Digital Technology Innovation in Scholarly Communication and University Engagement

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Contents

ABSTRACT

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ABSTRACT:

Beginning in the 1990s, a substantial number of innovation projects in scholarly communication began to emerge worldwide. Researchers began to adopt digital technologies for purposes of communication with colleagues and a variety of scholarly journals began making content available online. Digital humanists and scholars across the social science disciplines also began to expand their involvement with emerging technologies in their research and teaching activities. Building on these developments, researchers interested in knowledge mobilization and university engagement also began to augment their efforts with digital technologies. Finally, a certain level of experimentation with the electronic publication of monographs began to appear. The key players in these developments were private sector foundations (for example, the Wellcome Trust and the Andrew Mellon Foundation); innovation-oriented scholars; systems and head librarians; journal editors and publishers; university presses; and SSHRC with its support for scholarly communication and later, knowledge mobilization. Canada has earned worldwide attention for its general level of digital innovation in scholarly and research communication and particularly for innovation in journal publishing, where Open Journal Systems, Érudit and Synergies stand out as significant projects, combined with consortium buying of online content through the Canadian Research Knowledge Network. These and other leading achievements call for purpose-built policy and programs, which have lagged behind innovation. Such policy and programs need to be designed to provide stable funding for innovation-oriented constructivist social scientific and humanist inquiry and university engagement initiatives that have national and international long-term promise. Tied into the post-secondary education system, such investments would enormously increase the visibility and public value

of Canadian social science and humanities research, multiplying the social benefit of this work through the development of digital technologies.

Introduction

THE SCHOLARLY WORLD exists in a transitional environment. Information and communication leave behind text and print on paper as a dominant medium in favour of digital media—text, image, sound, and data—all in electronic form. The information and communication tools that are emerging and that scholars, in part, are inventing focus on achieving post-industrial-age efficiencies. To capture the social and economic benefits that digital technologies make possible, Canada must build digital infrastructures and processes that facilitate existing and evolving ways of conducting research and engaging in scholarly inquiry, of interacting within and beyond the research community, and of communicating research findings and scholarship.

Two developmental dynamics in the evolving digital world exist in complement to and in tension with one another, resulting in a contested boundary. The first is the open tradition best exemplified by the Internet, which, as we know, is derived from the research sector. This tradition amounts to the development of a set of procedures and protocols to access hardware underwritten by institutions that allow universal interconnectivity of digital content without direct user payment. Not surprisingly, in its early manifestations and reflecting a paradigm of industrialization, this connectivity was called the information highway. The second dynamic is private initiative, the efforts of corporations, individuals, and organizations to provide unique functionality and to protect and exploit the tools and services it provides by means of intellectual property law combined with entrepreneurial market building. Microsoft, Apple, Oracle, and RIM are appropriate examples in the corporate sector, with the work of those involved in the Open Journal System and the Creative Commons as examples of researchers and non-profit initiatives engaged in this work. The contested boundary is, of course, in how far the open environment should extend into social and industrial processes, and where a proprietary environment should begin. Where the boundary is drawn and how it changes over time depends, in part, on what added value the private sector brings to the market and, hence, the degree to which users and governments can be persuaded to choose private-sector solutions over the open, public-sector ones. In certain cases, as we have seen, private-sector solutions are accepted for a period of time—as was the case with Internet browsers—and are later replaced by open-source solutions such as Firefox tapping in to crowdsourcing, a dynamic that owes its existence to the digital environment.

With its extension into university engagement, scholarly communication—through the scholarship of engagement, community-engaged research, knowledge mobilization, public

outreach, and related activities—straddles this open/closed, public/private boundary, developing and using open public systems in addition to proprietary technology. The pursuit of digital advantage takes on a cloak of social or public benefit, enablement, and affordance. It is important to underline that turning aside private gain and pursuing advantage for all—as Tim Berners-Lee did with his invention of the World Wide Web, as Linus Torvalds did with his development of Linux, as Canadian Tim Bray did with his development of XML, and as those behind the Mozilla Foundation did with Firefox—creates at least as much social advantage, if not wealth, as Microsoft's Bill Gates, Apple's Steve Jobs, or Google's Sergey Brin and Larry Page have created. The central concern of this paper is with the development of an open public system of knowledge development, exchange, and communication that maximizes access to publicly funded research carried out in public institutions.

This paper focuses on two elements that merge into one. The first is a review of digitally enabled scholarly activity, beginning with a review of the conduct of research, and continuing on to formal scholarly communication in journal and monograph publishing, the organization and availability of published work through the activities of libraries, and the extension and integration of academic activities with communities and in society through university engagement activities. As analysis and discussion of the social systems that have been built around digital technology proceed in each of these areas, the second element emerges. The foundation of this second element is not technology. Rather, the foundation derives from scholarly creativity and innovation, from the exploration and understanding of the digital, social, and economic environment. With that understanding in hand, members of the academic community continue to be pioneers in the creation and construction of new digital realities. This second element involves the changing role of humanists and social scientists as innovators in the development and deployment of digital technologies in the service of scholarly communication and university engagement activities. This changing role can be seen in constructivist, social, and human inquiry. Our intent in this paper is to describe the dynamic that is emerging, how it can be fostered, and how academic and research structures and processes need to be realigned and reinvented to reap benefit from the scholarly creativity and innovation that has and will continue to emerge in scholarly communication and university engagement.

Interestingly, as we pursued our topic, we came to appreciate that we were exploring elements that were far more interconnected than we first realized. To some degree, the worldwide repositioning of universities as more closely interactive with society can be seen as a manifestation of the emerging social dynamics that digital communication makes possible. In a world of interactive social networking 24-7, universities and research would be marginalized were they to dismiss this social dynamic as trivial and irrelevant to their mission. Similarly, in a world of crowdsourcing, scholars would be naïve not to tap into experiential understandings as well as formal expertise, both of which are often only several clicks away from accessibility. In addition, it is important to recognize the profound contribution that scholars and researchers have made to the digital world, including Wikipedia and extending through to government and health websites and social enterprise initiatives.

We open our knowledge synthesis by examining the changing activities and orientations of scholars in the early phases of the production and exchange of knowledge. We then examine developments in the creation and communication of the research record by means of two

major forms, scholarly articles and scholarly monographs. Following that, we examine developments in libraries, primarily research libraries, and how digital technologies have changed the nature of these knowledge institutions. We close our synthesis by turning to universities themselves and the degree to which they are engaged with and responding to the new environment. Our conclusion provides a summary of our findings and identifies key implications.

1–Digital Technologies and Changing Dynamics in Scholarly Structures and Practices

SCHOLARLY STRUCTURES AND practices have changed according to the role of higher education in society, the framework of a nation's post-secondary educational system, and the identity of a particular institution in its community.[1] Digital technologies have brought profound changes to scholarly structures and practices, with new possibilities for inquiry, data capture, data analysis, and presentation and communication of research results (whether for the purposes of research, teaching, or service). As the activities of faculty and post-secondary institutions have evolved, so too have the dynamics in administrative and academic structures and functions that both support and assess faculty work. This section of the paper identifies several key dynamics, with a view to assess how post-secondary institutions can draw upon the advantages of digital technologies to improve the communication of scholarship and university engagement in Canada.

Improvements in these areas extend the benefits of social sciences and humanities research and build upon the investment already made in the university's production and circulation of knowledge. The key dynamics discussed here are those:

1. between and among scholars;
2. between scholars and formal publishing outlets for the scholars' work;
3. between scholars and the university; and
4. between the university and the library.

In considering the first of these dynamics, between and among scholars, some of the general concerns about digital technologies relate to issues of connectivity, content, data push, data pull, and data deluge.[2] The transition to digital tools for the production of new knowledge has not been without challenges, and there has been some concern about differential access to the tools (mainly desktop computers and software) across disciplines and among institutions. Although multimedia offer clear benefits for research, teaching, and service, one of the challenges has been the slower uptake in academe of multimedia techniques, perhaps because of the associated costs, because the tools were commercialized, and production values and expectations spiraled upward. The second generation of multimedia, the social web, with its focus on user-generated content and an accompanying lower bar for entry, has seen a renewed interest in these tools, both for the distribution of scholarship and for the creation of teaching materials.[3] In addition to these developments in the production and distribution of knowledge,

1   See, for example, Arthur 2005; Benson, Harkavy, & Hartley 2005; Mathieu 2003; Ramaley 2006; Tierney 1999; and Votruba 1997.

2   Borgman 2007.

3   Many scholars are posting lectures and demonstrations to YouTube and similar websites, and using online media in their own work. The "screencast" is proving to be a particularly effective tool for creating short mini-lectures on specific topics.

there have been conceptual changes and attitudes toward knowledge. As prominent Canadian scholars such as Innis, McLuhan, Carey, and others have shown, changes in the medium of communication have been accompanied by changes in what people say and how they say it.[4] With digital technologies, at the very least, there is a bias toward currency and immediacy in the production of scholarship. In practical terms, knowledge that is available through an online search is more visible and more likely to be used than knowledge that is buried in an un-indexed format such as a printed book.

Because searching through sources remains a task that must be undertaken purposefully and since the equivalent to "wandering the stacks" or "perusing a journal issue" has not quite been replaced (yet), one of the most promising alternatives to both of these activities is the scholarly blog or news aggregator. A growing number of scholars are reading blogs and are blogging—both about their own work and the items that interest them—and these links and comments are a source for unexpected insights and information that can evolve into debate, discussion, or research questions. As Johnson recently observed, services like Twitter (which bring a potentially diverse set of microblogs together into a stream through the mechanism of "following" people) provide a modern-day equivalent of the "coral reef" of ideas; a place teeming with possibility.[5] The widespread use of blogs, wikis, and other tools for open and collaborative sharing of knowledge is part of an overall trend toward instantaneous sharing of information as it is created. Importantly, these practices and tools provide means for sharing not only within teams, but also, sharing the scholarly enterprise with those outside the traditional halls of academe. A growing number of scholars have also discovered that they can bring interested professionals or members of the public into their research program by extending the invitation for people to participate, whether in generating data by submitting items, in helping to analyze data by contributing observations, or in participating in online discussions about the findings.[6]

There has also been increased attention given to the role of networks and the development and evolution of new tools to study them. These tools, which include high-powered computers and advanced software, have permitted scholars to reveal the impact and force of social networks. Social networks are just one example of phenomena that are revealed in new ways through digital tools. Another development lies in the holy grail of scholarship: the automation or mechanization of knowledge. New tools and techniques are now being introduced, as part of a so-called "semantic web," to embed information about information within a growing range of documents. For example, when people interact with the web (by clicking on things, by "tagging" things, by "liking," sharing, and recommending), they engage in creating linkages and information about information, which forms a semantic web. While this has enormous commercial implications, it has academic implications, as well.

The computer in this situation moves from being a "brute force" tool—sifting through data or making calculations—to being a more nuanced and helpful tool for the comprehension of vast storehouses of information, perhaps extracting patterns, perhaps answering questions. These kinds of implications and possibilities are evident across the social sciences and humanities disciplines. For example, digital technologies can be used in the field of archaeology to record excavations, in post-excavation analysis, in virtual access to archaeological data, in analysis of spatial data using Geographic Information Systems, and in virtual-reality reconstructions.[7] In the field of cultural history, digital technologies can be used to investigate the population

4 *Innis 1951; McLuhan 1962; and Carey 1989.*

5 Wired Magazine *September 27, 2010.*

6 *Although expanding the discussion does sometimes result in nonsense or mischievous behaviour (as with Wikipedia, for example), scholars are able to leverage a vast, largely untapped interest on the part of larger publics to get involved in research. Natural scientists have been particularly savvy to this (amateur astronomers, for example, make notable contributions every year), but social scientists and humanities scholars are, if anything, even more likely to find allies in the general public.*

7 *Shennan 1999, 19.*

of authors in a particular time and place, or to conduct analysis of government documents, with which the historian "become[s] part archivist, part social scientist."[8] In the field of law, digital technologies bring a "shift in legal paradigm," resulting from "movement along a legal continuum between written legal sources and human legal experts."[9] Simulations made possible by digital technologies permit methodological and theoretical developments across the fields of social science.[10] In the field of film studies, digital technologies permit digital files (and films) to be edited, animated, or otherwise manipulated, whether through image overlay or embedding clips into slide presentations or other digital documents, and these all are significant for criticism, analysis, and teaching.[11] Whether for film, text, or other media, digital technologies are used to create thematic research collections that "are digital aggregations of primary sources and related materials that support research on a theme... customized for intensive study and analysis in a specific research area."[12] Digital technologies have also led to "the creation of corpora in electronic form that could be searched automatically for a variety of language features, and compute frequency, distributional characteristics, and other descriptive statistics."[13] In addition, digital technologies provide other possibilities for textual analysis. Computational stylistics is used "to find patterns in language that are linked to the processes of writing and reading."[14] Similarly, cognitive stylistics (which analyses an individual's language traits) draws on cognitive psychology and neuroscience to "characterize how we mentally create and utter sentences . . . [and can] conceivably map long-term associational memories in an author's mind."[15] The examples listed here offer only a glimpse into the possible implications of digital technologies in social sciences and humanities research: from data gathering and shared data sets to curatorial work and visualization, among other possibilities. With digital technologies, research across the social sciences and humanities disciplines is evolving.

SCHOLARLY DISCOURSE, THE KNOWLEDGE RECORD, SCHOLARLY PRODUCTIVITY, AND PERFORMANCE

Beyond the implications of digital technologies in research and for dynamics between and among scholars, as described above, are the dynamics involving scholars and the university, the library, and formal publishing outlets, all of which have implications for the communication of scholarship and university engagement in Canada. In the *scholar-university dynamics*, university budget allocations are made for faculty salaries, facilities, and resources for research, teaching, and service. In turn, policies are set in place to guide faculty members in the conduct of their activities, with scholars having a certain degree of freedom in what they teach, what research they choose to pursue, and what kind of service they are prepared to engage in, inside and outside the university. The dynamics between *scholars and formal publishing outlets* are elaborated on in Sections 2 and 3 of this paper and involve the following: university presses, other book publishers, and research or other organizations producing formal publications (such as reports); journal publishers (including commercial publishers, society publishers, university presses, and other journal entities); and a variety of other periodicals, such as newspapers and magazines. In the *university-library dynamics*, resources are allocated from the university budget to the library in order to provide the university community (and to a lesser extent, the public) with access to collections of books, periodicals, multimedia materials, and increasingly, as a direct result of digital technologies, access to services and tools for dissemination.

8   *Genet 1999, 55.*

9   *Susskind 1999, 171.*

10   *Gilbert 1999, 203.*

11   *Kolker 2004.*

12   *Palmer 2004, 348–349.*

13   *Ide 2004, 289.*

14   *Craig 2004, 273.*

15   *Lancashire 2004, 397.*

These various dynamics—both individually and together—directly affect the communication of scholarship and university engagement in that they involve formalized scholarly discourse and building the knowledge record within scholarly disciplines, as well as measurements of published scholarly work to evaluate scholarly productivity and performance. Digital technologies have brought changes in formalized scholarly discourse and in the knowledge record in the disciplines. These two arenas have changed in regard to the spectrum of content found in scholarly publications and in how publications are accessed and used. Related to this are issues of using measurements of published scholarly work in order to evaluate scholarly productivity and performance.

There has been both an opening up and a narrowing of scholarly discourse and scholarly publishing as practices in scholarly communication have evolved. Online publishing and the open-access movement have significantly opened up reader access to scholarship. Online journal content—and to a lesser extent, content for books—has proliferated, with a growing number of journals adopting an open-access publishing model, making all content freely available.[16] At the same time, however, there has also been a narrowing of access resulting from increasing costs to acquire scholarly publications, particularly in science, technical, and medical journals, which has indirectly narrowed acquisition of other materials, notably, scholarly monographs. This narrowing occurs in scholars' own purchases (of books or journal subscriptions) and in university library acquisitions.[17] Similarly, in regard to scholarly discourse, there has been an opening up as well as a narrowing. As the scholarly disciplines have become increasingly professionalized from the turn of the twentieth century, they have utilized increasingly specialized discourse that can prevent (or at least, discourage) access by non-specialists. Scholars have had, and continue to have, an important role in the opening up and narrowing of access to scholarly discourse and scholarly publications, and their involvement has changed with digital technologies. A clear understanding of this involvement and the place of digital technologies in the possibilities at hand can provide scholars, universities, and libraries with the vision and agency to move forward.

DIGITAL TECHNOLOGY AND SCHOLARS' INVOLVEMENT IN PUBLISHED SCHOLARLY DISCOURSE

The long-standing involvement of scholars in published scholarly discourse has primarily been in their roles and functions as authors, peer reviewers, and editors. These functions have changed over time as scholars have shaped their disciplines in regard to discursive conventions and publishing practices, and as concepts, conventions, and practices have been changed by digital technologies. In general, and with respect to scholarly discourse, this includes defining disciplinary parameters, discursive style, and citation conventions.[18] In regard to publishing, this includes establishing the conventions for peer review, making decisions about what constitutes acceptable research in books and journals to adequately represent a discipline as it evolves, and determining how particular journals or publishers are situated in a hierarchy of scholarly publishing outlets.[19]

One early effect of digital technologies on scholarly practice was increased rates and speeds of correspondence among scholars, as part of both the research process and the scholarly

16 *See, for example, DOAJ 2010, SPARC 2010, Willinsky 2006.*

17 *See, for example, Guédon 2001, Lewis 2007, Orsdell & Born 2008.*

18 *See, for example, Bazerman 1988 & 1998, Bizzell 1992, Russell 2002.*

19 *See, for example, Blyth et al 2010, Fitzpatrick 2010, Haslam & Koval 2010, Goel & Faria 2007, Bornmann 2010.*

publishing process. Ideas and information are now shared informally through email (as they had been less frequently by telephone and, at a slower pace, with letter writing). Within a digital publishing process, electronic copies of manuscripts are sent out for peer review, and peer reviews are received in electronic form rather than sent by post in hard copy. Electronic scholarly publishing is now commonplace in the case of journal publishing (though book publishing is not as far along, as we discuss in Section 3). The expansion of electronic journal publishing in particular has meant an expansion of scholars' involvement in the journal publishing process (see Section 2), as print journals have transitioned online and as new journals have been launched as electronic publications only.

The major implication of scholars' involvement in the transition to electronic publishing is that while some elements are transferable from the print environment, such as peer review and editing of scholarly work, the digital environment also requires knowledge and expertise that is normally outside the repertoire of most scholars. Digital technologies fundamentally change publishing, simplifying manuscript management but adding complexity to content management, evolving business models, and copyright. Digital content management requires proper metadata to meet international searchability standards. Evolving business models require incorporation of both aggregation and open-access developments. Digital rights management requires an understanding of copyright, Creative Commons licensing, appropriate author/journal legal relationships, and secondary commercial aggregation. Few scholars have expertise across all these areas. Further, in a rapidly changing digital environment, this lack of familiarity makes scholarly publishing vulnerable to large (and in the case of Canada, foreign), commercial publishers that aim to exploit both access to and ownership of the intellectual property created by scholars. The continued high profit margins of commercial publishers that date back to the aftermath of World War II have come at a significant cost to scholars and the whole of the research and education community.

