



Canadian Association of
Research Libraries

Association des bibliothèques
de recherche du Canada

Improving Canada's Digital Advantage: Strategies for Sustainable Prosperity

Response by the Canadian Association of Research Libraries to the Consultation Paper on a Digital Economy Strategy for Canada (2010)

Submission Summary

The Canadian Association of Research Libraries (CARL) makes numerous recommendations in its response to the Digital Economy Strategy Consultation Paper questions. Canada's research libraries support research, innovation, and education by making content available to researchers and students, by preserving and managing content, and by teaching information and digital skills. We are pleased to offer a response to many of the Consultation Paper questions.

As we have provided direct responses to the questions asked, recommendations are sometimes restated in different ways. Many of the recommendations made by CARL in the individual sections of this consultation can be placed under one or more of the general, over-arching recommendations below.

- (a)** Support the continuing development of a cohesive national research, innovation, and education (RIE) infrastructure that includes a robust data network
- (b)** Contribute to the building of a national research data management system
- (c)** Support the digitization of Canadian heritage documentation for online research, teaching, and cultural creation
- (d)** Continue to support the research enterprise at universities through investments in the national granting councils
- (e)** Build digital skills in the Canadian labour force through training programs and incentives and through partnerships with the library community
- (f)** Encourage open access to the results (and data) of publicly funded research

By working with educational and research institutions and their libraries and research support units and organizations to effect these recommendations, the federal government will greatly improve Canada's digital advantage.

CARL's recommendations for Canada's Digital Economy Strategy generally fall under three key development areas: *infrastructure*, *content*, and *skills*. There is some repetition or overlap of these throughout given the question and response structure of this government consultation submission.

Infrastructure

- Encourage adoption of or R&D in ICT through the lever of tax incentives and matching-fund programs
- The presence of a strong national digital infrastructure (a network, content, services, skilled support, and policies) to support local ICT developments will also be important
- Continuously maintain update and expand robust, high bandwidth networks within and among educational and research institutions (e.g., CANARIE [www.canarie.ca] and the regional/provincial research networks)
- All federal research funding councils should adopt CIHR's open access digital publication policy for the results of research funded by them
- Assist the collaborative development of a research data archiving infrastructure - both technical and professional; grant funding would allow universities and research support organizations to build this platform
- An overly-broad legal protection of technological protection measures (TPMs) may result in the prevention of reasonable legal uses of copyright materials that are integral to the creation of new knowledge and ideas
- Avoid accepting terms in international agreements – e.g. ACTA - that might restrict the ways in which Canadians have traditionally been able to legally interact with copyrighted materials in digital formats
- Promote fair and transparent network traffic management policies and practices of internet service providers (ISPs)
- Respect the privacy of Canadians, especially in educational and library contexts, in matters of legislation and measures to facilitate police investigation of online-assisted criminality
- Encourage, through matching grants or tax incentives, enrolment in web development and e-commerce training programs

Content

- For Canadian researchers and innovators, the digital content advantage includes access to relevant research data sets, and ready access to the results of completed research, available in open access digital repositories, and open access scholarly journals
- Canadian researchers and Canadians benefit from being able to find federal government publications online - both current ones on their original departmental websites and preserved documentation, which should be kept in a "trusted digital repository"
- The federal government has an interest in supporting the digitization of Canadian materials in order to make their national heritage freely available online to all Canadians
- The development and marketing of value-added services around the digital collections present both cost-recovery opportunities for not-for-profit entities and as well as profits for Canadian businesses
- Ensure that not-for-profit organizations that provide services for persons with disabilities (e.g., the Canadian National Institute for the Blind) are well supported
- Help ensure that Canada's libraries, both public and in educational settings, have appropriate computing hardware and software so that people with disabilities are able to benefit from the library and Internet content that is available to other Canadians
- Continue to work with provincial and territorial governments and with the private sector in extending access to broadband Internet service to all communities and rural and northern areas

