

The Other Side of the Coin for Open Access Publishing – A Developing Country View

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This article presents the Open Access publishing experience of researchers in an academic research institution, in a developing country, Trinidad and Tobago, namely at the University of the West Indies (UWI) St. Augustine Campus. It considers UWI researchers' knowledge of Open Access, their access to the scholarly literature, Open Access Archives/Repositories at UWI and related issues of Research and Library funding and Information Communication Technology (ICT) Infrastructure/Internet connectivity. The article concludes that whilst Open Access publishing yields some obvious and well-documented benefits for developing country researchers, including free access to research articles and increased impact and visibility of "published" Open Access articles, there are some disincentives that militate against developing country researchers fully contributing to the global body of knowledge via Open Access. It finds that Open Access Journals are beneficial for scholars who consume information but are of little benefit for developing country scholars wanting to publish in these journals because of the high cost of page charges. Inad-

equately and unreliable ICT infrastructure and Internet connectivity also often limit access to information. It concludes that because of technical, financial, human and infrastructural limitations, Open Access via the Green Road of self-archiving is also often not an option for developing country researchers. These researchers are therefore unable to reap the real benefits, of making their research Open Access, that of increased impact and visibility. This study is to develop and evaluate methods and instruments for assessing the usability of digital libraries. It discusses the dimensions of usability, what methods have been applied in evaluating usability of digital libraries, their applicability, and criteria. It is found in the study that there exists an interlocking relationship among effectiveness, efficiency, and satisfaction. It provides operational criteria for effectiveness, efficiency, satisfaction, and learnability. It discovers users' criteria on "ease of use," "organization of information," "terminology and labeling," "visual attractiveness," and "mistake recovery." Common causes of "user loss" were found. "Click cost" was examined.

Introduction

Open Access publishing is a concept where the results of research in the form of mainly scholarly articles are freely available to the public. Access is usually to an electronic form of the article via the Internet. There are two primary methods to achieve Open Access:

- by publishing articles in Open Access Journals (OAJ) and/or
- depositing copies of articles in Open Access Archives (OAA) or Repositories, often referred to as self-archiving

These two parallel but complementary paths for achieving Open Access are sometimes referred to as the Gold (publish in an OAJ) and Green Roads to Open Access (publish in a non-OAJ but archive in an OAA) (Harnad et al. 2004).

Open Access via the Gold Road (Publishing in Open Access Journals)

Publishing articles in Open Access Journals is increasingly seen as an alternative to publishing in the traditional journals. In traditional journals the readers of those journals pay for the costs associat-

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ed with publication and peer review either through personal or institutional subscriptions (normally through a library). This traditional mode of funding the dissemination of the results of research has often been referred to as the “subscriber pays” model. Access to articles in these journals is *restricted* to those who can pay the subscriptions, or the costs of acquiring copies of the articles by other means, such as using interlibrary loan facilities.

Alternatively, the Open Access Journal model allows all who have Internet access to freely read, download, copy, distribute, and print articles and other materials (see <http://www.soros.org/openaccess/read.shtml> [viewed February 15, 2006]). Of course, “free” availability on the Internet is only possible if “someone” pays for the cost of production and dissemination. Open Access publishers sometimes meet these costs by charging authors (“author pays”). In other cases, Open Access Journals are run by researchers and the publishing costs are absorbed by their employers/institutions.

The “author pays” model of funding the publication of Open Access Journals involves the payment of “page charges” directly by the authors of the articles or indirectly through their sponsors and research institutions. The author pays most commonly by a fixed charge per page, sometimes a charge per article, sometimes with surcharges for colour illustrations or lengthier articles. It must be remembered that Open Access Journals are not the only ones that impose page charges. Interestingly there are traditional or “subscriber pays” journals that also levy page charges to offset the cost of publication (for example, see <http://www.tandf.co.uk/journals/authors/uphoauth.asp> [viewed February 15, 2006] and <http://www.tms.org/pubs/journals/JEM/authorguide.html> [viewed February 15, 2006]). This “author pays” model of using page charges to either cover the entire cost of publication or to subsidize the full cost and so reduce subscriptions is not new and has been used since the early 1960s by the professional associations and other not-for-profit publishers (Kligfield 2005). Indeed one study has shown that as early as the 1970s, half of all science articles written by U.S. authors required some form of author payment and in some fields nearly all articles involved author payment (King et al. 1981).

The number of Open Access Journals is increasing. Ulrich’s periodicals directory (see [\[www.ulrichsweb.com/ulrichsweb/\]\(http://www.ulrichsweb.com/ulrichsweb/\) \[viewed February 15, 2006\]\) lists 1252 refereed academic and scholarly Open Access Journals out of a total of 24,293 such journals \(as of January 5, 2006\). The Directory of Open Access Journals \(<http://www.doaj.org/>\) lists 1991 such journals \(as of January 5, 2006\). Of the 8700 selected journals covered by the Web of Science \(Science Citation Index Expanded online\), 239 are reported to be Open Access Journals \(Thomson 2005\).](http://</p></div><div data-bbox=)

Several studies have been carried out on Open Access Journals. Almost all cite the benefits to developing country researchers namely:

- Free access to information.
- Increased research impact (measured by citations/downloads) of Open Access articles versus non-Open Access articles (Lawrence 2001; Antelman 2004; Harnad & Brody 2004; Harnad et al. 2004; Kurtz 2004; Hajjem et al. 2005).
- Possible solution to the so-called “serials crisis” or “journal affordability problem” (Harnad et al. 2004) where the high cost of subscriptions to serials particularly in the sciences has caused many libraries to reduce the number of serials in their collection (Mobley 1998; Parks 2002).

