approach. A proposed scholarly communication guidance model to be used by the academic library is presented. The model proposes that scholarly communication guidance should be offered to doctoral students immediately they enrol for their programmes, throughout their research process, and finally when the research is completed since they are expected to conduct original research. The model will guide the drafting of policies and the academic library in developing tailor-made channels and contents for scholarly communication guidance to doctoral students. The study has contributed to the body of knowledge on scholarly communication guidance by the academic library to doctoral students as previous studies recorded in the literature pertains mostly to faculty and not to students – particularly doctoral students.

## Keywords

Academic library, doctoral students, information literacy education, scholarly communication guidance, scholarly communication guidance model

## Introduction

Universities across the world share a common view that the conduct of research to supply solutions to societal issues and supplying research support is an indispensable part of their mission (Bonaccorsi and Secondi, 2017). Doctoral studies and students form a core component of research output in many universities across the world (Horta and Santos, 2016). Bonaccorsi and Secondi (2017) state that although governments fund doctoral studies in different ways, universities with high numbers of doctoral students have more productive research output.

There exists a general trend to deliver postgraduate programmes either partially or fully online and as students do not visit the university campus to access library services and training physically, their special research needs should be addressed by the academic library (Bussell et al., 2017). De Long et al. (2017) are of the view that academic libraries are core to the mission of the parent institution and no

longer just academic support units, but rather partners to faculty, staff, students and the society as a whole. Thus, the work of academic libraries should be in line with the strategic goals of universities which emphasize teaching, learning, research, student success, informed citizenship and global awareness.

In view of these, this article seeks to give academic librarians insight and guidelines into the provision of an effective scholarly communication guidance to doctoral students. Thus, a proposed scholarly communication guidance model by the academic library to doctoral students is presented.

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## **Kwame Nkrumah University of Science and Technology (KNUST) library system**

KNUST was officially opened on 22 January 1952. It has six colleges, namely Agriculture and Natural Resources, Art and Building Environment, Humanities and Social Sciences, Engineering, Health Sciences and Sciences. Each college consist of departments, faculties and research centres.

The KNUST library system consists of the main university library, six college libraries and libraries in departments, faculties and research centres (KNUST Library Strategic Plan, 2005:1). The aim of the KNUST library system is to select, acquire, organize, preserve and make available resources to build a comprehensive collection reflecting the goals and objectives of the university and to support the teaching, learning and research in science and technology for national development (KNUST Research Report – KNUST, 2015b). The library subscribes to over 50 academic databases containing 30,000 online journals and more than 100,000,000 full-text documents, bibliographic information, abstracts and book reviews (KNUST Facts and Figures – KNUST, 2015a). It also hosts the Open Access Institutional Repository, KNUSTSpace and serves as a depository library for all materials published in Ghana as well as for international institutions and organization like the World Bank and other United Nations Agencies (KNUST, 2015b).

Trainings and workshops organized for postgraduate students within the KNUST library system aim mainly to teach students to search for relevant information – especially online databases, to use plagiarism detectors to avoid plagiarism and how to use Mendeley, a reference management software.

## **Problem statement**

There is an assumption by faculty that doctoral students improve their research ability over time despite the lack of training (Bury, 2011) or they have every skill needed for research and scholarly communication (Campbell, 2017). Most supervisors therefore do not give prominence to the acquisition of research dissemination and scholarly communication skills by their doctoral students (García-García et al., 2014). In reality, however, many postgraduate students do not have the required skills for research and publishing which causes hindrances for their academic progression.

The literature reflects the advantages of early publishing by doctoral students (Bartkowski et al., 2015; Horta and Santos, 2016; Larivière, 2012; Pickering and Byrne, 2014; Pinheiro et al., 2014), scholarly communication outreach and education by the academic library to faculty (Bazeley et al., 2014; Duncan et al., 2013; Klain-Gabbay and Shoham, 2016; Malenfant, 2010) and

scholarly communication practices by faculty, but limited information on doctoral students who are expected to conduct original research (Dawson, 2014; McGrath, 2016; Rao, 2009).

At Kwame Nkrumah University of Science and Technology, where the research was conducted, doctoral students are required to show evidence of submission of at least two manuscripts from the thesis for publication in peer-reviewed journal(s) (KNUST Graduate students' handbook – School of Graduate Studies, 2017) but not much emphasis is placed on the guidance and training needed to equip them to produce manuscripts for publication or presentation at conferences, either in graduate school handbooks or by the academic library, although training programmes on accessing the library's online databases are organized frequently.

Findings in this article are part of a major study for a doctoral thesis on scholarly communication guidance as a core service of the academic library to doctoral students. The findings presented in this article focus on the development of a scholarly communication guidance model to be utilized by the academic library for scholarly communication guidance to doctoral students.

This article was therefore guided by the following research questions:

- Why should the academic library provide scholarly communication guidance to doctoral students?
- Are doctoral students at KNUST receiving scholarly communication guidance?
- Are there available policies on the promotion of scholarly communication by doctoral students?
- What are the preferred contents and channels of scholarly communication guidance?

## **Literature review**

This section aims to identify links, differences and gaps in the literature with reference to the need for scholarly communication guidance for doctoral students and channels as well as contents of scholarly communication guidance.

### **Scholarly communication**

Scholarly communication is defined as 'the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly community, and preserved for future use' (Association of College & Research Libraries (ACRL), 2003). Guru et al. (2010) described scholarly communication as an inclusive process representing all forms of dissemination of research output passed from author to readers through publishers, universities and libraries. Reed (2018) broadened the concept of scholarly communication to include skills in creating (research methodology), evaluating (peer review),

sharing (through scholarly journal articles, monographs, conference proceedings and research reports), and preserving (repositories) subject knowledge.

Not mentioned explicitly are the publishing and legal aspects of scholarly communication. The publishing aspects involve publishing trends (open access and institutional repositories) and meeting requirements of funders. In the view of Rao (2016), results from every research study be it social sciences, scientific, technological or humanities need to be made available for use by the society for further research and societal development. This reasoning is strengthened by the fact that research is largely funded by the government or sponsored by public funds. It is therefore justified to make research public via open access or by institutional repository as a mechanism for capturing, archiving, managing and enhancing the collective digital research outputs of an institution (Marsh, 2015; Nemati-Anaraki and Tavassoli-Farahi, 2018).

