THE ADOPTION OF OPEN ACCESS SCHOLARLY COMMUNICATION IN TANZANIAN PUBLIC UNIVERSITIES: SOME INFLUENCING FACTORS[1]

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ABSTRACT

Open access is a means for free availability of scholarly content via the internet. It is an emerging opportunity for wider and unlimited access to scholarly literature. Scholarly communication, through open access journals and self-arching, are the two main approaches of open access publishing. However, this mode of scholarly communication is not widely utilised in developing countries such as Tanzania. This article discusses the factors that influence the adoption of open access for scholarly communication in Tanzanian public universities, based on a study conducted in 2008 using a survey questionnaire. A sample of 544 researchers, selected through stratified random sampling from a population of 1 088 researchers and 69 policymakers at six public universities in Tanzania, provided their views. It was evident from the findings that researchers' internet usage skills and self-efficacy, social influence, performance expectancy, effort expectancy, and the respondents' general perceptions about open access were the positive factors likely to facilitate open access adoption. The current poor research conditions and researchers' low internet self-efficacy (such as inadequate information search skills) were cited as the main hindrances for researchers to use open access outlets to access scholarly content.

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It is therefore recommended that university policies on scholarly communication should be revised to incorporate the use of open access publishing. Furthermore, universities should accelerate the establishment of institutional repositories, advocacy campaigns and training directed at researchers, policymakers, readers and information managers of scholarly content, and the improvement of internet speed through subscription to more bandwidth, so as to meet the demand from the scholarly community.

KEY WORDS

Institutional repositories, open access publishing, scholarly communication, Tanzania public universities.

1 INTRODUCTION

Scholarly communication, the process through which scholars exchange information with one another, is an important process in fostering the growth of, and open access to, information through science and technology. It is acknowledged that scholars used to communicate informally to distribute their research findings among one another until 1665 when the first journal, *Philosophical Transactions of the Royal Society of London*, was launched (Yiotis 2005; Swan 2007). From its onset, the core value of scholarly communication has been the sharing of knowledge without price and copyright restrictions. However, the joining and dominance of commercial publishers in journal publication as well as distribution after World War II resulted in limitations to scholarly content access. The interest of commercial publishers has been on reaping profits from journal sales, rather than facilitating knowledge sharing for the further growth of science and technology. Until recently, over 2.5 million articles published annually appeared in subscription-based journals, making it impossible for researchers with financial limitations to gain access to such information (Yiotis 2005; Moller 2006; Bjork, Roos & Lauri 2009). According to Alemu (2009), the exorbitant journal prices imposed by commercial publishers have forced academic institutions and libraries to reduce journal subscriptions. This has resulted in access limitations, as scientists may not access most of the literature deemed necessary in their scholarly work. Compared with scholars from developed countries, those from developing countries are severely affected due to the widespread poverty in the latter nations (Bjork, Roos & Lauri 2009; Habib 2009).

The enabling information and communication technologies (ICTs) as well as the frustratingly high journal prices have prompted the scholarly community to devise an alternative scholarly publishing system whose aim is to achieve a wider distribution of scholarly content without price or other copyright restrictions to end users (Bjork 2004; Yiotis 2005; Moller 2006). The emerging scholarly communication model is known as open access (OA). The *Berlin Declaration of Open Access* (2003) defines open access as a mode of scholarly communication through which the "author(s) and right holder(s)

of scholarly work grant(s) to all users a free, irrevocable, worldwide right of access to, and a license to copy, use, distribute, transmit, and display the work publicly in any digital medium for any responsible purpose, subject to proper attribution of authorship". According to this definition, a complete version of the work and all supplemental materials, including a copy of the permission to use, should be deposited in at least one online repository using suitable technical standards to enable open access to such works. This form of scholarly communication is achieved through two main channels: open access journals (OAJ) for electronic refereed journals and self-archiving (Chan & Costa 2005; Bailey 2006). Unlike the business publishing model, in open access publishing, the end user is not charged to access scholarly content. Instead, various funding strategies such as direct author fees, institutional membership to sponsor all or part of the author fees, funding agency payment of author fees, grants to open access publishers and institutional subsidies are used to cover the costs for publication and distribution of open access content for free access by the end user (Hirwade & Rajyalakshmi 2006).

1.1 PROBLEM DEFINITION

Contrary to the business mode of scholarly publishing that increases the information access gap between developed and developing countries, open access provides visibility and accessibility to research output without restrictions. Despite the promising potential for open access to improve scholarly communication, this mode of publishing is not yet widespread in developing countries (Moller 2006; Wang & Su 2006; Directory of Open Access Repositories (DOAR) 2010). The limited adoption of open access in developing countries, as well as the absence of specific detailed studies addressing the awareness, acceptance and usage of open access scholarly communication in Tanzanian public universities, motivated this study. The findings reported in this article are part of a PhD study titled "An analysis of open access scholarly communication in Tanzanian public universities". The objectives of the main study, among others, are to investigate the general awareness and open access usage; to find out factors that facilitate researchers' adoption of open access; to determine factors that hinder researchers' adoption of open access; to determine researchers' and policy makers' perspectives on open access; to formulate and validate a research model of technology acceptance regarding the adoption of open access; and to suggest strategies to resolve the hindrances to open access uptake. This article reports results obtained from investigating the following objectives:

- To assess researchers' and policy makers' general awareness and open access usage
- To find out factors that facilitate researchers' adoption of open access
- To recommend strategies to enhance the adoption of open access in the study area.