Most of the papers that cite the benefits of Open Access Journals have been written by researchers from the so-called “north” or more developed countries. Few commentators have discussed in depth the difficulties that authors, particularly those that are developing country researchers, may encounter when attempting to publish in Open Access Journals (Anderson 2004; Graczynski & Moses 2004).

Open Access via the Green Road (Self-Archiving)

Some individual researchers make available the full text of their publications on their personal websites (or personal archives) (Andrew 2003). There is an increasing number of universities or research institutes, albeit still a small number, that collect, preserve and provide access to the scientific output of their institute in Institutional Repositories (IRs) (Crow 2002; Anscombe 2005). The visibility of the institutions with Institutional Repositories is increased and access to their research output is expanded thus greatly increasing the impact of the institution’s research (Lawrence 2001; Crow 2002; Harnad 2003).

Archives or repositories may contain electronic pre-prints (before peer-review) as well as post-prints (reviewed and accepted, or in the process for publication) (Harnad 2001a; Harnad 2001b; Pinfield 2005). These archives use a common meta-data protocol to describe the details of each article thus enabling the sharing of the contents of these archives/repositories and making them therefore interoperable (Lagoze and Van de Sompel 2001; see <http://www.openarchives.org> [viewed February 15, 2006]). Search engines, which can harvest the information in these repositories, make their contents searchable and freely accessible via the Internet. Specialized search engines, which enhance access to the content in these archives/repositories, include:

- Google Scholar, (<http://scholar.google.com> [viewed February 15, 2006]), a search engine that makes it easier to find academic publications in higher-education repositories as well as in researchers' private websites (Grogg and Ferguson 2005; Myhill 2005).
- The science search engine Scirus (<http://www.scirus.com> [viewed February 15, 2006]) searches IRs and Open Access repositories (Felter 2005; Notess 2005).
- OAIster (<http://oaister.umdl.umich.edu> [viewed February 15, 2006]), a project of the University of Michigan Digital Library Production Services, uses the Open Archives Initiative (OAI) protocol (<http://www.openarchives.org/> [viewed February 15, 2006]) to harvest repositories (Hagedorn 2003). Up to December 22, 2005, OAIster enabled the searching of the repositories of 578 institutions worldwide via the Internet.

Apart from personal archives/repositories and IRs, subject archives have been widely used for several years in areas such as physics, computer science and library and information science (see <http://www.ArXiv.org/>, <http://cogprints.org/>, <http://eprints.rclis.org/> [viewed February 15, 2006]). Like Open Access Journals the number of archives or digital repositories of all types is reported to be increasing (Open Citation Project 2003). Thus, if an author is unable or chooses not to publish in an OA Journal (the Gold road), he/she can still achieve Open Access to some version of the article, or research results, if at least the pre-print version is deposited in a freely and easily searchable and accessible digital archive or repository.

The success of Open Access Archiving in expanding access to articles depends significantly on the author's knowledge of Open Access, and the ready availability/accessibility of the facility of

the archives to the authors. If authors are unaware of the existence and benefits of archives then they cannot self-archive. Additionally, just like Open Access Journals there is a cost attached to setting up and maintaining an archive (Crow 2002, 27–28). Archives require server space, staff time and long-term maintenance which may require migration of data to new platforms (or technologies). This cost has to be borne by someone. Many articles cite the benefits of archives particularly institutional archives, and either downplay or make no mention of any long term and start up costs (Johnson 2002; Chan 2004; Chan et al. 2005, 4). For developing country institutions "costs" are always a matter of concern even if such costs are deemed small by those from more developed countries.

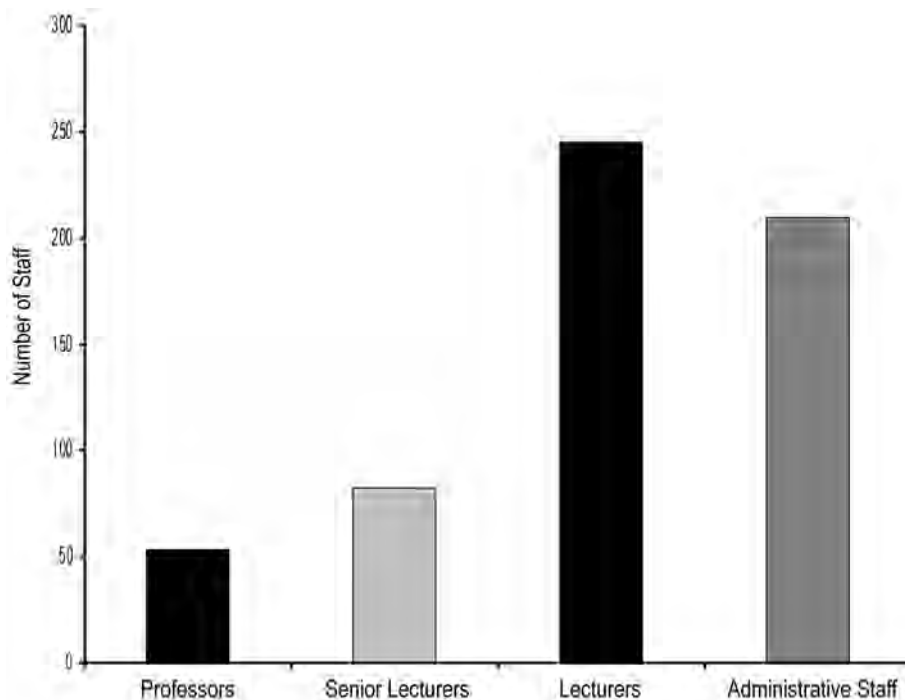
It should also be noted that achieving Open Access via archiving assumes the availability of a stable Internet connection since generally articles to be deposited must be uploaded to the digital repository or archive via an Internet connection (see <http://eprints.ictp.it/help/>, <http://www.eprints.org/documentation/handbook/adding-eprints.php>, <http://hal.ccsd.cnrs.fr/?langue=en> [viewed February 15, 2006]). Without a "good" (fast and reliable) Internet connection, the deposit of papers into archives becomes very difficult.