The legal aspects of publishing include the rights of authors and understanding publishing agreements which include, knowing authors' privileges for publishing in a particular journal, arrangements between a publisher and an author, copyright as well as intellectual property and moral rights legislation (Sutherland-Smith, 2016).

### *Need for scholarly communication guidance by the academic library to doctoral students*

This section identifies the research and scholarly communication needs and skills of doctoral students as well as the need for guidance by the academic library. For effective scholarly communication guidance, the research needs and scholarly communication needs of doctoral students should be ascertained.

**Research and scholarly communication needs and skills of doctoral students.** Participatory and service design methods were adopted by Johnson et al. (2015) to identify research needs and prevailing perceptions of library services among some faculty, post-graduate and graduate student researchers based at a satellite campus at the University of Colorado Boulder in the United States. The authors define participatory design as an approach to building spaces, services and tools where the people who will use those facilities participate centrally in coming up with concepts and then designing the actual products.

Identified research needs were: knowing what experiments have already been done and which have failed; understanding how to analyse data; keeping up with the literature; finding a research question and knowing which methods to use to answer it; library spaces for convenient access to workshops, group work, browsing collections and promotion of library services/resources; dedicated email, phone and in-person support from librarians; and lastly, workshops/tutorials/seminars on skills/tools useful

for research and easier electronic access to journal articles. Other needs identified in the literature are choosing effective keywords, finding and analysing data, research findings dissemination, access to journals, conference proceedings and online resources (Becker and Chiware, 2015; Bussell et al., 2017; Tomaszewski, 2012).

Pinto et al. (2013) are of the view that doctoral students require skills in order to effectively address their research and information needs. They identified information literacy competence which entails the ability, skills and knowledge of analysing, synthesizing, evaluating, using and disseminating information. Skills required by doctoral students for research and scholarly communication also include information communication technology skills (to be able to manage research workflow, share research and archive information), ability to determine effective ways of disseminating research findings and ability to conduct efficient literature searches (Ince et al., 2018; O'Malley and Delwiche, 2012).

**Need for scholarly communication guidance.** Singh (2018) defined guidance as a programme with highly specialized activities instigated to assist targeted individuals to make wise, intelligent choices and decisions. Combined with the definition of scholarly communication by ACRL (2003), scholarly communication guidance is defined as providing training to equip users on scholarly communication practices such as the conduct of research study, research dissemination, copyright, data analysis, citation techniques and author requirements (White, 2019).

It has become necessary for the academic library to offer scholarly communication guidance to doctoral students. This is in support of Kennan et al. (2014) that knowledge and skills should be imparted to create responsible and employable professionals, and in line with Kamler's (2008) realization that most doctoral students do not receive adequate mentoring or structural support to publish and contribute to new knowledge production in universities.

Academic libraries exist to support the teaching and research of their parent institutions (Kennan et al., 2014) and should dynamically find new roles and responsibilities to engage with researchers in order to enhance the institutional research profiles (Delaney and Bates, 2018). Koler-Povh and Turk (2018) stressed the importance of cooperation between doctoral candidates and librarians, not only to successfully complete studies but also to develop useful skills and competencies for everyday life research work. Emphasis is placed on the role of the academic library in supporting, sharing and preserving doctoral research through training on institutional repositories, open access, bibliometrics, enhancement of research impact and research data management (Borgman, 2015; Keller, 2015; Suber, 2012; Willinsky, 2006).

Although many doctoral students are expected to show evidence of submission or acceptance of peer-reviewed

journal articles as part of the requirements for graduation (Lei and Chuang, 2009; Li, 2016; Shelby and Okilwa, 2011) and, doctoral students are mostly considered as future faculty members (Baltrinic et al., 2016; Bøyum and Aabø, 2015; deBettencourt et al., 2016; Mello et al., 2015) most discussions on scholarly communication guidance rest with faculty members and the role and appreciation of the academic library has not been outlined as it should be.

**Collaborators of scholarly communication guidance.** Collaboration is defined by Pham and Tanner (2015) as a joint working, learning and sharing process that specifically focuses on the activities of teaching, learning and researching among educational participants, in which knowledge can be activated and transferred. Collaboration in the light of this article is defined as a cooperation between stakeholders in the provision of guidance towards effective scholarly communication by doctoral students.

Collaborators for scholarly communication guidance have been identified as supervisors or faculty members (Delaney and Bates, 2018; Pham and Tanner, 2015; Shelby and Okilwa, 2011), university information technology offices and offices of grants and research (Jaguszewski and Williams, 2013; Mamtara, 2013).

Another major issue with collaboration is funding for scholarly communication guidance programmes. Björk (2007) had earlier noted the importance of basic university funding for research. This article posits that scholarly communication guidance should basically be funded by the university administration through increased budgets for academic libraries.

### *Contents of scholarly communication guidance to doctoral students*

Contents of a course on scholarly publishing designed by the university library at Pacific University, USA are professional writing and editing; introduction to digital media; publication, editing and design; editing practicum; introduction to scholarly journal publication; book editing; design and production and lastly literary magazine production (Gilman, 2013). Other programmes include how to use citation management tools, copyright, plagiarism and research support (Buehler and Zald, 2013; Thomas, 2013).

Similar thoughts on the contents have been outlined to include training users through information literacy initiatives on issues of open access, copyright and publishing agreements as well as providing research support. Open access services should include publishing models. Copyright and publishing agreements services should include assisting patrons to use copyrighted materials legally and to consult authors on their publishing agreements. Research support services should include training users in finding and evaluating open access resources as well as helping authors to comply with funding mandates. In summary, the focus

should be on writing, research and creating new knowledge (Davis-Kahl, 2012; Thomas, 2013).

### *Channels for scholarly communication guidance*

The need to develop online learning modules and tutorials for researchers have been suggested by Davis-Kahl (2012) and Jaguszewski and Williams (2013). These online platforms include blogs, Twitter accounts and other online marketing tools that can be used on a consistent basis to showcase open access and scholarly communication resources to increase awareness and understanding especially of author rights.