Skills

- Continue to invest in university research through the federal government granting councils
- Maintain support for the Canada Institute for Scientific and Technical Information (NRC-CISTI)
- Consider establishing, in partnership with universities, a centre of excellence focused on ICT research and innovation
- Contribute to the establishment of co-op programs and internship positions in ICT to help current and recently graduated ICT students to find employment in the field
- Support basic literacy and numeracy in Canada, within jurisdictional limits; Canada's libraries play a major role in the acquisition of both general literacy and digital skills, within the K-12 and postsecondary systems and through public libraries
- Continue to attract immigrants and help remove structural and social barriers to employment in immigrants' fields of work, especially in the ICT sector; use tax incentives for encouraging the hiring of recent immigrants who have acquired these ICT skills
- Establish special scholarship programs to encourage enrolment in ICT programs of study at Canadian colleges and universities.
- Encourage professional development of staff who need to acquire ICT skills for career development; use tax incentives to encourage individuals and companies to undertake professional development
- Make funding available to educational institutions to develop digital skills programming online
- Continue to support the Canadian Access Program (CAP) so that all Canadians have access to computers and the Internet
- Develop, with education and library partners, affordable and accessible digital skills training both online and across the country in schools and libraries

Improving Canada's Digital Advantage: Strategies for Sustainable Prosperity

Response by the Canadian Association of Research Libraries to the Consultation Paper on a Digital Economy Strategy for Canada (2010)

The Canadian Association of Research Libraries (CARL) is pleased to offer this response to several of the questions posed in the Consultation Paper on a Digital Economy Strategy for Canada. Our response focuses on projects and ideas of particular importance within the research library context, which, in some cases, may not be voiced by other individuals or organizations. That said, CARL shares a range of opinions with like organizations such as the Canadian Library Association, the Canadian Urban Libraries Council, the Association of Universities and Colleges of Canada, Canadiana.org, the Canadian Research Knowledge Network, the Canadian University Council of CIOs, CANARIE Inc., Compute Canada, the Canadian Digital Media Network, and the various proponents of the principle of providing open access to the results of, and the data obtained through, publicly funded research who will also have submitted responses to this consultation.

We thank the Ministers for having launched this consultation on the digital economy and we would welcome any opportunity to discuss our recommendations more fully.

Capacity to Innovate Using Digital Technologies

- *Should Canada focus on increasing innovation in some key sectors or focus on providing the foundation for innovation across the economy?*

Based on the demonstrated success of research and business partnerships, we recommend a flexible approach to government support -- one open to supporting development in any sector, one sufficiently flexible to respond to innovation wherever it may occur. Ultimately, we believe that innovation in the development, application, and commercialization of digital technologies will benefit most from a solid, cohesive national research, innovation, and education (RIE) infrastructure, which will include a network, services, content, and skills, and to which both the public and the private sectors are connected at all levels.

- *Which conditions best incent and promote adoption of ICT by Canadian businesses and public sectors?*

Private sector businesses may be most easily encouraged by government to adopt ICT through the lever of tax incentives. In the areas of the public sector in which the federal government can play a direct role, matching-fund programs have often been successful in promoting development desired by government. Federal government initiatives, such as the Canada Foundation for Innovation (CFI; www.innovation.ca) have been crucial in bringing the advantages of ICT to Canadian research. For example, CFI funding has ensured that all researchers, even those at Canada's smallest universities, have online access to most of the published research literature available to researchers at the largest universities through support of CRKN consortial licensing programs. CFI funding has also promoted the transition of hundreds of Canadian scholarly journals from paper to digital formats through the Synergies program (www.synergiescanada.org); this has helped to expose Canada's research output to the world.

Other more general conditions will also favour the adoption of ICT by the private and public sectors. For example, a high level of digital literacy in the labour force will mean that workers and managers will see the potential advantages of the adoption of ICT. The presence of a strong national digital infrastructure for research, innovation, and education (RIE) to support local ICT developments will also be important.

- *What would a successful digital strategy look like for your firm or sector? What are the barriers to implementation?*

The Canadian Association of Research Libraries works in the context of research and higher education. Digital strategy in these domains will include developments in networks, content, services, talent, and policy.

Robust high bandwidth networks within and among educational and research institutions (e.g., CANARIE [www.canarie.ca] and the regional/provincial research networks) must be continuously maintained, updated, and expanded. Such networks must not be simply cables, but also tools and services that allow students, researchers, and innovators to fully exploit them. Network-wide user identity management and research data archiving tools or facilities are developments that are needed immediately.

In terms of policy, we recommend that the government encourage all federal research funding councils to adopt an “open access” digital dissemination policy for the results of research funded by them, as has already been done by the Canadian Institutes of Health Research (CIHR; see <http://www.cihr.ca/e/34846.html>). Online open access publication and archiving have been shown to increase the use and citation of research articles, which in turn promotes both further research and the practical application of research findings by Canadians or others around the world. Free public (open) access to the results of publicly-funded research allows it to be visible and useful to practitioners, industry, business, policy-makers, and others who may not have easy access to licensed content through university libraries. The U.S. Office of Science and Technology Policy has recently undertaken a national consultation on providing public access to federally-funded research and seems likely to implement public access policies in the near future.

