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# LASTING CHANGE: SUSTAINING DIGITAL SCHOLARSHIP AND CULTURE IN CANADA

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*Report of the Sustaining Digital Scholarship for Sustainable Culture Group:*

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*A Knowledge Synthesis on the Digital Economy funded by the Social Sciences and Humanities Research Council of Canada*

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**DECEMBER 2010**

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# Sustaining Digital Scholarship and Culture in Canada

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## EXECUTIVE SUMMARY

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This report reflects the growing concern in the scholarly and cultural communities, and beyond, regarding the sustainability of Canada's digital knowledge and heritage. Canada's digital advantage is only of value if it can be carried into the future. Canadians must meet the challenge of preserving and enhancing scholarly and artistic knowledge production and our culture in a digital environment. This report reviews the current state of knowledge about the sustainability of digital scholarship and related cultural activity in Canada and identifies research opportunities that emerge from consideration of the literature.

The report concludes the following:

**Economics and the Public Good:** Digital scholarship and artistic creation make major contributions to the public good; they also produce economic spin-off effects that are insufficiently understood.

**Challenges of Diversity:** Sustaining contemporary culture and digital heritage will require a multi-faceted approach that draws on the academic community to address cultural difference.

**Shifting Ground:** The pace of change creates major challenges and a need for agile, flexible responses to new developments on the part of both institutions and governments.

**Policy Opportunities:** Canada is well positioned to take a series of proactive steps towards achieving a position of leadership in relation to digital innovation, scholarship and the arts and humanities.

The report addresses the state of knowledge and the identification of knowledge gaps as follows:

### VALUE

Digital humanities scholarship and creation sustains both the economic and the public good in Canada. It sustains the economic good by fostering innovation and knowledge mobilization, and by training highly qualified personnel with diverse intellectual and practical skills. Digital humanities scholarship sustains the public good by generating uniquely Canadian digital content while also preserving Canada's digital and documentary heritage. The arts and humanities provide sites from which to arrive at a nuanced understanding of sustainability in the digital age, to serve as a basis for a flexible model of digital heritage that reflects the richness and diversity of Canadian culture.

**Research Opportunities:** Cultural spillover of digital scholarship in Canada; links between scholarship, cultural activity and artistic creation; sustainable digital activities for environmental sustainability; digital media as a site of indigenous engagement.

### PRESERVATION

Libraries, archives and cultural memory institutions are taking the lead in creating, aggregating and exposing digital repositories that not only preserve our cultural heritage for the long haul but make it accessible to a wide public. Sustainability of this knowledge resource must be central to national digital preservation strategies. Widespread mobilization of the content offers the best chance of preservation in a fragile, uncertain digital environment.

**Research Opportunities:** Long-term viability of open and distributed models of preservation; the development of a robust and reliable national digital preservation strategy; the development of a high-profile Canadian creative digital archive.

### INTELLECTUAL PROPERTY: RIGHTS, CREDIT, CONTROL

Alternative rights protocols model partnerships among scholars, artists and cultural practitioners to provide sustainable and equitable principles of access. They seek to acknowledge and balance the needs and

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investments of different sectors, and strive to foster a knowledge economy based on openness rather than a privatization of knowledge that results in the restriction of its dissemination.

**Research Opportunities:** The balance between credit and knowledge mobilization in the digital economy; the risks of privatizing cultural heritage; models of intellectual property rights that respect diverse interests; effective forms of remuneration for creative intellectual work in a digital economy; the promotion and circulation of scholarly and creative work.

## NEW MODES OF RESEARCH CREATION

New forms of digital research reach larger audiences, push the boundaries between the academy and communities, and provide opportunities for partnerships and collaborations across traditionally isolated sectors and disciplinary boundaries. Their difference from traditional research, however, means they may not be adequately assessed by existing systems of scholarly evaluation.

**Research Opportunities:** Discrepancies between institutional rubrics of value and new forms of scholarship; modes of recognizing collaborative work on large-scale digital projects; the role of voluntary labour in sustaining scholarship; alternative forms of authorization and credit; means of bridging the gap between scholarly research and preservation.

## INSTITUTIONAL INVESTMENTS, PARTNERSHIPS AND RESOURCING

Academic institutions can support digital research creation by providing infrastructural support, policy-level support of open access practices and technical staff invested in humanities research. Emergent institutional frameworks contribute to producing citizens with diverse and adaptable skill sets.

**Research Opportunities:** Evaluation of models for cross-sector partnerships; forms of accrediting digital skills acquisition through experiential learning; assessment of different modes of institutional support for digital research and content creation.

## FUNDING MODELS FOR SUSTAINABLE SCHOLARSHIP

Funding models must meet the particular needs of digital scholars, including fostering a range of partnerships beyond the academy and providing life-long learning to address the rapid shifts in digital technologies and practices.

**Research Opportunities:** The impact of funding models on research production and related cultural creation; the relationship between funding models and partnerships across institutional boundaries (libraries, archives, community and private sector); the role of sustainability in research programmes.

## NATIONAL POLICY GAP

The move towards digital research in the humanities is inevitable, and strong national initiatives to support and ensure the quality of this work are central to building a globally competitive knowledge society. These include: a national digital preservation strategy, the fostering of strategic partnerships and greater support for innovative research creation and dissemination. A national metadata portal, a national tool repository and an articulation of a set of national sustainability standards and practices would have a major impact in providing a policy foundation to strengthen Canada's digital economy.