Other authors in support of the suggestions from Davis-Kahl (2012) and Jaguszewski and Williams (2013) are Wright (2013) and Davis-Kahl et al. (2014). They indicated that there are many strategies for integrating scholarly communication concepts into different areas of a student's academic life. Such initiatives may be through digital materials, live presentations, formal instruction, exhibits, symposia and including student work in institutional repositories. These online platforms can be incorporated into a research portal, defined by Barman (2014) as a website or web service that provides information content to serve a specific community, which will serve as a 'one-stop' shop where all the necessary training and guidelines are presented. Users could visit the portal as and when research and scholarly communication guidelines are needed.

## **Methodology**

The study adopted a case study research design with KNUST as the research site and a sequential explanatory mixed method approach involving the combination or integration of qualitative and quantitative research and data (Creswell, 2014). Quantitative data was collected through questionnaire responses from doctoral students and doctoral supervisors while qualitative data was elicited through interviews with librarians and the Dean of the School of Graduate Studies, documentary analyses and a bibliometric survey.

Aspects of Wilson's 1981 information behaviour model (Wilson, 1999), proposed adaptation of Garvey and Griffith's model of scholarly communication for a print plus electronic environment by Costa (1999), and aspects of the scholarly communication lifecycle model developed by Björk (2007) were adopted as a theoretical framework to guide the study and the development of a scholarly communication guidance model.

### *Population and sampling*

The population for this study firstly comprised 699 doctoral students registered for the 2017–2018 academic year



at KNUST, regardless of their year of first enrolment as well as 215 academics supervising these doctoral students. The population for interviews included the two acting Deputy Librarians (representing the University Librarian, whose tight work schedule could not permit an interview) and 17 professional librarians with Master of Arts or Master of Philosophy in Library or Information Science qualifications in the KNUST library system. Most of the interviewees represented heads of the library departments, sections or units and are required to offer training programmes, orientations and liaison services to users. The interviews centred on the research and scholarly communication needs of doctoral students, skills doctoral students must possess for effective scholarly communication, and policies in the academic library on promotion of scholarly communication by doctoral students,

Purposive sampling technique which involves the selection of the entire population that have a particular set of characteristics was specifically adopted to select doctoral students and their supervisors at KNUST. Supervisors of doctoral students were purposively selected from each college because they are in close contact with the doctoral students and able to access their research skills.

### *Data collection and analysis*

A bulk text messaging service facilitated by the University Information Technology Services of KNUST with a link to the questionnaire was used to administer a web-based questionnaire designed with Google Forms via email addresses of 699 doctoral students between October 2017 and January 2018. Of these, 10 email addresses were found not to be valid. After a series of reminders through emails and the text messaging system, 123 responses were received, constituting a response rate of 17.9%.

Another web-based questionnaire designed using Google Forms was mailed to doctoral supervisors, but due to low response rate, a printed version was then administered by the researcher to 60 of them in their offices. After a series of personal follow-ups, a total of 29 printed questionnaires were retrieved out of 60 delivered, resulting in a response rate of 48%.

The data received from Google Forms was exported to Microsoft excel 2007 and subsequently exported to the Statistical Package for Social Sciences (SPSS) 21 for analyses. SPSS was used in generating frequencies and charts for the data analysis.

Face-to-face interviews were conducted with the Dean of the School of Graduate Studies, two Deputy Librarians and 10 professional librarians to identify needs and practices regarding scholarly communication. The interviews were also aimed at identifying research and scholarly communication needs and skills required by doctoral students as well as policies in the academic library on promotion of

scholarly communication by doctoral students. Interview questions were both closed and open-ended questions.

The recorded interviews were transcribed and saved as individual Microsoft word files before they were exported to AtlasTi, version 8. Keywords to be used as codes were generated based on the variables derived from the research questions, theories adopted as well as other themes and ideas that emerged from the interviews. In AtlasTi, selections of text and paragraphs were tagged and named with the predetermined codes. Codes were then grouped under themes to facilitate in the presentation of the data.

## **Results and discussions**

The findings presented in this article focus on guidelines into the provision of effective scholarly communication guidance to doctoral students. That is, the presentation of scholarly communication guidance model for academic libraries.

To ensure anonymity and confidentiality, the respondents for the interviews were labelled with PL (professional librarian). They are PL1, PL2, PL3, PL4, PL5, PL6, PL7, PL8, PL9 and PL10. The two Deputy Librarians were labelled with Deputy A and Deputy B. Dean was used to label the Dean of the School of Graduate Studies.

### *Research and scholarly communication needs and skills required of doctoral students*

Information on the research and scholarly communication needs of doctoral students was sought from the Dean of the School of Graduate Studies and the two Deputy Librarians through their interviews. The responses were categorized according to themes identified and presented in Table 1.

In Table 1, both Deputy A and the Dean of the School of Graduate Studies indicated access to credible journals and databases as one of the research and scholarly communication needs of doctoral students. Access to Internet services and the ability to make research findings accessible and visible to global audience were further stated by Deputy A.

The skills doctoral students need to possess for effective conduct of research and scholarly communication were also sought for from the professional librarians and the two Deputy Librarians. This information was sought for to determine the necessary contents and tools needed in the development of scholarly communication guidance for doctoral students by the academic library. Table 2 is a reflection of the collated responses grouped under themes.