Whatever the method of achieving Open Access (Gold, Green or both), the real benefit to the researcher of facilitating Open Access to his/her research findings or publications is not the altruistic feeling he/she gets from sharing their work with the world, but the benefits from the increased impact of his/her research through an increased number of citations or downloads (Harnad 2001c; Harnad & Brody 2004; Harnad et al. 2004).

The University of the West Indies

The University of the West Indies (UWI) was first established at Mona, Jamaica, in 1948, as a College in special relationship with the University of London to serve the British territories in the Caribbean area. The St. Augustine Campus of the UWI was established in 1960 when the Imperial College of Tropical Agriculture (ICTA) was incorporated into the University College of the West Indies. In 1962, the University was granted its own Charter under the Great Seal of the British Realm and thus became empowered to grant its own degrees. There are now three UWI Campuses, Mona in Jamaica,

Figure 1: Academic Staff at UWI, St. Augustine 2005



Cave Hill in Barbados and St. Augustine in Trinidad and Tobago.

At the St. Augustine Campus there are now five faculties, namely, Engineering, Humanities and Education, Science and Agriculture, Social Sciences and Medical Sciences. The composition of the academic staff at UWI St. Augustine is shown in Figure 1. In addition 13,441 students are presently enrolled at UWI of which 2804 are postgraduate students (UWI Today 2005). Thus UWI can be considered as a mature research level university comparable to those that are members of the North American Association of Research Libraries (ARL) (see <http://www.arl.org/members.html> [viewed February 15, 2006]).

Like researchers at universities worldwide, UWI researchers are required to “publish or perish”. When considering the publication of an article in a journal, the developing country researcher has no choice but to seek out peer reviewed journals (both OA and non-OA) which match his/her research interests but do not have page charges, because of very limited access to research funding, as is discussed later. Thus publishing in Open Access and indeed most other journals that impose page charges is excluded for the developing country researcher. Anecdotal evidence from UWI research-

ers indicates that the search for journals to publish in which do not require page charges is often quite a time consuming and challenging exercise.

Experience of UWI researchers

As mentioned earlier there are documented benefits to the researcher of enabling, or facilitating, Open Access to his research results in the form of scholarly articles. There are also problems associated with achieving Open Access via the Gold Road of publishing these articles in an Open Access Journal and/or the Green Road of self-archiving in some form of digital repository or archive. Such problems include:

- Researchers’ lack of knowledge or awareness of Open Access Publishing
- Inadequate funding available for:
 - Page charges/research costs and
 - Institutional Repositories
- Poor ICT infrastructure/Internet Connectivity

The UWI researchers’ experience with Open Access publishing encompasses all of these issues.

Knowledge of Open Access Publishing

An exploratory study was carried out on the academic staff of the Faculty of Engineering at UWI to determine their awareness of Open Access publishing. This Faculty was chosen since members of this Faculty are considered, within UWI, to be on the “cutting edge” of technological advancements and would probably represent the “best case” in terms of knowledge of emerging scholarly communication issues like Open Access Publishing. This study was a preliminary exercise simply to garner general information on the Faculty members’ knowledge of OA and was not intended to be a formal scientific study. A simple questionnaire was emailed to the 112 academic staff members of the Faculty of Engineering to poll their knowledge of Open Access Journals and Archives. Seventy-nine academic staff members responded (i.e. a response rate of approximately 70%). Eighteen staff members were aware of Open Access Journals (18/79 i.e. 23%) and just six (6/79 i.e. 8%) were aware of digital archives/repositories. Only two staff members had actually published a paper in an Open Access Journal and none had self-archived their papers. Pelizzari (2003) reports for the Social Sciences sector at Brescia University in Italy that 44% were aware of Open Access initiatives with 4% actually depositing a paper in an archive. The JISC/OSI (2004) study of journal authors from mainly the developed countries of the USA and Europe reports that about two thirds (67%) of those who never published in an Open Access journal were aware of Open Access concepts but that around 70% of authors were unaware of repositories/archives. Not surprisingly, UWI researchers’ knowledge of Open Access (23%) is poor in comparison.

Anecdotal evidence suggests that this lack of awareness of Open Access Journals and Archives extends to promotion committees. Indeed, one lecturer was told, off the cuff, by a member of one such committee, that little was thought of his publication since the committee heard that he had paid for it to be published. In fact, the lecturer concerned had paid page charges on one article upon its acceptance for publication in an Open Access Journal.

To those who are uninformed, publishing in Open Access Journals is often equated to “vanity publishing”. Open Access Journals are also gener-

ally not the most highly ranked journals in their fields and so promotion committees are not very impressed by publications in these journals. In universities with colonial traditions and legacies like UWI, there is still some hesitancy to recognize publications in electronic only journals. The free availability of such journals via the World Wide Web does not help to alleviate the scepticism. Free is often equated with “poor quality” and expensive with “high quality”. It is clear that the success of Open Access initiatives in any institution rests heavily on authors/researchers knowledge of and willingness to support the initiatives (Mackie 2004).

Access to the scholarly literature

Despite the low awareness of Open Access in a major Faculty of the university, there is some awareness of Open Access Publishing among librarians and a few in other UWI departments and Campuses. The Main Library of UWI St. Augustine has facilitated access to Open Access Journals through two mechanisms:

- The provision of links to academic and research databases like the Directory of Open Access Journals, the Public Library of Science and SciELO (see <http://www.mainlib.uwi.tt/ersearchtools/onlinedatabaseupload/showindexresult.cfm?indexstart=ALL> [viewed February 15, 2006])
- A listing of e-journals that includes Open Access Journals (see <http://www.mainlib.uwi.tt/ersearchtools/ejournalupload/showjournalresult.cfm?journalstart=ALL> [viewed February 15, 2006])

Interestingly, many researchers at UWI happily discover or are linked to Open Access articles when using popular search engines like Google and are unaware that these are there as a result of Open Access initiatives. Praise is heaped instead on the search engine Google!

