

1. Cover Sheet

**MacArthur Research and Writing Grants
Technological Change and Global Security and Sustainability**

Extending the Global Knowledge Exchange: Technological Change and the Research Capacities of Developing Nations

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Duration: 18 months

2. Project Summary

Technological changes have radically altered the way university faculty go about their research, whether in collecting data, consulting the relevant literature, collaborating with colleagues or writing and publishing their work. While these new systems have made things easier and faster for university faculty in advanced countries, they are also exacerbating the knowledge gap between the developed and developing world in ways that affect the ability of developing nations to participate in this knowledge economy, as well as their ability to utilize this knowledge in significant areas of policy and governance. This undermines the very sustainability of development, while diminishing any gains in global security that might otherwise arise from a greater exchange of knowledge.

While the UNESCO and the World Bank have focused on knowledge's vital role in development, little attention has been paid, up to this point, on the global implications of new publishing and knowledge technologies for improving research capacities.¹ This project – which builds on my work in developing new publishing and indexing systems with the Public Knowledge Project² – will address questions of how technological changes in scholarly work, especially around the production, circulation and utilization of knowledge, is affecting the research capacity in the universities of the developing world, which currently account for only 3% of scientific journals, rarely indexed by the major services (Cetto, 2000). It will examine the current impact of technological changes on access to knowledge, as well as exploring the potential of the “open access” and “open source” publishing and indexing systems for improving research capacities while extending the global exchange of knowledge in a manner that can be shown to support the sustainability and security of these developing nations.

My plan is to explore these issues directly with researchers, students, librarians and policymakers, through surveys, interviews and seminars, in a small but varied sample of six universities in developing countries, namely, Cairo University (Cairo), Jawaharlal Nehru University (New Delhi), the National University of Vietnam (Ho Chi Minh City),

¹ See UNESCO's [Science for the Twenty-First Century: A New Commitment](#) (2000) and the World Bank Group's 2000 Annual Report [Promoting Knowledge and Learning for a Better World](#).

² The Public Knowledge Project is a federally funded research initiative at the University of British Columbia (<http://pkp.ubc.ca>).

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the Universidad Nacional Autónoma de México (Mexico City), the National University of Singapore (Singapore) and the University of Dar es Salaam (Dar es Salaam).

I will discuss and consider with the participants – both in person and through electronic exchanges among all involved – what these technological changes mean for them at this point, and what these changes could mean to their research capacity and their work with local communities, if their voices and potential contributions figured in the design and development of these new information and knowledge management systems for research. I will address issues of technology and linguistic access in relation to the Internet. The result will be, I believe, a well-documented and carefully researched case for expanding research capacity in developing countries through new policies, approaches, and technologies. It will serve policymakers, funding bodies, and the academic community, as each looks for ways to support a sustainable and secure future within a growing knowledge economy.

The project that I am proposing to the MacArthur Foundation, then, extends this earlier work into the global arena, situating the exchange of academic knowledge against issues of global security and sustainability. It asks how technological changes in processes of collaboration and publication can be designed so as to extend the inclusiveness of the university's knowledge system, that it might contribute more to global understanding, as well as to local improvements in sustainability policies and economic development.

3.0 Project Narrative

This project is dedicated to understanding how the research capacities of developing nations can be improved through new information technologies. The driving question is whether and how changes in scholarly publishing can increase the global exchange of knowledge by facilitating greater participation from universities in developing nations. Scholarly societies, journal editors and boards, research librarians, university administrations, and granting agencies, as well as individual faculty members, are all facing critical decisions about the future of research and scholarship. The decisions now faced over new publishing technologies – between, for example, “pay-per-view” and “open access” publishing systems – need to take into account the potential of these new systems increasing an exchange of knowledge that advances global sustainability and security. While it would be foolish to imagine that technology alone is the deciding factor, what we make of these technologies should be guided by an understanding of how these machines could do more to support such a global exchange.