2 RESEARCH METHODOLOGY

The study adopted the survey method for data gathering. Data were collected at six of the eight Tanzanian public universities: Ardhi University (ARU), Muhimbili University of Health and Allied Sciences (MUHAS), Mzumbe University (MU), Open University of Tanzania (OUT), Sokoine University of Agriculture (SUA), and the University of Dar es Salaam (UDSM). The other two public universities, Dodoma University and Zanzibar State University, did not meet the selection criteria. The criteria for selecting the universities for the study were (a) having existed as higher learning institutions for at least ten years, and (b) evidence of running postgraduate programmes. The two criteria were used to ensure that the selected institutions had a comparatively well-established research infrastructure resulting in the generation of more research output, and hence they were more likely to benefit from open access initiatives than the newer institutions. Furthermore, public universities were targeted by this study on the understanding that being publicly funded, they are obliged to make their research findings available for free to the public (Comba & Vignocchi 2005).

A self-administered questionnaire was distributed to 544 respondents, selected through stratified random sampling from a population of 1 088 university researchers, ranging from the ranks of lecturers to professors at the main campuses of the six public universities. The stratified random sampling ensured the desired representation from the various subgroups on the basis of gender, rank and research discipline of the respondents. Table 1 presents the study population.

Table 1: Distribution of senior researchers at six Tanzanian public universities [N= 1088]

University	Distribution of researchers by rank			Total number of researchers
	Professors	Senior lecturers	Lecturers	
ARU	6	20	30	56 (5.1%)
MUHAS	40	56	71	167 (15.3%)
MU	14	32	46	92 (8.5%)
OUT	14	20	45	79 (7.3%)
SUA	104	68	74	246 (22.3%)
UDSM	128	110	210	448 (41.2%)
TOTAL	**306 (28.1%)**	**306 (28.1%)**	**476 (43.8%)**	**1088 (100)**

The researchers also conducted interviews with 67 policymakers from the six universities to complement the questionnaire survey. With the exceptions of the vice-chancellors and deputy vice-chancellors (administration and finance), all university policymakers from directors/deans or equivalent positions were eligible for the interview. Among the distributed copies of the questionnaire, 405 were returned of which 398 copies were

found usable for analysis. From the targeted interviewees, 63 (94%) were available and participated in the study. The overall response rate of 73 per cent for researchers and 94 per cent for policymakers is considered adequate for this kind of study. The standard and acceptable response rate for most surveys is 60 per cent (Malaney 2002; Evans, Peterson & Demark-Wahnefried 2004).

After the data collection, editing by means of checking and adjusting for errors, omissions and legibility was done in order to ensure completeness, consistency and readability before entering into the database for analysis. Content analysis was used to organise data emerging from open-ended questions. The descriptive statistics of the SPSS (v15) package were used for data analysis. The software in question has also been widely applied in technology acceptance and user studies (Al-Zahrani 2006; Ifinedo 2006; Louho, Kallioja & Oittinen 2006).

3 RESULTS AND DISCUSSION

Descriptive statistics including the profile of the respondents as well their awareness and usage of open access scholarly communication, are presented in the first three subsections. The major part of this section presents and discusses factors affecting open access adoption. Key conclusions and recommendations of the study are provided at the end of the article.

3.1 PROFILE OF RESPONDENTS

Among the 398 researchers who responded to the questionnaire, 310 (77.9%) were males and 88 (22.1%) were females. This compares with 73 per cent males and 27 per cent females from among 63 university policymakers who were interviewed. Table 2 presents data with respect to the distribution of respondents by their rank. It is revealed that close to a half (46.2%) of the researchers were lecturers, followed by professors (28.9%) and senior lecturers (24.9%). These percentages correspond well with the total population of the senior researchers in these universities, that is, 43.8 per cent lecturers, 28.1 per cent senior lecturers and 28.1 per cent professors, as reflected in Table 1.

Table 2: Distribution

Rank	**Institution**						**Total (%)**
	ARU	**MUHAS**	**MU**	**OUT**	**SUA**	**UDSM**	
Lecturer	10	20	17	24	30	83	184 **(46.2)**
Senior lecturer	9	23	8	7	25	27	99 **(24.9)**
Professor	2	14	2	3	45	49	115 **(28.9)**
Total (%)	21**(5.3)**	57 **(14.3)**	27 **(6.9)**	34 **(8.5)**	100 **(25.1)**	159 **(39.9)**	398 **(100)**

In terms of the highest academic qualifications attained by the researchers, 299 (75.1%) were holders of PhD degrees while the remaining 99 (24.9%) had Master's degrees. With respect to age, 78 (19.6%) were aged between 31 and 40 years; 157 (39.4%) between 41 and 50 years; 145 (36.4%) between 51 and 60 years; and 18 (4.5%) were above sixty years. The majority of the researchers (53.5%) had internet usage experience of six to ten years, while 34.9 per cent had more than ten years of experience. Only 11.6 per cent had one to five years' internet experience. Based on the above profiles – age, academic qualifications and seniority – it is clear that the respondents were highly educated and experienced researchers. This was accentuated by the fact that junior lecturers were excluded from the study, as they were considered inappropriate due to their limited experience in scholarly publishing. It should also be noted that among the 67 interviewed university policymakers, four were deputy vice-chancellors (academic), 31 were deans of faculties/schools, and 28 were directors of centres/directorates or institutes. Thus, the findings discussed in the forthcoming sections represent authoritative views. This is further evidenced by the respondents' level of awareness of open access.