Despite the general lack of awareness of Open Access Journals on the Campus, a recent development has been the publication of two new Open Access Journals by members of the Campus community. The Main Library is to start publication of *The Caribbean Libraries Journal* as an Open Access Journal and has recently issued an invitation for authors to submit articles (see <http://www.mainlib.uwi.tt/Clj/call4papers.htm> [viewed February 15, 2006]). The Centre for Gender and Development Studies of UWI has also issued a call for papers for the Open Access Journal

“Caribbean Review of Gender Studies” with its first issue expected to be July 2006 (see http://www.mainlib.uwi.tt/newsitems/CRGS_CallForPapersOct2005.doc [viewed February 15, 2006]). These two journals are currently entirely supported by the university’s infrastructure and resources and so do not plan to introduce page charges.

Open Access Archiving/Repositories

The UWI Main library has started work on the creation of an Institutional Repository. As is the case in most IRs, content in UWI’s repository is expected to include working papers, teaching materials, dissertations and theses, slides, images and datasets. Open source software for setting up repositories is readily available (Crow 2004). The most well known of these are DSpace developed at MIT (<http://www.dspace.org/> [viewed February 15, 2006]) in the USA and GNU Eprints from the University of Southampton in the UK (<http://www.eprints.org/> [viewed February 15, 2006]). UWI, St. Augustine has decided to use DSpace to implement its IR. The software has been installed on the library’s servers, and policies and workflows are presently being developed to add content to the repository. So far agreement has been reached with the Faculty of Social Sciences and the Centre for Gender and Development Studies of UWI St. Augustine for the inclusion of their content in this repository.

Progress on implementation of this repository has been unfortunately slow because of a lack of resources (human, financial and technical). For UWI, server space is limited and work on the implementation of the IR was initiated by the Main Library using existing resources. Indeed there is a “cost” to setting up an IR that is reported to range from US \$6980 to \$2.5 million and ongoing costs ranging from \$39,500 to \$285,000 (Swan 2004; Barton and Walker 2003). Costs are said to be on the lower end of the scale for large institutions that already have a cadre of highly trained staff, abundant equipment and good infrastructure. But for smaller institutions, like UWI, which are already struggling with inadequate staffing and inadequate IT equipment, costs are at the higher end (Crow 2002). Thus developing country institutions like UWI expect the true economic cost of setting up and maintaining an IR to be high.

In the absence of an IR, it is possible for researchers to deposit their work in personal Web pages or subject repositories and so achieve Open Access. At UWI, because of limited server capacity, staff members and indeed students are not allocated any server space for personal web pages. Free Web page hosting services like Geocities are not commonly used by UWI researchers because of a lack of knowledge and know-how. It can also be argued that self-archiving via personal web pages is not the best method of archiving research papers because of the ephemeral nature of such websites (Koehler 2004).

There are also concerns among UWI researchers about copyright and other permissions (see <http://www.sherpa.ac.uk/romeo.php> [viewed February 15, 2006]). It is generally believed by them that depositing any version of an article submitted to a journal anywhere else is not “allowed” or is illegal. This itself is still a touchy issue within the publishing world and has been the subject of many discussions (Bide 2002; Coleman and Malone 2005; Harnad 1999).

Thus, without an IR in place at UWI together with a general lack of awareness of the existence of subject repositories and concerns about copyright, self-archiving is practically non-existent on the Campus.

Information communication technology infrastructure/Internet connectivity

It is often a much-overlooked fact that access to articles in Open Access Journals and Archives requires a reliable and fast Internet connection since the most common mode of availability of such articles is as PDF (portable document format) files. Internet access is sometimes subject to the vagaries of other infrastructural elements in Trinidad and Tobago. For example, Trinidad and Tobago has an electricity supply which, although much improved, still can be unreliable (Virjee 2005; Atwal 2003). As a consequence of this, UWI’s Main Library found it necessary to install a stand-by electricity generator. Additionally, ownership of computers and access to the Internet is low when compared with more developed countries (Table 1).

Open access to scholarly articles thus becomes very difficult for the developing country researcher when basic infrastructure like good Internet

Table 1: Telecommunications Infrastructure for Internet Access Comparison of Trinidad and Tobago to Selected Countries for 2002

Countries	Telephone Lines & Cellular Subscribers/100 Population	Personal Computers/100	Internet Users/100
Trinidad and Tobago	53	8	11
United Kingdom	143	41	42
United States	114	66	55
Singapore	126	62	50
Sweden	163	62	57
Venezuela	37	6	5
Brazil	42	8	8
Chile	66	12	27
China	33	3	6
Guyana	19	3	14
India	5	1	2
Nigeria	2	1	0

Source: United Nations Statistics Division-Millennium Indicators (ITU estimates) from http://unstats.un.org/unsd/mi/mi_series_list.asp, rounded to the nearest whole number

connections, computers and a reliable electricity supply is absent. UWI Trinidad has a network of over 2000 computers with more than 50 (LAN) edge switches, wireless capabilities and a Campus Area Network (CAN) that is one of the largest in Trinidad and Tobago with minimum connectivity quoted as 100Mbps (UWI 2004, 11). Yet, the per-

ceived/experienced bandwidth is inadequate for the number and type of users on the Campus. It is not unusual at peak times of the day for PDF files in particular to be very difficult to download on the UWI Campus. Similar experiences are reported in other developing countries (Arunachalam 1999; Pasch & Miranda-Murilo 2004). This is often referred to as the “digital divide” problem (Chinn & Fairlie 2004; Cullen 2001).