3.1 Grant Objectives (following MacArthur program objectives, shown in bold)

- a) The first objective of this research and writing project is to assess the current impact of **technological change** in scholarly publishing on the international exchange of knowledge, by focusing on three academic areas – education, engineering, and health sciences – in a set of six universities situated in developing countries. By working with research librarians, faculty members, graduate students, and policymakers associated with these universities, the project will consider whether current uses of new information technologies are pointing to a more equitable and sustainable intellectual exchange between rich and poor nations, or whether they seem likely to widen the knowledge gap between them, with negative consequences for global security and understanding.

- b) Essential to assessing the impact of these changes is an analysis of the **problems of access to the technology**. This will entail taking stock in the sample universities of the state of relative access to hardware, software, connectivity, support, training, linguistic resources (multiple language sources, translation services) and scholarly information resources (journals, indexes, databases, etc.), with an eye to how these

resources could facilitate greater research and development initiatives, as well as support more participation in global knowledge exchanges.

- c) This project will also take stock of the **cumulative impact of technological advances**, by exploring how these advances are improving, and could further improve, the research capacity of the developing nations. This will entail examining the impact on technological advances, including email, web access, serial indexes, library catalogues, online journals (and online submission processes), reference works, pay-per-view services, open-access publishing, online forums and virtual conferences, and archives, databases, and data-sets. How have these advances affected the general knowledge, research productivity levels, grants success, network and collaborations? How have these affected how scholars think about their own knowledge and work? How have these affected the local application of expertise and experience (in areas of policy and governance, for example) as well as global participation in the knowledge economy of the academy? To that end, this project will identify the impediments, interests, and incentives to this greater participation, and it will explore with participants new models of scholarly publication and participation that include not only journal publishing, but that will also open up global participation in research collaborations, networks, discussions, agenda setting, editing, and reviewing.
- d) This project will explore how **public policy might respond** to these changes in information access and research capacity, at a local level in developing countries with the application of knowledge and expertise, as well as on a global scale among organizations, such as UNESCO and philanthropic foundations, devoted to building research capacities and global knowledge resources. Do these technological changes in scholarly publishing bode well for increasing the contribution of universities in developing nations and building a stronger relationship among university, community and nation? On a global scale, the question is whether this technologically enhanced research capacity will enable universities in developing countries to play a greater role, in shaping international policies and treaties, as well as in the setting of related research agendas among the academic community and within the world of NGOs.

e) And finally, this project will carefully consider how increased participation in academic knowledge exchanges can contribute to **global security and sustainability**. My principal interest here is not only in the sustainability of developing nations' research capacities. I want to look for evidence that increased research capacity and greater participation in a global knowledge system sustains development in a larger sense, whether economically, socially, politically, or educationally. This work would also test whether there are grounds for believing that achieving a stable and secure world would be supported by reducing developing countries' reliance on outside research and expertise. Finally, I wish to consider how supporting more equitable access and participation in this critical aspect of modernization, will provide an improved basis for international understanding, so critical to global security.

3.2 Methods of Investigation

My approach to "Extending the Global Knowledge Exchange" is to build an accurate and compelling picture of how technological change could build research capacity in the universities of the developing world. I plan to visit six universities in developing nations to meet and work with librarians, as well as faculty and graduate students (in education, engineering and life sciences), as well as with a sample of policymakers and government officials with whom the faculty have contact. My goal is to learn more about the potential for bolstering these institutions' research capacities through technological changes in scholarly publishing; to document the interests and frustrations of scholars in utilizing new information technologies in the developing world; and to help with expanding that research capacity by demonstrating new systems and collaborating on their improvement in facilitating a greater global knowledge exchange.

In the course of this research, I will gather detailed information on (1) current access to technology and information resources (including language issues), and how that has changed in recent times and its prospects of continuing to change; (2) the culture of incentives and opportunities for conducting research and how that research relates to teaching, to the local and national community, and to the larger academic community; (3) the prospects of greater collaboration, coordination, cooperation and network-building, in international research ventures; and (4) the potential value of new publishing systems to build research capacity and utilization in developing nations.