3.2 AWARENESS OF THE CONCEPT OF OPEN ACCESS

The majority of both the policymakers (90.5%) and researchers (72.1%) were aware of open access before this survey. This means that for most of them, the open access concept was quite familiar and hence they were in a position to have an opinion about it. Compared with several previous studies done in Tanzania and elsewhere, the findings of this research reveal an improvement in open access awareness over time. For example, studies done prior to 2007 in the southern Africa region indicated that less than 60 per cent of the respondents were aware of open access (De Beer 2005; Lwoga et al 2006; Moller 2006). This compares with recent studies that were conducted in the same region by Fullard (2007) and the Southern African Regional Universities Association (SARUA 2008), which reported awareness of open access among respondents to be 61 per cent and 71 per cent respectively. However, it should be noted that despite an increased awareness of open access by policymakers, that is the interviewees, they were more familiar with open access journals as compared with other open access aspects or initiatives. This implies a lack of deeper understanding of open access on the part of these respondents and hence the need for more awareness creation so that the concept is well understood.

3.3 USAGE OF OPEN ACCESS SCHOLARLY COMMUNICATION

The findings from this study indicate that fewer Tanzanian researchers disseminated their findings through open access channels than those who accessed free online content. Less than 20 per cent of the respondents published in open access outlets as compared with 62 per cent of those who accessed free scholarly content from the internet. The

phenomenon of researchers publishing less than they access content in open access outlets is not peculiar to public universities in Tanzania. A notable example is the study done by Gadd, Oppenheim and Probet (2003), which found that 57.8 per cent of 456 respondents were reported to have submitted papers to open access journals, in comparison with 88 per cent who acknowledged having accessed free online content made available by other scholars. A survey by Deoghuria and Roy (2007) also reveals that out of 125 respondents, 80 per cent used open access to access literature and 20 per cent used open access for publishing their research output. Similar findings indicate that even though 66 per cent (n = 481) of the respondents claimed to use open access publication media to access scholarly content at least once in their academic career, only 28 per cent had actually published using the same media (Mann et al 2008). The low utilisation of open access outlets by researchers to disseminate their scholarly output is probably attributed to the effort involved in this process, in contrast to accessing information using similar means. While it is possible for one to access free materials by chance through a simple search on the internet, publishing via the same media is more involved as one must have, firstly, something to publish, and then additionally, adequate online publishing skills, as well as sufficient familiarity with potential websites for publishing.

Despite the fact that many researchers in Tanzanian public universities do not utilise open access for publishing, the majority of the respondents (78% of 384) were optimistic about publishing via open access in the future. This implies good prospects for future development of open access in such universities. This is compared with previous studies in which less than 50 per cent of respondents were reported to be in a position to publish in open access outlets in future (Deoghuria & Roy, 2007; Hess et al 2008). Contrary to the two studies above, in which the respondents were asked about their likelihood of publishing in open access media within a limited time frame, in the current study the aspect of a time frame was excluded. The respondents were only questioned about their future likelihood of disseminating their research findings using open access outlets. This is the possible reason why the majority of the respondents in the current study indicate their high likelihood to publish in open access outlets in future. It is also possible that the respondents who did not expect to publish in open access outlets (indicated in other studies) did not expect to have anything to publish within the indicated time frame. The remaining part of this article discusses important factors which are likely to affect adoption of open access in the study area.

3.4 FACTORS AFFECTING THE ADOPTION OF OPEN ACCESS SCHOLARLY COMMUNICATION

Various factors have been established as motivating or inhibiting the adoption of open access. Attitude, self-efficacy, facilitating conditions, social influence, performance expectancy and effort expectancy are the factors considered to play a key role in shaping individuals' acceptance and usage of technology (Venkatesh et al 2003; Schaper &

Pervan 2007; Hess et al 2008; Tibenderana & Ogao 2008). These factors were assessed in the current study to determine their possible effect in the adoption of open access scholarly communication at Tanzanian public universities, as reported and discussed in the following subsections.

3.4.1 Attitudes and general views on open access

Attitude is an individual's overall affective reaction to using a system (Venkatesh et al 2003). Respondents' attitudes about open access were evaluated before examining their perceptions about the quality of open access publications. Their general comments about open access in general also provided some insights regarding the acceptance of this mode of scholarly communication. Among 396 respondents, over three quarters (80%) considered open access beneficial to the scholarly community, access and use of open access as a good idea, and publishing in open access a good idea. This implies that the majority of the researchers had very positive attitudes towards open access publishing. In addition to their positive attitude, many researchers also positively evaluated the open access publications they accessed. Table 3 summarises researchers' assessment of open access publications.

