

## **Chapter 7: Towards an Integrated Knowledge Ecosystem: A Research Strategy**

In contrast to the development of holistic and integrated approaches to scholarly communication elsewhere, little attention has been given in Canada to this concept to date. Canadian policymakers and others have remained focused on “traditional” models, such as digital libraries, electronic publishing, and economic issues. Although many Canadian researchers and practitioners are undertaking valuable research on specific elements of scholarly communication, no coherent national research agenda is directed towards the entire knowledge generation and dissemination process in Canada and no funding is directed to specific research priorities addressing the profound transformation of the research enterprise. Given the increased awareness of the contribution of research knowledge to our society and the increased complexity of the knowledge dissemination environment, greater consideration should be given to the processes and channels by which research knowledge flows. Any changes to knowledge dissemination must be made with the international context in mind. This is an opportunity for us to strengthen Canada’s knowledge society by promoting and implementing policies and methods that better support the communication needs of Canadian researchers and the users of scholarly knowledge in general.

Rather than continue to build a knowledge infrastructure that mirrors the print system, we recommend a scholarly communication model based on the needs of our diverse research community and the capabilities afforded by new technologies. Of course, the new model will incorporate the important functional requirements of scholarly communication. The generation and dissemination of scholarly knowledge must be seen as social processes that are part of the same system.

“The real challenge is to build systems supporting scholarly communication that yield new capabilities and capacities so effectively and efficiently that they are intuitive and transparent in their operation” (Wave of the Future 2003). We are already seeing new modes of communication that enable rapid dissemination of new findings, discussion and debate of these findings, leading to major reductions in time for fully vetted results and a new form of scholarly communication infrastructure that holds the promise of enabling fuller exploitation of knowledge (Wave of the Future 2003).

Scholarly communication and research knowledge take on different forms, depending on the discipline, and a variety of systems and techniques will therefore be needed. There is a greater awareness of the complexity of scholarly communication, including the existence of multiple communication systems arising out of differences among disciplines. There is no single solution to the challenges facing scholarly communication: it has always been recognized that there are differences between the sciences and technology on the one hand and the social sciences and humanities on the other. The opening theme of the panel report supports this. Theme I (Knowledge systems) speaks of “unique and diverse research results that must be presented and preserved in various formats without the application of technology that will homogenize this material” and asserts that new methods of “producing, preserving and accessing this research” must reflect the diversity of research and the communities out of which it arises.

### **A Vision for Knowledge Dissemination in Canada: An Integrated Knowledge Ecosystem**

The results of this study clearly support the creation of a more holistic and integrated knowledge ecosystem for scholarly communication. The Consensus Panel was clear in its recommendations for this system: “a coherent national policy of knowledge preservation and dissemination must be devised to create a greater cohesion, accessibility, security and access to research findings.” Although the major objective of this study was to assess the need for a research agenda for knowledge dissemination in Canada, in examining the transformation of scholarly communication it became apparent that a national vision for knowledge dissemination in Canada is needed.

One example of such a strategy can be found in the United Kingdom, which recently launched the Research Libraries Network (RLN). The RLN brings together the U.K.’s four higher education funding bodies (the British Library, the national libraries of Scotland and Wales and the eight members of Research Councils) to develop the United Kingdom’s first national framework aimed at addressing the information needs of researchers. According to the RLN:

the financial, technological and organisational demands on university and research libraries are huge. They include the transition to electronic publishing, the increasing volume and cost of information, new models for publishing and disseminating research (such as Open Archives), researchers' changing patterns of behaviour, massive growth in the volume of publicly-funded research, and government initiatives to foster innovation and technology transfer. The RLN aims to provide the unified and focused strategic leadership needed to address these demands. (<http://www.hefce.ac.uk/news/hefce/2004/rln.asp>)

The Government of Australia is providing \$542 AUD over the period 2004-2005 to 2010-2011 to implement the National Collaborative Research Infrastructure Strategy to strengthen the coordination of the government's funding for research infrastructure (see [http://www.dest.gov.au/highered/research/review\\_resp.htm](http://www.dest.gov.au/highered/research/review_resp.htm)). We have already noted the European Union's commitment to creating the European Research Area (ERA) and the initiative of the National Science Foundation in the United States to build the national Cyberinfrastructure in support of research. All of these initiatives reflect national strategies to achieve a ubiquitous knowledge environment.