Scholars have begun some key initiatives in their attempts to confront issues of access to scholarly publications. As discussed in the next section on journal publishing, there has been notable leadership and innovation in Canada with regard to online journal publishing and open access. Internationally, groups of scholars have also been involved in moving open access forward, whether in collective online initiatives such as arXiv.org (originally organized for physics research but now also including mathematics and other fields of quantitative science)[20] and the Public Library of Science.[21] A number of universities have mandated open access (for example, Massachusetts Institute of Technology,[22] Harvard University,[23] Stanford University,[24] University of Edinburgh,[25] University of Southampton,[26] University of Ottawa,[27] University of Calgary,[28] and Concordia University[29]). Open access has also become integrated into some areas of funding policy (such as the Wellcome Trust[30] in the UK, National Institutes of Health Research[31] in the US, and the Canadian Institutes of Health Research[32]). The funding mandates require that publicly funded research be made freely available (within a certain time frame of published research results), and university open-access mandates require scholars to deposit their work in the university's institutional repository. It should be noted, however, that it is not altogether clear in all cases that decisions to implement mandates have been sufficiently consultative with a spectrum of publishers, upon which a significant part of the research enterprise depends.

20   See http://arxiv.org/.

21   See www.plos.org.

22   MIT 2010.

23   Harvard 2008.

24   Stanford 2010.

25   DSpace 2009.

26   University of Southampton 2008.

27   University of Ottawa 2009.

28   University of Calgary 2009.

29   Concordia University 2010.

30   Wellcome Trust 2010.

31   National Institutes of Health Research 2010.

32   Canadian Institutes of Health Research 2007.

Digital technologies also bring new possibilities for scholarly performance and productivity by enabling scholars to move beyond the confines of print. It has been widely acknowledged that online publications are more visible, that they are more frequently accessed and cited,[33] and measures of both usage and impact are now readily available. These changed realities have led to questions about implications for scholarly performance, productivity, and evaluation, in particular in regard to citation measurements (for both their significance and their limitations) and the challenge of evaluating increasingly diverse scholarly performance and productivity.

Digital technologies have expanded citation indexing and measurements to such an extent that they are being formally adopted as tools for evaluating the productivity and performance of individual scholars, the status of a scholarly publications, and even international ranking of post-secondary institutions. At the same time, however, existing citation measurements remain controversial. They are considered by many to be flawed, arbitrary and damaging to research and scholarship because they favour a narrow (and not necessarily high-quality) selection of published scholarly work. They also pressure the research community in ways that can be seen as compromising both academic freedom and the quality of scholarly work.[34]

Use of citation measurements, however, can be expected to be more extensive in the future. This expectation opens up a field of study focused on ensuring that the criteria and the collection being measured have validity in what they purport to measure and that they are equitable, inclusive, and sensitive to patterns of research and publishing. Having built up a substantial research-publishing infrastructure, Canada needs to ensure that its scholars, publications, institutions, and research enterprise, especially in the social sciences and humanities, are not disadvantaged by the use of citation measurements. One way to do so is through collaborative efforts that draw on the strengths of existing Canadian infrastructure and initiatives involving Canada's journals and university presses, Open Journal Systems (OJS),[35] Synergies,[36] and Érudit.[37] Further and formalized collaborative efforts that bring together the potential of research excellence with digital technologies and publishing expertise (including marketing) can support Canada's research output and ensure that research communication is maximized, not just in the number of scholars it reaches but also in its contribution to social development in Canada and through the international exchange of knowledge. In the context of the digital economy and digital communications, content indexing and appropriate aggregation that lead to optimized citation measurement become advisable business practices.

Alongside addressing the challenges of ensuring that citation measurements capture the value of published scholarly work in Canada is a similar challenge in capturing the value of scholarly work (or output) beyond what is formally published in books and journals. As noted earlier, scholars' contributions to online media, blogs, and websites continue to grow rapidly as digital technologies become more widely embraced by both producers and users of scholarly work. The issue of recognizing the value of increasingly diverse scholarly activities as legitimate scholarly work brings forward a discussion of the changing role of both individual scholars and post-secondary institutions (the latter discussed in Section 5). The changing role of post-secondary institutions includes issues such as support and recognition for excellence

33   *See, for example, Groote 2008; Hajjem, Harnad, & Gingras 2005.*

34   *See, for example, Jarwal et al 2009, Straub & Anderson 2009.*

35   *Public Knowledge Project 2010.*

36   *Synergies 2010.*

37   *Projet Érudit 2010.*

in teaching;[38] the popularization of scholarship and the value of public intellectuals;[39] the formation of new disciplines, from gender studies to popular culture to the digital humanities;[40] issues of style and voice in scholarly discourse;[41] and an increasing momentum and pressure to extend the reach and benefits of scholarly research to a diversity of communities, particularly if that research is publicly funded (see footnote 1, page 6).

In the same way that bibliometrics do not adequately define, capture, and measure the value of a diversity of scholarly publications, in the context of the role of post-secondary institutions in a digitizing society, scholarly publications do not adequately capture the diversity of scholarly productivity and performance. Yet, in both cases, these measures are used to evaluate scholars and their work. Clearly certain kinds of scholarly performance and productivity—namely, what appears in peer-reviewed journals and books—are privileged over others.[42] Arguably, such privileged treatment is appropriate, given the roles assigned to and/or adopted by research and universities. Certainly, the practices and standards that are upheld through peer-reviewed journal and book publication are fundamental to the integrity of scholarly research. However, with fundamental changes emanating from the digitization of information and a digital society, the rules of engagement between scholarly research and society have changed. This raises the question of how the evaluation of scholarly work can reflect these changes in ways that ensure the continued strength of the research enterprise in Canada, which extends beyond formal journal article and monograph publishing to include informal outputs and processes that are becoming a legitimate part of scholarly activity and discourse.

The capacity of digital technologies not only transforms scholarly publishing and scholarly discourse, as we have discussed, but also it brings new possibilities for *engagement with* scholarly research, because engagement with digital technologies changes the dynamics of how ideas are exchanged; how they evolve; and how they are contested, constructed, deconstructed, and again exchanged, collectively and with a level of participation that had previously not been possible. As a consequence, scholarly performance and productivity have become more open to public view (and to public engagement). Updating evaluation criteria and procedures to recognize "engaged" scholarly work in tenure and promotion evaluations[43] or funding applications is a task yet to receive due attention in Canada. Canadian post-secondary institutions can better capture digital advantage if appropriate recognition is given to the diversity of scholarly productivity and performance that digital technologies make possible (see Section 5).

In summary, the fundamental changes that digital technologies bring to scholarly work call for complementary changes in scholarly infrastructures, as they relate, in particular, to scholarly publishing and the evaluation of scholarly activities. In order to address social scientific and humanist research questions adequately, Canadian researchers require an infrastructure appropriate to the evolving digital production and circulation of knowledge at national and global levels. Similarly, the survival of a Canadian infrastructure in the transition to digital realities requires Canada to maintain and build upon its already powerful foundations for ensuring cost-effective production and circulation of knowledge. This translates into formal support for evolving (and experimental) discourse, alongside support for evolving, text-based journal and book content. Both require parameters that adequately define, capture, and measure the significance of a diversity of scholarly work and reflect the valuable contributions of the social sciences and humanities research community.

38   See, for example, Friedman et al 2010, Gibbs 2008.

39   See, for example, Calhoun 2009, Kyvik 2005.

40   See, for example, Kessler-Harris 2007, Schreibman et al 2004, Wright et al 2009.

41   See, for example, Tomlinson 1996, Young 2000.

42   See, for example, O'Neill & Sachis 1994, Rice & Sorcinelli 2002.

43   See, for example, Ellison & Eatman 2008, Holland & Bennett 2009.

2–Journals and the Digital Advantage

BEFITTING THE ABIDING interest of Canada in communication and technology, several Canadians were among the first to engage in the development of electronic journals. In 1990, for example, Jim Winter from the University of Windsor became the founding editor of the *Electronic Journal of Communication*.[1] In 1991, Jean-Claude Guédon founded an online journal called *Surfaces* and went on to become a proselytizer for electronic journals. In 1994, Richard Smith and Rowland Lorimer made back issues of an established journal, the *Canadian Journal of Communication,* available online and established delayed open access publishing in Canada.

Such developments were the mere beginning. In 1993, Leslie Chan helped establish the multi-journal site, Bioline, "a not-for-profit electronic publishing service committed to providing open access to quality research journals published in developing countries."[2] In England, Stevan Harnad took up arguments in favour of self-archiving.[3] By 1997, there was sufficient activity and interest to convene a national conference to assess developments.[4] In 1998, John Willinsky founded the Public Knowledge Project (PKP),[5] which places emphasis on the development of paperless manuscript management software for open access journals. Combined with a subscription-management system,[6] PKP's Open Journal Systems (OJS) has gone on to be used by 7,000 journals worldwide.[7,8] Also in 1998, a multi-journal online publishing initiative called Project Érudit was founded by Gérard Boismenu and Guylaine Beaudry.

Myriad developments followed. In 2007, after many years of effort, and greatly assisted by the Social Sciences and Humanities Research Council (SSHRC) of Canada, a national initiative was funded to build a Canadian social science and humanities research database. This initiative, Synergies: *Canada's SSH Research Infrastructure*,[9] brought together many of the above-mentioned individuals: Project Érudit, OJS and the Public Knowledge Project (PKP), the Electronic Text Centre at the University of New Brunswick, and initiatives at the University of Toronto Library and at the University of Calgary.

At various stages in the history of electronic scholarly publishing, Canada has taken a lead role. For example, Érudit was an early example of a centralized online publishing system. Similarly, OJS has become far and away the leading open-source journal-publishing software in the world. Bioline has received international recognition and, teamed up with OJS within the larger PKP, has served as a model for developments in Africa spearheaded mainly by the International Network for the Availability of Scientific Publications (INASP). Canadians have carved out a prominent place for Canada as leaders in both technology and in the social

1   Harrison, Stephen, & Winter 1991, 25–38.

2   Bioline International 2010.

3   Harnad 2001, 1024–1025.

4   Various authors 1997.

5   en.wikipedia.org/wiki/ Public_Knowledge_Project

6   This was developed by the Canadian Journal of Communication.

7   Willinsky has also overseen the development software for the management of conference proceedings (Open Conference Systems), and for the development of scholarly monographs (Open Monograph Press,).

8   See Public Knowledge Project pkp.sfu.ca.

9   The Synergies site is www.synergiescanada.org.

development of knowledge policy. That knowledge policy can be summarized as having four elements: non-profit journal publishing, open-source software, maximizing access to scholarly research, and working with developing countries to bring their research into the mainstream of world research and to help them gain affordable access to research in the developed world.

The above developments, complemented by many others, are contributions on which Canada can build in the development of digital technology and research practice and that can benefit both Canada and the world. Four policies have been crucial to development to date. First is SSHRC support for non-profit journals owned by Canadian entities. Second is SSHRC support for monographs through the Assistance for Scholarly Publishing Program (ASPP), made available to authors through Canadian publishers. Third is the Quebec government's support for online publishing, support that made Érudit a viable entity. Fourth is SSHRC's in-principle support of open access, which assisted in the redefinition of the allocation of its journal support. These four policies underlie the unique body of knowledge contained in Canada's social science and humanities journals that interprets Canadian society and culture. It is to Canada's credit that scholarly publishing is largely independent of commercial publishing ventures and is thus in Canadian hands.

While such policies have served Canada well, notably keeping acquisition costs the lowest in the developed world, neither a policy framework nor funding sources for needed investment in groundbreaking, large scholarly publishing projects that build on these foundations exists. For example, as early 2000, Synergies partners were ready to build and launch a multi-format Canadian social science and humanities database. Had such a project materialized nearer to 2000 rather being delayed in its development and finally funded in 2007, it would have been a world leader and contributed substantially to retaining public-sector control over research communication generated by publicly funded research projects.

The above accomplishments represent a limited selection of the efforts that Canadian researchers are expending on establishing digital scholarly communication. But even at this early stage of development, these accomplishments point toward the need for reconceptualizing research investment to capture as fully as possible the gains that digital realities offer. As will become apparent in this paper, particular emphasis on constructivist inquiry is key.

THE LITERATURES OF JOURNAL DIGITIZATION

The main developments in journal publishing are found in three areas of literature, as outlined below. The first, which speaks to digital journal publishing, is a policy and program literature and is to be found on relevant websites and in agency reports, foundation reports and announcements, project reports, and government reports. A second, multidisciplinary, constructivist innovation literature that deals with both technical and enterprise innovation taking place is quite limited. A third literature, which would normally be called research literature, is readily found in a variety of scholarly journals.

THE POLICY AND PROGRAM LITERATURE

It would be difficult for a researcher searching scholarly journals to discern that substantial investments are being made worldwide in electronic journal publishing. That information is

to be found in the policy and program literature of the agencies, foundations, and government departments concerned with digital innovation in scholarly communication. A first example is the effort of the Scholarly Publishing and Academic Resources Coalition (SPARC), a project of the US-based Association of Research Libraries, to detach research communication from commercial publishing.[10] On the SPARC site are resources for administrators, authors, libraries, media, publishers, students, and university presses. These resources cover a wide variety of themes, including campus-based open access policies, journal pricing, open data, open educational resources, public access to research, and repositories. The resources deal mainly with principles and procedures and a great deal of news focuses on easing the circulation of knowledge.

The US-based Andrew W. Mellon Foundation has been sufficiently active supporting scholarly communication that it requires a full-time program officer. The Mellon Foundation has played an important role in both journal and monograph publishing (the latter will be discussed in the section on monograph publishing). Its most noteworthy funding success has been the assistance it gave to JSTOR, a bright archive of back issues of many different journals primarily in the social sciences and humanities. Mellon also assisted with the start-up of Project Muse, an aggregation by Johns Hopkins University Press mainly of humanities journals that the foundation describes as "the widest selection of current humanities journals available online."[11] It has supported other small journal projects, including some Cornell University-based journal publishing software.

The Wellcome Trust is also active. In partnership with the Joint Information Systems Committee (JISC) and the National Library of Medicine (NLM), it has digitized back issues of some significant medical journals and has made some of them available through PubMed Central.[12] All authors funded by the trust are required to make their articles publicly accessible. It has signed an agreement to allow those intending to publish in an Elsevier journal to meet this requirement by providing subsidies to Elsevier to defray the costs of peer review and publishing.[13] The Wellcome Trust also monitors publishers' behaviour. During Open Access week, it called for greater transparency in author fees to ensure against double payment.[14]

The British Joint Information Systems Committee (JISC) has a mandate to provide "easy and widespread access to information and resources, anytime, anywhere; a vision with technology and information management at the heart of research and education."[15] JISC's annual allocations are in the neighbourhood of £50 million (£45.18 million in 2006–07).[16] They are spent in the pursuit of responsive, national information system services and resources aimed at improving the efficiency and effectiveness in learning, teaching, and in the quality, impact, and productivity of academic research.[17] In an attempt to achieve these strategic goals JISC funds "a wide range of infrastructure, services, innovative projects and studies. A large number of these originate from a successful response to a grant funding call, inviting eligible HE [higher education] and FE [further education] institutions to bid for project funding."[18] And it also procures other studies such as an evaluation or market research, by means of a tendering process. Agencies in the EU and in other European countries are also active.

Knowing the main actors and their activities in this quickly developing area is key to understanding likely development strategies and directions and how Canada might pursue a digital social benefit. For example, a JISC report argues that the strategic foundations of digital development include the following three points:

10 SPARC Website, http://www.arl .org/sparc/.

11 Scholarly Publishing Initiatives, 2007 Annual Report.

12 Wellcome Trust 2004.

13 Elsevier. Elsevier agreement with Wellcome Trust http://www .elsevier.com/wps/find/authorsview .authors/wellcome_trust_authors.

14 Wellcome Trust 2009.

15 JISC website, http://www.jisc .ac.uk/aboutus/strategy.aspx.

16 JISC 2006.

17 JISC Infrastructure and Resources, http://www.jisc.ac.uk/funding opportunities/futurecalls/grant.

18 JISC Funding Opportunities, http://www.jisc.ac.uk/funding opportunities.aspx.

1. Wider impact to research papers has economic impact;
2. Research outputs are significant institutional assets if visible;
3. Open Access Institutional Repositories (OA-IRs) are an efficient way of opening the knowledge base.[19]

On the foundation of this three-point rationale, JISC works to coordinate various repositories in Britain, noting that availability in a repository does not translate into accessibility. Thus, it has been funding work on post-print archiving and indexing because both are key digital benefits, as are search engine optimization (SEO) and the implementation of sustainable models.

These points yield two insights. First is that as a funding and analytic agency that sees and analyzes the operations of many different digital publications and projects, JISC has a deep understanding of the meta-elements of publishing. This deep understanding is further evidenced by JISC's work on an article-level usage standard that is sensitive to both excellence and impact. Second, while its emphasis on institutional repositories (IRs) may be particularly appropriate to the UK, the role of IRs in other countries such as Canada may not be parallel to the developing role for IRs in Britain.

A more general consideration of this policy and program literature provides further perspective. SPARC shows a similar level of sophistication and understanding to JISC. However, SPARC tends to play a more advisory role bringing a whole host of issues forward and suggesting how they might be able to be addressed. Understanding the contributions of other groups such as the *Association of Learned and Professional Society Publishers* (ALPSP), where issues at the journal level are brought forward, and INASP, which helps developing nations gain access to developed-world science, further enriches an understanding of the force and development of digital journal publishing initiatives in which Canadians command a significant role.[20]

Many other reports exist and form a valuable policy and program literature. A recent example is a report of the US Scholarly Publishing Roundtable convened by the US Office of Science and Technology.[21] The report notes some key metrics: the industry is a $8 billion industry, $3 billion in the US alone; it employs over 100,000 persons worldwide and 30,000 in the US; and, as of 2008, it estimates that 96 percent of scientific articles and 87 percent of social science and humanities articles published were available online, with the dominant business model being subscriptions paid by libraries. It notes the need for bright and dark archives (bright archives can be seen, they are internet-accessible to users, whereas dark archives are inaccessible) . scholarly certification, and the relative downplaying of citation rates by scholarly assessment committees. It reports that the open access share of articles published, inclusive of all models, stands at 20 percent, and a declining insistence by publishers that authors transfer copyright on publication to journals. It claims that 55 percent of journals are linked to scholarly associations and the growing acceptance of authors' fees in social science and humanities article publishing. It also concludes that a sudden immediate transfer to open access could destabilize scholarly communication.

The Scholarly Publishing Roundtable's core recommendation is that US research funding agencies "expeditiously but carefully develop and implement an explicit public access policy that brings about free public access to the results of the research that it funds as soon as possible after those results have been published in a peer-reviewed journal."[22]

19 *JISC Open Access for UK Research* 2010.

20 *Understanding what is happening in science is also useful. Following Paul Ginsparg's setting up and running of the ArXiv.org preprint server, to circulate articles prior to official publication, a number of initiatives have come forward. First have been open access publishing initiatives such as Public Library of Science (PLoS) journals as well those of BioMed Central, which is now in the hands of the private sector. Then comes PubMed Central (PMC), organized and operated by the US National Institutes of Health (NIH), as a "free digital archive of biomedical and life sciences journal literature . . . composed of journals that deposit material in PMC on a routine basis and generally make all their published articles available [through the PMC site]. . . . PMC also contains author manuscripts of articles published by NIH-funded [and Wellcome Trust] researchers in various non-PMC journals" (http://www.ncbi.nlm.nih.gov /pmc/). Finally, we have the policies of first, the NIH, and second, the Canadian Institutes for Health Research (CIHR) requiring that the resulting research is made publicly available in a timely manner.*

21 *US Office of Science and Technology* 2010.