Responses in Tables 1 and 2 are in agreement with identified research and scholarly communication needs of doctoral students in literature from Becker and Chiware (2015), Bussell et al. (2017), Johnson et al. (2015) and Tomaszewski (2012). They include knowing what experiments have already been done and which have failed; understanding how to analyse data; keeping up with the

**Table 1.** Research and scholarly communication needs of doctoral students.

Theme	Interviewee	Responses
Access to databases	Deputy A	<i>How to have access to the local contents that are deposited in the KNUST institutional repository.</i>
	Dean	<i>Doctoral students need research in a particular field of interest because we realise that most of the students prefer to use Google and others instead of accessing scientific writings so for us they need top most journals.</i> <i>Materials that are genuine to whatever they are doing. Credible journals instead of materials from dubious sources.</i>
Access to Internet	Deputy A	<i>Getting access to internet services wherever they are on campus</i>
Visibility of research findings	Deputy A	<i>How to make what they have found locally available to the global audience to access.</i>

**Table 2.** Research and scholarly communication skills needed by doctoral students.

Theme	Interviewee	Responses
Information literacy skills	Deputy A	<i>Doctoral students need to acquire information literacy skills.</i> <i>They should be able to identify an information need, why the information is needed, and be able to search among the lot for the needed information as well as making maximum use of the information.</i> <i>How to evaluate and utilise credible information.</i>
	PL1, PL2, PL3, PL4, PL5, PL6, PL7, PL8, PL9 and PL10	
	PL4 and PL5	<i>How to do proper citation and avoid plagiarism.</i>
Computer or information technology (IT) skills	Deputy A	<i>Doctoral students should also be well versed in information technology.</i> <i>They should be able to use it to their advantage</i>
Effective communication skills	Deputy A	<i>The doctoral student should have effective communication skills to be able to clarify his problem. Even when the research is done, he /she should be able to communicate the findings effectively.</i>
Dissemination channels	PL1, PL2, PL3, PL4, PL5, PL6 and PL7	<i>They should be able to determine predatory journals.</i>
	PL1, PL4, PL5, PL6 and PL8	<i>They should have the ability to determine where to publish their final research results.</i>
	PL5	<i>How to respond to reviewer's comments.</i>
Data analysis software	PL1, PL2, PL3, PL4, PL5, PL6, PL8 and PL9	<i>Doctoral students should be able to use software for data analysis.</i>
	Deputy B	<i>Sometimes the supervisors as well as academic librarians assume that the students know but that may not be the case.</i>

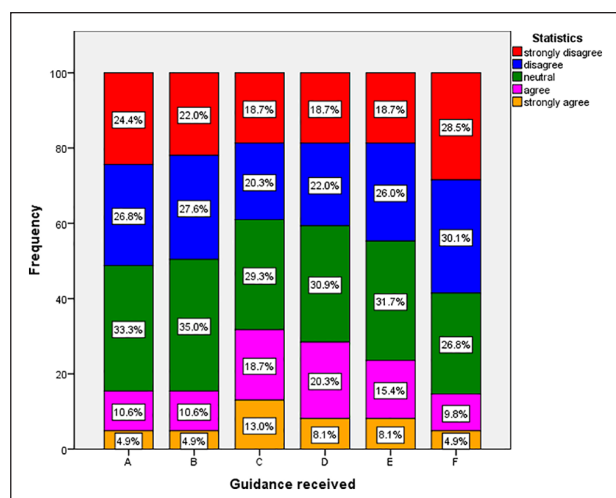
literature; finding a research question and knowing which methods to use to answer it; promotion of library services/resources; dedicated email, phone and in-person support from librarians; workshops/tutorials/seminars on skills/tools useful for research and easier electronic access to journal; choosing effective keywords and access to journals, conference proceedings and other resources.

*Level of scholarly communication guidance received from supervisor.* Figure 1 reflects that doctoral students at KNUST had not received much training and guidance on research and scholarly communication practices from their supervisors, supporting the assertion by (Kamler, 2008) that most doctoral students do not receive adequate mentoring or structural support to publish and contribute to new knowledge production in universities.

The majority of the doctoral students either strongly disagreed or disagreed with all the statements. The highest

respond (58.6%) for strongly disagreed and disagreed is seen in the statement *My supervisor has given me guidance on how to access funding for my doctoral research.* All the statements had comparatively high percentages (26.8%–35%) for the neutral option. This may possibly be an indication that the students did not want to present their supervisors in a negative light. Although *My supervisor has trained me to prepare manuscripts for publication from my research* and *My supervisor has shown me the various ways of disseminating research findings* received some positive (31.7% and 28.4% respectively) response for agree and strongly agree, the figures are comparatively low, indicating the need for more guidance from the academic library.

*Level of scholarly communication guidance provided by supervisors.* Supervisors had to indicate the level of guidance provided to their doctoral students on accessing library



**Figure 1.** Level of scholarly communication guidance received from supervisor (N=123).

A = I have received training on how to access library resources by my supervisor.

B = My supervisor has directed me to academic librarians for training on library resources.

C = My supervisor has trained me to prepare manuscripts for publication from my research.

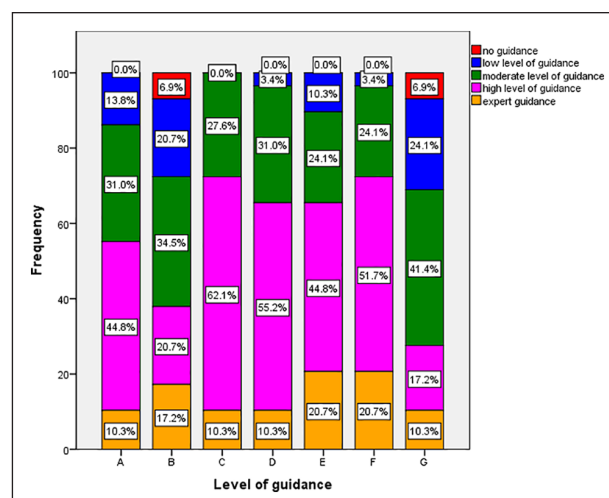
D = My supervisor has shown me the various ways of disseminating research findings.

E = My supervisor has trained me to access full-text articles from online databases.

F = My supervisor has given me guidance on how to access funding for my doctoral research.

resources, various ways of disseminating research findings, accessing full-text articles from online databases, preparing manuscripts for conference presentations and journal publications, directing students to academic librarians for training on library resources and on how to access funding for research. Figure 2 is a presentation of the data.