Canada is falling behind other developed countries in terms of managing knowledge dissemination and scholarly communication. For example, in the UK, US, Australia and other countries, significant monies are being invested in scholarly communication research. Meanwhile, the stakeholders of the Canadian scholarly communications system must rely on research and models generated elsewhere. These solutions do not necessarily address the requirements of Canadian society and the need for an effective transformation of the dissemination of scholarly research in Canada. In 1996, an AUCC-CARL Task Force acknowledged that the scholarly communication crisis is international in scope and that solutions must be international. However, it also asserted:

But unless we ensure that Canadian interests are kept in the forefront as we work in the context of international developments, we risk having standards and practices imposed from beyond our borders that will not fully respond to Canada's unique culture and demography.

Accordingly, the Task Force concluded that "It is our system of scholarly communication, and we can and must make choices, individually and collectively, to

ensure that Canadian scholarship flourishes in the global network of knowledge dissemination of the future" (AUCC 1996).

These observations remind us that Canada cannot rely solely on research, development, and models from elsewhere. Scholarly communication is a complex mix of systems undergoing transformation throughout the process and demanding a variety of solutions. The absence of Canadian driven research threatens to have a significant impact on the quality and speed of Canadian research production, and eventually Canadian society itself. Canadian research in scholarly communication is vital for maintaining the unique values on which our society is based.

It is our view that there is a disconnect in Canadian public policy in this area. Although a high public policy priority is assigned to the generation of research, there are no national policies addressing the *dissemination* of research. To ensure the vitality of the knowledge society in an environment where a profound transformation is occurring, Canadians need to pay more concerted attention to the dissemination of research knowledge. In its report, the Consensus Panel not only discerned the need for a national policy on knowledge dissemination but also stipulated a number of principles such a policy should embody. Drawing on the Consensus Panel Report, our first set of recommendations addresses the need for a national knowledge dissemination policy.

**Recommendation 1: The Government of Canada should formulate and implement a National Strategy for Knowledge Dissemination and integrate this strategy into appropriate government research and development policies.** The strategy should be based on a vision of sustainability and should be formulated and implemented within Canada's unique social context. The strategy should embody the following principles. The strategy should be based on a vision of sustainability and be formulated and implemented within Canada's unique social context. The strategy should also embody the following principles.

**Recommendation 1.1: The Strategy should seek to create a more holistic knowledge ecosystem integrated into the research processes.** The strategy should aim to better integrate the entire lifecycle of research knowledge within the research process. In

particular, the strategy must acknowledge the fact that in an international scholarly communication system access to knowledge and dissemination of knowledge are inextricably linked.

**Recommendation 1.2: The Strategy should support the dissemination of a range of knowledge representations.** As noted by the panel, “If knowledge dissemination strategies are to be effective and useful to users, they will evolve logically from, and be based upon multiple forms and varieties of knowledge content. This means that many forms of knowledge and knowledge systems will be included in strategies of knowledge dissemination.”

**Recommendation 1.3: The Strategy should address the ethical challenges that are encountered with knowledge dissemination.** As the Consensus Panel Report states, “The growing use of digital formats and other new technologies impose significant ethical issues with regard to the collection and dissemination of information. Developing a national research policy in these fields and implementing national strategies demand a careful and on-going recognition of these ethical challenges.”

**Recommendation 1.4: The Strategy should create a system in which resources are more equitably distributed.** “To the extent that there is inequitable distribution of funding resources, academic research is disadvantaged and this has implications for both the production of knowledge and its communication.” ... “Given that universities exist in relation to the societies of which they are a part, how *and how well* scholars communicate their research matters. It is imperative, therefore, that we develop a strategy that is inclusive and equitable. As well, such a strategy should attend to different linguistic and cultural communities.”