22 *Report and Recommendations from the Scholarly Publishing Roundtable, 2010, ii.*

In overview, this policy and program literature and knowledge of key involved agencies is an essential consideration for Canada in any planning with respect to digital development. It provides an empirical foundation for selecting appropriate action in the context of world-wide developments.

A MULTI-DISCIPLINARY, CONSTRUCTIVIST, INNOVATION LITERATURE

Normally, basic or curiosity-driven scholarly research is directed at understanding. However, a central goal permeates much scholarly activity with respect to digital journals. That goal is a redesign of scholarly communication—technologically, financially, and socially—to take full advantage of digital realities in creating a knowledge record and providing worldwide public access to publicly funded knowledge. As well as maximizing accessibility, that goal includes facilitating insight. To illustrate, query tools and presentational forms that include still and moving images, sound, and colour can advance knowledge and provide new insights. As well, the production economics of digital dissemination can remove the inefficiencies of the old, subscription-based, mixed commercial and public system of journal distribution. Like major initiatives such as placing a man on the moon, in moving from understanding to goal-oriented understanding, adding a constructivist innovation literature, that is to say, descriptions of the foundations and design of various projects, to a policy and program literature increases our understanding of opportunities for further innovation and for attaining social benefit. (See Appendix I for an example of constructivist inquiry)

That said, the literature on innovation with respect to digital journal publishing is limited. Some can be found in the library systems and information science journals, some in economics, and some in the humanities where digital humanists have taken the position that demonstration is analysis. As well, *Scholarly and Research Communication* has committed to publishing reports descriptive of innovation, one of which has already appeared.[23] But the literature is sparse, in part, as a result of prevailing notions of the nature of social science and humanities research and attendant practices. The dynamic is important and can best be illustrated with reference to the theory of technology.

Technology theorist Andrew Feenberg makes a persuasive case that technology is most usefully viewed and therefore researched from a constructivist perspective.[24] He argues that technology exists within society and is a manifestation of political decision-making and social forces, for example, the desire of many people to remain in communication with others 24 hours a day, and state policies that are unthreatened by that dynamic. Feenberg also argues that human thinking about technology tends toward closure around particular machines and practices once they are up and operating. This closure leads to a determinist illusion—to see the machine as an inevitable manifestation of machinery. The determinist illusion gets the matter backwards. Machines embody social forces and political decision-making not machine inevitabilities. Were social contingencies different, different technologies would emerge. These ideas are nicely complemented by Wiebe Bijker's notion that every piece of technology is in fact a socio-technical ensemble bringing together social practice and machine capacity.[25]

This thinking on the nature of technology and its development leads beyond considerations for the digitization of journals and into the nature and funding of innovation research. Innovation research most often sees leadership established in an individual or a group of

23 *MacGregor & Kosavic 2010.*

24 *Feenberg 1999.*

25 *Bijker 1993, 113–38.*

researchers. In either case, a close partnership is created either prior to a project or in its initial stages, with either or both technology practitioners (programmers) or technology managers (systems designers). The initial stages of digital projects focus on the translation of a social design into operating technology. Such projects make real what appears to be possible, derived from the vision of the researcher. As projects develop and become increasingly detailed by virtue of being fine-tuned, there can emerge a drift towards what is technologically possible, rather than what advances the project goals. Guarding against such a drift while ensuring that opportunities are not missed is a continuing challenge. Indeed, it requires quite an effort for the overseers (the lead researchers) to maintain sufficient technological sophistication to direct the project.

Beyond a project's technological development phase, after subsequent phases of technological refinement, the project may enter an operational phase. At this point, a new constructivist innovation framework is called for, to provide the foundations of a digital strategy. Once a machine or piece of software is created, consideration must be given to how it can be operated and sustained while retaining a position at the forefront of change through continuous revision to adapt to a changing world. Normally, private industry would license the technology and bring it to market, either alone or by means of a partnership with its developers. But since a foundational element in the development of digital journals has been to bring control over the dissemination of publicly funded knowledge back into the public system, scholars, universities, and research funding agencies can hardly walk away from a proof of concept or from a demonstration of operations, feeling that the task has been accomplished. A sustainability model must be developed.

As well as getting the job done, these operationalizing activities and those of the initial phase provide insight into the dynamics of scholarly communication, its design, its effectiveness, its organization, and so forth. In short, constructivist research yields insight and attains achievement. Yet, it is often a struggle to have technology development recognized as research. (As noted, please see Appendix I in which an exemplary case explains constructivist inquiry.)

The implication? As the British seem to have realized with the creation of JISC, the dynamics and realities of innovative, constructivist research and the implementation of promising technology innovations require funding agencies, processes, and structures that are fully cognizant of such dynamics of research-based innovative enterprises.[26]

While there is a fair amount of innovation in journal publishing taking place (Érudit, OJS, and Synergies are examples), the existing innovation literature is sparse. The need exists for a multidisciplinary constructivist innovation literature as both a record and as an incubator. There is especially a need for a literature that is well connected to the operating principles, if not activities, of key agencies such as JISC, SPARC, the Mellon Foundation, and the Wellcome Trust, and in Canada, SSHRC, the Canada Foundation for Innovation (CFI), the Canadian Institutes for Health Research (CIHR), the Canadian Association of Research Libraries (CARL), and the Canadian Research Knowledge Network (CRKN). This is not typical social science and humanities research. Indeed, it is at odds with what is normally thought to be social science and humanities research. But if social scientists and humanists are to participate in goal-directed research designed to reap social benefit from digital technology, as Érudit, OJS, and Synergies are doing, funds and funding agencies devoted to innovation and incubation must be created. Funds are required to encourage the broad stimulation of innovative initiatives, and a second tier of funds must be made for contribution to outstanding projects.

26 To some extent this point is complemented by a keynote address given to the Society of Scholarly Publishing 2010 conference entitled "Journal Identity in a Digital Age." O'Donell 2010, 46–55.

A sense of normal social science and humanities research focused on scholarly communication can be gained from the literature found in scholarly journals dealing with scholarly communication and digital journals. That literature is to be found across many disciplines and fields, spanning computing science, library science, information science, communication, economics, education, mathematics, physics, psychology, biology, anthropology, the humanities, history, and several others. For the main part, the research literature is an evaluation literature, tracking and assessing developments in an after-the-fact manner. Early work on digital journals tracked the number of journals in existence and their nature. For instance, it tells us that the beginning of electronic journals in the US has been traced back to 1976[27, 28] and that by 1996, one incomplete count set the number of journals at 115.[29] Currently, journal articles have been replaced by websites such as Genamics (http://journalseek.net) and the Directory of Open Access Journals (http://www.doaj.org/), which track recent developments. They tell us that there are just short of 100,000 online journals and 5,458 open access online journals, 1,291 of which are in the social sciences and 528 in the humanities.

The research literature also considers questions such as the relative cost of software-facilitated online publishing compared to commercial prices and print- and subscription-based journal publishing.[30, 31] A non-exhaustive review suggests that categories of costs such as office management, printing, shipping, postage and handling, subscription management, financial management, claims, and warehousing translate into substantial savings, in the neighbourhood of 20 percent of overall costs, or more, especially in the case of open access journals. As the proceedings of the annual ELPUB conferences attest, there is a fair number of economics papers calculating net advantages and sometimes suggesting models for increasing performance.[32] One can also learn that the costs of sustaining an infrastructure to take full advantage of a digital environment, which Synergies has estimated to be $1.5 million per year, are not taken into account in any study published to date.

The value of the digital environment is that it opens up a vast array of new possibilities that can be usefully documented. The corollary is that in opening representation and facilitating communication, digital publishing is bound to cost more, even though it promises to be more cost-efficient in terms of dissemination. Equally, digital publishing is bound to deliver far more: for starters, think data sets. Illustrative 2D and 3D images, still and moving, can ease understanding, and aggregation and meta-analyses can provide greater insights that ease syntheses of knowledge. Digital publishing opens new possibilities for evidence-based analysis by allowing a variety of measures—downloading frequency, citations, visits, for example—to determine if reputation or the relative subscription cost matches performance.[33] Many of these measures are being built directly into e-publishing software. Digital publishing has also opened for view the consideration of inter-scholar communication, separate from the creation of the official record of knowledge, which is notable in the sciences and especially in high-energy physics.[34]

Other studies have focused on the use of electronic and open access journals by various subcategories of scholars. The relative lack of use of open access journals by young scholars brings forward a policy question of how maximum exposure and usage can be aligned with career assessments.[35] Along the same lines, the research literature reports a general low level of awareness of new scholars of open access journals and the increased exposure they offer researchers.[36] As well, the resistance of scholarly associations to open access is noted because it

27 *Harter & Kim 1996.*
28 *Turoff & Hiltz 1982, 195–202.*
29 *Hitchcock, Carr, & Hall 1996.*
30 *Lorimer & Lindsay, 253–275.*
31 *Willinsky 2009.*
32 *ELPUB 2011.*
33 *Wellington & Torgerson 2005, 35–48.*
34 *Bohlin 2004, 365–391.*
35 *Harley, Acord, Earl-Novell, Lawrence, & King 2010.*
36 *Heath, Jubb, & Robey 2008.*

would destabilize associations' funding models. No mention is made of the responsibility those same associations have to maximize the dissemination of knowledge.[37]

To a surprising extent, differential consideration of the operational environments and pricing levels of journals in the science, technology, and medicine (STM) journals in contrast to social science and humanities journals is relatively undiscussed. Journal pricing is far higher in the former, hence the pressure for change should be greater. Nor do British and US studies (or any others for that matter) seem to take into account that journals exist within a support model substantially different from most European countries and Canada, where they receive direct subsidies. Such environments have substantial impact on consideration of funding models. Thus, studies exist that argue the unworkability of author fees in social science and humanities journal publishing. They rue the development of open access publishing, blissfully unaware of the admirable role played by SSHRC subsidies in Canada.

Also to a surprising extent, there seems to be a relative lack of consideration of the business operations of journals and their cost structures. Certain studies examine the economics of journals from a consumer perspective but not from a producer perspective.[38] Particularly notable is the ongoing work of the Bergstroms, who report on a variety of measures of performance and price.[39] The focus of their many analyses is consumerist, that is to say, value for money. The limited financial analysis of the financial operations of Canadian social science and humanities journals is an exception[40] but by no means is it a thorough investigation into the business of journal publishing at the level of such firms as Taylor and Francis, Sage, or Wiley-Blackwell. In an apparent lack of understanding of the contribution of non-profit journals to journal publishing, one author opined that low margins in open access journal operations might lead to low quality journals.[41]

In summary, although time constraints make this overview necessarily incomplete, what would normally be called the research literature provides an evaluation of the performance to date of electronic journals. Some interesting social patterns surrounding journals also emerge. While such externalities as scholar awareness, career measurement, and reputation of title appear to dampen the consideration of online and open access journals as first choices by authors for publication, there is no suggestion in the literature that digital journals, whether open access or not, are destined for the dustbin of history.

PRESSING ISSUES

Led by the commercial science, technical and medical journal publishers, the journal publishing industry has been far more attentive to maximizing revenue from investments than most scholarly owners of journals. The approach taken by the industry is a version of what follows. The publishers tend to monitor the development of the disciplines and, as new subfields emerge, identify a lead academic or research group, assist them to form a journal, sometimes provide the editor with a stipend to increase his or her presence and prestige at conferences, and, in the case where they take over an existing journal, may offer a small royalty payment. In some cases, in some fields, the contract the editor signs with the publisher requires him or her to deliver a set number of articles for each issue. In this scenario, the editor has virtually no idea of the revenue his or her efforts generate. What she or he gains is the prestige of being the

37   Waltham 2009.

38   La Manna, 2003, 18–28.

39   Bergstrom & Bergstrom , 2001.

40   Lorimer & Lindsay 2004, 253–275.

41   Waltham 2005.

editor of an international journal of a known publisher that may help reap salary increments, graduate-student support, tenure, and promotion.

Like the contracts that are signed between editors and commercial journals, the contracts that disciplinary associations are offered by some apparently reputable firms leave ownership in the hands of the original owners. But such are the terms of the contract that it is difficult for the owning entity to extract itself from the services of the publisher without incurring considerable costs. It is not uncommon for bright, new, energetic editors to be persuaded that their interests lie in handing over the operation of the journal to the commercial company, taking away all the administrative headaches, leaving the academic elements in the hands of the editor, and guaranteeing a stipend to both the association and the editor. It is difficult for others, most of whom have no knowledge of the manner in which publishers work, to argue against such a takeover.

Another route to the same end of commercial exploitation, which is probably less profitable but requires less investment, is through secondary aggregators such as EBSCO and ProQuest. These companies bundle journals together and offer them as a bulk package. The advantage of such an arrangement is that the journal gains greater exposure in markets where there is marginal interest in the content. The major drawback is that under budget constraints there is nothing preventing libraries in the journals' primary market from canceling their direct subscriptions and opting for a much cheaper per-title aggregation of titles. In return for a very small share of the revenues of the aggregator, journals can receive as little as an amount equal to five institutional subscriptions for whole-world access.

Is there a literature that deals with any of these issues? No. And there cannot be one because the contracts journals sign insist upon confidentiality. Hence, keeping academics aware of such issues, which have the potential to retard effective and affordable scholarly journal publishing worldwide, is quite impossible. The only safeguard is the degree of knowledge held by journal professionals whose credibility is often compromised by the fact that they have an interest in keeping their jobs when a takeover of journal responsibility is proposed.

CONCLUSION

In conclusion, driven by continuously rising STM journal prices, the emergent technological opportunity represented by the Internet, the curious legal practice of academic authors assigning copyright to both non-profit and commercial journal publishers,[42] and the absence of a significant Washington business lobby to suppress developments in North America,[43] the transition from print journals to online journals began in earnest in the early 1990s.[44] Canadian social science and humanities researchers have been active leaders in online journal publishing, and they have developed technological foundations that can help maximize knowledge dissemination. In contrast, with the exception of SSHRC's endorsement of the principle of open access, the public circulation of the National Research Council's (NRC) journals to all Canadians, and the CIHR policy of timely access, Canadian governments and universities have not been nearly so proactive in building a digital infrastructure to assist in the communication of scholarly research and knowledge.

42 *A practice recommended by the Chicago Manual of Style.*

43 *The major STM journal producers at the time were owned by European companies.*

44 *Okerson 2000.*

Understanding the potential for the development of digital journal publishing requires the consideration of a policy and program literature of reports of proactive agencies, an under-developed constructivist innovation literature, and the research literature. Some Canadian projects are reaching the threshold of implementation in a competitive environment with commercial-sector producers. Neither policy nor obvious support programs are in place to carry them forward. A Canadian equivalent to the British Joint Information Systems Committee (JISC) would be of great help.

3–Monographs and the Digital Advantage

AS DISCUSSED IN the previous section, scholarly journals are well on their way to taking advantage of both current and future digital technology. This development can be attributed to several factors. The relative financial security of many journals is first. Scholars' constructivist research into journal publishing derived from direct involvement in the management of journals has also been critical. The journal form composed of a compendium of articles and its predominant use as a reference literature is also important. The willingness of libraries to enter into partnerships with journals and scholars has also played a contributing role that, in turn, was facilitated in Canada by the nature and extent of funding provided by the Canada Foundation for Innovation (CFI).[1] In overview, there has emerged in journal publishing a general acceptance of technology as a means of maximizing knowledge communication and thereby gaining public benefit. Where profitable journals have used marketplace earnings, journal-oriented academics have tapped into research funds for development, and libraries have stepped in as collaborators with journals to develop technical systems for journal hosting and a national database for non-profit social science and humanities journals.

In contrast, digital developments in monograph publishing in Canada (and around the world) have been more halting. The slower pace can be attributed to a complexity of at least a dozen contributing factors that have made it much more difficult for university presses to seize digital opportunities. These factors can be divided into four groups: (1) the position and operations of the presses, (2) the general marketplace dynamics of monograph publishing, (3) the dual markets involved in monograph publishing, international trends, and countertrends, and (4) Canada's special position in the development of digital monograph publishing. The factors can be introduced as follows: They begin with the position of university presses as operationally distinct businesses. Related to this operational position is the lack of access that the presses have to research and development (R&D) funds. The management of the presses by professional publishers is also a factor, as is the lack of established, extensive, cooperative relationships with libraries and with constructivist researchers as development partners. Then come the needs of academics for publication following a substantial investment of time and other research resources that is independent of the viability of the monograph's marketplace. Also important are market factors, including the predominance of printed books as a revenue item, the thin margins the presses eke out of the marketplace, the slow emergence of a viable digital market, and the continuing decline of sales in general. In reaction to the manner in

1   *The Canada Foundation for Innovation contributed to the establishment of cooperative relationships among scholars, journals and libraries by advising that its interest would best be captured through a multi-sectoral proposal. Synergies was that proposal.*

which university presses operate outside of Canada, libraries and commercial publishers are setting up competitive alternatives or replacement initiatives, some of which add value and some of which do not. These competitors are doing this partly in response to the slow pace of change and partly in response to the university presses' turning away of valuable information, analysis, and insight. Emerging from this review is an assessment of the current and possible design of monograph publishing in Canada and the distinctive contribution Canada can make to gain digital advantage, that is to say, social benefit.[2]

THE STRATEGIC POSITION AND OPERATIONS OF MONOGRAPH PUBLISHING IN ACADEME

Throughout their history, university presses have served two needs: one was to provide texts for students, the other was to provide publishing opportunities for work written by faculty members. University presses continued in this role into the twentieth century, typically and gradually emerging as distinct operations within universities and, later as operationally self-sufficient organizations, in many cases bolstered by healthy endowments and/or annual funding from their parent institutions.

As the presses became increasingly responsible for their own financial affairs, they adopted mandates that cast their acquisition nets in ways that would generate income, toward "the best scholarship" in some cases, toward specializations in others. Beginning in the US in the 1970s and followed later and more gradually in Canada, this positioning was accompanied by the withdrawal of institutional funding and the establishment of a market model, effectively mandating the presses to become self-supporting. Along the way, the presses also seemed to adopt some aspects of a trade publishing model in their efforts to attain self-sufficiency. The formula worked for the most prestigious presses with relatively high sales (some of which were backed by endowments) but worked far less well for smaller presses.[3]

With increased emphasis on financial viability and market management, university presses increasingly assumed a greater identity as businesses operating in the scholarly marketplace. With this operational identity the appropriateness of professorial and institutional control diminished and there gradually emerged a professionalization that reduced the role of the professoriate to peer review and formal approval of titles by a scholarly board of directors within a direction usually set by the press director and the acquisitions team. Bolstered by trade publishing models, including the concept of vanity publishing and the need to break even, scholarly publishing professionals took over lead responsibility for the extent and nature of monograph publishing. None of this is meant to say that the general trend was to diverge from an emphasis on scholarly value; rather, the above factors came into play as scholarly value was pursued.

SOME MARKETPLACE DYNAMICS IN MONOGRAPH COMPARED WITH JOURNAL PUBLISHING

For the most part, journals have already negotiated sales or access to back issues. Some, particularly non-profit journals, have made public access to back issues freely available and libraries have developed services that nurture the emerging digital market and help users access the journals.