Table 3: Researchers' assessment of open access publications (N = 227)

Open access publications' assessment	Number of respondents	Percentage
Publications represent adequate standards of quality and have scientific merit	178	82.4
Publications are original and represent high-quality research	116	54
Publications are mediocre or of little scientific merit	33	14.5

It is noted from Table 3 that among 227 respondents who evaluated open access publications, they rated them to have adequate standards of high-quality research and scientific merit (82.4%) and that such publications were original, with high-quality research (54%). On the negative side, 14.5 per cent of the respondents claimed that open access publications were mediocre, with little scientific merit. These results mirror the researchers' and policymakers' general comments about open access. Overall, apart from ensuring quality control for open access publications, most of the comments were in favour of open access scholarly communication (see Textbox 1).

Textbox 1: Researchers' and policy makers' general comments on open access

- Open access is good, it should not be limited to universities alone but should be adopted nationwide.
- University administrators should be educated on open access benefits and limitations for its adoption at respective institutions.
- University policies should be reviewed to consider open access publications in career development.
- Open access is good for sharing research results as well as increasing researchers' and institutions' recognition internationally.
- Open access increases collaboration of researchers internationally.
- Open access is important but it is new. There is a need for more sensitisation and support with university policies.
- Awareness for positive perceptions on quality and value of open access publications should be created.
- Open access is especially good for countries with limited access and dissemination of research findings.
- There is no reason to hide academic work, so I support open access.
- Open access is good, it will benefit distance learning students.
- Good initiative, promote and implement it.
- Open access depends on internet, so connectivity should be improved for more researchers to benefit.
- Open access is good but perceived low quality for free journals and poor internet connectivity especially in Tanzania remain the main challenges.
- Open access is very new to most academicians though it seems to be very good as far as accessibility to information is concerned.
- Open access is something new and interesting – it should be promoted. Developing countries should accelerate the pace of establishing open access publishing in order to make their publications widely accessible.
- Open access publications increase the visibility and impact of scientific findings from researchers to a wide audience especially in developing countries.
- Scholars in developing countries should be encouraged to publish in open access outlets so that their findings reach more people.
- Open access is good for information sharing but there is need for a good mechanism to ensure quality control to avoid poor quality materials.
- It is unacceptable/difficult making publications free of charge, hence do not support open access.

General support for open access has also been noted in previous studies (Swan & Brown 2005; Kim 2006; Lwoga et al 2006; Fullard 2007; Hess et al 2008). These results suggest that attitude and the general perceptions of the respondents of open access may not be a major stumbling block for the adoption of this mode of scholarly communication in Tanzanian public universities. However, it is still important for open access proponents to further promote this mode of scholarly publishing, in order to ensure positive views for all stakeholders – this, to enhance its adoption.

3.4.2 Effort expectancy

Effort expectancy is the degree of ease associated with the use of the system (Venkatesh et al 2003; Louho, Kallioja & Oittinen 2006). The researchers' views about their expected difficulties or ease of use of open access outlets were examined by providing a number of statements to the respondents for rating themselves against their ability to use open access in scholarly communication. Table 4 presents the results of this investigation. Noted from Table 4 is that more than half of all respondents believe that they are unlikely to face difficulties in using open access outlets to access or publish scholarly output. Finding it easy to access scholarly content was agreed or strongly agreed to by the majority of the respondents (76.5%), while the least 61.3 per cent agreed or strongly agreed that they understood the implications of publishing in open access outlets.

Table 4: Researchers' effort expectancy with respect to the use of open access outlets in scholarly communication (N = 394)

Tasks	Ratings (number & percentage)				
	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
I expect interaction with open access publication system to be clear and understandable	71 **(18.2)**	194 **(49.7)**	44 **(11.3)**	5 **(1.3)**	76 **(19.5)**
It is (will be) easy for me to become skilful at publishing my work in open access	54 **(13.8)**	212 **(54.2)**	58 **(14.8)**	9 **(2.3)**	58 **(14.8)**
Learning to publish my work in open access outlets is (would be) easy for me	58 **(14.7)**	212 **(53.8)**	65 **(16.5)**	10 **(2.5)**	49 **(12.4)**
I clearly understand the implications of publishing in open access outlets	57 **(14.5)**	184 **(46.8)**	71**(18.1)**	11 **(2.8)**	70 **(17.8)**

Tasks	Ratings (number & percentage)				
	Strongly agree	**Agree**	**Disagree**	**Strongly disagree**	**Don't know**
It is (will find it) easy to access open access scholarly content from the internet	89 **(22.4)**	212 **(54.1)**	46 **(11.7)**	8 **(2)**	37 **(9.4)**