Open access archiving requirements should also be established for research data (discussed below), but adherence to such requirements will be a challenge for researchers until a research data archiving infrastructure is more fully developed.

Similarly, much government data would have immense value for Canadian innovators were it easier to locate and access. Various governments around the world are developing “Open Data” policies. Both the US and the UK governments have recently launched open data initiatives that increase public access to high value, digital datasets generated by their federal governments. It is expected that these initiatives will have large economic benefits as businesses and individuals build new applications and services that employ previously locked-up government data in new ways. In the UK, for example, an added value of £ 6 billion (GBP) is anticipated from the initiative (see http://www.conservatives.com/Policy/Where_we_stand/Technology.aspx). We would encourage the Canadian government to explore an open data initiative as well.

There are two specific areas of digital research content that will require greater government support in the next few years. The first is the digitization of Canadian heritage documents, crucial in defining Canada for ourselves and the world, as a basis for historical and social research focussed on Canada, and for cultural and artistic creation (see the “Digital Media” portion of this submission).

The second area is the archiving of research data so that it can be re-analyzed to address future research questions. There is a need for the creation of a national research data infrastructure and grant funding would allow universities and research support organizations to build this infrastructure.

Open Research Data: A Resource for Discovery and Innovation

In the course of scholarly and scientific research, data is generated that may be useful not only for answering the original research questions or validating earlier conclusions, but also for addressing new questions by other researchers. As research data is collected and stored digitally, it can also be shared and reanalyzed digitally. Given the large cost of obtaining data in the course of research, much of this through public funding, it is important that it be archived such that it can be discovered and used by other researchers and innovators whether they are at public institutions or in private sector industry.

CARL has been working with other organizations, especially the NRC-CISTI-led Research Data Strategy Working Group (RDSWG; <http://data-donnees.gc.ca>), to develop and promote data archiving. Some Canadian funding agencies, such as the Social Sciences and Humanities Research Council (SSHRC) require the retention of research data, but this requirement has been difficult for researchers to honour to this

point because of a lack of digital repositories with adequate technical capability and adequately trained professionals.

The development, maintenance, and use of data archives is labour- and knowledge- intensive, but the data archiving infrastructure at Canadian universities is not yet well developed. It would be a great advantage for the Canadian research and innovation enterprise to develop collaboratively a research data archiving infrastructure, something that CARL has recommended to the federal government in pre-budget submissions.

A research data management infrastructure includes the professional skills and services to assist researchers in the archiving of their data and in working with the data of others; this expertise needs to become more widely available in Canada. There is also a need for data management skills training for researchers themselves, including graduate students. CARL has promoted training in this area with its course on data management for librarians and through the RDSWG and we are working with CNC CODATA on a similar course for researchers.

Most of Canada's research libraries already host open access digital repositories for published research results; this technological and digital management expertise, along with the data librarian's skill set, forms a good basis on which to develop a similar repository system for research data.

The CARL booklet, *Research Data: Unseen Opportunities*, explains more fully the importance of research data and the necessary elements of an infrastructure to support it (http://www.carl-abrc.ca/about/working_groups/pdf/data_toolkit_low_res-e.pdf).

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- *Once anti-spam legislation, privacy and copyright amendments are in place, are there new legislative or policy changes needed to deal with emerging technologies and new threats to the online marketplace?*

We applaud the government's recent copyright bill for its inclusion of education among the explicit fair dealing uses, for its helpful provisions for persons with perceptual disabilities, for its tempered approach to statutory damages, for its adoption of a notice-and-notice approach to ISP responsibility, and for the specific education and library exceptions in the bill. We caution the government, however, that an overly-broad legal protection of technological protection measures (TPMs) may result in the prevention of legal uses of copyrighted materials. CARL submitted a response to the government's 2009 consultation on copyright, the text of which can be found on the CARL website (http://www.carl-abrc.ca/projects/copyright/pdf/carl_copyright_consultation_submission_2009.pdf).

The government is currently negotiating the Anti-Counterfeiting Trade Agreement as well as a free trade agreement with the European Union. In both of these contexts, we urge the government to avoid accepting terms in these agreements that might restrict the ways in which Canadians have traditionally been able to legally interact with copyrighted materials in digital form.