2 *Because the primary focus of this paper is on Canada, it does not deal with the considerable role that commercial presses play in the publication of scholarly monographs in Britain. That said, we have been careful to account for that tradition in our thinking.*

3 *Givler 2002.*

Monograph publishers see their backlist as a valued asset, which, in print form, they warehouse and distribute to meet demand that manifests itself rather slowly as each title comes to the attention of the scholarly community. The revenue from such sales, which are manifestations of Chris Anderson's long tail of demand, can be substantial. For instance, Edwards Brothers printers was able to generate $1 million in revenue in 2004 for the University of Chicago Press from the management of 8,800 backlist titles with average print runs of twenty-five copies.[4]

Backlist sales also point to the different general relationship that monograph publishers have with the market in comparison with journal publishers. Whereas journal publishers tend to go to the library market once a year (although commercial publishers have ongoing marketing programs), monograph publishers depend on sales revenues on a month-to-month basis, which, in turn, depends on constant marketing. Monograph publishers must also deal with middlemen, retailers who bring their product to market and double the price in doing so. In contrast, journal publishers tend to deal directly with consumers. The depression on e-book prices for popular selling titles introduced by Amazon, where it priced e-books at $9.99 in an effort to create and dominate the market, created major anxieties for book publishers as they looked at a diminishing print market and a possible future of trying to recoup title origination costs on e-books.[5] Such pricing is impossible for scholarly monograph publishers and did not apply to them. That said, such low prices for a new market commodity cannot help but affect the general sense that consumers have of the value of content in a similar format. Nor is the emerging struggle among Amazon, Apple, and Google to serve as the three main sources of e-books likely to improve the situation markedly. The market power of each of those organizations overshadows publishers considerably. Should the evolving market prove sufficiently unfriendly to scholarly monographs, there is, of course, the possibility that an alternative supply channel for scholarly monographs, or scholarship in general, might open up.

Faced with such market pressures, many monograph publishers have emphasized that print production constitutes a small percentage of the overall cost of originating a title compared with the costs of manuscript acquisition, development, peer review, editing, proofing, indexing, in other words, all the functions that would also be required in digital publishing. The general amount cited is one fifth of all costs.[6] As well, scholarly presses continue to produce for the print market noting that approximately 90 percent of their revenues are earned from print sales. They argue that a viable e-book market has not yet emerged while at the same time they have yet to make it possible for readers to purchase digital versions of their titles. It is true that, at the time of writing, less than 10 percent of trade book sales are e-book format sales. A further complication is an issue that is, as well, a key tension in arguments for and against Canada's Copyright Modernization Act, Bill C-32. In an environment of increasing student fees and declining percentages of students purchasing course materials, libraries are pushing for multi-user licenses for e-books that, in the digital world, could too easily displace or at least diminish course adoption sales. In the end, both end-users and libraries want e-copies. The result is that monograph publishers are unsure of how to confront the very real possibility that e-books will cannibalize the sales of library print editions.[7] In face of inadequate markets to support monograph publishing, the need for another revenue formula to arise, with some dispatch, is clear.

4 *Edwards Brothers website, www .edwardsbrothers.com/.*

5 *Even though it was Amazon that swallowed the loss from this pricing policy, the publishers knew full well that Amazon's willingness to swallow such losses was temporary. Therefore, the industry set up an agency relationship with Apple, in which Apple took a percentage of the selling price that was established by the publisher rather than by Apple. Even with this fix in place, the continuing downward pressure on e-book prices is leaving consumers with the impression that it is reasonable to expect substantially lower prices for e-books in comparison with printed books. Moreover, the 50 percent discount that both demand makes it doubly difficult for scholarly publishers to participate. With that in mind, some presses are pursuing consortial alternatives for the display and sale of e-books, which may eventually successfully address availability.*

6 *With increased use of just-in-time digital printing this percentage has become more variable.*

7 *It is important to note that many small journals are still earning their main income from print sales. Yet many have put digital editions in place to respond to consumers as the market emerges.*

THE DUAL NATURE OF THE MONOGRAPH MARKETPLACE
AND RESULTING DYNAMICS

The marketplace for monographs is a double marketplace, as is the journal market. It addresses the demands for acceptance of manuscripts needed by scholar-authors to establish themselves as well as the demands for information and analysis desired by researchers and other readers. As explained below, the primary market actually addresses the publishing demands of scholar-authors. The secondary market addresses readers' needs. That said, currently, it is reader demand—or rather, the stand-in for reader demand, which is library purchase—that generates revenue.

The current status of the reading side of the scholarly monograph market is that it is well served if not over-served. The demand for monographs has reached the point where title sales can be fewer than 300 copies worldwide, hardly justifying the publishing effort, let alone the effort of the author. Extensive use of monographs by academics through their own reading or as part of their teaching process is lacking, which is recognized by both publishers and academics alike.[8] Librarian Colin Steele reports a rather extreme position on this issue, from the publishers' side:

> Richard Charkin, former CEO of British publisher MacMillan and president of the UK Publishers Association, was particularly revelatory when he stated in the UK Bookseller for 23 September 2005 that "most of our words aren't read, so it's how you package it that really determines the profit." Universities thus need to look holistically at all scholarly communication costs on campus and identify and rework the public good benefits. (Houghton, Steele, & Sheahan 2006)[9]

From the academics' side, the Modern Language Association produced a 2006 report questioning the appropriateness of monograph publishing as a criterion for promotion in face of lack of readership.[10]

In Canada, monograph publishing carries on with grants from three federal agencies: SSHRC through the Aid to Scholarly Publications Program (ASPP), the Canada Book Fund of the Department of Canadian Heritage, and the Canada Council for the Arts. Sometimes sponsorship comes from a third party, and sometimes the press brings support to a title from an endowment or from its host institution, requiring authors (which usually means their institutions) to shoulder costs such as indexing, proofing, and illustration preparation, and coming close to zero rating royalties. Even with all that support in place, few titles generate revenues substantially beyond the costs of production.

The above grim picture is but one view of monograph publishing realities. As Biomed Central is fond of saying, publication should be seen as the last step of the research process.[11] Tied to the research process, the publication of research, which entails a quality-control process in its conceptualization and presentation, the costs would become part of the overall effort. With an understanding of publishing costs as an integrated final step of the research process, like commissioned reports, the publications could be made publicly available without charge. Put another way, the explanation for how and why publishing carries on with such modest demand comes from the primary market, the demand for publishing services that

8   Steele 2008, Thompson 2005.

9   Steele 2008.

10 Modern Language Association 2006.

11 BioMed Central, "What Is BioMed Central?" http://www.biomed central.com/info/.

universities and scholars need to demonstrate the value of their intellectual work, sometimes called credentialing.

Into this market of insufficient demand to cover costs march three other categories of publishers in addition to university presses. One is commercial publishers, who believe that they can attract good manuscripts and bring them to market in such a way that they can generate decent returns on their investment. A wide variety of presses operate successfully in this manner, particularly in Britain and Germany, and there are some that are adopting digital publishing models and open access, even as they attempt to generate sales revenues. Bloomsbury Academic is a good example.

A second is what might be called copyright exploiters or even copyright trollers, a term derived from patent trolling.[12] Copyright trollers identify promising work, usually of young academics, and offer them a chance to publish a monograph. Following the university press model of off-loading costs onto the author, they carry the matter one step further. They require the author to present the material in ready-to-publish form. The trollers then place the title in a catalogue and attempt to sell the resulting manuscript to libraries at a price that allows them to print on demand and recoup their costs with fewer than 50 sales. The drawback is that the copyright-trolling publisher locks up the copyright with almost no investment and turns around and charges high access fees. There is little understanding of this phenomenon in the scholarly community, which makes its members vulnerable.

The third category of organization willing to address the demand of scholars for publishing opportunity (the author-demand side of the dual market) is made up of digitally enabled libraries. Libraries in the developed English-speaking world appear enthusiastic to partner with university presses in the provision of publishing services, just as they have done with journals. The difficulty is that the predominant model within which this partnership is being proposed, understandably suitable for library needs, is not workable for university presses. The policy literature coming out of the US tells the story.

In 2007, a key report, *University Publishing in a Digital Age*, was published. Written by publishing and library members of the board of directors of the Ithaka Group,[13] it began as "a review of U.S. university presses and their role in scholarly publishing and evolved into a broader assessment of the importance of publishing to universities."[14] While the report made several recommendations, the two fundamental thrusts of the report are equally or more important. One thrust is that university presses needed to collaborate with university administrators and university libraries, particularly for the latter's digital expertise, to address the demand needs of faculty members as authors and the knowledge dissemination needs and, therefore, the strategic interests of the university. The document recognizes the contribution of university presses, the need for and advantages of collaboration with libraries, and the considerable resources and expertise, documented in Section 4 of this paper, that libraries can bring to such a partnership. The presses might object, however, to the funneling of funds to libraries to build such capacity when centralized commercial information technology (IT) services, as cloud computing, might provide competitive services.

The problem arising from the report is that it defines the role of the university press as subordinate to the mission of its host university. This point is made clear in the first paragraph

12 Patent trolling: *http://en.wikipedia.org/wiki /Patent_troll*

13 *http://www.ithaka.org/ about-ithaka*, accessed 12 January 2010.

14 Ithaka 2007, p.3.

of the executive summary of the report: "universities do not treat the publishing function as an important, mission-centric endeavor."[15] The report recommends that universities do so.

Why is making university presses mission-centric problematic, especially when doing so is likely to bring increased funds and valuable collaborative partners? The reason is that it recasts university presses as information agents of academic institutions rather than agents that play a parallel role to the professoriate in being academically free to choose what fields are worthy of pursuit and what manuscripts are worthy of being recognized as genuine contributions to knowledge, and, as a result, being press published. It denies the presses autonomy from the politics of the institution of which they are a part. As the Open Humanities Press notes in its mission statement, "we aim to emulate the strengths and flexibility of commercial presses, while avoiding the institutional limitations of the university-based e-presses."[16] In short, the Ithaka report recommends that the presses become technicians and join with other university departments to form an information arm of their parent institution. The move is akin to subjecting professors and scholarly inquiry to the interests of their university as an employer and thereby denying them academic freedom.

This framework severely weakens the notion of collaboration. By the time the Ithaka document reaches its recommendations, it reports that "Some universities have tried to encourage this kind of collaboration by bringing the press inside the library, or creating centralized leadership for both bodies in the form of a chief information officer or head of academic information and services." Although this kind of structure would clearly subordinate the press, it is neither explicitly advocated nor recognized in the report's remark that "We do not wish to advocate a specific configuration or reporting structure for these activities, but we would argue that these activities must be connected to program strengths of the university if they are to remain relevant to their campuses."[17] The report's third appendix, Recommendations to Press Directors, presents further serious problems, as it seems to represent a fundamental lack of understanding of the position of the press in the university and, more broadly, in society.

It is true, as the report advocates, that in the information society, which digital technology makes possible, that every university should have a publishing strategy. It is also true that any university can assist both the institution and the professoriate by extending digital services to make content produced by those within the institution publicly available in an orderly and accessible fashion. But in the same way that academic freedom of the professoriate to pursue questions of their own choice is fundamental to the university, the freedom of the press to pursue the publication of academic inquiry is fundamental to the record of research and scholarship. This view of the autonomous role of the university press conflicts with its proposed status as a mission-centric information arm of its host institution.

The danger of the framework put forward in the Ithaka report is its too-easy amplification, leading to a dismissal of the contributions made by current monograph publishers, as appears to have happened in a statement made in the name of the Emory University Library:

The digital production and management of information is central to the redefinition of university libraries. Through digitization and the development of new tools and systems for information management, libraries are poised to play a pivotal role in the production of knowledge, replace university

15   Ithaka 2007, p.3.

16   Open Humanities Press:
     Access is Fundamental
     to Scholarship. http://open
     humanitiespress.org/about.html

17   Ithaka 2007, p.29.

presses as 21st-century disseminators of knowledge, *and contribute to the internationalization of scholarship by building and integrating access to global resources[18] (emphasis added).*

Certainly, the Emory University Library statement may be atypical. Librarians, including those in Canada, generally put themselves forward as willing partners and collaborators. But the absence of appreciation for the advisable freedom of university presses and other monograph publishers, as evident in the above quote, is alarming.

A different version of the same scenario, which explicitly brings forward the role of open access, can be found in a study done for Britain's Joint Information System Committee (JISC). In a 2009 report that they commissioned, *Economic implications of alternative scholarly publishing models: Exploring the costs and benefits,*[19] Australian economist John Houghton and his colleagues, supported by a team of British librarian/information scientists and economists, claimed that a shift to open access publishing would result in significant overall savings in knowledge dissemination. The research team also noted that savings would be maximized by self-archiving. As they note, "Indicative modelling of post-transition 'steady-state' alternative systems returns benefits of 5 times costs for open access publishing and more than 45 times the costs for open access self-archiving with overlay services." The authors saw savings in the unnecessary costs of marketing and selling that is intrinsic to the university press/library relationship which, as Milroy points out, is more a form of scholarly communication than a selling tool.[20] However, the report neglected to identify and analyze the nature of the value added by publishers in peer review, editing, layout, and the overall creation of an appealing reading product. The report's authors mention that there would be "a reduction of activity and employment in the industry" but, they add, "the economy is a dynamic system … [a]s a result, the capital and labour no longer employed in publishing would be employed in an alternative activity."[21] This would mean gutting all publishing functions, resulting in substantial job loss and undermining a good percentage of the scholarly monograph publishing industry.

A rebuttal to the JISC-sponsored economic study from the UK Publishers Association, the Association of Learned and Professional Society Publishers, and the International Association of Scientific, Technical and Medical Publishers pointed out that no consideration was given in the report to the full functioning of scholarly publishing nor to the value of prior filtering on behalf of those who read and use scholarly books. As Ashling was later to report, the document also gave "scant recognition [to] the economic and social benefits contributed to the UK by British publishers and societies."[22]

The attractive elements of universities taking on a publishing strategy, perhaps with libraries assuming a key role are, in theory, that such a system would be less restrictive of titles generated by scholars. It would also leave the opportunity for assembling the needed publishing resources in the hands of author/scholars and institutions rather than a press, which now invests in those resources only after a manuscript goes through peer review. The unattractive elements of the model begin with the advancement of knowledge falling within the strategic interests of the university. As well, many of the technical and quality-control functions of the university press would need to be re-established and funded in the absence of a press. Manuscript development costs would still be necessary and peer review would need to be administered to certify the value of the work. There is some danger that this way of proceeding

18 *Emory University Library 2007.*

19 *Houghton, Rasmussen & Sheehan 2009.*

20 *Email to author Nov. 19, 2010.*

21 *Houghton et al. 2009, xxiv–xxv.*

22 *Ashling 2009, 22. Report examines costs of OA publishing.*

would flood the market with even more barely read monographs. In short, the functions and services now provided by university presses would need to be reorganized and re-instituted, and there would be some danger of inundating the world with items of marginal value, thereby frustrating research efforts and confounding the record of knowledge. This is not to say that university presses are not far too restrictive. They are. Moreover, in general they have been lax in not exploring developmental editing models whereby good research and insight can be turned into good manuscripts.

In pulling back from the policy and program literature and reconsidering Canadian digital realities, there is significant value in a three-way collaboration among constructivist researchers, libraries, and university presses, with the added caution that such a collaboration must be founded on full acceptance of the differing principles inherent in the role that each plays in academic institutions and in the advancement and dissemination of knowledge.

WORLDWIDE TRENDS

Such cautions entered, Canada exists in a favourable position that other countries are attempting to achieve in that, within Canada, both social science and humanities monographs and journals are brought to market at cost. If an open access model were to become policy at least the same level of costs would accrue to the academic community if not more. Such costs would be less visible, but they still would be there. We must be careful not to get so caught up in the analysis and actions of the US, UK, and elsewhere that we destroy our own advantage. To be specific, a determined movement of the academy in Europe and the US toward massive open access databases has gained considerable momentum. The launching of Open Access Publishing in European Networks (OAPEN) is a publishers' initiative (that appears to have weak support among European university presses). It is the first European open access monograph publishing project spearheaded by Saskia de Vries, director of Amsterdam University Press. Launched at the Frankfurt Book Fair, the strange element of the launch of this €900,000, 30-month project funded by the European Commission is that the launch video emphasized the basic, in-theory advantages of open access, rather than providing any description of the project's planned publishing program, although that was available elsewhere.[23] The emphasis underlined the primary thrust of the project as a technology play rather than a publishing project.

Nor is OAPEN a single digital project in an environment primarily oriented to print. In a soon-to-be-released report commissioned by the Association of Canadian University Presses (ACUP), and funded by Heritage Canada,[24] Andrea Kwan gives a sense of the resolve in Europe to free itself from the stranglehold of commercial journal and monograph publishers:

In December 2006, the European Research Council (ERC) issued a statement in favour of open access and indicated its intent to mandate that any ERC-funded research be deposited in an open access archive no later than 12 months after publication.[25] By December 2007, the ERC amended its position to shorten the acceptable embargo period to six months after publication.[26]

. . . [By 2008, the EC was encouraging member states to] define clear policies with respect to open access and promote "through these policies, access through the internet to the results of publicly

23 *Open Access Publishing–opening the Oapen Library, http://www .youtube.com/watch?v=GnYhialJ64 8e&feature=youtu.be*

24 *Kwan 2010.*

25 *"ERC Scientific Counsel Statement on Open Access, December 2006," available at http://erc.europa.eu/ pdf/open-access.pdf.*

26 *"ERC Scientific Council Guidelines for Open Access, 17 December 2007," available at http://erc.europa.eu/ pdf/ScC_Guidelines_Open_Access _revised_Dec07_FINAL.pdf.*

financed research, at no cost to the reader, taking into consideration economically sustainable ways of doing this, including delayed open access."[27]

. . . The July 2008 publication of the EC's handbook on open access, Open Access: Opportunities and Challenges,[28] *marked the Commission's public endorsement of the principles of open access . . . A month later, the EC officially launched an open access pilot project, requiring that certain recipients of EU funding for projects representing 20 percent of the EC's research program budget from 2007–2013 make the published results of their research freely available to the public.*

Specifically, these researchers are required to "deposit peer reviewed research articles or final man-uscripts resulting from their FP7 projects into an online repository [and] make their best efforts to ensure open access to these articles within either six (health, energy, environment, parts of information and communication technologies, research infrastructures) or twelve (social sciences and humanities, science in society) months after publication."[29]

In Australia, a similar evolution toward open access initiatives prevails. Three e-presses, University of Sydney Press, Australian National University EPress, and the University of Adelaide Press, have been recently established in an atmosphere of quite limited expansion of university press publishing for some number of years. The Sydney University Press and the Australian National University EPress have risen phoenix-like from the 2003 ashes of their traditional predecessors of the same names.

A difficulty with many of these initiatives, OAPEN being an exception, is that they repre-sent alliances of funding agencies, scholars and librarians that bypass university presses. Their intent is to strive, as the Australian National University EPress does, to "reduce high operation overhead of . . . conventional academic presses."[30, 31] From one perspective, this can be read as a good thing: they are bringing important material forward in what they see as a cost-effective manner.[32] But from another perspective, the emergence of such efforts can be seen as a failure of the academy to support university presses in favour of facilitating their replacement, albeit with different business models, which is not necessarily desirable.[33]

Kwan's analysis in the ACUP report makes clear that there is extensive support for open access and that librarians see themselves expanding into new roles,[34] for instance by setting up digital repositories, which, according to the JISC-funded OpenDOAR at the time of writing, numbered 1,798, 34 percent holding "books, chapters and sections."[35, 36] OpenDOAR also indi-cates that in Canada, there are 55 institutional repositories, 12 of which hold "books, chapters and sections." These repositories, together with self-archiving, are certainly valuable to address the bottlenecked circulation of scientific research published by many STM journal publishers. But the double edge of institutional repositories, which is in their structure, but less so in their activities, is that while they combat commercial exploitation of the circulation of knowledge and/or may contribute positively to the brand prestige of the university, they can simultane-ously negatively impact the survival of non-profit publishers by depriving publishers of their market. There is certainly vigor in the IR movement in the US, the UK and Europe and it would not be inaccurate to portray such developments, as Kwan does, as adversarial between publish-ers and libraries.