Funding

Lack of adequate funding is a root cause for many of the problems experienced by developing country institutions (Arunachalam 1999; Papin-Ramcharan and Dawe 2006). Funding for libraries determines the extent to which the library can satisfy the researchers’ need to access the scholarly literature. Funding of research costs may impact on the quality of the research and also the ability of the researcher to disseminate the research results because of relatively high “page charges”.

Library funding

The UWI Main Library’s budgetary allocation for library materials is shown in Table 2. It can be seen from Table 2 that the budget allocated for library materials increases by approximately 5% annually to allow for inflation. However a significant expansion in enrolment from about 8000 students in 2001 to over 13000 in 2005 without a correspond-

Table 2: Budget Allocation For Library Material [1] (Note 1TT\$ = 0.16 US\$)

	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
Total Student Population	8110	9121	10,601	11,409	13,441[2]
Total Vote (TT\$)	8,983,833	9,415,054	9,866,982	10,880,120	11,424,127
Library Materials Budget/ Student	1107.75	1032.24	930.76	953.64	849.95
Serials Print (TT\$)	4,531,427.61	4,712,684.71	4,712,684.71	4,100,000	\$4,715,000
Per cent of Total Vote	50%	50%	48%	38%	41%
Electronic Resources (TT\$)	1,177,628.39	1,287,315.29	1,287,315.29	2,000,000	2,909,480
Per cent of Total Vote	13%	13.7%	13%	18.4%	25.5%
Total Serials + Databases	5,709,056.00	6,000,000.00	6,000,000	6,100,000	7,624,480
	63.5%	63.7%	61%	56.1%	66.7%
Total Books Expenditure	3,274,777	3,415,054	3,866,982	4,764,615.11	3,799,647
	36.4%	36.3%	39.2%	43.8%	33.2%

[1] Electronic Resources Allocation is for subscriptions to mainly online databases e.g. Engineering Village, OCLC FirstSearch

[2] Source: (UWI Today 2005)

Source of data: Internal Memoranda of the UWI Main Library From the Head Technical Services to All Professional Staff

Table 3: 2002 Expenditure on Materials Association of Research Libraries (ARL) Mean [1] vs UWI Main Library

	Total Library Materials Expenditure/ Student (US\$) 6.3TT\$ = 1 US\$	Monographs Expenditure/ Student (US\$)	Serials Expenditure/ Student (US\$)
Mean ARL	481.1	129.4	295.0
UWI Main Library St. Augustine	151.4	66.3	57.0

[1] ARL is a not-for-profit membership organization comprising 123 libraries of North American research institutions. ARL Descriptive Statistics for Academic Libraries is available at <http://www.arl.org/stats/arlstat/ddoc.html> and <http://fisher.lib.virginia.edu/arl/index.html>

[2] Extracted from data in Table 2 and converted to US \$

ing increase in the budget for acquiring library materials has resulted in a net decrease (~30%) in the amount spent per student at UWI. Additionally, if the price inflation for books and journals is considered, the amount spent per student is even worse than it appears in Table 2. For example the average price of an academic book in the UK is reported to have risen by approximately 20% from 1992/93 to 2002/03, and the average journal subscription price by approximately 70% from 1994 to 2000 (Sowden 2005, 20)!

Clearly libraries in developing countries such as Trinidad and Tobago are unable to offer access to the wealth of information resources often taken for granted by those in more developed countries. Table 3 illustrates this by comparing the mean expenditure figures for the purchase of library materials for libraries in the USA that are members of the Association of Research Libraries (ARL) to that for the Main Library at UWI St. Augustine for the year 2002. Whereas the mean expenditure for monographs at ARL libraries is 95% more than that at the UWI Main Library, it is about 420% more for serials! Thus, when one considers access to the source most needed for research, that is journal articles, UWI researchers are seriously disadvantaged in comparison to the researcher with access to ARL libraries. The availability of Open Access Journals and the existence of Open Access Archives indeed help to alleviate this disparity in access to research articles.

Research and publication funding

There are very few opportunities for the funding of research from grants or from other agencies in developing countries (Moreno-Borchart 2004). Indeed recently, The Chancellor of UWI Sir George Alleyne, made a vigorous appeal at the university's graduation ceremonies in Trinidad and Tobago to non-governmental sources to contribute to the university and reported a total of \$TT 40 million (\$US 6.3 million) in grants and gifts to the university for the year 2005 (Trinidad and Tobago Newsday 2005). This is in contrast to universities in the developed world where most submitted papers are the result of research that has been paid for by a funding body. For example, The Engineering and Physical Sciences Research Council (EPSRC) in the UK is the Government's leading funding agency for research and training in engineering and the physical sciences and is known to have a line item for page charges. There are similar research funding bodies in the USA, e.g. The National Science Foundation (NSF) and the National Institutes of Health (NIH). Both explicitly state that page charges are allowable costs (NIH Grants Policy 2003; NSF Grant Policy 2005).

Thus for researchers in the developed world the payment of page charges is of little concern since it is readily funded from their grants or sponsors and so publishing in Open Access Journals is readily embraced. On the other hand the researcher in the developing world can only access research funding from their poorly funded institutions or from their personal resources.