The above results are comparable to a similar study, establishing that among 125 scientists 21 per cent believed the interaction with open access publication systems to be clear and understandable; 18 per cent thought that it was easy for them to become skilful at publishing their work in open access outlets (Deoghuria & Roy 2007). The findings by the cited study are contrary to the current findings and other similar studies (for example Kohne, Schoop & Staskiewicz 2005; Louho, Kallioja & Oittinen 2006; Butler & Richardson 2008), which report a high proportion of the respondents to have significantly expressed less effort expectancy towards the usage of new technologies. The literature reveals that less effort expectancy is expected as users accumulate experience in the usage of a new technology (Venkatesh et al 2003). Therefore, less effort expectancy for open access usage in the current study might have been attributed to the fact that many respondents (88.4%) indicated having had internet usage experience of more than five years, and hence they expected that it would not be difficult for them to learn how to use open access in disseminating their research findings as well as accessing open access content. Despite the fact that over 60 per cent of the respondents in this study believed that they were unlikely to face difficulties in using open access outlets to publish their research findings, to a large extent most would find it easy to use open access outlets in accessing rather than disseminating information through open access. This observation reflects why the majority of the respondents reported more usage of open access content than the dissemination of their scholarly content using the same outlet (refer to section 3.3). Having retrieved some useful information from the internet, an individual may rank himself as skilful in internet searching, without taking into account time spent on such an endeavour. As a matter of fact, it has also been observed that in practice, despite high self-rankings, many internet users have inadequate knowledge especially if they have never attended specific training on effective usage of the online environment in scholarly communication (Dulle 2010). It is thus necessary to design training aimed at enabling researchers to effectively exploit the online environment for both accessing and disseminating scholarly content. Equally important is the need for more user-friendly open access platforms for researchers' ease of accessing and publishing research output. This is particularly important if one takes into account that a transition from the print to the electronic information environment has resulted in more challenges to researchers in effectively accomplishing their scholarly communication tasks (Eger 2008).

3.4.3 Facilitating conditions

Facilitating conditions are defined as the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of a system (Venkatesh et al 2003). Five factors relating to infrastructure and technical support (facilitating conditions) (as presented in Table 5) were assessed, based on the respondents' perceptions to determine the possible effect of such factors on scholars' usage of open access.

Table 5: Availability of facilitating conditions for open access usage [N=394]

Facilitating condition	Ratings (number & percentage)				
	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
I have the necessary knowledge to publish my work in open access outlets	47 **(11.9)**	120 **(30.5)**	133 **(33.8)**	55 **(14)**	39 **(9.9)**
I have the necessary resources (eg internet access) to publish in open access outlets	**40(10.2)**	152 **(38.3)**	114 **(28.9)**	50**(12.7)**	38 **(9.6)**
My institution recognises open access publications for my career development	38 **(9.7)**	120 **(30.5)**	79 **(20.1)**	53 **(13.5)**	103 **(26.2)**
Guidance is available for me to use the internet for publishing my research output	36 **(9.1)**	132 **(33.4)**	93 **(23.5)**	56 **(14.2)**	78 **(19.7)**
Guidance is available for me to use the internet effectively for information access.	51 **(12.9)**	167 **(42.4)**	87 **(22.1)**	48 **(12.2)**	**41(10.4)**

As noted from Table 5, less than half (50%) of all the respondents strongly agreed or agreed that their institutions provided adequate facilitating conditions for them to publish in open access outlets. Only the availability of guidance for effective usage of the internet to access information was supported by slightly more than half (55.3%) of the respondents. The overall results from this study imply that most of the facilitating conditions for researchers to effectively use open access outlets for scholarly communication were inadequate. For example, while only 42.4 per cent of the respondents either agreed or strongly agreed that they have the necessary knowledge to publish in open access outlets, 57.7 per cent either disagreed or strongly disagreed or they were not sure of having such knowledge. Slow internet speed and inadequate skills to access and publish in open access were also cited by the respondents as the main causes for researchers' less effective usage of open access and the internet in general to enhance scholarly communication. This further supports the above observations about

inadequate facilitating conditions to enhance researchers' effective exploitation of open access opportunities.

Supporting the above observations, a further analysis revealed that none of the universities in the study had adequate bandwidth to meet the actual demands of its user population, as a result of high connectivity costs.

Table 6: Internet connectivity by six public universities in Tanzania during 2009

University	Bandwidth	
	Downlink	Uplink
ARU	1.2 mbps	0.2 mbps
MUHAS	1.024 mbps	0.512 mbps
MU	1.0 mbps	1.0 mbps
OUT	0.512 mbps	0.512 mbps
SUA	2.048 mbps (shared 1:8)	0.256 mbps
UDSM	12.5 mega	1.5 mbps

As observed in Table 6, in the beginning of 2009 it was revealed that the University of Dar es Salaam had the internet speed of 12.5 megabits per second (mbps) downlink and 1.5 mbps uplink; Muhimbili University of Health and Allied Sciences, 1.024 mbps downlink and 0.512 mbps uplink; Sokoine University of Agriculture, 2.048 mbps downlink (shared 1:8) and 0.256 mbps uplink; Ardhi University, 1.2 mbps downlink and 0.2 mbps uplink; Mzumbe University, 1.0 mbps downlink and 1.0 mbps uplink; and the Open University of Tanzania, 0.512 mbps downlink/uplink. The observed situation remained the same until July 2010 when the University of Dar es Salaam was connected to the sea fibre-optic cable to upgrade its connection from 12.5 to 155 mbps. With 155 mbps, the University of Dar es Salaam can adequately serve 51 666 users (more than its total user population all the time) during peak period.