The major difficulty is the spillover enthusiasm for IRs and also for self-archiving into a non-profit environment in which pricing is non-exploitative. While the threat may be overblown in

27 *Ibid, 5.*

28 *Available at http://ec.europa .eu/research/science-society //document_library/pdf_06 /open-access-handbook_en.pdf.*

29 *"Open access pilot in FP7," avail-able at http://ec.europa .eu/research/science-society /index.cfm?fuseaction=public .topic&id=1680. Also Kwan 2010.*
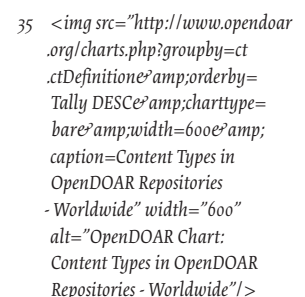
30 *Steele 2008, 40.*

31 *OAPEN–D 3.2.3, 2010. Overview of Open Access Models for eBooks in the Humanities and Social Sciences. http://www.oapen.org /xtf/home?brand=oapen.*

32 *See, for example, Murray-Smith 2009.*

33 *Such a statement does not imply that university presses played no role in that lack of support.*

34 *Kwan 2010.*

35 **

36 *Sixty-four percent held articles.*

its actual consequence for social science and humanities monograph publishers, there has been insufficient effort to work collaboratively with non-profit publishers to ensure both publisher stability and general social benefit from maximizing knowledge circulation.[37] Given these many different elements, the resources committed to, and mandates of, IRs need to be carefully assessed. If IRs are to remain elements in the research environment, the libraries would be better advised to obtain the content of non-profit publishers either through links or content feeds.

Publishers' concerns are realized in alliances and initiatives that shift control from the academy of scholars to the institutions that employ them. Journal/library partnerships are a middle ground in that they are mostly scholars acting as part time publishers/editors partnering with librarians, acting as information and communication technology (ICT) providers. In the monograph world, the scholar/librarian partnership is repeated only when the scholar is an author, not a publisher/editor. With the librarians facilitating access to dissemination through ICT, just as they do with journals, and with encouragement of IR-deposits and self-archiving, the importance of peer review and pre-publication preparation is diminished and becomes vulnerable to being erased. The foundation for this potential erasure is both noble and easy to understand. If hundreds of thousands of dollars are spent on research, what sense is there in failing to set aside $50,000 to ensure that well-presented reports of such research are made public? The rationale is fine as far as it goes. But the extension of the research process without after-the-fact consideration of the knowledge value of the work and the crafting of cogent publications, which is also represented in the reader-demand market, can contribute to an information glut as opposed to increases in the flows of salient new knowledge. Again, acceptance of the need for collaboration addresses this by including publishing functions. Subordinating publishing to institutional interests threatens monograph publishers not because what universities produce is not valuable but because, as history tells us so vividly, institutions are conservative at best and suppressive at worst of new ideas. Librarians have seldom enjoyed the autonomy afforded to individual scholars.

One point is clear: because the digital environment is more effective in the communication of knowledge in the sense that, once posted, content is available worldwide; because the digital environment is far more capable of taking advantage of a range of media; and because, in the digital environment, usage can be tracked, it is clear that the death knell for the print-on-paper scholarly monograph as the sole long-form format for the expression and communication of knowledge has already sounded.

What appears to be lacking in the enthusiasm for ICT and in diminishing the commercial over-exploitation of knowledge generated by the professoriate at the international level is firm commitments to the pursuit of the first principle of ensuring the continuing flow of needed resources for an effective and efficient scholarly communication system. That lack of a first principle commitment appears to derive from too great a focus of both libraries and commercial publishers on their own contribution rather than on assembling the needed resources to build the best possible digitally enhanced scholarly communication system.

37 *The overspill problem is reminiscent of the "serials pricing crisis" that was restricted mainly to STM journals but often spoken of as if it were universal.*

A COUNTER-TREND

There is some counter-movement to the trend described above. At the time of writing of Kwan's report, in the US, for example, open access experimentation was going on at 15 university presses, and a report forthcoming from the Association of American University Presses details more. These universities are:

- Ohio State University Press;
- University of Pittsburgh Press;
- Harvard University Press;
- Utah State University Press;
- Columbia University Press;
- Rice University Press (now closed);
- Yale University Press;
- MIT Press;
- University of California Press;
- Pennsylvania State University Press;
- University of Michigan Press;
- University of Illinois at Urbana-Champaign's Computers and Composition Digital Press;
- Miami University Press;
- University of Tennessee; and
- Georgetown University.

Most extensive and well known are the activities of the University of California Press. In collaboration with the California digital library, the University of California Press has made 2,000 volumes available to its faculty, students, and other clients and 400 volumes available to the public.[38] OAPEN cites many of the same institutions and a few more[39] in a whole variety of activities including the simultaneous and sometimes free digital distribution of PDFs combined with print sales.

The Open Humanities Press (OHP) is another contribution to the counter-trend. It is a scholar-driven publishing initiative led by a group of enthusiastic open access scholars that makes special note of its partnership, its non-institutional status, its determination to remain free of institutional goals, and its aim to place at the forefront open access to scholarship. OHP defines itself thus: OHP is

> an editorially-driven international press, focused on building respect through its brand . . . aim[ing] to emulate the strengths and flexibility of commercial presses, while avoiding the institutional limitations of the university-based e-presses. In 2009, [it] partnered with the University of Michigan Library's Scholarly Publishing Office (SPO) to publish open access monographs, to draw on SPO's infrastructure, scale, and experience but drawing upon self-organizing editorial teams of senior scholars affiliated with OHP in various fields of the humanities to provide the editorial functions and peer review.[40]

38 *http://content.cdlib.org /ucpress/subjects_public.html*

39 *OAPEN – D 3.2.3, 2010.* Overview of Open Access Models for eBooks in the Humanities and Social Sciences. *http://www .oapen.org/xtf/home?brand=oapen.*

40 *Open Humanities Press: Access is fundamental to scholarship, http://openhumanitiespress .org/about.html.*

WHERE DOES THIS LEAVE CANADA?

Some of the adversarial dynamics between libraries and mainly commercial publishers in other countries has bled into Canada. Open access advocates and the traditional university presses in Canada have had few serious discussions of how best to preserve the value of professional publishing while pursuing barrier-free access to knowledge that digital communication appears to make feasible.[41] While such discussions are more common in journal publishing in Canada, and partnership is very much a guiding ethic, there too one can find a lack of full appreciation of fundamental differences that cannot be ignored if scholarly communication is to be enhanced rather than bulked up.[42] To wit: open access advocates are interested in putting their publishing plans in place. Libraries appear to want open access but, while expressing willingness to do so, the Canadian Research Knowledge Network has yet to take a determined initiative to craft non-subscription-based support to help make open access financially feasible for non-profit publishers. And publishers, for their part, are often unwilling because they are not in a financial position to re-structure their models of operation and experiment with new ones. As libraries seem able to find the funds to expand publishing services to resident scholars, the presses do not see how to bring significant amounts of new money to the table.

On the other hand, Canada's system of grants has nicely anticipated the need for facilitative funding to maintain a Canadian social science and humanities discourse. As noted in the section on journal publishing, the funds are certainly of assistance. Moreover, through the years, the eligibility criteria for receiving those funds has ensured that Canada create a publishing system that is so low cost it would be difficult for the overall cost to the academic community to be lowered through a policy of open access. For monographs, the relevant program was the Aid to Scholarly Publishing Program. The final recipients were and are Canada's university presses.

This is not to say that open access should not be explored, especially as digital publishing takes over from print. Based on the activities in both the journal and the monograph sector, it appears as if open access publishing could be combined with low-cost publishing to good effect. Rather, it is to caution against Canada's following in the steps of the US and Europe in search of a cost-effective state of affairs that already exists in the domestic production and consumption of scholarly articles and monographs in the social sciences and humanities in Canada.[43]

Within Canada, the most impressive development in monograph publishing is occurring at Athabasca University. Athabasca University Press (AU Press) has embarked on an open access publishing program. The importance of this initiative tends to be underrated, perhaps because the university is small and is a distance learning institution. But the initiative is significant and is directly attributable to the commitment of Athabasca's president, Frits Pannekoek. It is a clear alternative to libraries coming to "replace university presses as 21st-century disseminators of knowledge."[44] The organization of the publishing program is what matters. The AU Press program is based on a commitment of up to one percent of the university budget. This is a university that has adopted Biomed Central's view that publishing should be seen as the final step in the research process.[45] And, as noted, the university is fully committed to experimenting with open access and monitoring the results. A potential reader can choose to download a free PDF or pay for a print copy.

41 Two meetings have been convened by the provost of the University of British Columbia but they have not resulted in definitive action.

42 In 2009 and 2010 the Canadian Association of Learned Journals (CALJ) hosted two consultations on journal publishing in an attempt to build an understanding of the best way forward. Some progress was made but a clear path of development eluded the meeting. Attending the meeting were representatives of journals (CALJ), librarians (the Canadian Association of Research Libraries), scholars (the Canadian Federation of Humanities and Social Sciences), the Social Science and Humanities Research Council (SSHRC), CRKN, the National Research Council Press, Synergies, OJS, Érudit, and other notable individuals such as Leslie Chan.

43 The major drawbacks are lack of access outside the scholarly community and the inefficiencies of purchase-based availability.

44 Emory University Library 2007.

45 BioMed Central, "What Is BioMed Central?" http://www.biomedcentral.com/info/.

EMERGING POSSIBILITIES IN CANADA IN LIGHT OF DIGITAL DEVELOPMENTS

The consideration of monograph publishing reviewed in this section leads towards a recognition that, in Canada, all sectors—scholars, publishers, and libraries—can make valuable contributions to a cost-efficient and effective digital monograph publishing enterprise. The most obvious difficulty is the position, management, and market orientation of university presses. Currently university presses are not in a position to benefit from access to constructivist scholarly research and technical expertise guided both by scholars and library-based systems designers. Equally importantly, they are not seizing opportunities to benefit from the digital systems that libraries have developed. To gain access to the contribution of scholars and libraries, the internal and external structural organization of scholarly presses must change, as must the organization of the publishing functions that scholarly presses perform. The goal to guide such changes and to create a digital system that will maximize social benefit can be reached by collaboration among equals, including scholars, libraries, and presses.

AND WHAT OF THE THREE LITERATURES?

In an attempt to reflect on the contribution of the social science and humanities scholarly community to understanding and developing the digital economy, we took note in the previous section of three literatures: an innovation literature, a scholarly literature, and a policy literature. To wrap up this section on monograph publishing we turn again to those literatures.

Reflective of the limited involvement of scholars in monograph publishing, there is quite a limited innovation literature. In Canada, the extension of John Willinsky's manuscript management system from a journal base (i.e., OJS) to a monograph management system (Open Monograph Press, OMP) is significant. Willinsky has been working with Athabasca University Press and other partners on this software, which is still in beta form. There is little published on this project. SFU's John Maxwell's production-oriented work integrates web and print editorial/production workflows that easily flow into traditional print production processes, allowing monograph-sized works to be developed on the web. Maxwell's purpose is threefold: one is to demonstrate that online e-production is possible; a second is to open the creation process to public view partly as a means of gathering an audience and thereby facilitating open peer review in the sense described by Fitzpatrick;[46] and a third is to promote a hybrid print + online publication that combines the advantages of both forms of media. The third area of innovation research can be found in the work of digital humanists such as Ray Siemens. As Siemens notes, digital humanists tend to see the publishing outputs not as discrete entities (an article, a journal issue, a monograph) but, rather, as textual building blocks of knowledge that can be harvested, navigated, mined, mixed, and mingled across discrete entities, across disciplines, and across sectors. Analogically, this view could be expressed as seeing the book as a gateway into an entire library of knowledge.[47]

The scholarly literature, which is international, is also thin. For the most part it comes out of information science, the discipline evolved from librarianship. Christine Borgmann's work on scholarship in a digital age is a case in point.[48] John Thompson's sociology of scholarly

46 Fitzpatrick 2010.

47 Email to the author from Siemens, November 16, 2010.

48 Borgmann 2007.

publishing in a digital age is also noteworthy.[49] On the other hand, recent issues of the University of Toronto Press's journal, *Scholarly Publishing*, and the University of Michigan's *Journal of Electronic Publishing* have been more concerned with journal publishing than with monograph publishing. In summary, there does not exist a substantial body of scholars in Canada or worldwide with research interests in the development of the monograph, digital or nondigital.

The foundation of this paper has come from our general knowledge of monograph publishing combined with a policy literature on monograph publishing. As noted, librarians/information scientists have been busy in producing program and policy documents. Only because they are feeling quite threatened are the university presses responding with reports of their own.

49   *Thompson 2005.*

4–Library Data Systems and Organizational Realities

OUR DISCUSSION THUS far of the involvement of libraries in scholarly communication has emphasized the systems organization and technology of libraries. Systems, it is important to recall, are created by people to serve a particular purpose. They represent constructive R&D interventions that are envisioned and designed to address a need (a research component) and following that, are developed and deployed for their intended purpose. In the information and communications technology sector, systems are largely made up of hardware and software. Fuller consideration of what libraries bring to scholarly communication, if not university engagement more broadly, provides a greater appreciation of the details and dynamics of what libraries offer but also a fuller appreciation of the context of the contribution by Canadian libraries, showing them to be valuable partners in the transition of scholarly communication to a digital society.

The lessons libraries offer that contribute to understanding the requirements of a digital transition are substantial. The key lessons are as follows:

1. Building in-house expertise and infrastructure requires the investment of real resources.
2. Collaboration and partnerships are a key component of success.
3. A foundation for creating a cost-effective scholarly communication system is to shift reliance to academy-governed or non-profit organizations from the commercial sector.
4. In the shift to digital, disciplinary traditions may prove to be unnecessary barriers, whereas principles such as library domain, privacy, preservation, and access are critical.[1]
5. Critical issues must be addressed both in principle and from a production or operational perspective.
6. The need to develop open standards and facilitate adherence to them is absolutely critical.
7. The rise of open processes in all manifestations—open access, open source, open standards—is critical.
8. Finding ways to fund production so that openness can be pursued is crucial.

[1] For instance, the historical vesting of control of journals and, in monograph publishing, peer review outside of universities are important historical principles.

9. Libraries can provide infrastructure and related support to exciting, potentially transformative initiatives, for example, virtual research environments such as Islandora.

10. The embedding of librarians in research projects assists in the planning process.

11. In general, libraries are in the midst of a shift from being passive, reactive collectors of content and often at the mercy of publishers and vendors, to becoming active and proactive co-participants in creating [digital] collections. This role transformation moves further up the scholarly communications stream with the advent of journal hosting, institutional repositories, aggregated databases, etc.

In overview, the use of many robust and mature information and communication technologies (ICTs) within libraries allows libraries to offer a range of services. Libraries have developed local technical expertise but have also partnered internally within academe, with other libraries, and with the commercial sector to achieve production-level services. Conceptually, work to date has often mimicked, rather than extended, the print tradition. However, groundwork has been laid for transformation as the full potential of digital is gradually realized.

THE ROLE OF THE LIBRARY

In 1898, the president of Harvard University, Charles William Eliot, noted that the library is "the heart of the university."[2] More recently in 1990, Samuel Rothstein described the library as a laboratory,[3] especially in the case of scholars in the humanities and social sciences. As the digital environment asserts its influence, the importance of the library remains, but as libraries morph from a physical place to a physical and virtual one, the relationships libraries have with their patrons are bound to change.

Libraries experienced substantial growth alongside their parent institutions, universities, in the aftermath of World War II, as science and knowledge of all kinds began to play an increasing role in the industrialization of society. However, significant though the growth was, it was short lived. From the 1970s on academic libraries have been assailed by reductions in institutional budgets and by cost increases. In the 1990s, because of journal price increases beyond inflation and, in the case of Canadian institutions, currency fluctuations, many university libraries cancelled many serials. The traditional balance between journal subscriptions and other collections purchases, especially monographs, was destabilized, resulting in major, long-term consequences for teaching and research activities and for the orderly and systematic growth of collections.

While Canadian academic libraries were affected as much as other libraries, the Canadian academic library scene is distinguished by a strong collaborative tradition. Reflective of this tradition were collective and proactive responses to serials cancellation issues and the transition of those same journals from a print to digital environment. Two initiatives, the Canadian Research Knowledge Network (CRKN) and Scholars Portal (in Ontario), are excellent examples of the pre-emptive measures taken by Canadian academic libraries to temper the effects of the business practices of the large commercial vendors.

2   *Eliot 1898, 229.*

3   *Rothstein 1990, 44.*

CRKN started as an initiative funded by the Canada Foundation for Innovation (CFI) in 1999, with the full participation of all Canadian academic libraries. After a second round of CFI funding, CRKN worked toward and achieved a member-supported sustainable model. CRKN negotiated national site licences with major digital resource providers, mainly of journals and monographs, on behalf of Canadian academic libraries and their user communities. The project garnered international recognition for its development of a model licence and the use of traditional procurement tools such as RFPs to negotiate agreements and prices that would not be available to libraries acting alone. With that achievement in hand, CRKN's members made available a wide range of electronic journals and related resources to Canadian students and researchers in a manner that "leveled the playing field" among students and researchers across the country. Whether they were at large or small universities, all Canadian researchers were able to access the same comprehensive suite of electronic resources.

Scholars Portal is an Ontario-based initiative of the Ontario College and University Libraries (OCUL) that arose at the same time as CRKN and had a similar agenda, but with several significant additions. Scholars Portal built a regional infrastructure necessary to acquire and load CRKN-purchased materials and other provincially negotiated resources. In doing so, Scholars Portal ensured that OCUL libraries would have more direct control over the development and improvement of access mechanisms to this content. Most importantly, it addressed the issue of long-term access. By taking steps to load and maintain content locally, Scholars Portal has ensured that Ontario academic libraries will continue to have access to their content in the long term.

The CFI funded Synergies initiative is another significant Canadian example of a proactive response to a changing environment. Synergies provides a non-profit platform for the publication and dissemination of research results in the Canadian social science and humanities fields. It is a collaborative project that has librarians, researchers, and software developers based in five regional nodes working in concert to develop and implement both the national and distributed platforms that will host and provide access to this scholarly content.

TECHNOLOGICAL PROCESS CHANGES: DATA SYSTEMS

The foundations of the transformative technology innovations for academic libraries and their collections and services go back to the 1970s and 1980s. During those decades, many libraries implemented computer-based systems that automated their operational processes and workflows for acquisitions, cataloguing, circulation, and serials management. These backroom systems had limited direct or visible consequences for library users other than the computer-enabled check-out systems libraries put into place using CRTs and barcode scanners.

During this time, libraries realized the classic benefits of workplace automation: operational workflows were substantially improved, and many manual procedures were automated. Consequently, libraries were able to manage general budget reductions during this period while also introducing many improvements for collections management and public services. As libraries automated, they began to create, store, and access large databases of bibliographic data. These functions generated database-management and computer-storage requirements that pushed the boundaries of the computer systems support available on many academic

campuses. A commercial niche market of vendors developing, marketing, and supporting automated library systems appeared by the end of the 1970s and flourished in the 1980s and 1990s.

By the end of the 1980s, most academic libraries had closed their card catalogues and were implementing the first primitive online public access catalogues (OPACs). These early systems replicated the access methods of the recently closed library card catalogues and took only limited advantage of the potential functional enhancements that could be realized in a digital environment.