UWI tries to assist researchers with publication costs via its Research and Publication Fund, which can be used for funding publication in journals and covering other associated costs of research. This Research and Publication grant was recently increased to a maximum of \$400 US per researcher per year from \$250 US because of lobbying by Faculty members about the high page charges often associated with publication in Open Access Journals and publications of many learned societies. It is reported that Open Access publishers are currently charging between \$500 US to about \$1,750 US per article (King 2004). When these high costs are juxtaposed against the \$400 research and publication grant at the University of the West Indies St. Augustine Campus and the lack of other avenues for funding, then the difficulty for the developing country researcher becomes clear. Sup-

porters of the benefits of Open Access Journals for developing countries often quote that most journals would waive the page charges for authors "in need" or economic hardship. The reality is that the researcher in a developing country who is unable to pay page charges is not really on equal footing with his grant-rich well-funded counterparts in the more developed world. This is illustrated by the following experiences researchers have encountered with journals imposing page charges:

- One journal states that:
"publication will follow in the *first available issue published after remittance of the page charges*, thereby ensuring rapid turnaround."
(*International Journal of Engineering Education* 2005)
- Others state that:
"the journal can publish a very limited number of articles by authors who are unable to pay page charges, *but their publication may be delayed significantly*."
(*American Society for Engineering Education* 2005; *Journal of the Electrochemical Society* 2005)

The best situation for the payment of page charges encountered by one UWI researcher is that from the *Journal of Geoscience Education* which indicates that:

A fee of \$75 per page is charged to authors who have institutional, industrial, or grant funds available to pay publication costs. Authors without access to such funds are strongly urged to assist in defraying costs to the extent their resources permit. However, payment of page charges has no bearing on the decision to accept or reject a manuscript, and authors need say nothing about page charges at the time of submission. (National Association of Geoscience Teachers 2005)

Most of our researchers report feelings of embarrassment at even contemplating the making of a request to a journal to waive the page charges because of financial need. They prefer to avoid the situation altogether by continuing to submit their articles to the traditional "subscriber pays" journal. Interestingly, we discovered that some journals have a stated policy that authors from certain listed developing countries are not obliged to pay such charges (see <http://stroke.ahajournals.org/misc/ifora.shtml> [viewed February 15, 2006]). Such journals remove the obligation for the economically disadvantaged author to request the waiver of page charges. Even with such schemes, page charges can seriously deter developing coun-

try authors from publishing in journals with such charges.

Discussion and conclusions

It is clear that the experience of developing country researchers with Open Access publishing is somewhat different to that of researchers from institutions in developed countries. Although there are the obvious benefits to developing country researchers of free access to the scholarly literature, there are many hindrances to such researchers fully benefiting from this largesse. Limited technological infrastructure restricts researchers' access to the free information. Page charges certainly deter the less well-funded researcher from publishing in Open Access Journals. Journals that waive page charges for the economically disadvantaged author normally require such authors to make a request for the waiver of the charges. This requirement places most developing country researchers in an embarrassing position. Therefore, schemes should be implemented where page charges are waived for deserving authors without requiring them to make any requests. This should not result in significant added costs for publishers or other sponsors since the proportion of published articles originating in developing countries is presently small.

Additionally, lack of awareness of Open Access and its benefits, ensures that authors cannot avail themselves of Open Access opportunities. In an attempt to correct the lack of knowledge of Open Access at UWI, the authors of this paper will initiate planning for the implementation of a marketing and education campaign to sensitize the UWI Campus community to the benefits of Open Access. We are confident that this will result in support for OA becoming widespread at UWI. An understanding that following the Green and Gold roads to Open Access increases significantly the impact and visibility of the University's research will follow naturally from knowledge of Open Access. Work published in Open Access journals should be recognized for promotion and tenure as is the case for any other peer-reviewed publication.

More direct assistance needs to be given to developing country institutions for the setting up and marketing of Institutional Repositories. The slow start to UWI's Institutional Repository would

also be transformed if University administrators become convinced that Institutional Repositories are a key component of any long-term strategy to ensure the preservation of the Scholarly Output and/or Institutional Memory of the University and at the same time increase the University's visibility and research impact.

We look forward to the expansion of schemes by publishers and others to encourage the dissemination of research by developing country authors through Open Access initiatives.