From Figure 2 it can be seen that supervisors rated their input as high levels of guidance in *Guidance on how to access library resources* (44.8%), *Guidance on how to prepare manuscripts for publication from their research findings* (62.1%), *Guidance on the various ways of disseminating research findings* (55.2%) and *Guidance on how to access full-text articles from online databases* (44.8%). However, moderate levels of guidance are seen in *Directing doctoral students to academic librarians for training on library resources* (34.5%) and *Guidance on how to access funding for doctoral research* (41.4%). This is an indication that some guidance is provided but the responses from the students did not reflect it. Again, the role of the academic library in the training of doctoral students has not yet been appreciated by the supervisors. The academic library should be able to find ways of guiding doctoral students to cater for the gap that is left or train them to be totally equipped for effective scholarly communication. As indicated by Keller (2015) and Koler-Povh and Turk (2018), there is a need for cooperation between



**Figure 2.** Level of scholarly communication guidance provided by supervisors of doctoral students (N=29).

A - Guidance on how to access library resources.

B - Directing doctoral students to academic librarians for training on library resources.

C - Guidance on how to prepare manuscripts for publication from their research findings.

D - Guidance on the various ways of disseminating research findings.

E - Guidance on how to access full-text articles from online databases.

F - Guidance on how to prepare a manuscript for presentation at a conference.

G - Guidance on how to access funding for doctoral research.

doctoral students and academic librarians not only to successfully complete their studies but also to develop useful skills and competencies for everyday life research work.

**Policies guiding scholarly communication by doctoral students at KNUST.** The Dean of the School of Graduate Studies, the two Deputy Librarians (A and B) and the professional librarians were asked to comment on the existence of policies regarding scholarly communication by doctoral students. Table 3 is a presentation of their collated and categorized responses. The 10 professional librarians (PL) are represented with PL1–PL10.

Five professional librarians indicated that there are no policies while two were ignorant about whether such policies exist. The two Deputy Librarians and the Dean reported on a policy requiring doctoral students to show evidence of at least two peer-reviewed journal articles as a graduation requirement.

**Promoting scholarly communication.** With regards to the promotion of scholarly communication by doctoral students at KNUST, the Deputy Librarians were of the view that the adoption of a plagiarism software known as Turnitin is an indication that the library promotes scholarly communication. Their responses are presented in Table 4. One professional librarian represented as PL4 in Table 4 indicated an attractive and inviting atmosphere in the library with

**Table 3.** Policies for scholarly communication by doctoral students at KNUST.

Theme	Interviewee	Responses
Policies	PL10, PL3	I don't know if there are policies.
	PL6, PL7, PL8, PL2, PL1	No, there is no policy.
	Deputy A	Yes, School of Graduate Studies has instituted a policy that, every doctoral student should publish at least two peer-reviewed journal articles before they will be allowed to graduate. It is therefore a policy that binds all departments in the university
	Deputy B	Yes, the policy of two peer-reviewed journal articles before graduation is not a bad idea.
	Dean	There a policy that they should have two publications before they defend their thesis

**Table 4.** Promotion of scholarly communication to doctoral students.

Theme	Interviewee	Responses
Promotion of doctoral students' scholarly communication	Deputy A	Yes. We make sure that the student has access to research conducted globally. We also make sure that their works are also made discoverable. We provide for them the ability to avoid plagiarism by providing Turnitin. If doctoral students can access over 50 databases subscribed to by the academic library for their research, then scholarly communication is being promoted through the availability and access to such databases and information from other scholars
	Deputy B	As part of graduation requirement, doctoral students are required to deposit a copy of their final thesis in institutional repository through the assistance of Electronic Library professionals. This mandatory requirement is a way to promote scholarly communication by doctoral students. A plagiarism software has also been provided by the academic library for doctoral students to do a plagiarism test. This is one way of promoting scholarly communication by doctoral students.
	PL4	There should be an attractive and inviting atmosphere in the library for doctoral students. Specialised rooms (space) devoid of traditional library rules.

specialised rooms (space) devoid of traditional library rules. This article is of the view that because doctoral students indicated less guidance being given to them on scholarly communication issues, much more training on the use of Turnitin should be provided. This will enhance the originality and quality of their research output.

**Dissemination of research findings.** In order to determine content needed for scholarly communication guidance, interviewees were asked to identify ways of disseminating research findings from doctoral theses. This will guide the academic library to develop the right contents for scholarly communication guidance. Responses were collated and categorized and presented in Table 5.

All the professional librarians, Deputy A and the Dean outlined publishing in peer-reviewed journal articles. Seven professional librarians, Deputy A and the Dean indicated conference presentations. Presentation at seminars was indicated by the Dean and all the professional librarians. Poster presentations was listed by all the professional librarians. Publication of books was listed by five professional librarians, while one opted for publication in the dailies. Library deposit of the thesis itself was indicated only by the Dean. In the literature, similar sharing of findings through scholarly journal articles, monographs, conference proceedings, research reports and preservation in repositories was also identified (Guru et al., 2010; Reed, 2018)

## Scholarly communication guidance model

A scholarly communication guidance policy should be in place to be utilized by academic libraries, supervisors, graduate schools, offices of grants and research as well as other stakeholders in doctoral education to be educated on effectively developing and maintaining scholarly communication guidance for doctoral students. Apart from evidence of peer-reviewed journal articles per graduation requirements, there were no other mention of other KNUST policies. This calls for the development of a scholarly communication guidance model to guide in the drafting of policies, to guide the academic library in developing tailor-made channels and contents, and to guide doctoral students and the entire university research community on effective research dissemination for national development.

Although there was an indication of some guidance provided by supervisors, training is still needed to better equip doctoral students for effective scholarly communication.