According to INASP (2003), a minimum of 3 kilobits per second (kbps) (one mega bit = 1000 kilo bits) is considered sufficient per user during peak periods for universities in developing countries. Based on the bandwidth owned by the six universities, as noted above, none of the institutions had the minimum bandwidth requirements during the study period, implying that researchers from these institutions were compelled to spend a lot of their time trying to access information online due to slow connectivity. Similarly, users' access to documents uploaded in the respective university websites was expected to be difficult due to the low uplink connectivity of these institutions. A similar study by Deoghuria and Roy (2007) also reveals that 45 per cent of scientists claimed to have knowledge of publishing in open access outlets, while ten per cent said they would need specific assistance (from computer or library personnel) in order to publish their works in such outlets. Limited availability of facilitating conditions, both infrastructure as well

as technical know-how, has also been cited as among the reasons for the low uptake of open access in most developing countries (Muthayan 2003; Hirwade & Rajyalakshmi 2006; McCulloch 2006). It is thus necessary to improve the technological and human factors in Tanzanian public universities in order to improve the adoption of open access. The improvement of facilitating conditions (for example, provision of training in online publishing) will also raise researchers' internet self-efficacy, which is also considered to be on the low side, as noted in the following section.

3.4.4 Internet self-efficacy

Internet self-efficacy refers to individuals' ability to use the internet using their own skills (Hsu, Chiu & Ju 2004). For individuals to access or publish scholarly content on the internet and open access outlets in particular, it is important that they have the necessary skills. This view is also supported by Wang and Su (2006) who assert that in order to benefit from open access initiatives, readers should improve their information and computer literacy skills. It is equally important for researchers to become internet literate in order to use the electronic media environment more effectively for accessing and disseminating scholarly content. Respondents in this study rated themselves as having very good or good skills in terms of accessing online information (83.7%) as compared with 65 per cent who claimed to have very good or good skills in publishing online. These findings resembled those concerned with researchers' effort expectancy in terms of disseminating and accessing information using online sources, as presented in Table 4.

Table 7: Researchers' internet self-efficacy ratings [N=384]

Internet-self-efficacy statement	Ratings (number & percentage)				
	Strongly agree	**Agree**	**Disagree**	**Strongly disagree**	**Don't know**
I feel confident searching information on the internet	**170 (44.3)**	170 **(44.3)**	28 **(7.3)**	6 **(1.6)**	10 **(2.6)**
I feel confident publishing research output on the internet	72 **(18.8)**	176 **(46)**	86 **(22.5)**	22 **(5.7)**	**27(7)**
I feel confident in designing my personal website	34 **(8.9)**	87 **(22.8)**	120 **(31.4)**	77 **(20.2)**	**64 (16.8)**
I feel confident publishing on the internet even when there is no one around to show me how to do it	27 **(7.1)**	111 **(29.1)**	131 **(34.4)**	65 **(17.1)**	47 **(12.3)**

As observed from Table 7, the majority of the respondents strongly agreed or agreed that they felt confident in searching information on the internet (88.6%), while 64 per cent claimed to have confidence in publishing research output on the internet. It should

also be noted that a large proportion of the respondents (68.4%) disagreed or strongly disagreed or did not know/were not sure about their ability to design personal websites. Similarly, 63.8 per cent of the respondents expressed less confidence in publishing on the internet without assistance. These results support the findings about respondents indicating the need to improve their ability to disseminate scholarly content online.

It should be noted, however, that the reported internet usage skills and self-efficacy are solely based on respondents' own perceptions and that they were not tested or measured by any other means. This means that the reported self-assessment results by researchers may be considered as indicative of, rather than an actual reflection of, their skills and self-efficacy in internet usage. However, based on the researchers' actual usage of open access, it can safely be argued that low internet self-efficacy (in terms of disseminating research output) as reported by many respondents in a way reflects why many of them accessed rather than disseminated scholarly content using open access outlets. Both internet usage skills and self-efficacy have been acknowledged as key determinants for the effective exploitation of information in the digital environment era (Waldman 2003; White & Gendall 2005). Specific measures towards the improvement of internet usage skills and self-efficacy on the part of researchers would also contribute to the further minimisation of researchers' effort expectancy to exploit the online environment for information access and dissemination of scholarly output, as observed in Table 4.

3.4.5 Performance expectancy

Performance expectancy relates to how individuals believe new technology will help them to better perform their job (Venkatesh et al 2003; Louho, Kallioja & Oittinen 2006). In this study, an assessment was made to determine how the researchers believed open access facilitates accessibility to and the dissemination of scholarly content. Results from this investigation are presented in Table 8.