#### ***TOWARDS AN INTEGRATED KNOWLEDGE ECOSYSTEM IN CANADA: A RESEARCH PROGRAM***

Throughout this report, we have been referring to the profound changes occurring to scholarly communication in Canada and throughout the world. Given our nation’s

growing desire to improving the impact of research, there is a pressing need for the development, implementation and assessment of new models, technologies, standards and systems to improve the efficacy of our scholarly communication systems. Canada will have to make a significant investment in research and development in this area if it is to adapt to these changes and remain competitive.

**Recommendation 2: A Scholarly Communication Research Program should be implemented as the central component of a national strategy for knowledge dissemination in Canada.** The results of this study point clearly to the need for research on the issues of scholarly communication in Canada. In the face of the rapid and profound transformation affecting all aspects of scholarly communication, there is an urgent need to move ahead in establishing such a national research program. The research program should have the following characteristics.

**Recommendation 2.1: The Scholarly Communication Research Program should be based on the five themes outlined in the Consensus Panel Report.** Researchers are the major creators and users of scholarly knowledge. The research program for scholarly communication should therefore be guided by the needs and vision of the research community with input from other stakeholders. To that end, this study engaged a consensus panel of diverse Canadian researchers, who, in consultation with experts, identified five priority themes that represent the intellectual underpinnings of a research strategy for scholarly communication in Canada: Knowledge systems; Knowledge/data storage and retrieval; Knowledge production and the social contract; Power and infrastructure in the academy; Copyright and intellectual property. The research themes and the more specific research problems that flow out of these themes indicate that a national research program on knowledge dissemination must be an inclusive multi- and interdisciplinary program.

**Recommendation 2.2: The Scholarly Communication Research Program should be open to all research disciplines and be multi-council and multi-departmental.** While individual researchers and practitioners are making valuable contributions to the study

and implementation of different aspects of knowledge dissemination and its development, these efforts are not guided or supported by a national research and development strategy. Canada currently has no coordinated strategy for research into issues of scholarly communication. Research related to knowledge dissemination is currently being funded by all of the Canadian academic research funding agencies, such as the Social Sciences and Humanities Research Council, the Natural Sciences and Engineering Research Council, and the Canadian Institutes of Health Research. As well, there are a few non-governmental bodies that fund research in some areas of scholarly communication, such as the Virtuoso Group and the Max Bell Foundation, but these funds are often limited and are not guided by a long-term cohesive vision. Furthermore, the research that is being conducted in this area is overwhelmingly technological in nature and therefore fails to address the higher level issues that are needed to improve scholarly communication. The transformation of scholarly communication is deep and complex, and requires a range of intellectual queries. Such a research and development program would involve researchers from the arts, humanities, social and behavioural sciences, law, computing and computer engineering, and library and information sciences and it would consequently be supported by multiple-councils and government departments.

**Recommendation 2.3: The Scholarly Communication Research Program should be implemented by a high-level coordinating body.** The program can be implemented through various governmental agencies, but it should be coordinated by a high-level public policy body. It is not appropriate to recommend a specific body responsible for coordinating the research at this time, but we note that models in the United States, the European Union, and the United Kingdom are available for study. The intent here is not to create a new level of bureaucracy or to launch a full-scale reorganization of current structures. The existing councils that fund research already have mechanisms for inter-council review of grant applications. It is our intent to express the need for high-level support and coordination to ensure that knowledge dissemination is fully integrated with the vision of a knowledge society in Canada, as expressed in national innovation and other research strategies.

**Recommendation 2.4: This Research Program should foster partnerships between academic researchers and other important stakeholders in the public and private sectors.** A research strategy should include the participation of and partnerships with other stakeholders, such as public-sector institutions (e.g., libraries, archives, museums) and the private sector (e.g., computing software and hardware). The early and ongoing involvement of relevant decision makers in the conceptualization and conduct of a study is the best predictor of its impact. The Consensus Panel strongly supported closer relationships between researchers and other members of society. In light of the multi- and interdisciplinary nature of the research themes and the responsibility of various government departments and agencies for delivering the federal innovation strategy, any number of government advisory bodies (e.g., Advisory Council on Science and Technology), funding councils (the Social Sciences and Humanities Research Council, the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council), federal departments (e.g., Industry Canada, Canadian Heritage, Department of Social Development), and organizations (e.g., the Canada Institute for Scientific and Technical Information (CISTI), CANARIE, Library and Archives of Canada) might participate in the formulation and implementation of a national research strategy.