Inasmuch as the use of online government publications are important in both education and research, we are very pleased that the government has been granting generous license for the use and copying of online materials under crown copyright. We commend the government for this progressive policy and we encourage broad application of it.

We encourage the government, through the CRTC, to promote fair and transparent network traffic management policies and practices of internet service providers (ISPs). Because most Canadians and Canadian businesses must use the services of a small number of large ISPs, the traffic management practices of the ISPs should be as "neutral" as possible, not favouring, for purely commercial reasons, some content over other. While some policies have been enunciated by the CRTC, "net neutrality" will be an ongoing concern as ever more Canadians and Canadian companies conduct business online.

The government has introduced in earlier parliaments legislation to require ISP's to put in place measures that would facilitate police investigation of online-assisted criminality. CARL has cautioned that while this may be important, it should be done in such a way that the traditional respect for the privacy of Canadians, specifically in educational and library contexts, is maintained. Bills C-46 and C-47, introduced in the last parliament, seemed to respond to our concerns; we encourage the government to give renewed consideration to these concerns when and if it introduces new "lawful access" bills in the future.

- *How can Canada use its regulatory and policy regime to promote Canada as a favourable environment for e-commerce?*

E-commerce in Canada can be promoted by the continuing development of broadband networks to which even small businesses can link and which provide robust security features, standards for which might be developed by government in consultation with stakeholders. Government might also consider encouraging, through matching grants or tax incentives, enrolment in web development and e-commerce training programs.

Building a World-Class Digital Infrastructure

- *What speeds and other service characteristics are needed by users (e.g., consumers, businesses, public sector bodies and communities) and how should Canada set goals for next generation networks?*

University researchers and research libraries depend upon wide bandwidth networks that are fast, dependable, and secure. A key use of the network is to move digital content and the amount to be moved is growing rapidly, increasingly incorporating multi-media and massive numerical content; thus, the network on which this content is moved must be constantly upgraded to the latest standards and new network tools and services must be incorporated to enable Canadian researchers and businesses to maintain their competitive edge.

We encourage the government to continue to fund CANARIE Inc. (www.canarie.ca) as a key part of the national digital infrastructure. CANARIE is Canada's Advanced Research and Innovation Network which manages an ultra high-speed network, hundreds of times faster than the Internet, which facilitates leading-edge research and big science across Canada and around the world. More than 40,000 researchers at 125 Canadian universities, 132 colleges and 49 CEGEPs use the CANARIE network, as well as scientists at many research institutes, hospitals, and government laboratories throughout the country.

For small and medium-sized businesses to be successful in the digital sphere high-quality networks must reach even to small communities, and access to these networks must be affordable for small businesses. An ongoing need for network personnel to assist businesses with the use of the networks should not be forgotten in the planning of programs to extend broadband access.

As a general matter, the fuller development in Canada of an infrastructure for research, innovation, and education (RIE) should be a matter of careful planning and coordination among governments federal and provincial, research institutions (e.g., universities), research support organizations (e.g., CANARIE Inc.), content providers (e.g., research libraries), and researchers themselves. The funding available for infrastructure development in Canada is limited, so an integrated, cohesive RIE infrastructure should be the aim, rather than a series of one-off projects with duplicated components. We support the recommendations on this theme of the group of digital infrastructure organizations that includes the Canadian Digital Media Network, the Canadian Research Knowledge Network, the Canadian University Council of CIOs, CANARIE Inc., and Compute Canada.

Growing the Information and Communications Technology Industry

- *Do our current investments in R&D effectively lead to innovation, and the creation of new businesses, products and services? Would changes to existing programs better expand our innovation capacity?*

The total impact of innovation is difficult to measure, but one need only look to the contribution of Open Text, Research In Motion, and Red Hat to begin to understand its contribution to the Canadian economy. We encourage government to continue to invest in university research through the federal granting councils. It has most often been curiosity-based research that has led to discoveries with innovative practical applications; many digital innovations began with discoveries occurring at universities that were then commercialized. As well as direct support of research and of the indirect costs of research incurred by universities, we commend the government for continuing to fund in its recent budget programs such as the Industrial Research Assistance Program (IRAP) to promote the commercialization of research discoveries.

Researchers and innovators in private industry also benefit from access to library services as a source of research intelligence. We strongly encourage the government to maintain its support of the Canada Institute for Scientific and Technical Information (NRC-CISTI; <http://cisti-icist.nrc-cnrc.gc.ca>). This would allow CISTI to serve as Canada's national science library and most effectively provide library services to researchers and innovators in private industry, especially in small and medium-sized enterprises (SMEs) that may not have other research library support.