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To achieve this, I have begun developing a variety of survey forms with two Cameroonian librarians for a pilot study, and will work up interview protocols for the different groups with whom I will be working. These methods will be supplemented by the scheduling of seminars, demonstrations, and informal discussions with participants with the intention of introducing new skills and approaches, all of which will be further supplemented by an interactive website for sustaining the discussion, launching publishing projects and building on this work. The results of this systematic and open exchange will provide valuable insights not only for policy makers and funding bodies, but also for the academic community at large, as it looks to restructure its publishing and knowledge management technologies over the coming years.

Phases of the Study (18 Months)

1. Review of policy and program initiatives directed at improving access to technology, the Internet, and information resources (World Bank, UNESCO, UNICEF, etc.), as well as literature on research productivity in universities in developing nations.
2. Negotiate access to sample of universities in developing countries, selected to represent variety of cultures and stages of development, as well as drawing on initial contacts that I have been able to make: Cairo University (Cairo), Jawaharlal Nehru University (New Delhi), the National University of Vietnam (Ho Chi Minh City), the Universidad Nacional Autónoma de México (Mexico City), the National University of Singapore (Singapore) and the University of Dar es Salaam (Dar es Salaam). Make arrangements to meet with librarians, faculty and students (in education, engineering and life sciences), as well as with recommended (by participants) policymakers and teacher association representatives.
3. Development and review with participants the survey and interview instruments for librarians, faculty, students, policymakers, and teacher associations. Establish website to introduce project, demonstrate concepts, share results, and continue discussions.
4. Conduct visits to the universities in the sample and conduct surveys, interviews, seminars, demonstrations and informal discussions. The visits are to be spread over four different periods to enable reflection and refinement of process.

5. Write up an initial analysis and refine research process in the field and after each visit, as well as continue discussion and demonstrations through website.
6. Develop final analysis of the materials and data gathered into a book-length manuscript, including the narrative structure of visits and experiences, and recommendations for universities in developing countries, academic community at large, and funding agencies, with regard to securing and sustaining development through this extended knowledge exchange.

3.3 Current State of the Field

The knowledge-based economy that prevails today appears to be exacerbating economic disparities between rich and poor nations, according to State Street Bank analyst Avinish Persaud, and he points to the knowledge gap as the source of the problem (2001). He estimates that this gap between rich and poor nations is currently ten times the size of the income gap (based on number of scientists in developing nations). Reducing this knowledge gap, Persaud believes, is critical to the development of local economies, as well as to the global spread of democracy and prosperity. This theme has been reiterated, if too sanguinely, by World Bank head James Wolfensohn who holds that “it is through the exchange of knowledge and experience in the marketplace of ideas that development problems will be solved” (2000).

The response to date has necessarily been about increasing infrastructure, bandwidth and hardware in the developing world, with the Digital Opportunity Taskforce, for example, bringing together advanced nations, the private sectors and aid agencies to reduce the digital divide (Hammond, 2001, p. 99). It is time, however, to consider how technological changes will affect the research capacity of developing nations, especially in light of the reform of academic publishing currently underway. As things now stand, university libraries in developing countries are simply not able to keep up with the current state of scholarship, given a doubling of journal titles between 1975 and 1989, and a doubling in average subscription costs. At the same time, academic publishing in Africa, for example, continues to decline, while remaining journals are poorly represented in the major serial indexes (Alamna et al., 1999). It would seem that the world of print scholarship has gone as far as it can in distributing research to a greater

portion of the world. And while new technologies hold much promise, the fear is, as Colin Darch, a Cape Town librarian, puts it, that the North “will continue to refuse to cooperate in the establishment of an equitable world information order, based on entrenched principles of full disclosure and free flow”(1998). The universities of the North have not so much refused to cooperate, I contend, but have stood oblivious to the inequities of scholarship’s particular knowledge economy.