Table 8: Researchers' ratings on performance expectations from open access (N = 396)

Expectation	Ratings (number & percentage)				
	Strongly agree	**Agree**	**Disagree**	**Strongly disagree**	**Don't know**
Open access outlets enable scholars to publish more quickly	109 **(27.7)**	164 **(41.6)**	52 **(13.2)**	6 **(1.5)**	63 **(16)**
Open access outlets increase research impact by researchers' works being highly cited	126 **(32.1)**	157 **(39.9)**	58 **(14.8)**	7 **(1.8)**	45 **(11.5)**
Open access outlets improve accessibility to scholarly literature because it is free	171 **(43.3)**	157 **(39.7)**	29 **(7.3)**	**7 (1.8)**	31 **(7.8)**

Expectation	Ratings (number & percentage)				
	Strongly agree	**Agree**	**Disagree**	**Strongly disagree**	**Don't know**
Open access enables researchers from developing countries to access literature more easily	179 **(45.2)**	140 **(35.4)**	34 **(8.6)**	8 **(2)**	35 **(8.8)**
Publishing in open access outlets exposes scholarly work to a large potential readership	165 **(41.5)**	160 **(40.5)**	29 **(7.3)**	7 **(1.8)**	34 **(8.6)**

As observed from Table 8, most of the respondents were quite optimistic regarding open access publishing in improving both accessibility as well as the dissemination of scholarly output. Over two-thirds of the respondents either agreed or strongly agreed that open access publishing was superior to the conventional subscription-based scholarly publishing in many aspects. The above findings also support the observation that despite the fact that many researchers had not previously published in open access outlets, the majority had expectations of publishing in open access outlets in the future. This implies that the future adoption of open access is highly dependent on the expected benefits of open access in improving accessibility to and the dissemination of scholarly content. Several other studies also acknowledge performance expectancy as a motivation for scholars to adopt open access. For example, free access to online content has been reported as the main motivation for many researchers to access open access scholarly materials (Hajjem, Harnad & Gingras 2005; Schroter, Tite & Smith 2005; Warlick & Voughan 2006). Similarly, it has been observed that increased research impact (Chan 2004; Brody 2006), increased speed of publication or dissemination of research output (Prosser 2005; Carr et al 2006), and wider dissemination of research output (Swan & Brown, 2005) are among the other factors influencing researchers to consider making their publications openly accessible. The belief by the majority of scholars that open access improves scholarly communication, compared to conventional business-based publishing, may be used as a strong selling point for open access to the scholarly community.

3.4.6 Social influence

Social influence relates to how an individual is affected by his/her peers or other leading researchers and/or his/her organisation in deciding on open access usage (Venkatesh et al 2003; Schaper & Pervan 2007). In the current study, the researchers were provided with a number of statements about social influence and were asked to indicate the extent to which such factors would influence them to publish in open access outlets. Table 9 presents the results regarding how researchers' use of open access is influenced by social factors.

Table 9: Role of social influence on researchers' future publishing in open access outlets (N = 394)

Factor	Importance ratings (Number and percentage)				
	Very important	Important	Less important	Least important	Don't know
If close colleagues publish in open access outlets	70 **(17.8)**	165 **(41.9)**	102 **(25.9)**	23 **(5.8)**	34 **(8.6)**
If leading researchers in my discipline publish in open access outlets	128 **(32.4)**	158 **(40)**	66 **(16.7)**	12 **(3)**	31 **(7.8)**
If my research finding agency would look favourably on me	125 **(31.7**)	168 **(42.6)**	56 **(14.2)**	9 **(2.3)**	36 **(9.1)**
If my research finding agency requires me to publish in open access outlets	121 **(30.4**)	190 **(48.2)**	41 **(10.4)**	10 **(2.5)**	32 **(8.1)**
If my institution would look favourably on me for publishing in open access outlets	137 **(34.8)**	169 **(42.5)**	42 **(10.7)**	6 **(1.5)**	40 **(10.2)**
If my institution requires me to publish in open access outlets	130 **(33.1)**	179 **(45.5)**	42 **(10.7)**	5 **(1.3)**	37 **(9.4)**

It is noted from Table 9 that all social influence factors were considered by more than two-thirds of all respondents as important or very important determinants for their publishing in open access outlets. However, the influence of researchers' peers and colleagues was found to be less important when compared with other social influence factors related to organisational or research funding bodies. These results imply that employers and/or research funding bodies in the study area stand a better chance of accelerating the adoption of open access at their respective universities than fellow researchers' influence. Similar findings were reported by previous studies. A study by Deoghuria and Roy (2007), for example, indicates that out of 125 scientists, 64 per cent and 20 per cent considered their funding agencies' and employers' influences as crucial determinants in their quest to publish in open access. The influence of peers has also been negated by the majority of the respondents as a motivation for their publishing in open access outlets (Deoghuria & Roy 2007; Hess et al 2008).

The above observations suggest that it is important to enforce measures that may be employed by universities and other research funding agencies to boost the adoption of open access in the country. The majority of the university policymakers who were interviewed in this study also supported most of the measures earmarked for fostering open access development, which further supports this view. Among the 63 respondents,

92.1 per cent said they would support or would likely support the establishment of a policy requiring their faculty to deposit research output in institutional repositories; 87 per cent would support or likely support the recommendation for researchers to retain copyright of their publications; 85.7 per cent would support or likely support their institutions to sponsor author charges for their employees to publish in open access journals; 82.5 per cent would support or likely support their institutions to sponsor publication of their institutional journals so that they are made openly accessible; and lastly, 82.5 per cent would support or likely support the explicit recognition or reward for open access publications published by their employees.