## Development of a scholarly communication guidance model

Three models in literature guided in the development of the scholarly communication guidance model. These models are the scholarly communication for a print plus



**Table 5.** Ways of disseminating research findings from theses.

Theme	Interviewee	Responses
Publishing in peer-reviewed journal articles	Dean  PL3, PL10, PL4, PL5, PL6, PL7, PL8, PL9, PL2, PL1 Deputy A	<i>These days there is a policy that they should have two publications before they defend their theses but beyond that some students meet stakeholders like the Ministries. If it is a funded project, then the project would fund the publications. But some journals don't charge.</i> Publication in journal articles  <i>They are also supposed to publish two journal papers before graduation. A mainstream journal in their area. It could be open access or a subscription journal.</i>
Conference presentations	Dean  PL3, PL4, PL5, PL6, PL8, PL9, PL1 Deputy A	<i>Conferences. For proposal stage of their theses, they might not have much. For literature review stage, it depends on the type of conference but they have to seek permission and if it is outside Ghana, permission is sought from the Vice-Chancellor. Sponsorship normally comes from conference organisers not the university.</i> Through conferences  Conferences and seminars
Institutional repositories	PL3, PL10, PL4, PL5, PL6, PL8, PL9, PL2, PL1 Deputy A	Deposit in the institutional repository  <i>Deposit of the thesis in the repository. Once it is available to the library, the staff involved makes sure that they are deposited in the institutional repository. No timeline but it depends on the volumes we have because of large student numbers but there is no need to delay because information delayed is information denied.</i>
Presentation at seminars	Deputy B PL3, PL10, PL4, PL5, PL6, PL7, PL8, PL9, PL2, PL1 Dean	<i>Through the institutional repository</i> Through seminar presentations of findings  Seminars
Poster Presentations	PL3, PL10, PL4, PL5, PL6, PL7, PL9	Poster presentations
Book publications	PL3, PL4, PL5, PL9, PL1	Publication of books in some departments
Publication in dailies	PL1	Through the dailies
Library deposit	Dean	<i>The thesis itself.</i>
Online profile platforms and social media	PL3, PL10, PL4, PL5, PL6, PL9, PL2, PL1 Deputy A	Platforms such as ResearchGate, Academia.edu  <i>Social media offers mostly primary information which needs to be verified before it can be used. But when it comes to the discovery of one's publications, social media plays a very important role.</i> <i>A researcher may decide to link the DOI of a publication to all the social media platforms that he subscribes to. This makes it discoverable but the user has to verify the information.</i>

electronic environment proposed by Costa (1999), Wilson's model of information behaviour by Wilson (1999) and aspects of the scholarly communication lifecycle model developed by Björk (2007). Björk (2007) incorporated new models of publishing available through institutional repositories and the open access movement.

**Wilson's model of information behaviour.** Wilson's 1981 model suggests that information seeking arises as a consequence of a need perceived by an information user, who, in order to satisfy that need, makes demands upon formal or informal information sources or services, which result in success or failure to find relevant information. Motivation for the adoption of Wilson's 1981 model is because it refers to information systems, information sources and the information user, because it demonstrates that people may

be part of information seeking through information exchange and that information is perceived as useful as it may be used by the information seeker or passed to other people (Wilson, 1999). Wilson's model is illustrated in Figure 3.

**Costa's proposed adaptation of Garvey and Griffith's model of scholarly communication for a print plus electronic environment.** In order to establish the processes used to disseminate and communicate research findings either by print and/or electronic media, Costa's (1999) hybrid scholarly communication process model was used. It is based on work done by Garvey and Griffith (1972) on print-based communication by scholars in the 1970s and the adaption thereof by Hurd (1996) to accommodate the electronic environment used by contemporary scholars and researchers. Costa was of the

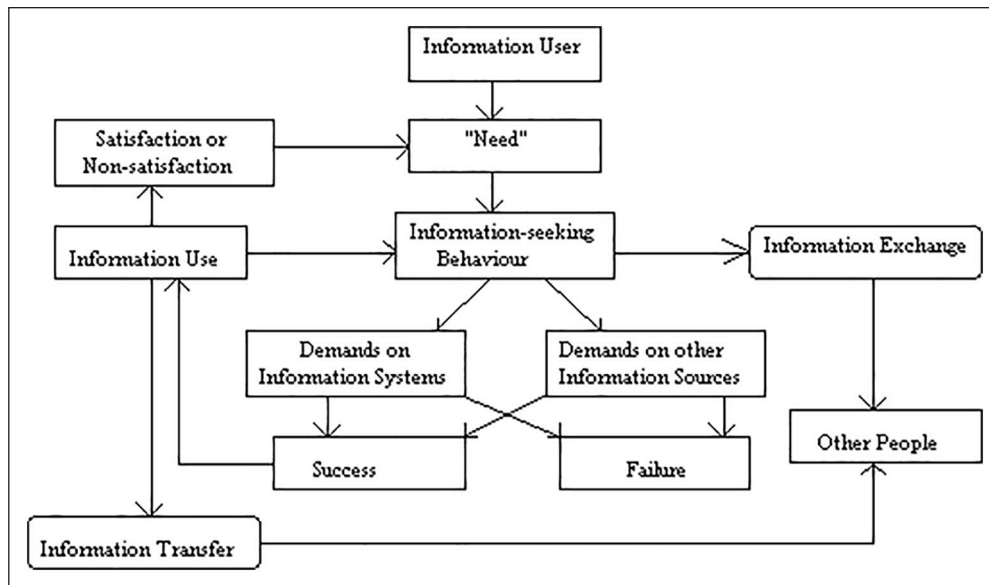


Figure 3. Wilson's model of information behaviour (Wilson, 1999).