Certainly, innovative “knowledge networks” have begun to link scholars in the North and South (Stein et al., 2001). As well, an emerging “open access” publishing model holds promise for resolving the “crisis in scholarly publishing” created by escalating subscription prices of print journals. The International Network for the Availability of Scientific Publications is one of a number of services supporting African journals (Alemna et al., 1999). The Association of Research Libraries has launched BioOne, with open-access journals in biology. The Public Library of Science has garnered, as I write, the signatures of 29,000 scientists from 174 countries on a petition calling for free access to scientific publications. The corporate publishing sector has responded, in turn, with six leading publishers offering developing countries free online access to about 1,000 of the world's top medical journals (Nagourney, 2001).³

While these initiatives will certainly help narrow the knowledge gap, they rely on a one-way and often sponsored flow of information to the developing world. As such, their impact on sustainable research capacity in developing nations needs to be carefully assessed. The question is whether technological changes in scholarly communication could do more to foster a greater global exchange of knowledge. The answers to such a question could well inform the critical decisions that scholarly societies, journal editors, university librarians and administrators, granting agencies, and individual researchers are all facing over the future of academic publishing in this time of changing systems.

The current situation in Africa, for example, is well represented by the Development Policy Centre, in Ibadan, Nigeria. A good deal of its work in “enhancing national capacity for policy analysis and development management” now comes from Internet sources, amid the dwindling journal subscriptions that mark most Nigerian

³ Publishers: Blackwell, Elsevier Science, the Harcourt Worldwide STM Group, Wolters Kluwer International Health & Science, Springer Verlag and John Wiley. The Soros Foundation is sponsoring a similar initiative with the EBSCO full-text databases (<http://www.eifl.net/>).

university libraries (Mabawonku, 2001, 100). But then overseas “vendors have never supplied more than 60 percent of the issues [with prepaid print journal subscriptions] published each year,” while the Centre librarian’s letters of complaint were “never acknowledged” (p. 105). Yet librarian Iyabo Mabawonku is not without hope for the future, as she sees libraries taking on publishing and editorial functions that would help African scholars reach out with their own work. With a long-standing problem publishing and distributing African journals, the new generation of portable and open-source online publishing systems might make a significant difference in such endeavors (Rosenberg, 1997).

A strong instance of this interest in greater participation is found in the African Virtual Library, which was launched at Kenyatta University, Nairobi, in 1999. Not only will the Virtual Library provide a greater range of information sources – after years of declining access in Kenya – it will be devoted, according to Nancy Kamu, Senior Librarian at the Kenya Medical Research Institute, to “breaking through the information access barriers” by making African content available to the world through this “global platform” (2001). It has already become all too obvious to African scholars, as Kamu puts it, that companies “that market information products from the developed world... fail to recognize the potential that local content has as a part of a global knowledge.”

Just how to shepherd local experience and scholarship more fully into a global knowledge system is one of the challenges that this project seeks to consider with its participants. What appears to be missing are not so much the technology, but what Susana Quiroz, Director General, Universidad Nacional Autonoma de Nicaragua calls, “university intellectual production databases” (1998). The time has come to determine how best to structure productive databases that utilize local knowledge and resources on a global scale. “The building up of electronic libraries seems realistic,” holds Vu Van Son, Director of Vietnam’s Central Library for Science and Technology, “Vietnam has already the computer networks or workstations” (1998). Given what is now in place, my goal is to work with participants on the design of systems that can integrate and extend the sharing of local and global scholarly resources.

India presents yet another picture, given its \$6.2 billion in annual software exports and its extremely low level of computer access (Lal, 2001, p. 109). Here the issues are,

on the one hand, far more about library automation and database access, through such innovative projects as the Information and Library Network which connect some 150 university libraries, 50 postgraduate centers, and 200 research and development centers (Roa, 2001). On the other hand, new initiatives are trying to provide computer education courses to remote areas of India through, for example, the Indira Gandhi National Open University, and efforts are underway to equip poor villages with cyber kiosks that offer a wide array of information services (Hammond, 2001, p. 101). Similar efforts, I should add, to increase the information available to rural areas – whether on the running of micro-credit systems or to enable traditional healers to work with medical doctors – are also underway in Africa (Mchombu et al., 2001). Here the critical link that needs exploring is how to improve the information flow among local universities and communities, as well as the larger world. How do we improve the connections between knowledge arising from research and that of experience, so as to ensure that it forms part of a sustainable system of knowledge exchange on a global scale?⁴

What still needs to be established is how improved access relates to research capacities of developing countries, and how these capacities affect, in turn, local policies and economies, all of which are at the root of this project. Can these new technologies, now that they have more than a toehold in the developing world, do more than print scholarship in supporting and sustaining global systems of collaboration, coordination, consultation, and publication that more fully involve the developing world? Such an expanded exchange of knowledge would seem to have much to do with global sustainability and security. With the MacArthur Foundation's support, I wish to work with scholars in these countries to better understand the global prospects and responsibilities that follow from a greater exchange of this public good.