In 1993, online computer systems changed dramatically when Mosaic, the first widely deployed Web browser appeared. By the mid-1990s every library systems vendor was offering a web-based OPAC interface, and many academic libraries were creating local websites that provided access, not just to the OPAC, but to much wider ranges of online services and databases. Technology was now transforming the very way in which libraries delivered services and provided access to their collections and other resources. Faculty and students were becoming increasingly accustomed to accessing the library in a growing variety of virtual and remote ways.

Building on four decades of automation, by the end of the twentieth century, academic libraries were radically transformed institutions. They had acquired extensive technological infrastructure and had developed the expertise to operate and support it. The shift to digital collections and resources was well underway, and many more library services were being delivered in a virtual environment. Academic librarians were rapidly developing expertise in creating, maintaining, and navigating the digital landscape in a very practical and hands-on way.

On the producer side of digital migration, traditional publishers of scholarly journals were carrying forward subscription-pricing models anchored by the traditional print format. Access to electronic versions of journals was being offered as a value-added option, usually at a surcharge of 15–25 percent. And libraries did not always have the option to purchase only the electronic version; it was sometimes bundled with the parallel print product, a sales technique that translated into a significant increase for collections budgets that still had not recovered from the serials crisis of the 1990s.

Meanwhile the library systems marketplace in North American and Europe was reaching saturation. Most libraries that needed an automated system had acquired one. In a limited growth marketplace, the pace of ongoing software enhancement and improvement from vendors was slowing, especially in the area of acquiring and managing digital collections that required new software. This slowed pace opened the market to new vendors that specialized in link resolvers, electronic resource management systems, and similar applications, and stimulated local, in-house software development at some libraries.

Both publishers and library systems vendors were undergoing consolidation. Previously separate journal collections were consolidated into single large offerings, giving libraries more, but making budget reductions more difficult to administer. On the library system vendors' side, choosing from eight to ten very competitive systems was reduced to choosing from three or four options that were increasingly legacy-based systems with vendors primarily interested in market share.

INSTITUTIONAL REPOSITORIES

With the appearance of open source software such as DSpace in 2002, academic libraries began to offer support for institutional repositories (IRs), "a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. IRs represent an organizational commitment to the stewardship of digital materials, including long-term preservation where appropriate, as well as organization and access or distribution."[4]

Initially, library-based IRs provided overly optimistic offerings, and many libraries were puzzled and disappointed by the limited uptake on the part of faculty. Inertia, disciplinary-based norms of self-promotion, and reward systems have been identified as key barriers. Many libraries are now developing strategies for more effective IRs, such as making it easier for researchers to provide content as they move forward to acquire and preserve research data. Key considerations for data repositories have been identified by Salo,[5] including flexible storage and metadata architectures;[6] de-coupling ingest, storage, and use;[7] APIs, plugins, mods;[8] versioning and de-accessioning;[9] and standards and interoperability.[10] Salo notes:

> On the surface, libraries would seem to have much human and technological infrastructure ready-constructed to repurpose for data: digital library platforms and institutional repositories may appear fit for purpose. However, unless libraries understand the salient characteristics of research data, and how they do and do not fit with library processes and infrastructure, they run the risk of embarrassing missteps as they come to grips with the data challenge.[11]

JOURNAL HOSTING

Library-based digital journal hosting is a logical extension of the support for scholarly publishing and communication that libraries initiated with institutional repositories. Academic librarians initiated journal hosting programs as another way to support scholarly communication by providing equivalent support for electronic journals, either via an existing IR platform or with readily available open source software like OJS. Library journal hosting coincides with the continuing growth of the open access movement in scholarly publishing and the associated interest in alternative publishing models to support it. In the same way that many scholars were exploring open access publishing, librarians were equally interested in encouraging alternative publishing models that might provide some relief from the control exercised by the large commercial publishers over the marketplace. In the 2008 report for the US-based Association of Research Libraries (ARL), Karla Hahn determined that "44% of the 80 responding ARL member libraries reported they were delivering publishing services and another 21% were in the process of planning publishing service development."[12] Preliminary findings from a more recent Canadian survey of Canadian academic libraries are similar: "55% of the 33 respondents were already providing hosting services and related support and another 24% were considering the provision of such services."[13]

4 Lynch 2003.

5 Salo 2010.

6 Flexibility is critical in order to encompass the variety of data and interactions, especially across disciplines, and metadata architectures must be capable of handling multiple, often more specific, data schemas from a variety of sources.

7 Many ingest mechanisms should be able to interoperate with the same storage pool; similarly data should be reusable and remixable in as many web-based environments as possible.

8 Technical architectures should support Application Programming Interfaces (APIs), software plug-ins, and be modification friendly. They should be standards based whenever possible or at least adhere to contemporary programming models, that is, be well structured and documented.

9 Versioning, change tracking, and rollback are essential for data that may be used and repurposed by many. The same practices that journals have traditionally applied to the various iterations a journal article goes through, from submission to review and eventual publication, must also be applied in this area.

10 Standards and interoperability do not yet exist for acquiring, accessing, and preserving research data. This is especially true for any associated metadata because it also has to address a more complex data set that reflects data format, structure, technical, software requirements, etc. Their development and adoption is critical for success. New metadata models built on the emerging concepts such as linked data will be important.

11 Salo 2010.

12 Hahn 2008, 5.

13 Morrison & Owen 2010.

There are additional features of the Canadian environment that help to explain the higher rates of journal hosting activity. Synergies, a major CFI initiative, has provided significant funding for the development of a national infrastructure to transform Canadian scholarly publishing from a print to digital environment. This project is developing a non-commercial aggregator platform based at the Université de Montréal and also supporting the development and enhancement of two local publishing platforms, Érudit and OJS. Twenty-one Canadian universities are participating in this project, some directly in the infrastructure development and all through the provision of content from locally hosted journal environments.

What is the relationship of journal hosting to journal publishing? In contrast to the indications that emerged from our review of US library activities in monograph publishing, but in keeping with journal development worldwide, Hahn states that, "The aspirations to replicate traditional publishing services are modest to non-existent."[14] Most library-based journal hosting services are primarily providing the online system and related technical support. Publishing activities such as article review processes, copyediting, and subscription or membership management remain the responsibility of the journal. In a 2009 survey of 998 journals using the OJS software, Willinsky and Edgar identified the "scholar-publishers" who were responsible for the majority of the journals in their survey as a growing alternative to the traditional commercial publisher.[15] Many of the journals using these hosting services are start-up, born-digital publications that rely heavily upon the volunteer efforts of their editorial board and free (or low-cost) hosting. Their revenue streams are limited, from a small or non-existent subscription base, because many are open access journals.

Open access policies add a layer of policy confusion with respect to journal hosting. Some libraries have mandated that all content they host in IRs or on journal platforms be open access. Others are less prescriptive and more interested in supporting alternative publishing models that improve accessibility and reduce costs without necessarily adopting a full open access model.

MASS DIGITIZATION: PRIORITIES, STANDARDS, LEGAL, COSTS, PARTNERSHIPS, GOOGLE

Karen Coyle provides a useful definition and distinction between mass digitization and other variants: "Mass digitization is more than just a large-scale project. It is the conversion of materials on an industrial scale. That is, conversion of whole libraries without making a selection of individual materials."[16] There are a number of projects such as the Open Content Alliance (Internet Archives), and the Universal Digital Library that have embarked on mass digitization initiatives in the past few years, but the most prominent, controversial, and probably successful player has been Google with its Google Books Project. By mid-2010, Google announced that it had digitized over 12 million books in 400 languages. Google has also estimated that there are about 130 million unique books in the world. The project has raised many issues that have been discussed in a variety of locations including in the new journal *Scholarly and Research Communication*.[17]

In the context of the Google Books Project in 2010, the Board of Directors of the Association Research Libraries (in the US) endorsed nine principles to guide libraries undertaking

digitization projects whether they are mass, large-scale, or local. The principles can be read as cautionary to allowing private sector partners (for example, Google) to gain access to collections to treat as they desire. As the Google digitization project illustrates, such partnerships can have both long-term and large-scale consequences.[18]

BIG DATA

Research data encompass a very large and diverse spectrum. At one end are scientific data collection initiatives like Neptune Canada (http://www.neptunecanada.ca). This CFI and CANARIE funded project has installed over 800 kilometres of fibre-optic cable to connect observation nodes located in the northeast Pacific Ocean. Numeric and other data, including video feeds, are being continuously collected 24-7. A project news release states, "During the period [December 2009 to the end of March 2010] we recorded 267,000 data files containing raw data, complex data, and recordings from streaming instruments like hydrophones. At the end of March our dataset had grown to 4.4 TB [terabytes] in size. . . . We expect these numbers to triple over the next 12 months."[19] Over the twenty-five-year life of this project, collected data will be measured in the petabytes (1 petabyte = 1,000 terabytes).

However, as Dorothea Salo observes:

"Small data" may prove to be the bigger problem [where small data are] defined as data emerging from individual researchers and labs, especially those with little or no access to grants, or a hyperlocal research focus. Though each small-data producer produces only a trickle of data compared to the like of the Large Hadron Collider Project, the tens of thousands of small-data producers in aggregate may well produce as much data (or more, measured in bytes) as their Big Data counterparts. Securely and reliably storing and auditing this amount of data is a serious challenge. The burgeoning "small data" store means that institutions without local Big Data projects are by no means exempt from large-scale storage considerations.[20]

The data curation challenges for research data are significant. The data cover every content type, size and digital format imaginable. Special programs and tools, often custom built and/or proprietary, are often required to access and analyze data. The results of specific research projects can comprise a more refined subset of the original corpus. The same base data sets can potentially be shared and repurposed by other researchers and projects, often within a more discipline-specific context. Research data include not just the primary or raw data sets, but many of the secondary outputs— project descriptions, working papers and notes, communication amongst collaborating researchers, results documentation, pre-print articles—that typically precede the publication of a formal report or article that constitutes the official scholarly research output.

PRESERVATION

Preservation, whether for print or digital collections, remains an outstanding issue. For every printed book with pages quietly disintegrating in library stacks, institutions are amassing

18 *Association of Research Libraries 2010. The principles are:*

1. Distinct collections demand extra vigilance in digitization.

2. Libraries must respect any donor-imposed restrictions on the digitization and use of materials.

3. Libraries should seek the broadest possible user access to digitized content. This includes patrons of other libraries and unaffiliated researchers.

4. Libraries should receive copies of all digital files generated from their collections, with the option for complete local access to the files (to the extent that copyright law allows).

5. Any enhancements or improvements to the digitized content including all metadata should be shared on a regular basis with the supplying library.

6. Restrictions on external access to copies of works digitized from a library's holding should be of limited duration.

7. Libraries should refrain from signing nondisclosure agreements (NDAs) as part of digitization negotiations.

8. Libraries should ensure that the confidentiality of users is protected in the vendor's products.

9. Libraries are encouraged to refrain from charging fees or royalties for access to or non-commercial use of public-domain materials held in their collections.

19 *Neptune Canada 2010.*

20 *Salo 2010.*

extensive digital data collections susceptible to the digital equivalent of "bit rot" (decay of physical storage media) and similar afflictions. Digital preservation is a more complex problem because a larger array of technical preservation issues must be addressed: storage media, applications software, operating systems, data schemas, etc.

Current best practices largely exist at the operational level of institutional computing facilities that follow regular data backup procedures and periodically refresh or replace storage devices and media. These practices often do not extend beyond the walls of central facilities to research labs and individual research environments (e.g., a workstation or server residing under a faculty member's desk). And data that exist in even more ephemeral settings—web pages, blogs, wikis, etc.— are often so dynamic and fluid that they do not necessarily have any systematic collection and backup procedures in place.

Initial efforts of academic libraries in the digital preservation realm have focused on electronic journals and similar content such as theses, conference proceedings, and local digital collections. Digital preservation practices and standards are still at a very early stage of development. Standards are multiple and focused. These are not competing standards. They address specific parts of digital preservation and must be combined in various ways to provide a complete solution. Testing and pilot implementations are currently underway.

OVERVIEW AND ASSESSMENT

Digital innovation began in academic libraries in the 1970s and 1980s. Initially the projects were local, in-house development projects but they were soon superseded by library systems and commercial alternatives. By the 1990s the ubiquity of the web enabled even more dramatic change. Remote access for users, in conjunction with evolved computer control systems, radically transformed the library into a tech-savvy information institution. During the past decade, the scope has expanded further, with academic libraries leveraging their expertise and extensive IT infrastructures to support IRs, host online journals, undertake mass digitization, and venture into the realm of "big data."

Collection issues, primarily associated with escalating journal costs and the transition from a print to increasingly digital environment, have provided additional impetus for libraries to be more proactive in seeking solutions. Canadian academic libraries have successfully adopted large-scale collaborative strategies—for example, CRKN, Scholars Portal, and Synergies—informed by their expanded technological expertise and capacity. The growing interest and adoption of the open access concept in concert with alternate publishing models has informed the inclination of academic libraries to provide more direct support for scholarly publishing and communication. If there is an underlying and unifying theme, it is the shared resolve of researchers and librarians to repatriate control of scholarly output to the academy to ensure accessibility, affordability and sustainability. In Canada, the high degree of collaboration among researchers, librarians, and others engaged in these endeavours is especially noteworthy.

Many of the interesting research questions in this area are associated with topics that have long been the focus of library science and librarians. These topics include content description, metadata schemes, discovery and access, and data preservation. These topics are more pervasive in a digital environment and the transition from print-based traditions has certainly

highlighted them and generated growing interest across many research domains, especially those directly associated with scholarly communication and university engagement.

Research often leads to innovation that is ultimately manifested in the successful implementation and ongoing operationalization of new concepts. As practitioners in an area that is primarily concerned with scholarly communication, academic librarians possess not only the theoretical understanding of the key issues but also the practical abilities and resources to address them. Canadian academic libraries and librarians are second to none in leading-edge achievements that have been undertaken in very collaborative ways at the local, regional, and national levels.

5–Digital Technologies and University Engagement

THIS PAPER OPENED with an overview of changes that digital technologies have brought to research and scholarship within and across the social sciences and humanities disciplines, with some attention to scholarly practices, scholarly discourse, and scholarly publishing (Section 1). Following this, it discussed the implications of digital technologies in the communication of scholarship through scholarly journals (Section 2), through scholarly monographs (Section 3), and through the activities of university libraries in supporting and providing access to research and scholarship (Section 4). The discussion in each of the previous sections reflects the worldwide repositioning of universities as increasingly responsive to the emerging social dynamics that digital communication makes possible. There are new possibilities (and expectations) for university engagement within society at large, with governments, industry, community organizations, students and parents, and members of diverse publics. This final section of the paper presents key points from the literature on university engagement and international university engagement initiatives, leading examples of engagement efforts in Canada, and possibilities for the use of digital technologies to support and advance university engagement efforts in Canadian universities.

Discussions of university engagement have been gaining momentum over the course of the past twenty years and although perspectives continue to evolve, the research and professional literature on university engagement commonly draw on Boyer's 1990 report to the Carnegie Foundation, *Scholarship Reconsidered: Priorities of the Professoriate*.[1] Boyer argued that, rather than having a narrow definition of discipline-based "research" marginalize other forms of faculty work, there were four equally valuable categories of scholarly work—the scholarships of discovery, integration, application, and teaching[2]—that required increased support and rewards within the policies and practices of the university. Following from this, in 1996, Boyer published "The Scholarship of Engagement" in which he argued that "the academy must become a more vigorous partner in the search for answers to our most pressing social, civic, economic, and moral problems, and must reaffirm its historic commitment to what I call the *scholarship of engagement*" and he encouraged scholars not only to engage with communities beyond academe, but also to consider how structures within academe could support the scholarship of engagement.[3]

1   Boyer 1990.

2   A brief elaboration on each of these categories of scholarship: (1) scholarship of discovery *refers to discipline-based research;* (2) scholarship of integration *refers to research across disciplinary boundaries;* (3) scholarship of teaching *refers to research that is informed by and improves teaching practice; and* (4) scholarship of application *refers to research that directly involves and benefits communities beyond academe.*

3   Boyer 1996, 11–20.

UNIVERSITY ENGAGEMENT: COMMUNITIES, PUBLICS, FACULTY, AND STUDENTS

Since the 1990s, issues related to engagement have been given increased attention by funders, post-secondary institutions, and research organizations. As suggested by the names given to various centres and programs, university "engagement" is understood and approached in a number of ways, which can generally be described as follows:[4]

1. COMMUNITY AND CIVIC ENGAGEMENT: This category concerns the manner and extent to which the university—students, faculty, and administration—are engaged with civic issues, whether through community organizations or informal community groups, or as individual members of communities beyond academe. Key aims are to improve student civic participation, such as involvement in the political process and non-profit sector activities; to enable the exchange of knowledge, where practice informs research, research informs practice, and both are strengthened as a result; to support community-based research and develop collaborative relationships and activities between the university and other communities; and to increase faculty involvement with regional, national, or international communities and their most pressing issues in order to improve social conditions.

2. PUBLIC ENGAGEMENT/OUTREACH: This category concerns the manner and extent to which members of the public engage with the university in terms of curriculum offerings, research activities/findings, or scholarly discussion. Key aims are to improve the relationship between the university and the public and to ensure that the public is better able to recognize and reap the benefits of higher education, in terms of both learning and research/scholarship.

3. STUDENT ENGAGEMENT: This category concerns the manner and extent to which students are engaged with the university curriculum, their program, and their institution. The key aim is to improve student learning, with some focus given to service learning, internships, co-op placements, and participation in campus activities, including student involvement in faculty-directed research and campus administrative/governance committee work.

4. UNIVERSITY ENGAGEMENT: This is a broad category that encompasses and purposefully links student engagement, civic and community engagement, and public engagement/outreach through both academic and administrative departments of the university, from student and alumni to faculties and departments, to VPs of research and advancement. Also included are issues related to the scholarship of engagement, such as the need for further research on university engagement as a field of study and area of scholarly practice, further support for engagement activities in terms of faculty and university administrative structures and resources, and further recognition of engagement work undertaken by faculty in terms of formal peer review and reward structures.

4   *Note that the four categories—student engagement, community/civic engagement, public engagement/outreach, and university engagement—overlap in terms of aims and activities. These categories are presented here not as rigid divisions but as a way of identifying how engagement is variously understood and approached.*

5   See www.aacu.org/resources
    /civicengagement/index.cfm.

6   See http://classifications.carnegie
    foundation.org/descriptions
    /community_engagement.php.

7   See also the Kellogg Foundation
    support for civic engagement
    (www.wkkf.org/what-we-support
    /civic-engagement.aspx), Campus
    Compact support for civic engage-
    ment and service learning (www
    .compact.org), the National Forum
    on Higher Education for the Public
    Good (www.thenationalforum
    .org/index.htm), the National
    Collaborative for the Study of
    University Engagement (http://
    ncsue.msu.edu/), and the National
    Survey of Student Engagement
    (http://nsse.iub.edu/).

8   Examples include the University
    of the Sunshine Coast Office of
    the Pro Vice-Chancellor, Regional
    Engagement and "Regional
    Engagement Plan" (http://
    www.usc.edu.au/University/
    AbouttheUniversity/Governance/
    Policies/Engagement.htm);
    Queensland University
    Engagement Committee (www
    .qut.edu.au/commun/combusgov/
    engagementcommittee.jsp); and
    the University of Western Sydney
    "Making the Difference Strategy"
    (www.uws.edu.au/about
    _uws/uws/mission_goals
    _strategic_plan/ uws_making
    _the_difference_strategy).