4 CONCLUSIONS AND RECOMMENDATIONS

The findings of this study indicated that researchers and policymakers at Tanzanian public universities are fully aware of the potential of open access publishing. Yet, it also became evident that they are not fully in a position to take advantage of this potential. However, the overwhelming willingness by the majority of the researchers to disseminate their scholarly content through open access outlets in the future suggests positive prospects for this mode of scholarly communication in Tanzanian public universities. These findings also provide a strong basis for the introduction of this mode of scholarly publishing at Tanzanian public universities and other research institutions in the country. Attitude, effort expectancy, social influence and performance expectancy were highly ranked as factors that could facilitate the adoption of open access scholarly communication in the study area.

On the other hand, respondents indicated that the current state of internet self-efficacy and facilitating conditions hinder them in adopting open access. Accordingly, slow internet connectivity, inadequate skills for information searching and publishing in the digital environment were identified as the main hindrances for researchers to exploit open access opportunities. Based on the study findings, the following recommendations are considered important to enhance the adoption of open access scholarly communication in Tanzanian public universities and other research institutions in the country and elsewhere:

- ***Advocacy for open access***

Open access scholarly communication can flourish only if faculty and university administrators are made aware of its benefits (Chan & Costa 2005). In view of the fact that some researchers and policymakers in Tanzanian public universities were found to be unaware of open access, it is important to further advocate for this mode of scholarly communication. The need for advocating open access in such institutions is further motivated by the low publishing involvement of the researchers in open access outlets,

as revealed by this study. For a wider impact, open access advocates that campaigns should be conducted at all levels – from institutional to national levels. At the national level, open access advocates should be led by the Tanzania Library and Information Association (TLA). The Consortium of Tanzania University and Research Libraries (COTUL) also has a better chance of advocating for open access among its member institutions.

- ***Internet connectivity improvement***

The potential of open access can only be exploited to the fullest in situations of adequate internet connectivity. However, slow internet connectivity was evident throughout the study area because of low bandwidth. This implies that researchers from these institutions are compelled to spend a lot of time trying to access information online. At the same time, information hosted at their university, even if available online, may not be easily accessed by other scholars from outside because of the existing low uplink connectivity at all the Tanzanian public universities. It is thus highly recommended for the universities involved in this study to improve their internet speed via subscription to more bandwidth, so as to meet the demand from the scholarly communities at the respective institutions. The Eastern African Submarine Fibre Optic Cable connecting Tanzania to the rest of the world (launched in June 2009 by President Jakaya Kikwete of the Republic of Tanzania) offers a great opportunity for such universities to improve their connectivity (Shame 2009). Once connected to this gateway, universities will be in a position to increase their connectivity at an affordable cost, compared to the current situation where such institutions are dependent on satellite-based communication systems that are deemed quite expensive. At the time of writing this article, the laying of fibre-optic cable in various locations in the country was ongoing. Except for the University of Dar es Salaam, which had already improved its internet connectivity, the rest of the institutions should determine their adequate bandwidth based on their user population and should take advantage of the optic-fibre infrastructure in the country to upgrade their connectivity.

- ***Improve researchers' online publishing skills***

Among others, one of the reasons for the low usage of open access outlets by the researchers to disseminate their research findings is associated with the inadequate skills in online publishing by such respondents. This is probably why Harle (2009:15) emphasises: "With more sophisticated ICTs now being used in HE [Higher education], and with developing web technologies relating to information access and publishing becoming more sophisticated, libraries need to continually upgrade the technical skills of existing staff and to enable and encourage them to develop new expertise." It is thus highly recommended for information professionals from both libraries and university computing centres to proactively devise attractive training modules for upgrading publishing techniques in the online environment. This will ensure effective exploitation

of open access potentials by the researchers to improve the dissemination of scholarly content.

- ***Formal institutionalisation of open access publishing***

The willingness of researchers from Tanzanian public universities and research institutions elsewhere to publish in open access outlets in future can only be put into practice if appropriate mechanisms to foster the adoption of this mode of scholarly communication are put in place. Most important is to put in place appropriate policies that would encourage researchers to disseminate their findings through open access. Policies that support recognition of open access publications in career development, for example, can play a major role to motivate researchers to disseminate their research findings in such outlets. Lack of recognition of open access publications in staff career development has been acknowledged as among the reasons why scholars are reluctant to publish in open access outlets (Sale 2006; Deoghuria & Roy 2007; Fullard 2007; Hess et al 2008; SARUA 2008).

The other motivation for researchers to disseminate their research findings through open access is to make available such publishing opportunities locally. For example, among the viable strategies to encourage researchers to publish in open access outlets are for universities and other institutions to establish open access publishing outlets on their premises. This can be made possible by turning into open access some of the locally published journals as well as establishing institutional repositories. This would highly improve the dissemination of local content, which remains invisible to the rest of the world because of the low circulation of local journals and other grey literature in the conventional publishing system. This is also expected to improve the research impact of the respective universities by making their research output visible worldwide.

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