- *What is needed to innovate and grow the size of the ICT industry including the number of large ICT firms headquartered in Canada?*

Aside from direct interventions by the government, such as development grant and tax incentive programs, leaders of ICT companies considering whether to invest more heavily in Canadian operations or to locate in Canada will look at locations well served by excellent infrastructure, including a strong network and excellent and affordable telecommunication services. We suggest as well that excellent science and technology library support, such as that provided through NRC-CISTI, will be important for firms that undertake research and development. Government would do well to consider establishing, in partnership with universities, a centre of excellence focussed on ICT research and innovation.

- *What would best position Canada as a destination of choice for venture capital and investments in global R&D and product mandates?*

In addition to our response to the previous question, we suggest that ICT Companies will also favour a location with a well-educated and highly skilled labour pool; Canada's research libraries are pleased to play an important role in higher education and in serving their communities. Finally, as the research of the University of Toronto urbanist Richard Florida has shown, creative companies such as ICT firms tend to choose locations that offer an excellent quality of life; Canada's universities, national and public libraries, and other cultural institutions contribute considerably to quality of life in their area.

- *What efforts are needed to address the talent needs in the coming years?*

ICT industry talent needs in coming years will be developed in Canada through university and college programs. Government could directly favour enrolment by high-achieving students in ICT-related programs by establishing undergraduate scholarships and graduate research fellowships specifically in this area, while allowing flexibility for innovative cross-disciplinary programming. Government might also consider contributing to the establishment of co-op programs and internship positions in ICT to help current and recently graduated ICT students to find employment in the field. In some cases, demand for ICT-related education may not be met because there are no programs available for local enrolment; ICT would be a natural fit for greater development of online education programs. We recommend that programs include graduate library and information studies programs as well since many of these graduates are recruited by, and find employment in, the ICT sector.

We encourage government to support basic literacy and numeracy in Canada, within its jurisdictional limits. Canada's libraries play a major role in the acquisition of both general literacy and digital skills, both within the K-12 and postsecondary systems and through public libraries. Throughout Canada, the local public library provides the only computer and Internet access for some citizens; library staff provide courses in computer and application use and online navigation. Librarians at universities provide similar support for thousands of university students and teach "information literacy", the finding, evaluating, and responsible use of information.

Digital Media: Creating Canada's Digital Content Advantage

- *What does creating Canada's digital content advantage mean to you?*

For Canadian researchers and innovators, the digital content advantage includes access to relevant government and research data sets (as discussed above), and ready access to the results of completed research, some of which may be found in open access digital repositories, open access scholarly journals (some of which have been made available online through Canada's CFI-supported Synergies program and some through research libraries by way of CRKN and regional research content licensing consortia.

Canadian researchers and Canadians would also benefit from being able to find federal government publications online -- both current ones on their original departmental websites and preserved documentation, which should be kept in a "trusted digital repository (TDR)." A pan-Canadian system of TDRs is currently being developed by several other research libraries together with Library and Archives Canada.

Canada's research libraries believe that Canada's digital content advantage must also include access online to Canadian historical and cultural content, for researchers and for all Canadians. One particular area where the government has a clear role to play is in the digitization of Canadian heritage documents in all forms.

Digitization of Heritage Canadiana

The digitization of Canada's documentary heritage has been a strong interest of CARL for many years. Canada's research libraries have the responsibility for the long-term preservation of our documentary heritage and the capability and mandate to make it available to Canadians; digitization is a practical approach to achieving both aims. Canada's documentary heritage is held in paper (or other analog formats) in libraries, archives, museums, or other facilities. There are few copies available of many priceless older documents and they are often in a fragile state. A fire or a flood in one library can destroy unique materials of great historical or cultural value. Once the original is scanned to high standards, its lifespan and availability is greatly increased by directing most use to its digital version, and the information carried by the original will survive in its digital surrogate if this is properly managed, even if the original does not.

The more important reason for digitizing Canada's documentary heritage is to increase access to and use of it by Canadians and by others interested in Canada. Documents dispersed across many libraries and archives are difficult to discover and difficult or expensive for a researcher to consult. Inter-library loans of rare or fragile documents are not possible and travel to consult items is unaffordable for most.