9   Community Based Research
    Canada is also affiliated with the
    Global Alliance on Community
    Engaged Research (http://
    communityresearchcanada
    .ca/?action=alliance).

10 See, for example, the Knowledge
    Mobilization Unit at York
    University (www.researchimpact
    .ca/localRI/YorkU/), the Office of
    Community Based Research at
    the University of Victoria (http://
    web.uvic.ca/ocbr/index.html), the
    Harris Centre of Regional Policy
    and Development at Memorial
    University of Newfoundland
    (www.mun.ca/harriscentre/),
    and the Institute for Community
    Engaged Scholarship at University
    of Guelph (www.theresearchshop.
    ca/). In the UK, aside from the six
    universities involved in the
    (continued next page)

Each of these categories of engagement involves activities that include integrating service learning into the curriculum, university-community collaboration, formation of non-profit entities, research projects led by university and community organizations, frequent "town and gown" events for diverse publics, and journals and conferences devoted to engagement issues and research.

A brief overview of the movement toward university engagement in the US, UK, Australia, and Canada offers an indication of the extent to which issues of engagement have become key concerns for funding bodies, post-secondary institutions, and the research community. Several organizations in the US have taken a leading role in supporting the development of university engagement activities, for example, in the Association of American Colleges and Universities' Resources on Civic Engagement[5] and the Carnegie Foundation for the Advancement of Teaching "Community Engagement" classification,[6] among others.[7] Australia has invested in engagement, as evidenced by formal university planning to improve and evaluate engagement activities.[8]

Engagement is also becoming visible within universities in the UK and Canada (though not as prominently as in the US), with organizations such as Research Impact (www.researchimpact.ca), the Knowledge Commons Initiative (http://knowledgecommons.ning.com), Community Based Research Canada (http://communityresearchcanada.ca/),[9] the National Co-ordinating Centre for Public Engagement (www.publicengagement.ac.uk), and the International Science Shop Network (www.scienceshops.org). There is also a growing number of universities in Canada and the UK that house units dedicated to knowledge/technology transfer, knowledge mobilization, public engagement, community engagement, or community-based research activities.[10] The activities of these and other post-secondary institutions and organizations extend beyond how they employ digital technologies in university engagement. An overview of these activities is given here, with focus on the possibilities that digital technologies hold for addressing issues of university engagement in Canada, such as digital platforms for collaboration, the use of digital technologies in knowledge brokering and knowledge mobilization, and the potential for digital technologies to enable, capture, and measure engaged scholarship.

UNIVERSITY ENGAGEMENT AND DIGITAL POSSIBILITIES

The Association of American Colleges and Universities describes civic engagement as "an essential learning goal for institutions throughout higher education."[11] Similarly, the Carnegie Foundation for the Advancement of Teaching in 2006 added "community engagement" to its classification system of US colleges and universities, aiming to determine the level of "collaboration between institutions of higher education and their larger communities (local, regional/state, national, global) for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity."[12] University outreach comprises a variety of events, including town-and-gowns, sports events, lectures, exhibits, performances, and dialogues in the style of a "philosopher's café." In addition, outreach provides the opportunity for customizing continuing education or professional development offerings for members of the public who are under-represented in the student body but have learning or training interests and needs that the university is able to address. Outreach also has links to fundraising (which, in most cases, is formally integrated into the university infrastructure as offices of university "development" or "advancement").

A good example of a university engagement initiative is found in the UK's National Coordinating Centre for Public Engagement (NCCPE), established in 2008 as part of the "Beacons for Public Engagement" initiative, which is

> a four-year project designed to create a culture change across the higher education sector. It consists of a network of . . . six beacons, which are university-based collaborative centres that help support, recognise, reward and build capacity for public engagement work. The six Beacons are based in Newcastle and Durham, Manchester, Norwich (UEA), UCL, Cardiff and Edinburgh.[13]

The NCCPE website also notes that public engagement is a priority "in a variety of sectors—from arts and heritage to science policy and local government" and this is evident in "Higher Education Funding Councils and the UK Research Councils . . . express[ing] their ambition for a different, more inclusive relationship between the academic and non-academic worlds."[14] The six Beacons have integrated public engagement into their institutions through initiatives such as innovation funding, funding for "Beacon Mentors" within faculties, identifying theme areas for research and collaboration, providing funding for researchers in residence and a leadership program for researchers, developing infrastructural plans (such as business plan, incentive and reward scheme, enhancement fund, and professional development opportunities), and funding fellowship programs.

NCCPE's "Briefing Paper: Auditing, Benchmarking and Evaluating Public Engagement" identifies seven dimensions of public engagement as follows:

1. Public access to the university library, conferences, events, museums, galleries, and sports activities;

2. Public access to university curricula, science shops, and university expertise, as well as involvement in research;

3. Student involvement in volunteer activities, experiential learning, research projects, and student-led activities (in the arts, environment, etc.);

4. Faculty involvement with community advisors on research activities; university engagement offices/staff; local, national, and international non-profit groups; public lectures and alumni services;

5. Recruitment and success of students under-represented in the student population (whether through financial support, online offerings, or peer mentoring);

6. Research collaboration and knowledge transfer/mobilization; support for small to midsize enterprises through business advisory services or by curricular offerings that meet their skill needs; expansion of innovation by teams of students, staff, and community; or awards/prizes for entrepreneurial projects; and

7. The university's engagement office or departmental engagement activities; university responsiveness to community-identified needs; collaborative and community-based research; networks of knowledge exchange; public ceremonies, events, competitions, and awards; and policies on recruitment, procurement, and environmental, social, and corporate responsibility.[15]

National Co-ordinating Centre for Public Engagement, there is also the Access and Community Engagement unit at the University of Leeds (http://www.leeds.ac.uk /ace/index.html), the Science Shop at Queen's University, Belfast (www.qub.ac.uk/sites /ScienceShop/) and Interchange, a registered charity partnering with University of Liverpool, Hope University and John Moores University (www.liv.ac.uk/sspsw /interchange/).

11 See http://www.aacu.org/resources /civicengagement/index.cfm.

12 See http://classifications.carnegie foundation.org/descriptions /community_engagement.php.

13 See http://www.publicengagement .ac.uk/about-nccpe.

14 See http://www.publicengagement .ac.uk/what-is-public-engagement.

15 See http://www.publicengage ment.ac.uk/sites/default/files /EvaluatingPublicEngagement.pdf (p. 14-15).

In regard to the priorities for university engagement identified both in the UK and in the US, a number of questions arise about how digital technologies can be used to support and advance engagement activities. These include questions such as: (1) How are digital technologies able to increase civic engagement—whether regional, national, or international—among students, faculty members, and the larger university administration, address society's most pressing issues, and improve social conditions?; (2) How are digital technologies able to help build and strengthen relationships and collaborative work among the university and community organizations, informal community groups, and members of diverse communities beyond academe?; and (3) In what ways can digital technologies enable the exchange of knowledge between the university community and other communities?

Looking to community engagement practices offers a first response to the above questions. A practical starting point in Canada is with three leading institutions affiliated with Research Impact, which describes itself as "Canada's knowledge mobilization network."[16]

UNIVERSITY ENGAGEMENT AND DIGITAL TECHNOLOGIES: LEADING EXAMPLES IN CANADA AND FUTURE POSSIBILITIES

The home base for Research Impact is the knowledge mobilization unit at York University, which was established in 2006 and uses a balance of text and audio-visual material on its website and blog, an RSS feed, Twitter, and an online calendar to keep members of academic and other communities informed about the organization's activities and resources. Digital technologies and social media are commonly used to connect friends and family members. Built on a philosophy of engagement between or among individuals, knowledge-mobilization activities draw on the potential to use social media to connect researchers with each other and with non-academic research partners from industry, community, and government sectors.

The York unit "works to create space—both virtual and physical—in which people can engage in knowledge creation and usage" through the following: (1) the Mobilize This! blog; (2) KM in the AM, monthly breakfast sessions in partnership with York Region; and (3) the KMb Expo, an annual event showcasing the unit's collaborations within the region and inviting further and continued participation with community organizations and government agencies.[17] York's knowledge mobilization unit makes particular use of digital technologies to create collaborative spaces for information exchange and to support a community of practice of knowledge brokers, both those associated with Research Impact and others interested in the work of knowledge brokers. This community of practice supports engaged scholarship through digital-technology-enabled activities such as Twitter, blogging, social bookmarking, and the collaborative online Research Impact community (http://researchimpact.othree.ca).

In the example of blogging, the York unit blog, Mobilize This! (www.researchimpact.word-press. com), has posted 190 stories since its inception in May 2008, with authors coming from York University, the University of Victoria, and Memorial University of Newfoundland. Mobilize This! has been picked up on blog rolls (such as KMb Works!) and has been used for media stories repurposed by York University. Mobilize This! has more than 1100 subscribers, and from May to September 2010, the home page received 35,263 views, and the blog had an average of 3,658 views monthly, which indicates a substantial digital engagement of readers comprising

16   See http://www.researchimpact.ca /home/.

17   See the Research Impact website (http://www.researchimpact.ca /localRI/YorkU/) and Phipps, D.J., and Shapson, S. (2009). Knowledge mobilisation builds local research collaborations for social innovation. Evidence & Policy 5(3), 211–227.

students, faculty, and research partners. The Research Impact YouTube channel (www.you tube.com/researchimpact) has 22 videos posted by videographers at Memorial University of Newfoundland, Université de Québec à Montréal, York University, and the University of Saskatoon. Research Impact has also contributed to videos produced by the Canadian Science Policy Conference[18] and ORION.[19]

The University of Victoria is also affiliated with Research Impact. The University of Victoria Office of Community Based Research (OCBR) has a mission to support "community engagement and research to create vibrant, sustainable and inclusive communities."[20] Although the OCBR website is mostly text-based (with a list of resources, networking, and event links, as well as information on its background and tradition, mission, and a page responding to the question, "What is CBR?"), there are many hyperlinks to useful and relevant documents and websites. The University of Victoria's OCBR-hosted Community-University Expo 2008 and proceedings from this conference include digital media such as a YouTube channel,[21] a blog,[22] and photos posted on Flickr,[23] and many of the office projects are featured in over 100 video clips on blip.tv. One of the most innovative uses of digital technologies by the University of Victoria OCBR is in their work in interactive community mapping (http://mapping.uvic.ca/). Using open-source web-mapping software, individuals and groups from communities create their own maps or contribute to group projects like the Coastal Community Green Map (http://mapping.uvic.ca/coastal/).[24]

Affiliated with Research Impact, also, is the Harris Centre at Memorial University of Newfoundland, established in 2004. The Harris Centre's mandate is to "co-ordinate and facilitate Memorial University's activities relating to regional policy and development, advise on building the University's capacity and identify priority themes and projects relating to: teaching, research and outreach" (Memorial 2010). The Harris Centre website contains sections on research, outreach, public policy forums, news and events, reports and presentations, and video and audio. One of the main challenges for engagement is for the community to know what scholars are working on. Leadership in this area has been taken up by the Harris Centre's Yaffle project, which is a growing database of the university's research activities, searchable by project, opportunities, research interests, and expertise categories and sub-categories.[25]

In each of these examples, the universities are clearly making efforts and providing support for university engagement activities. Indeed, universities in Canada (and worldwide) are increasingly addressing the need for community university-engagement, and digital technologies offer new possibilities, as shown in the examples above. As is clear from the literature on university engagement, as well as practices, there are multiple approaches to university engagement activities. The issues and activities that fall within and across the categories we have identified and described here are telling in a number of ways.

First, university engagement can be taken up in different ways, by different groups. This is reflected in the nomenclature, in the priorities identified, in the approaches taken, and in the activities involved. In the UK, "public engagement" and "technology transfer" are used to capture a broad spectrum of university engagement activities. In the US, "civic engagement" and "community engagement" are both used, with the "civic" focus often linked to the language of "democracy"[26] and/or civic responsibility. In Australia and Canada, the word "community"

18   See http://www.youtube.com /watch?v=7KcHI9TiYPM.

19   See http://www.youtube .com/researchimpact#p /f/0/7XCt9t1CeFM.

20   See www.uvic.ca/ocbr.

21   See http://www.youtube.com/view _play_list?p=1E0E393EB6297F4F.

22   See http://cuexpo2008.wordpress .com/.

23   See http://www.flickr.com/photos /uvic/sets/72157605028605776/.

24   For example, with Coastal Community Green Map, indigenous communities, such as Ahousaht on Vargas Island, on the west coast of Vancouver Island, are mapping their traditional-use regions and linking video interviews of elders and youth to the locations where resources are harvested.

25   See http://www.yaffle.ca/.

26   The link in the US between issues of university engagement and "democracy" is derived in part from the influence of Dewey and other prominent figures and is evident also in the Council of Europe's 2006 "Declaration on Higher Education and Democratic Culture: Citizenship, Human Rights and Civic Responsibility" (see www .coe.int/t/dg4/highereducation /DemocraticCulture/Declaration _EN.pdf). It is worth noting, however, that using "democracy" is not unproblematic in terms of its links to controversy over the foreign policy of some nations. Further, the perspectives brought forward by critical theorists and post-colonial studies draw attention to the absence of women and slaves in the model of democracy that originated in ancient Greece. In addition, the legacy of inequity carried forward to recent, historical civil rights and women's rights movements is present still in power inequities that make democratic participation more accessible to groups that have historically been privileged (according to gender, race, ethnicity, or socio-economic status, for example).

figures prominently, either explicitly (as with "community-based research") or implicitly (in knowledge mobilization and outreach with communities outside of the university).

Second, engagement issues can similarly focus on areas of university research, teaching, or service and correspondingly, be attended to through research activities, curriculum offerings, and service-related work by university faculty and administration. The "scholarship of engagement" described by Boyer draws attention to the importance of having engagement integrated across the university, whether in research activities, teaching and learning, or involvement with communities outside of the academy.

The characteristics of efforts focused on public, civic, or community engagement within research, teaching, or service activities, reflect a varied but fragmented approach to an issue that is of increasing importance to post-secondary institutions and higher education worldwide. In the varied approaches to university engagement, there is an opportunity for the research community and higher education in Canada to learn from the spectrum of efforts that have developed. The research and professional literature (cited in both the footnotes and text of this section) recommend an integrated, coordinated approach to university engagement. This can be accomplished through more *research on* university teaching and service, more *teaching that integrates* research and service, and more *service activities* that inform research and teaching. This kind of integration would mutually support the university engagement activities of individual scholars and departments, as well as the university as a whole. Although *scholarship of engagement* encompasses this kind of work within the areas of research, teaching, and service, it is only beginning to establish itself as a field of research and study. Taking each of these considerations into account, universities and the research community can benefit from both the varied approaches to engagement and coordinated efforts.

Digital technologies present some interesting possibilities for the scholarship of engagement and the integration and measurement of university engagement across research, teaching, and service activities. The examples below identify key engagement activities and describe how they can be extended with digital technologies.

27 See http://www.yaffle.ca/.

28 See www.youtube.com
    /researchimpact#p
    /f/0/7XCt9t1CeFM and
    http://researchimpact.othree.ca/.

29 This website allows people to
    correct errors in data sets such as
    historic census records. Community
    engagement opened up by Web 2.0
    includes the possibility to directly
    engage a vast number of widely
    dispersed volunteers to work
    collaboratively on large projects,
    including ambitious projects in
    which collaborators transcribe
    handwritten manuscripts, trans-
    late texts, scan and mark images,
    or upload their own archival mate-
    rial to databases. Striking examples
    of the latter are the September 11
    Digital Archive, where more than
    40,000 first-hand accounts of the
    events of 9/11 have been uploaded
    (http://911digitalarchive.org/),
    and the Hurricane Digital Memory
    Bank, which preserves the stories
    of people affected by Hurricanes
    Katrina and Rita (http://www
    .hurricanearchive.org/) and now
    has 25,000 items in its collection.

1. COLLABORATIVE RESEARCH BETWEEN FACULTY AND COMMUNITY (LOCAL, NATIONAL, AND INTERNATIONAL): Database of faculty research activities (i.e., Yaffle[27]) and online collaboration spaces allowing faculty, students, and non-academic research partners to collaborate (i.e., O3 collaboration[28] and vihistory.ca[29]).

2. PUBLIC ACCESS TO UNIVERSITY RESEARCH, EXHIBITS, LECTURES, SCIENCE SHOPS, AND DIALOGUES: Open journals and conferences, digital collections, and multimedia presentations summarizing research findings (i.e., www.youtube.com/researchimpact and http://knowledgecommons.ning.com/).

3. STUDENT (UNDERGRAD AND GRAD) INVOLVEMENT IN RESEARCH PROJECTS: Student use of digital technologies to collaborate on research projects with other students, faculty, and community partners, both locally and globally (i.e., student access and contributions to data sets, circulation of research findings to community, and production of research-related videos).

4. STUDENT AND FACULTY INVOLVEMENT IN SERVICE LEARNING, CO-OP, INTERNSHIP, AND NON-PROFIT-SECTOR ACTIVITIES: Shared, digital, and interactive space developed

by students, faculty, and the non-profit sector (such as Facebook groups set up for research collaborations and service learning).[30]

5. ENGAGEMENT OF RESEARCH, RESEARCHERS, AND STUDENTS WITH INDUSTRY: Databases (i.e., Flintbox) used to create an online transaction space for technology commercialization.

6. RECRUITMENT OF STUDENTS UNDER-REPRESENTED IN THE STUDENT BODY (FOR BOTH CREDIT AND NON-CREDIT COURSES): Offerings (online, classroom, and informal) developed in response to online feedback from groups under-represented in the student body.

7. FACULTY INVOLVEMENT WITH UNIVERSITY ENGAGEMENT STAFF: Shared digital and interactive space developed by university engagement staff and faculty to integrate research, teaching, and service activities (enhances transparency and, thus, awareness of opportunities for engaged scholarship).

8. CURRICULAR OFFERINGS TO PROFESSIONALS AND DISTANCE EDUCATION STUDENTS: Offerings (online, classroom, and informal) developed in response to online feedback from groups of professionals (i.e., use of new distance and pedagogical technologies such as ABEL, www.abelearn.ca).

9. AWARDS AND PRIZES FOR ENGAGEMENT LEADERSHIP AND LEVERAGING ENGAGEMENT FOR HIRING AND FUNDRAISING: Collecting and reporting of engagement activities in a database to identify engagement leaders in academic departments, and using this data to inform hiring policies and fundraising.

The literature on scholarship of engagement and the engaged university[31] makes one further point: In order to support student, civic, public, or community engagement adequately, the university must not only have an engagement office that works collaboratively with students, faculty, administration, and community organizations, but must also recognize these activities through formal reward structures in hiring, tenure, and promotion policies and practices. The University of Guelph and Community Campus Partnerships for Health (CCPH) are leading an initiative to change institutional policies and systems to better recognize and reward community-engaged scholarship (see http://cescholarship.ca/). The universities joining CCPH and Guelph in this collaboration are Memorial University of Newfoundland, University of Alberta, University of Calgary, University of Regina, University of Saskatchewan, University of Victoria, and York University.