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References

- American Society for Engineering Education (ASEE). 2005. *Journal for Engineering Education Guide for Authors*.
URL: <http://www.asee.org/about/publications/jee/guide.cfm> [Viewed July 20, 2005].
- Anderson, R. 2004. Author disincentives and open access. *Serials Review* 30(4): 288–291.
- Andrew, Theo. 2003. Trends in self-posting of research material online by academic staff. *Ariadne* 37 (October).
URL: <http://www.ariadne.ac.uk/issue37/andrew/intro.html> [Viewed January 4, 2006].
- Anscombe, Nadya. 2005. Repositories: Archive programmes gain momentum. *Research Information* October/November.
URL: <http://www.researchinformation.info/rioctnov05repositories.html> [Viewed December 15, 2005].
- Antelman, Kristin. 2004. Do Open Access Articles have a greater research impact? *College and Research Libraries* 65 (Sept.): 372–382.
- Arunachalam, S. 1999. Information technology: what does it mean for scientists and scholars in the developing world? *Bulletin of the American Society for Information Science* 25(4):21–24.
URL: http://www.asis.org/Bulletin/Apr-99/information_technology_.html [Viewed December 17, 2005].
- Atwal, H. S. 2003. *Privatisation and unbundling of generation and transmission and distribution – the Trinidad and Tobago experience*. Paper presented at the Organization of Caribbean Utility Regulators (OOCUR) First Annual Conference, "The Challenge for Utility Regulators in the Caribbean" 16–19 September, Port of Spain, Trinidad & Tobago (OOCUR).
- Barton, Mary. R and Julie Harford Walker. 2003. Building a business plan for DSpace, MIT libraries' digital institutional repository. *Journal of Digital Information* 4(2).
URL: <http://jodi.tamu.edu/Articles/v04/i02/Barton/> [Viewed January 4, 2006].
- Bide, Mark. 2002. *Open archives and Intellectual Property: Incompatible world views? A report for the Open Archives Forum*.
URL: http://www.oaforum.org/otherfiles/oaf_d42_cser1_bide.pdf [Viewed January 3, 2006].
- Chan, Leslie. 2004. Supporting and enhancing scholarship in the digital age: The role of open-access institutional repositories. *Canadian Journal of Communication* 29:277–300.
- Chan, Leslie, Barbara Kirsop and Subbiah Arunachalam. 2005. Open Access Archiving: the fast track to building research capacity in developing countries. *Science and Development Network (SciDevNet)* November.
URL: https://tspace.library.utoronto.ca/bitstream/1807/4415/1/Open_Access_Archiving.pdf [Viewed January 1, 2006].
- Chinn, M. D. and R. W. Fairlie. 2004. The Determinants of the Global Digital Divide. *Choice* 42 (Special Issue): 7–8, 10, 12–17.
- Coleman, Anita S. and Cheryl Knott Malone. 2005. *Copyright transfer agreements and self-archiving*.
URL: <http://dlist.sir.arizona.edu/804/01/colemanmalonetutorial.pdf> [Viewed January 4, 2006].
- Crow, Raym. 2002. *The case for institutional repositories: A SPARC position paper*.
URL: http://www.arl.org/sparc/IR/IR_Final_Release_102.pdf [Viewed December 17, 2005].
- Crow, R. 2004. *Open Society Institute: A guide to institutional repository software*. 3rd.ed. New York: Open Society Institute.
URL: http://www.soros.org/openaccess/software/OSI_Guide_to_Institutional_Repository_Software_v3.htm [Viewed December 15, 2005].
- Cullen, R. 2001. Addressing the digital divide. *Online Information Review* 25(5): 311–320.
- Felter, Laura M. 2005. Google Scholar, Scirus, and the scholarly search revolution. *Searcher* 13(2): 43–48.
- Graczynski, M. R. and L. Moses. 2004. Open access publishing – panacea or Trojan horse? *Medical Science Monitor* 10(1): ED1-3.
URL: http://www.medscimonit.com/pub/vol_10/no_1/4457.pdf [Viewed December 18, 2005].
- Grogg, Jill E. and Christine L. Ferguson. 2005. OpenURL linking with Google Scholar. *Searcher* 13(9): 39–46.
- Hagedorn, Kat. 2003. OAIster: a "no dead ends" OAI service provider. *Library Hi Tech* 21(2):170–181.
- Hajjem, Chawki, Steven Harnad and Yves Gingras. 2005. Ten-year cross-disciplinary comparison of the growth of open access and how it increases research

- citation impact. *Bulletin of the IEEE Computer Society Technical Committee on Data Engineering* 28(4):39–46.
URL: <http://sites.computer.org/debull/A05dec/hajjem.pdf> [Viewed January 1, 2006].
- Harnad, Stevan. 1999. *The copyright non-problem and self-archiving*.
URL: <http://www.ecs.soton.ac.uk/~harnad/Hypermail/Amsci/0449.html> [Viewed January 4, 2006].
- Harnad, Stevan. 2001a. For whom the gate tolls? How and why to free the refereed research literature online through author/institution self-archiving now. Paper presented at the Workshop on the Open Archive Initiative and peer review journals in Europe. Geneva, 22–24 March 2001.
URL: <http://www.cogsci.soton.ac.uk/~harnad/Tp/resolution.htm> [Viewed December 12, 2005].
- Harnad, Stevan. 2001b. The self-archiving initiative: freeing the refereed research literature online *Nature* 410:1024–5.
- Harnad, S. 2001c. Research access, impact and assessment. *Times Higher Education Supplement* 1487: 16.
URL: <http://www.ecs.soton.ac.uk/~harnad/Tp/thes1.html> [Viewed December 12, 2005]
- Harnad, S. 2003. *Maximizing university research impact through self-archiving*.
URL: http://eprints2.uqam.ca/archive/00000024/03/art07_01_eng.pdf [Viewed December 18, 2005].
- Harnad, S. and T. Brody. 2004. Comparing the Impact of Open Access (OA) vs. Non-OA Articles in the Same Journals. *D-Lib Magazine* 10 (6).
URL: <http://www.dlib.org/dlib/june04/harnad/06harnad.html> [Viewed December 18, 2005]
- Harnad, S., Tim Brody, François Vallières, Les Carr, Steve Hitchcock, Yves Gingras, Charles Oppenheim, Heinrich Stamerjohanns and Eberhard R. Hilf. 2004. The access/impact problem and the green and gold roads to open access. *Serials Review* 30(4):310–314.
- International Journal of Engineering Education. 2005. *Important announcement for authors intending to submit papers for publication*.
URL: <http://www.ijee.dit.ie/pagechrg.html> [Viewed December 17, 2005].
- JISC/OSI. 2004. *JISC/OSI journal authors survey report*.
URL: http://www.jisc.ac.uk/uploaded_documents/JISCOAreport1.pdf [Viewed January 1, 2006].
- Johnson, R. K. 2002. Institutional repositories: Partnering with faculty to enhance scholarly communication. *D-Lib Magazine* 8/11.
URL: <http://www.dlib.org/dlib/november02/johnson/11johnson.html> [Viewed December 12, 2005].
- Journal of the Electrochemical Society. 2003. *Instructions to authors*.
URL: <http://www.electrochem.org/guidelines/support/jag.pdf> [Viewed December 17, 2005].
- Koehler, W. 2004. A longitudinal study of web pages continued: a report after six years. *Information Research* 9(2) paper 174.
URL: <http://InformationR.net/ir/9-2/paper174.html> [Viewed December 12, 2005].
- King, Donald W., Dennis D. McDonald, and Nancy K. Roderer. 1981. *Scientific journals in the United States: Their production, use, and economics*. Stroudsburg, PA: Hutchinson Ross Publishing Company.
- King, Donald W. 2004. Should commercial publishers be included in the model for open access through author payment? *D-Lib Magazine* 10(6).
URL: <http://webdoc.sub.gwdg.de/edoc/aw/d-lib/dlib/june04/king/06king.html> [Viewed December 18, 2005].
- Kligfield, Paul. 2005. Rethinking page charges. *Journal of Electrocardiology* 38(4):296–298.
- Lagoze, Carl and Herbert Van de Sompel .2001. The open archives initiative: building a low-barrier interoperability network. Joint Conference on Digital Libraries 2001.
URL: <http://www.openarchives.org/documents/jcdl2001-oai.pdf> [Viewed December 18, 2005].
- Lawrence, S. 2001. Free online availability substantially increases a paper's impact. *Nature. WebDebates*. 31st. May.
URL: <http://www.nature.com/nature/debates/e-access/Articles/lawrence.html> [Viewed December 12, 2005].
- Kurtz, Michael J. 2004. *Restrictive access policies cut readership of electronic research journal articles by a factor of two*.
URL: <http://opcit.eprints.org/feb19oa/kurtz.pdf> [Viewed December 12, 2005].
- Mackie, Morag. 2004. Filling Institutional Repositories: Practical strategies from the DAEDALUS Project. *Ariadne* 39(April).
URL: <http://www.ariadne.ac.uk/issue39/mackie/> [Viewed December 18, 2005].
- Mobley, Emily, R. 1998. Ruminations on the sci-tech serials crisis. *Issues in Science and Technology Librarianship* Fall.
URL: <http://webdoc.sub.gwdg.de/edoc/aw/ucsb/istl/98-fall/article4.html> [Viewed November 12, 2005].
- Moreno-Borchart A. 2004. One problem at a time. Building research capacities in developing countries is necessary for economic success in the long term. But the numerous problems in doing so have to be solved for each country individually. *EMBO Rep.* 5(2):127–30.
- Myhill, M. 2005. Google Scholar. *The Charleston Advisor* 6(4).
- National Association of Geoscience Teachers (NAGT). 2005. *Instructions for Contributors to JGE*.
URL: <http://www.nagt.org/nagt/jge/instructions.html> [Viewed December 12, 2005].