Once digitized, described, and placed online, the digital versions of heritage documents are easily found and conveniently accessed by any researcher, teacher, student, writer, film-maker, or anyone in the cultural industries. The vastly greater availability and use of our documentary heritage in its digital form does much to increase knowledge about Canada, enhance national pride, and facilitate cultural creation.

Another important benefit of the digitization of print materials is that these become amenable to new techniques of textual data mining, important for thematic, rhetorical, and linguistic research.

There are in Canada digitization projects at many institutions, some of the largest of which include:

- Library and Archives Canada (LAC) has digitized many Canadian government documents

- the Library of Parliament has digitized the Debates of the House of Commons and the Senate across almost all of the 20th century
- the University of Toronto Libraries are working with the Internet Archive to digitize millions of out-of-copyright books (Canadian and not)
- the Bibliothèque et Archives nationales du Québec (BAnQ) has digitized a large collection of French-language newspapers
- The Simon Fraser University Library has led the Multicultural Canada digitization of publications relating to Canada's various immigrant groups
- Université Laval and the University of Calgary, with some funding from Canadian Heritage, have worked together since 2001 on the Our Roots/Nos Racines project to digitize Canadian local histories in both English and French; some 1.3 million pages in 5,700 books have been digitized. In 2009 alone, there were some 5.5 million page views from around the world.
- the University of Alberta Libraries are digitizing 30 million pages of microfilmed early Canadiana that was originally microfilmed by the organization that is now Canadiana.org

Canadiana.org is a coordinating organization for these and other projects, and carries out its own digitization work as well (www.canadiana.org). It is a not-for-profit body created originally by CARL. It has as its major sustaining members CARL, BAnQ, and LAC, and as smaller members many libraries, archives, and museums across the country. It works to digitize Canadian content; to develop a national portal to all Canadian digital collections; and to coordinate the development of a series of trusted digital repositories to ensure the preservation of Canada's digital content.

It should be noted here that what we call "digitization" is really a series of operations: scanning, assigning "metadata," indexing for text searching, and making content available and discoverable online. "Assigning metadata" is essentially describing or tagging the scanned items, so that people can find the content they want. The projects mentioned above are in various stages; in some cases, content has been scanned, but is not yet available online.

Canadiana.org has estimated the corpus of Canadian documents in all formats to be about 40 million published items and an unknown (but even larger) corpus of archival materials. The result of the digitization initiatives over the last dozen years is the digitization of probably less than 1% of the Canadian corpus. In terms of just textual materials, perhaps 3-4% of Canadian content has been digitized. Considerable content that has been digitized is not yet accessible online because of the need to assign metadata and to mount the content appropriately on servers.

Digitization is not inexpensive. While the Internet Archive, a U.S.-based digital library project has managed to bring the cost as low as about \$0.10/page, the more usual costs are \$0.50-\$1.00/page. Digitization directly from paper documents is expensive because it is labour intensive. However, money spent on digitization in Canada, flows primarily back into the Canadian economy through employment of students and other Canadians.

Much of the digitization effort has been through public funding directed to Canada's academic and national libraries and archives, but CARL has also received some much appreciated direct federal government support. For example, the Department of Canadian Heritage allocated in 2007 approximately \$200,000 to support the creation of a software tool to assist libraries with the assignment of standardized metadata to digitized collections, a project that was completed in 2009 and has been important in the process of making digitized materials available online. Its value and capability has been further enhanced through development work undertaken by Canadiana.org and it receives considerable and expanding use as a digitization tool and portal mechanism.

We believe that the federal government has an interest in supporting the digitization of Canadian materials in order to make their national heritage freely available online to all Canadians. We also believe, however, that the development and marketing of value-added services around the digital collections might present both cost-recovery opportunities for not-for-profit entities and as well as profits for Canadian businesses.

There are indeed distinct opportunities for partnerships with private cultural production companies. For example, commercial producers of educational media could exploit the growing digital corpus of out-of-

copyright heritage documentation managed by Canadiana.org for the creation of classroom and student resources. Some of the proceeds from this kind of commercial exploitation could flow back to Canadiana.org to assist with the ongoing costs of further digitization and digital preservation.

As well, as noted above, the availability online of our national wealth of historical documents would be a boon to the creative sector, saving writers and other creators much time and trouble, and encouraging cultural creation in and about Canada.

CARL was very pleased to have had the opportunity in May 2010 to discuss the importance of heritage digitization before the House of Commons Standing Committee on Canadian Heritage in the context of its study, "Emerging and Digital Media: Opportunities and Challenges." We refer readers also to the submission of Canadiana.org to this consultation.