3.4 Longer-Term Goals and Work in Progress

My own work for this project falls into three areas. Over the last few years, I have been investigating the technological, social, and philosophical issues involved in improving the

⁴ Ana Maria Cetto, Universidad Nacional Autónoma de México: "This means, in particular, that the local communities of developing countries must participate, along with the rest of the world, in all activities related to scientific publishing – including the development and use of electronic publishing – and that they must establish close working links among themselves in order for them to benefit from common experiences, to become stronger partners at the international level, and to take part also in related business" (2000, 148).

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scholarly and public quality of social science research, as part of a career-long effort to better understand the historical and social dimensions of knowledge (Willinsky, 1999; 2000). More recently, I have been putting my ideas to the test by working with a team of specialists in computer and information science at the University of British Columbia on the Public Knowledge Project, which is researching and designing new publishing systems for extending the open exchange of knowledge on a global scale. The long-term, if immodest and idealistic, goal is to improve the contribution of scholarly work to public life, whether in its ability to increase democratic participation, to foster global understandings, or to nurture personal curiosities and the simple love of learning.

While there are related alternative publishing projects, especially in the sciences, with the Open Archives Initiative and the Open Citation Project, for example, our research in this area has entailed interviewing policymakers about their research use, supported a teachers' federation's participation in policy formation, and provided research background for newspaper coverage of educational issues. The result is open-access and indexed e-journal systems, which link articles not only to related studies but also to relevant policy, practice, and media resources, so that users can consult and weigh different orders of knowledge. In preparation for this project, I am now collaborating with two librarians in Cameroon and an administrator in South Africa on piloting a survey with members of their institutions.

Although we are but one of many groups, both private and university-based, working on new publishing systems, what currently needs to be better understood by all involved in the reform of academic publishing is how these technological changes can improve both the research capacity and utilization in developing countries. What needs to be explored with members of developing universities, as well as policymakers, is how these technological changes could lead to more closely networked research ventures and productive exchanges of ideas, as well as extending basic access. Yet these efforts to situate scholarship critically, productively, and practically within a global exchange would seem to only add to the quality of our knowledge. I hope to establish, with MacArthur support, the prospects of such improvements, as well as be in a position to recommend technological changes that would best serve the securing and sustaining of a more open and collaborative forum for the global exchange of knowledge.

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5. Statement of related funding

The Public Knowledge Project has received funding from the Social Sciences and Humanities Research Council (1999-2002: \$138,600 USD) to conduct research on ways of improving the scholarly and public quality of research in the social sciences, with a focus on education, and from the Max Bell Foundation (2001-2002: \$69,000 USD) for working with policymakers and journalists in Canada to better understand how to improve the value of research for their purposes. The support of the MacArthur Foundation is sought to extend this work within a global framework of sustainability and security.

6. Biographical Statement

John Willinsky is the Pacific Press Professor of Literacy and Technology at the University of British Columbia and a Fellow of the Royal Society of Canada. He is the author of Learning to Divide the World: Education at Empire's End (University of Minnesota Press, 1998), which won Outstanding Book Awards from both the American Educational Research Association and the History of Education Society, as well as the author of the more recent titles, Technologies of Knowing: A Proposal for the Human Sciences (Beacon Press, 1999) and If Only We Knew: Increasing the Public Value of Social Science Research (Routledge, 2000). He directs the Public Knowledge Project, which is working with scholarly societies, professional organizations, and policymakers in developing online systems that improve the scholarly and public quality of academic research.

7. Curriculum Vitae (attached)