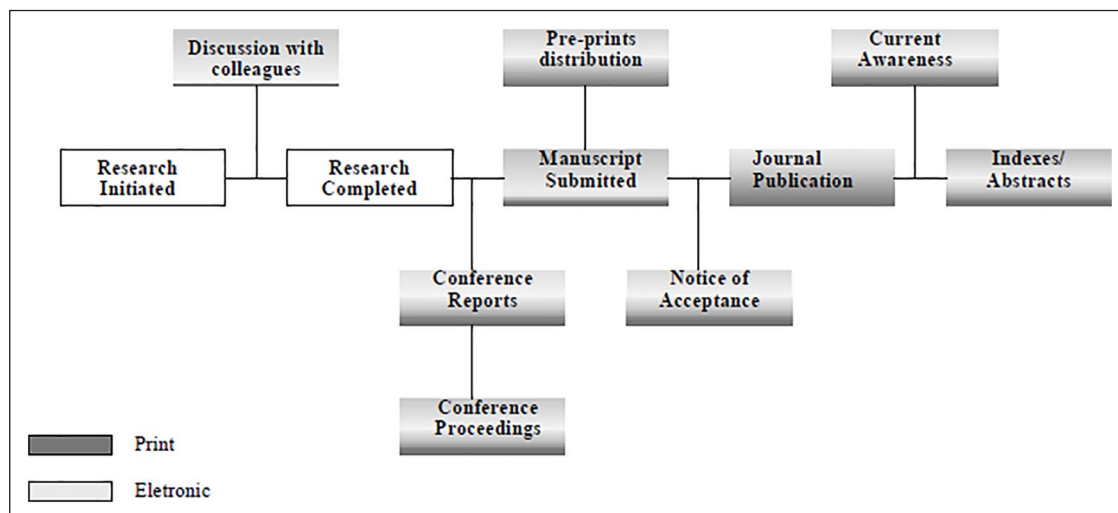


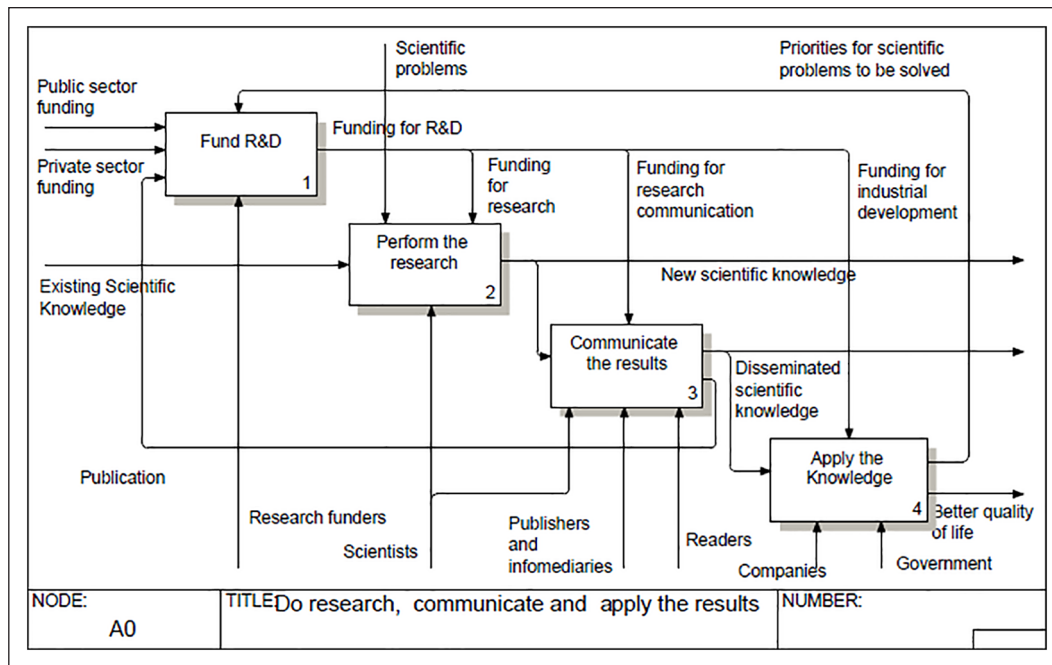
Figure 4. Proposed adaptation of Garvey and Griffith's model of scholarly communication for a print plus electronic environment (Costa, 2000).

view that scholarly communication based on printed media only no longer existed, but that a model based entirely on electronic media also did not depict all the interactions within the communication system to illustrate the various ways of disseminating research findings. The model illustrated in Figure 4 represented the co-existence of the printed and the electronic media, as was perceived by social scientists in Brazil and the UK.

*The scholarly communication lifecycle model developed by Björk.* This model was developed by building on a previous model by Björk and Hudlund (2004). It consists of 33 separate diagrams, arranged in a hierarchy up to seven levels

deep Björk (2007). The whole life-cycle is seen as consisting of four separate stages. The stages are Fund research and development, Perform the research, Communicate the results and Apply the knowledge (Björk, 2007). Emphasis was placed on the funding of the activities. Björk (2007) indicated, although parts of the overall process are carried out by commercially operating parties, almost all stages are predominantly funded by public finance via university budgets, research grant organizations and many more.

Performing the research, according to Björk, is the most resource-demanding part of the system. Communicating the results is the most extensive part of the model, with an end result called disseminated scientific knowledge,



**Figure 5.** The scholarly communication lifecycle model developed (Björk, 2007).

reflecting the viewpoint that scientific results which have been published, but which are not read by the intended readers are rather useless. Figure 5 is a presentation of the model containing a summary of all the activities in the model of Björk (2007).