**Recommendation 2.5: The Research Program should receive funding of at least \$15 million per year for an initial five-year period for a total of \$75 million.** It is instructive to examine a few examples of funding elsewhere in order to get an idea of the magnitude of funding that might be appropriate for such a research program. For fiscal year 2005, the National Science Foundation is requesting over \$618 million for research and related activities in computer and information science and engineering alone. As an example of its specific grants, the National Science Foundation Universal Access program issued a call for proposals due December 2004. Five grants of one-year duration will be made, for an anticipated total funding of \$1,900,000 US. NSF Digital Archiving and Long-Term Preservation issued a call for proposals due September 2004 and will award 12 to 15 grants for a total anticipated funding of \$2,300,000 US. The NSF



Computing Research Infrastructure program, with a proposal deadline of August 2004, will award 25 to 35 grants for an anticipated total of \$15,000,000 for the fiscal year 2005.

For the fiscal year 1999-2000, the three Canadian federal granting councils together budgeted about \$1,587 billion for research grants and scholarships. According to the latest Statistics Canada figures (2001-2002), expenditures for research and development in the social sciences and humanities, the health sciences, and the natural sciences and engineering in the higher education sector were almost \$3 billion. Clearly, major funding is being expended on research and development in the higher education sector. Given the strategic importance of research in this area, it would be reasonable to allocate the equivalent of at least 0.5% (half of 1%) of the \$3 billion expended in 2001-2002 (which can be anticipated to be less than what will be expended in 2004-2005).

### ***TAKING THE INITIATIVE***

In the face of the rapid and profound transformation affecting all aspects of knowledge dissemination and the need for an effective knowledge society, it is imperative that the Government of Canada establish a national strategy of research and development on knowledge dissemination.

**Recommendation 3: The Government of Canada should move ahead as rapidly as possible with the process of formulating and implementing a national strategy of research and development on the dissemination of scholarly knowledge.** A national strategy of research dissemination will of necessity be a multi-agency initiative involving numerous stakeholders within government and among non-governmental institutions, associations and organizations in the public and private sectors. These stakeholders will all have to be involved in the formulation of the national strategy. New initiatives involving so many players need champions within and outside government to give the initiative focus and direction and to maintain momentum. There is also a need for coalition building. As a possible model, we would draw particular attention to the U.S. Coalition for Networked Information (CNI), an organization designed to advance the transformative promise of networked information technology for the improvement of scholarly communication and the enrichment of intellectual productivity. CNI members

include higher education institutions, publishers, scholarly organizations, professional organizations, libraries, and information technology companies.

**The Social Sciences and Humanities Research Council and the Canadian Association of Research Libraries should take the lead as champions in achieving a national strategy on knowledge dissemination.**

The Social Sciences and Humanities Research Council has displayed an interest in and provided support for knowledge dissemination programs in the past. This interest has been given an even greater importance by SSHRC as it moves through its transformation process and attempts to increase the emphasis on research impact in the social sciences and humanities. As well, there are inequalities in the allocation of resources and funding for dissemination and access to knowledge resources across disciplines. For example, funding was granted by the Canada Foundation for Innovation for the licensing of scientific, technical and medical (STM) literature but not for the recent proposal for literature in the humanities and social sciences. A knowledge dissemination strategy could help to redress these inequities.

The Canadian Association of Research Libraries (CARL) is another obvious champion for the knowledge dissemination strategy. CARL has played a leadership role in addressing the challenges of knowledge dissemination over the past two decades, including undertaking this study. CARL represents 27 of the major academic research libraries in Canada as well as Library and Archives Canada, the Canada Institute for Scientific and Technical Communication (CISTI), and the Library of Parliament. These institutions manage much of the existing infrastructure for scholarly communication in Canada and have expertise and resources critical to the implementation of the infrastructure that may be required.