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- *What kinds of 'hard' and/or 'soft' infrastructure investments do you foresee in the future? What kinds of infrastructure will you need in the future to be successful at home and abroad?*

In brief, CARL recommends that the government invest in ICT infrastructure in the following forms, among others:

- (a) Support the continuing development of the national research network CANARIE;
- (b) Contribute to the building of a national research data management system;
- (c) Support the digitization of Canadian heritage documentation as an element of online research, educational, and creative infrastructure;
- (d) Continue to support the research enterprise at universities through investments in the national granting councils and the Indirect Costs Program (www.indirectcosts.gc.ca);
- (e) Build literacy and digital skills in the Canadian labour force through training programs and incentives and through partnerships in the library community.

- *How can we ensure that all Canadians, including those with disabilities (learning, visual, auditory), will benefit from and participate in the Canadian digital economy?*

With respect to the needs of persons with disabilities, we encourage the government to ensure that programs and not-for-profit organizations that provide services for persons with disabilities such as the Canadian National Institute for the Blind are well supported. We are pleased to see in the recently introduced copyright bill (Bill C-32), that there are provisions that ease import/export restrictions for alternate-format materials and that technological protection measures can be circumvented to give access to copyrighted materials to those with perceptual disabilities. The federal government can also play a role in ensuring that Canada's libraries, both public and in educational settings, have appropriate computing hardware and software so that students and other library clients with disabilities are able to benefit from the library and Internet content that is available to other Canadians.

As an example of the benefits to Canadian society that the application of ICT can bring, we note the enhancement of access to health information sources for health professionals by way of the Canadian Virtual Health Library (CVHL). This project supports health science and service research, bringing the benefits of 21st century information technologies to every health professional across the country, underlining the value of the information infrastructure for every Canadian. Already, research libraries have exercised leadership in healthcare information provision across several provinces, and CARL explicitly endorsed the successful funding of the Canadian Virtual Health Library, an initiative of the Canadian Health Libraries Association and CIHR, which aims to improve access to health information in all parts of Canada.

More generally, the federal government will encourage the engagement in the digital economy of all Canadians by continuing to work with provincial and territorial governments and with the private sector in extending access to broadband Internet service to all communities and rural and northern areas. Because a still-significant portion of the Canadian population does not have a computer or Internet service at home, the

local public library is still important in providing these; the government should continue its successful Community Access Program (CAP; www.ic.gc.ca/eic/site/cap-pac.nsf/eng/home).

Building Digital Skills for Tomorrow

- *What do you see as the most critical challenges in skills development for a digital economy?*

One challenge in Canada may relate to achieving full enrolment in Canadian college and university programs in ICT areas of study that may not be at capacity. An enrolment survey of institutions may be helpful to assess this. Where full capacity is achieved, it may be necessary to expand that capacity to meet regional ICT labour market needs. Greater development of online post-secondary ICT education programs will help to address both of these challenges. Students in ICT-related programs should graduate not only with technical skills, but also with a broader set of professional and business skills (writing, research, planning, ethics, etc.); since most doctoral graduates in sciences work industry, such professional skills will be important for them as well.

Another major challenge is the integration of skilled immigrants into the labour market in Canada. Given that immigration must continue to be a source of skilled workers, Canada must not only attract immigrants, but must more fully succeed in removing structural and social barriers to employment in immigrants' fields of work, especially in the ICT sector. Universities and colleges in Canada are "magnets" for attracting skilled foreign nationals who wish to access programs not otherwise available or accessible at home.

- *What is the best way to address these challenges?*

The government might consider special scholarship programs to encourage enrolment in ICT programs of study at Canadian colleges and universities. Tax incentives may be helpful for encouraging the hiring of recent immigrants who have digital skills. Special tax incentives might also be used to encourage professional development of staff who need to acquire ICT skills for their career development.

- *What can we do to ensure that labour market entrants have digital skills?*

The government might find jurisdictionally appropriate ways to work with the educational and library communities to ensure that digital skills are systematically taught to and practiced by students from as early an age as possible.

- *What is the best way to ensure the current workforce gets the continuous up-skilling required to remain competitive in the digital economy? Are different tactics required for SMEs versus large enterprises?*

The government might consider using tax incentives to encourage individuals and companies to undertake professional development. SMEs may benefit from online skills development options that could be developed on a national level. The federal government may wish to make some funding available to educational institutions to develop digital skills programming online.