- NIH grants policy statement. 2003. *Costs Under PHS Grant-Supported Projects/Activities (PHS GPS 9505)*.
URL: <http://grants1.nih.gov/grants/policy/gps/7costs.htm> [Viewed December 12, 2005].
- Notess, Greg R. 2005. Scholarly web searching: Google Scholar and Scirus. *Online* 29(4): 39–41.
- NSF Grant Policy Manual. 2005. Chapter VI. Allowability of costs. NSF 05-131.
URL: http://www.nsf.gov/pubs/manuals/gpm05_131/gpm6.jsp [Viewed December 18, 2005].
- Open Citation Project. 2003. Core metalist of open access eprint archives. Open Citation Project.
URL: <http://opcit.eprints.org/explorearchives.shtml> [Viewed December 11, 2005].
- Papin-Ramcharan, J. and. R. A. Dawe. 2006. Confronting the Cost of Information for a Research Library in the Developing World. The University of the West Indies, Trinidad and Tobago's Experience. *The International Information & Library Review* 38(1): 15-24.
- Parks, Robert P. 2002. The Faustian grip of academic publishing. *Journal of Economic Methodology* 9(3): 317–335.
- Pasch, G. and D. Miranda-Murilo. 2004. Information technology in Central American libraries. *IFLA Journal* 30(2): 141–149.
- Pelizzari, E. 2003. Academic staff use, perception and expectations about Open-access. A survey of Social Science Sector at Brescia University.
URL: http://eprints.rclis.org/archive/00000737/01/Academic_staff_perception_about_Open_archives.htm [Viewed December 17, 2005].
- Pinfield, Stephen .2005. A mandate to self archive? The role of open access institutional repositories. *Serials* 18(1):30–34.
URL: http://eprints.nottingham.ac.uk/archive/00000152/01/mandate_to_archive.pdf [Viewed December 18, 2005].
- Sowden, Peter. 2005. *University library spending on books, journals and electronic resources: 2005 Update. A Report for the Academic and Professional Publishers Division*. London: The Publishers Association.
URL: [http://www.publishers.org.uk/paweb/PAweb.nsf/0/460034df9bc9868b80256ffe003fdbf/\\$FILE/University%20Library%20Spending%20Update%202005.pdf](http://www.publishers.org.uk/paweb/PAweb.nsf/0/460034df9bc9868b80256ffe003fdbf/$FILE/University%20Library%20Spending%20Update%202005.pdf) [Viewed December 28, 2005].
- Swan, Alma, P. 2004. Posting Re: How to support institutional OA archive start-up and OA content provision. Mon, 4 Oct. The American Scientist Open Access Forum mailing list.
URL: <http://listserver.sigmaxi.org/sc/wa.exe?A2=ind04&L=american-scientist-open-access-forum&F=l&S=&P=82598> [Viewed January 1, 2006].
- Thomson. 2005. Thomson Scientific releases open-access journals study. *Computers in Libraries* 25(1): 38.
- Trinidad and Tobago Newsday. 2005. \$40 million for UWI from private sources. *Trinidad and Tobago Newsday* Monday October 31 Section A: 5.
- UWI. 2004. *Annual report 2004: The University of The West Indies St. Augustine Campus*. Trinidad: Marketing & Communications Office UWI.
- UWI Today. 2005. 124 National Scholars Chose UWI. *UWI Today* Sunday October 16th.
URL: <http://www.uwi.tt/uwiToday/2005/October/schols.asp> [Viewed November 25, 2005].
- Virjee, K. 2005. *The willingness to pay for changes in water, wastewater and electricity services in Trinidad and Tobago*. Information Document ER/001/05 of the Regulated Industries Commission (RIC).
URL: http://www.ric.org.tt/home/news/Revise_dWTPReportJuly2004.pdf [Viewed December 28, 2005].

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