### *Scholarly communication guidance model for academic libraries*

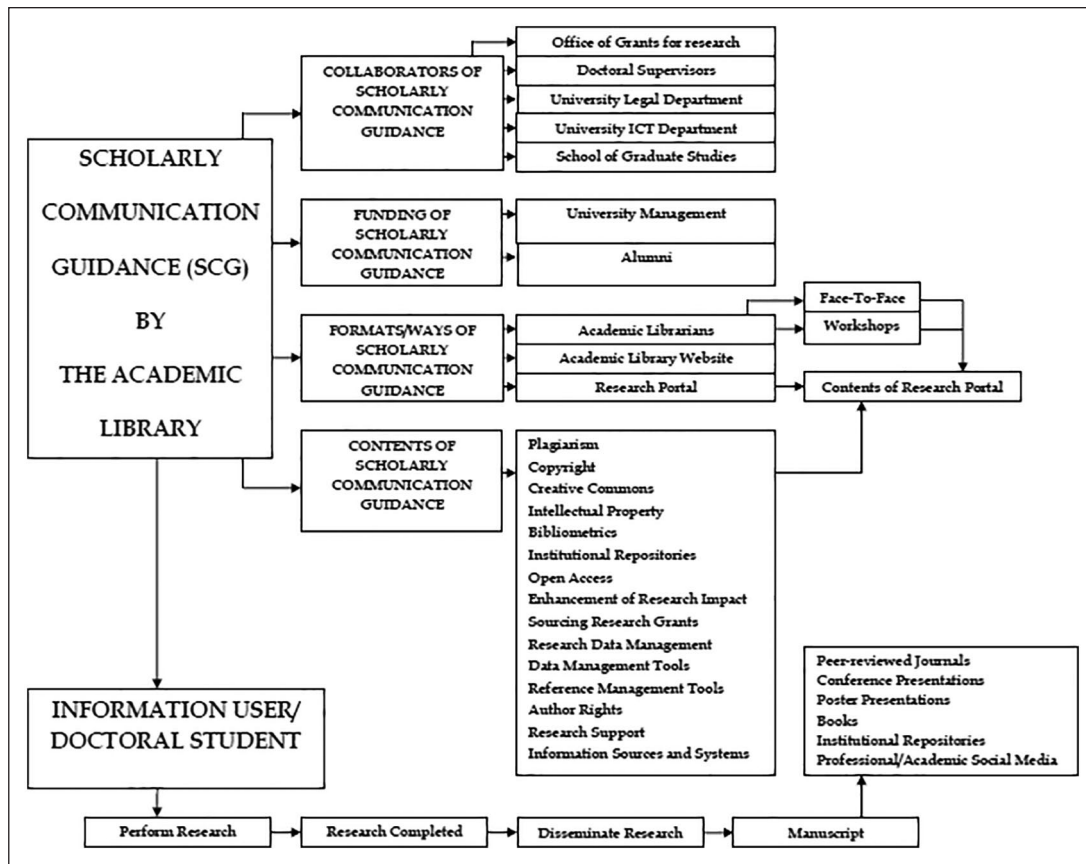
A scholarly communication guidance model for academic libraries was developed by combining aspects of the models by Wilson, Costa and Bjork as well as taking into consideration the findings for the study. The model proposes that scholarly communication guidance should be offered to doctoral students immediately when they enrol, throughout their research process and finally when the research is completed. Figure 6 presents the proposed model:

**The information user/doctoral student.** The information user is the doctoral student who has identified an information need. This need urges the student to consult various information sources and information retrieval systems. The information user moves to conducting research when he or she has retrieved sufficient information to satisfy his or her information needs. However, there is the need for guidance in the conduct of the research and subsequent dissemination of research findings. They need guidance in the production of manuscripts for publication. The platforms through which doctoral students could disseminate their research findings as stipulated in the model are

publishing articles in peer-reviewed journals, conference presentations, poster presentations, publication of books, deposit in institutional repositories, and linking published materials to professional and academic social networking platforms such as Research Gate and Academic.edu.

**Collaborators of scholarly communication guidance.** Office of grants for research, doctoral supervisors, university legal department, university information communication technology (ICT) department and the School of Graduate Studies have been identified as collaborators in scholarly communication guidance by the academic library. The office of grants for research could be contacted for information on various grants and funding agencies available for the conduct of research. Doctoral supervisors are very important collaborators in the delivery of scholarly communication guidance because they are in direct contact with doctoral students.

The university legal department should assist in issues related to copyright and other author rights. The university ICT department can support with the required technical infrastructure such as the design of software packages for the institutional repositories and data management. The academic library should also collaborate with the School of Graduate Studies for policies regarding the conduct of research. This will help in guiding doctoral students to meet requirements for the conduct of their research. The School of Graduate Studies can also assist in the relay of information to doctoral students on issues regarding scholarly communication guidance by the academic library.



**Figure 6.** Scholarly communication guidance model.

*Funding of scholarly communication guidance.* For scholarly communication guidance to be effective, funding is very critical. This could be in the form of meaningful financial budgets from the parent university. Alumni could also be contacted for financial support or other donations to aid in the purchase of logistics for effective scholarly communication guidance.

*Formats/ways of scholarly communication guidance.* Academic librarians, the academic library website and a research portal can be seen as the ways of delivering scholarly communication guidance. A research portal (which is updated regularly and can be accessed anytime and anywhere) as part of the academic library website should be available for the doctoral student from the time of registration to guide them in the conduct of their research. The whole research process, what is required of students and their supervisors, platforms of research findings dissemination should all be stipulated in the research portal to guide students. Materials and presentations from academic librarians during workshops and face-to-face interactions should also be replicated in the research portal.

*Contents of scholarly communication guidance.* Various scholarly communication needs and contents to be included in

scholarly communication guidance programmes have been identified in literature. This includes plagiarism, copyright, creative commons, bibliometrics, institutional repositories, open access, enhancement of research impact, sourcing research grants, research data management, data management tools, reference management tools, author rights, research support, and information sources and systems. These contents must be presented in the research portal. These contents also form the contents for guidance through the research portal.

## Conclusions

The scholarly communication model proposes that scholarly communication guidance should be offered to doctoral students immediately they enrol for their programmes, throughout their research process, and finally when the research is completed. The findings in the article showed that doctoral students had not received much training and guidance on research and scholarly communication practices from their supervisors and academic librarians. At KNUST where the academic library does minimal scholarly communication guidance to doctoral students, the study proposes a model for scholarly communication guidance to be used by academic librarians in their service to doctoral students.



The model can also be adopted by other universities in Ghana where scholarly communication guidance by the academic library is lacking as well as other West African countries and universities all over the world. The model also proposes that funding for effective scholarly communication guidance should be provided through meaningful financial budgets for the academic library by the parent university.

## Recommendations

Scholarly communication guidance from the academic library will help motivate and equip doctoral students to conduct publishable research and subsequently disseminate their research findings for national development. This study therefore recommends that academic librarians should be trained to adopt the scholarly communication guidance model to be able to provide such services irrespective of the department they find themselves.

Secondly, a committee represented by all stakeholders (academic librarians, doctoral students, supervisors, School of Graduate Studies, ICT experts and university legal services) should be established to develop policies on scholarly communication guidance. The policies should stipulate the use of the scholarly communication guidance model by all stakeholders. The policies should also indicate the establishment of a research portal as part of the academic library website for scholarly communication guidance. This should result in the successful development and implementation of scholarly communication guidance programmes. The sources of funding for scholarly communication guidance should also be stated emphatically in the policies.

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