While The Talloires Declaration[32] and an increasing literature support universities in their efforts to integrate and evaluate engagement activities, in the absence of large organizations such as the Carnegie Foundation and Campus Compact in the US, or the National Co-ordinating Centre for Public Engagement in the UK, there is an opportunity for the research community and universities in Canada to chart a course that secures an enviable position for our post-secondary education system and research funding system. In Canada, by virtue of a research community that is neither too large nor too dispersed for strategic collaboration, a coordinated and innovative approach to university engagement that draws on the advantages of digital technologies is within reach, provided that support to develop the necessary infrastructure is made available. Many such initiatives are underway in pilot phase across Canada. The opportunity

30 *See, for example, the Refugee Research Network hosted by York University at www.facebook.com/ home.php?#!/ group .php?gid=30614536012.*

31 *See, for example: Driscoll 2009, Furco & Miller 2009, Gibson 2006, Sandmann & Weerts 2008, and Stanton 2008.*

32 *See http://www.ulsf.org/pro grams_talloires.html: "Composed in 1990 at an international conference in Talloires, France, this is the first official statement made by university administrators of a commitment to environmental sustainability in higher education. The Talloires Declaration (TD) is a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities. It has been signed by over 350 university presidents and chancellors in over 40 countries."*

now is to link these grassroots initiatives in a truly national dialogue and infrastructure involving funders and national associations such as the Association of Universities and Colleges of Canada and the Canadian Federation for Humanities and Social Sciences, with Vice-Presidents Research and Vice-Presidents Academic of Canadian universities. Such an approach would allow Canada's social sciences and humanities research community and our research enterprise more broadly to address the concerns discussed in this section of our paper, and those involving scholarly communication through journals, books, and university libraries, as discussed in previous sections.

Conclusion

THIS PAPER HAS examined five areas of activity that are fundamental to scholarly communication and the mobilization of research through university engagement. Included are the activities of scholars in carrying out research; the dynamics of scholarly journal publishing, scholarly monograph publishing, libraries and library systems; and initiatives that reach outside the scholarly community. The focus of the paper has been to gain a sense of digitally enabled scholarly activity and digital innovation that scholars, libraries, non-profit journal and monograph publishers, and engagement initiatives are bringing forward in scholarly communication, from research inquiry, to knowledge creation, to widespread circulation and use. In the time available we have benefited from the already acquired knowledge of major sources of information that were familiar to team members. Even then, managing to take full account of what was available to us was a challenge. Thus our methodology must be regarded as limited sampling rather than a comprehensive analysis of all information available.

Digital technologies have, in fundamental ways, changed the manner in which members of the research community across the social science and humanities disciplines carry out research, interact with one another, teach, and engage with society as scholars. For example, in research, three-dimensional digital media are now being used to create data sets for analysis and for presenting research results. Scholars can now be in constant contact with peers, working collaboratively and sharing hypotheses and insights. Various forms of social media are being used to broaden engagement. Blogs are already used effectively by scholars,[1] Twitter is often used to help those not in attendance to follow conferences, and YouTube and similar services are being used to present very effective audio-visual summaries of "ideas worth spreading."[2] In this context, digital technology is sewing the seeds of integration of spatially dispersed knowledge communities. Indeed, encouraged by recent team-oriented research funding, more extensive collaboration is already underway and with it a diversity of research roles are becoming more visible—grant writer and project coordinator, scout and catalyst, chronicler and social communicator, knowledge broker and mobilizer—each reflecting the differential contributions necessary to successful collaborations. With the emergence of such roles are observable differential patterns of engagement with digital technologies by individual scholars and post-secondary institutions.

While scholars are beginning to make use of a wider number of digital technologies, new forms of scholarly communication, such as websites, audiovisual presentations, blogs, and so forth, are secondary in the formal knowledge record in that they are confined largely to the

1 *See, for example, Suber, http://www.earlham.edu/~peters/hometoc.htm.*

2 *See, for example, TED Talks: Ideas Worth Spreading, http://www.ted.com/talks/.*

citations in journal articles and monographs. It remains to be determined whether such media will gain recognition as first-order elements of the knowledge record and be used as evidence in formal incentive and reward structures. It is more likely that the matter will be resolved via practice rather than principle, because part of that resolution will be an accumulation of cases in tenure, promotion, and salary decisions that judge what is appropriate and for what purposes. In turn, policy will evolve to codify the recognition of new media and new roles. Institutions labour with policies that codify yesteryear. Yet, if society and researchers are serious about encouraging the achievement of social benefit from research and scholarly communication enabled by digital technology, systems of recognition cannot penalize those who assist in the pursuit of that goal.

The implications of digital technologies for scholarly publishing are no less profound. Our review of journal and monograph publishing brings forward a number of interesting points. First is how different the two areas are in moving forward with technological innovation. Journals have more quickly embraced the opportunities of digital technologies than have monograph publishers. Second is how different Canadian contributions to worldwide development have been in the two areas. Again, in journal publishing, Canada stands out, whereas in monograph publishing we do not. Identifying the key factors in accounting for these differences begins with an understanding of the nature of technological opportunity.

Technological opportunity is derived from the determination of innovators to apply machine capacity to the achievement of social goals. In a social science and humanities research context this is constructivist inquiry. Our analysis is this: in part because of Canada's established reputation and success with communications, and specifically through SSHRC's program of grants to non-profit Canadian social science and humanities journals, innovative constructivist scholars have had opportunities to be involved with the publishing of the journals that form the backbone of Canadian social science and humanities research. Canadian social science and humanities researchers have, as a result, risen to the forefront of digital journal publishing in unexpected numbers, with contributions of considerable consequence to the development of digital infrastructures despite the absence of formal programs of support for such activities and proper recognition for such activities as research.

Our review of Canadian research libraries indicates that they too have been notable contributors in the initiatives they have taken within their own operations and also with scholars involved in journal publishing. Since the mid-1970s, Canada's research libraries have been engaged in a step-by-step transition into the digital world so that, by the beginning of this current century, they were much changed institutions from the previous millennium. Not only were Canada's research libraries on par with other institutions in their systems development—that is, their digital infrastructure—but also, they were particularly notable for collaboration among themselves, collaboration that served as a foundation for cooperation with journals and journal scholars.

Despite this considerable contribution of Canadian scholars, libraries, and publishers to the transformation of scholarly communication in the form of journal and monograph publishing in Canada and worldwide, there is a general lack of scholarly literature on topics germane to digital innovation in scholarly communication.[3] As a consequence, this paper draws in large part from the involvement of team members and from a professional literature that contains

3   *Substantial literature detailing the nature of scholarly activity does exist. Similarly, the digital humanities are becoming well established. In regard to university engagement, the research literature has begun to deal with community-based research, knowledge mobilization, and related areas in teaching (such as service learning and student engagement, for example). But research and scholarship on university engagement as a field encompassing these activities and concerns, however, have only begun to emerge.*

accounts of policies, actions, and innovative programs. This material is generally referred to as grey literature, giving it a secondary status that seems quite inappropriate in this context.

The predominant focus of the formal scholarly literature that does exist consists of scholarly articles evaluating the transition from print to online and open access publishing.[4] Missing is a constructivist literature that provides an understanding of digital scholarly publishing—the principles of development and the nature of accomplishments. This missing literature derives both from how scholars (and librarians) see what they are doing and how innovation relates to traditional categories of scholarly research, categories that are under challenge most prominently by digital humanists and by digital realities themselves. The view that library systems managers and technicians have of their activities as solving practical problems also forecloses on the emergence of a constructivist literature. Also germane to explaining this missing literature of documenting innovation is its appropriateness to the two main scholarly communication forms, articles and monographs. Other forms, such as technical reports, may be more appropriate. The presence of an innovation literature would both recognize constructivist inquiry properly and speed innovation. The annual International Conference on Electronic Publishing (ELPUB) and the inclusion of technical reports within journals dealing with scholarly communication address this issue, but to a limited extent.

A final point on the missing literature describing digital innovation in scholarly communication is crucial. While many innovation-oriented academics and library systems professionals have programming expertise, the backbone of digital development is skilled programmers who turn ideas into code. Giving proper recognition to programmers (who may be students, faculty, or university staff) is important for three reasons. One is for their contribution to the enterprise. Second is to ensure that the structure of funding allows an ample budget for needed programming skills. Third is to encourage and integrate such individuals into innovative, technology-enabled R&D in the pursuit of social goals, and the development of such individuals to take on conceptual managerial and research positions.[5]

The above paragraphs of our conclusion have been written against a background of lively innovation and development in journal publishing, taking note of scholars, librarians, and publishers as participants. Standing somewhat outside this buzz of world notice for innovation and incubation in both journals and library systems is Canadian involvement in digital monograph publishing. Worldwide, digital development in monograph publishing lags behind journal publishing. Perhaps the main reason for this lag is that systematic, egregious overcharging for need-to-know information is far less frequent than in journal publishing. But there are other important factors. University presses are poorly placed and poorly resourced to take on innovation. The nature of the management of university presses also plays a role. Unlike scholars and academic librarians,[6] university press directors have little access to innovation funds and have been slow to take up possible collaboration with their clients and customers. Scholars, including those involved in the digital development of journals, are more accustomed to seeing libraries as a service to their needs. Similarly, presses appear reticent to partner with scholars engaged in research and innovation in publishing, even when those partners can bring resources to the table.

Our examination of general digital developments in libraries indicates the depth, sophistication, and substantial financial investment that libraries have made in the development

4 *In the week prior to the completion of this paper, a very useful special issue of the* Journal of Electronic Publishing, *13, 2 was published entitled "Reimagining the University Press." See http://www. journalofelectronicpublishing.org/.*

5 *Rushkoff 2010.*

6 *It should be noted that grant funding for Canadian libraries is far thinner than it is for US, European, and Australian libraries.*

of a digital infrastructure that serves the academic community as a whole. In that context, libraries represent well-established partners that already benefit scholars and journals and that could benefit scholarly presses. Such partnerships could also assist the presses in finding models to increase the presence of their output more widely in research libraries. That said, our assessment is that it would be a retrograde step were libraries to assume responsibility for monograph publishing and displace the established publishing functions and expertise that university presses have in areas such as title acquisition, editorial oversight, and marketing. This is mainly because many of the tasks now performed by the presses in the evaluation and preparation of manuscripts would need to be reinvented somewhere in the academic community. On the other hand, it appears that university presses cling to their restrictiveness, decision-making structure, and exclusivity at their peril.

It is not surprising that universities, given that they are knowledge institutions, have awakened to a possible increased connection to the community. Outside of health research, Canada does not appear to be a leader in university engagement, apparently because we lack sufficient infrastructure and policy to support universities and scholars in engaging in what have been seen, until recent years, as tertiary activities and are therefore given little credit. A scholarly literature on the research and scholarship of engagement in Canada is notably absent. It is evident, however, that in university engagement efforts—at York University, University of Victoria, and Memorial University of Newfoundland, among others—digital information sources can augment direct social interaction, although these initiatives are only now starting to emerge out of their pilot phases. Indeed, it may be that in this wider environment, digital inventiveness may come to the fore and, in some ways, imitate the very earliest forms of scholarly communication, in which dialogue and interactivity were central.

IMPLICATIONS

Our exploration of social sciences and humanities research communication and university engagement indicates that scholars, librarians, publishers, and university-based innovators, in collaboration with each other and with programmers, to a significant extent, have begun building pertinent digital infrastructure in advance of policy to support this work. The infrastructure that they have built is operational, but its potential far exceeds its current, initial scale of operations. The achievement of that potential requires policy designed to enable the emergence of Canadian leadership in the circulation of knowledge aimed to benefit society as a whole. We suggest the following:

1. That digital technologies have the potential to enable great gains in general and worldwide social benefit, in keeping with such fundamentals as universal education and Article 19 of the Universal Declaration of Human Rights, which states:

   Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive, and impart information and ideas through any media and regardless of frontiers.

2. Because there are such tremendous multiplier effects in education, and because constructivist inquiry is so far quite a minor part of social sciences and humanities research, focused support for constructivist digital inquiry and for students to participate in constructivist research would have substantial payoffs. These payoffs would come not just from exposure to digital realities but also from a whole range of knowledge, skills, perspectives, and attitudes that are intrinsic to innovation and incubation as Canada and the international community transition further into a digital society, whether that innovation takes place in research, publishing, library practice or university engagement.

3. As documented through the comparison between journal and monograph publishing and the use of digital technologies for scholarly engagement, collaboration is key. Great progress has been made in scholarly communication by tapping into the following: the energy of innovation-oriented scholars, library infrastructure and practical problem-solving in the library sector, publishing expertise in journals and presses, and the growing commitment to community engagement. In contrast, when collaboration has been lacking, progress has been less dynamic. The legitimization of innovation guided by all partners is particularly important in a situation where multiple parties can bring forward different offerings.

4. As significant as current digital innovation activities are, many are unstable because they exist as projects. Moreover, policy and appropriately designed funding programs do not exist that provide the proper grounding and assured development of digital innovation. To be specific, constructivist inquiry is thwarted by the norms of social science and humanities research that privilege an after-the-fact analysis and commentary. University engagement is thwarted by being categorized as service and as a tertiary activity separate from scholarship. Similarly, systems librarians cast their activities not as constructivist research in the pursuit of social goals, but as practical problem-solving. The misfortune is that these research activities go unreported and the lack of reporting encourages technological determinism. Such a view fails to recognize that technology, like other elements of society, is socially constructed and can be used for human betterment.

5. To capture social benefit from digital innovation, Canada requires a policy framework and purpose-built funding for social scientists and humanists to engage in constructivist inquiry. From such funding would emerge myriad innovations that, with suitable incentives, could not only address social, economic, cultural, and technological issues, but also provide a profound understanding of the digital dimensions and dynamics that are shaping and being shaped by society.

6. The needed policy framework can be most quickly set in place as follows: Britain's Joint Information Systems Committee (JISC) has a clear constructivist mandate and has had considerable success in capturing benefit from digital developments in the whole of the education and research sector. Canada could readily adapt the JISC structure to its own needs. JISC's mission statement is "providing world-class leadership in the innovative use of Information and Communications Technology (ICT) to support education, research, and institutional effectiveness." The mission

of Canada's JISC could be "to contribute to society, the economy, and culture by supporting digital development in research, education, and the circulation of knowledge in society as a whole."

The path forward requires continued collaborative efforts among stakeholders. SSHRC is well placed to assemble expertise to chart a road map to a digitally enabled academy. Leading projects in each of the five areas examined—journals, monographs, libraries, scholarly practices, and university engagement—are identifiable or could be quickly put in place and funding them in anticipation of purposive policy would achieve acclaim. In turn, the same projects would serve as exemplars for others to follow. Determined initiative by SSHRC would encourage cooperation from existing funding agencies (Canada Foundation for Innovation and the Network of Centres of Excellence, NSERC, and CIHR, among others) to develop a Canadian JISC-like agency.

An illustration of constructivist inquiry

Information and communication technology creates opportunities for social scientific and humanistic research to invent tools and services out of which emerge new realities and new insights. We have referred to these opportunities as "constructivist inquiry." The illustration that follows describes a constructivist initiative, the development of publicly accessible, open access scholarly communication software designed to maximize dissemination and engagement.

The specific elements that differentiate constructivist inquiry from what might be called, for purposes of contrast, analytic social scientific and humanistic inquiry, include the following:

1. The inclusion of technicians – programmers and associated technical workers such as user interface designers, technical conceptualizers, technical architects, and so forth;
2. A focus on tool production; (and tool production leads to)
3. Iterative development; (which leads to)
4. Tool or service extensions and the possibility of exploring new realities.

In the case of the Public Knowledge Project (PKP) and its most developed software, Open Journal Systems (OJS), the initiating idea was to create digital tools for online open access journals in order to demonstrate that journal production can be a relatively inexpensive activity. The goal behind the initiative was that such software could dramatically increase the circulation of and public accessibility to social science and humanities research. Work proceeded by the hiring of student programmers to create the code, and as is customary with programming, once the code succeeded in accomplishing the task, it needed to be recast, from beginning to end. Once the software was in place for open access journals to manage and publish manuscripts online, these tools were then taken up by print and online journals with subscribers. To provide access to subscribers and block access by non-subscribers, a subscription module was added to extend the software. With the basic functionality of publishing automation and subscription management in place, new needs and opportunities opened up, such as maximizing search engine recognition. Thus metadata were added. Then came citation management, then the inclusion of other media besides text, and then a whole host of other elements including web analytics. With respect to this web analytics, in addition to reproducing the capacities of

print publication, the tool-building created possibilities for new realities such as tracking actual use patterns (i.e., the reading and research behaviour of users).

These beginnings of PKP illustrate two significant elements in understanding the nature of constructivist inquiry. First, points one to four above represented an approximate time span of six to eight years. Second, as development progressed and journals adopted the tools created – at the ten-year mark 7,000 journals were using the technology, a greater usage level than any other journal publishing software in the world – a reliance on the continued existence and further development of OJS had been created. The significance: project-based research funding for such an initiative, once it demonstrated wide appeal, became inadequate. It has actually restricted growth opportunities. Constructivist research that results in significant tools or services requires a nimble-response model based on emerging needs for continuity. Out of the developments described so far arise three more distinguishing characteristics of constructivist inquiry. They are:

5. The need for long-term funding;
6. The need for clear criteria for qualifying for continuous funding, for example, utility, uptake, enhancement of understanding, and/or an ability to pursue further understanding with additional tool-based inquiry;
7. Assessments of progress/significance based on application, use, and potential for further development together with the capacity for nimble response.

As well as the above characteristics, support for constructivist inquiry must take into account ongoing developments in tool and service building. As with any field – and especially a still newly developing field such as programming and designing for online environments – new and better ways of accomplishing ends that have already been achieved are continuously emerging. New technological systems must be adopted because, in doing so, further opportunities emerge including the potential for integration with complementary technology. As well, online design is in a continuous state of flux as data accumulate through user interfaces and interactions. Hence two more distinguishing characteristics of the constructivist framework:

8. Provision must be made for continuous revision and re-development;
9. Allowance must be built in for training upgrades of technical staff.

The issue of training opens the dynamic of the relationship between constructivist inquiry and the education of researchers, bringing forth a further distinguishing feature of such research:

10. The opportunity to work on an initiative designed to be of direct value to a user community, which provides for continuous quality-controlling and direction-leading feedback, has tremendous potential for encouraging intense engagement, pride in work, a cooperative work experience and team building.

The above characteristics and the appropriate design of support have parallels with the development and design of research facilities. As with research facilities, in constructivist inquiry, after a development phase comes the need for sustainability. In the case of PKP, sustaining support becomes crucial because 7,500 journals worldwide now depend on OJS. Reflective of this dynamic, two other distinguishing characteristics of the constructivist enterprise reveal themselves:

11. Sustainability and serving the continuing needs of users calls for organizational development and the pursuit of an appropriate placement in the research infrastructure.
12. Legal, organization and financial consultants all become critical to creating an organization infrastructure to support this valuable suite of publishing tools.

The above description is a simplified trajectory of one constructivist-based research initiative. A key point is that support of constructivist-based projects that result in effective and valuable tools or services require funding tailored to tool building, accompanied by an early-stage assessment process to determine eligibility for continuous developmental funding. Once a research initiative is judged to warrant continuous funding, it requires further assessment that sees through the stage of development and then provides for sustainability. Following the model of various science facilities, stable base funding can provide assured continuous operation, worldwide accessibility, and most importantly, a foundation for attracting additional support. Even good ideas that manifest themselves in extremely useful tools or services cannot be 100% funded by a single source of research dollars.

A second key point: Constructivist research and the tools and services resulting from it are driven by different aims than analytical social sciences and humanities research. Once a successful tool or set of services are in place, a funding regime that has a 30% or even 60% success rate for project-based proposals is not appropriate. That said, a program of support for constructivist inquiry might well initiate support through project funding, followed by an assessment and winnowing process.

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