- *How will the digital economy impact the learning system in Canada? How we teach? How we learn?*

Already a considerable portion of the research, teaching, and learning materials provided by Canada's research libraries are in a digital format; this will become increasingly the norm. It is also likely that course textbooks will be sold primarily in digital format within a very few years. Canadian students, then, will more and more, and from an ever earlier age, need to have access to computers (or other e-reading devices) to conduct their studies. Increasingly, these will need to be mobile devices. The digital economy will encourage the development of many online learning options for learners, which may either supplement or replace classroom learning. Teaching and learning can become much more interactive and a variety of digital and information skills can be learned in the course of preparing assignments in digital formats.

Canada's research libraries are contributing to this transformation through their purchasing/licensing digital content from vendors (publishers or aggregators), either directly or through licensing consortia, and making this content available to their users. In the 2007-2008 year, CARL member libraries spent \$256.3 million on library materials, of which about half (\$122.8 million, 48%) was spent on electronic serials and books.

Over the last decade, Canada's research libraries have changed the way they maintain their collections. In addition to the shelves of books and periodicals, our members have expanded their technology resources and digital collections. This is an ongoing process, with scholarly journals becoming available in digital formats and now increasingly books and other formats (e.g., audio-visual). This process has been expensive for libraries since it has meant that during the transition, both paper and digital versions have had to be purchased; as the campus community has come to use and prefer digital versions and as technical and licensing provisions have improved, libraries are ceasing purchase of paper materials where there are quality digital alternatives.

A by-product of the shift to digital collections in university libraries has been the ability to use library space formerly occupied by shelving for student learning spaces that provide appropriate furnishings for both individual and group work; computing hardware and productivity and creative software; access to online and paper resources; and the availability of assistance by librarians, writing coaches, and computing assistants. These "learning commons" facilities have been extremely successful campus developments that support modern approaches to teaching and learning employing group work and digital multi-media presentation of ideas. With the explosion of digital library resources and better online systems for discovering and accessing them, librarians have shifted the emphasis of their contacts with users from assistance in finding information to teaching the evaluation and use of information. Perhaps ironically, Canadian university library buildings have become more heavily used by students in the digital age than they ever were in the paper age.

Canada's research libraries have been participants in recent discussions with the university presses and with the Canadian-based publishers of scholarly journals to consider the sustainability of the academic publishing regime in Canada. Digital publishing and online licensing has been identified as a key part of the solution, but discussions are still at an exploratory stage around appropriate business models for long-term sustainability.

- *What strategies could be employed to address the digital divide?*

In brief, some strategies that the government can employ to address the digital divide in Canada include: (a) continuing with the extension of broadband Internet access to rural and northern communities, including aboriginal communities; (b) continuing to support the Canadian Access Program (CAP) so that all Canadians can have some access to computers and the Internet; (c) develop, with education and library partners, affordable and accessible digital skills training both online and across the country in schools and libraries.

Canada can significantly contribute to scientific and scholarly research content that is available to all Canadians and to practitioners, educators, researchers, and innovators in even the poorest countries by mandating that the results of publicly-funded research be made accessible on the Internet on an open access basis. This is a low-cost policy decision that is currently even being legislated in the United States and other countries.

Conclusion

- *Should we set targets for our made-in-Canada digital strategy? And if so, what should those targets be?*

Canada might usefully set targets around such things as the proportion of Canadians who have access to broadband Internet (100 percent?); the number of pages of Canadian heritage content that is digitized each year; the yearly increase in the number of students in ICT educational programs; the achievement of policies on open access archiving of research data and results and increases in compliance rates; the speed of the national and regional research networks and the number of institutions and enterprises connected to them; the increase in the numbers of Canadian ICT patents from year to year—and so on.

- *What should the timelines be to reach these targets?*

2017 is the 150th anniversary of Confederation; the achievement of a set of digital strategy targets would indeed be something for Canadians to celebrate on that occasion.

The Canadian Association of Research Libraries

The Canadian Association of Research Libraries (www.carl-abrc.ca) is the leadership organization for the Canadian research library community. CARL members are the 29 largest Canadian university libraries as well as three national institutions (which do not participate in Association advocacy activities). CARL works to enhance the capacity of member libraries to partner in research and higher education; to seek effective and sustainable scholarly communication; and to promote public policy encouraging of research and broad access to scholarly information. CARL was established in 1976 and is incorporated as a non-profit organization under the Canada Corporations Act.

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