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## CONTEXT

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Canada's digital advantage requires a model for scholarly knowledge production and dissemination that recognizes the crucial role the digital environment plays in sustaining Canadian culture and the public good, and in generating research outputs — whether of exemplary content, software prototypes, or highly adaptive personnel — of major importance to the cultural sector and to private enterprise.

This is a review of what we know about sustaining scholarship and cultural creation within the digital ecosystem. A multidisciplinary and cross-sector team, ranging from academics and librarians to representatives of cultural groups, memory institutions and the private sector, produced this paper. We represent the partnership of the academic community with the broader cultural sector of creative practitioners, professional writers' groups and publishers. We span interests in current scholarly practice, cultural heritage and contemporary culture. While some articulations of the importance of the humanities omit the digital (Nussbaum 2010), this group sees the future of and indeed the hope for humanities scholarship and the arts to be intimately, inextricably, bound up with digital media and the digital economy. Many work in fields where a first generation of digital knowledge or creativity is imperilled, and we are well positioned to report on emergent solutions.

The quick pace of technological development together with the transformation of scholarship by digital media means that we cite here a wide range of sources ranging from academic books and journals to blogs, policy documents and online reports in an effort to capture the current state of knowledge and debate.

Canada is at a watershed moment in the shaping of Canadian culture. With each major shift in media, Canada has had a Royal Commission to consider the implications of the transition to new ICT (1928-29, Aird, on Radio; 1955, Fowler, on Broadcasting; 1960-62, O'Leary, on Publications; 1981, Kent, on Newspapers). The digital revolution is having a much more swift and profound impact than any of these previous media. The vigour of the response to the Government's two-month-long consultation on the Digital Economy Strategy paper demonstrates the strong public interest in the relationship between research and sustainability: the Idea Forum's top three contributions were all related to knowledge production and open access to data.

History indicates that how we engage with digital technologies will have a major impact on national identity and national sovereignty (Charland 1986). The Massey Commission of 1949 investigated the interrelation of science, humanities and culture, and in so doing laid the foundation for policies that underpin Canada's success as a knowledge producer and its hugely expanded cultural sector. However, the current situation is different in some key ways. The regulatory framework for Canadian culture has been transformed by increasing globalization and the shift to free trade (Jankowski 2009; Brydon 2010). Our population is more diverse than it was 60 years ago. Perhaps most significantly, Canada's recent endorsement of the UN Declaration on the Rights of Indigenous Peoples carries with it major responsibilities with respect to sustaining and revitalizing the knowledge and culture of our First Nations (Articles 11, 15, 16). Along with the digital revolution, these major changes have produced gaps in knowledge and policy that present significant new opportunities for research that will have a major impact.

## VALUE

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With respect to sustaining Canada's digital advantage, scholarship in the humanities produces research according to paradigms different from those of applied science or industry. In that difference lies the strength of complementarity. Investments in sustaining digital scholarship in the humanities have a high rate of return in terms of the public good, economic impacts, innovation and a labour force suited to the new economy.

A recent study conducted in the UK invited five disciplines to identify the impact of their research beyond the academy. Their results strongly suggest the many benefits of humanities research and creation, including partnerships with public institutions, valuable digital archive creation and impact on national literacy policy and international teaching standards. Humanities research, they concluded, "transforms the intellectual and cultural landscape, generates commercial capital and sustains citizenship and civil society" (Simons 2010). Similarly, the Lib-Value Project is a three-year research project proposing to assess quantitatively the return on investment of university libraries through a variety of measures, including the success rates of faculty grant proposals (Lib-Value Project 2010). Their findings thus far strongly suggest the level and quality of digital holdings at university libraries have a direct correlation to faculty grant success rates (Kaufman and Walter 2008). Both of these projects suggest that there is measurable value in the humanities and the cultural sector, and that further research is warranted.

Scholarship in the humanities and production of the arts in digital media encompass a huge range of activities, from the creation of highly authorized online content through the production of games and performance to the investigation of online behaviours or the creation of emergent materials such as electronic paper. The flexibility, creativity and diversity of this output is a vital component of the digital ecology (see McGann 2010a for a cross-section of digital scholarship), so is the frequent commitment to long-term sustainability and impact as a balance to the often more immediate goals of the private sector. This section will address the state of knowledge regarding the value of such scholarship in terms of:

- Rubrics of value that balance public good with economic good;
- The vital role of the humanities and creative arts in innovation and knowledge mobilization;
- The intrinsic but under-studied linkages between the academy and associated cultural activities, including both creation and consumption;
- The humanities as a site of training for highly qualified personnel;
- The ability of humanities scholarship to generate Canadian content and sustain Canadian heritage;
- The importance of an approach to the digital economy cognizant of cultural diversity;
- The nuanced conception of sustainability that emerges from humanities scholarship and the cultural sector.

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## RUBRICS OF VALUE

The public good and the economic good are complementary components of Canada's digital advantage, and digital research and knowledge creation are vital to both. A 2008 report by the Conference Board of Canada stresses the intrinsic interrelation of the cultural sector and economic prosperity. The movement of Canada towards a knowledge-based economy only strengthens this link, particularly through the increasing reliance of both the economy and the cultural sector on digital media. In order to remain a competitive global presence, the report argues, Canada must maintain its thriving cultural sector.

Since we cannot decide in advance what applications may emerge from what knowledge, prioritizing instrumental research over arts and humanities is problematic. For instance, environmental scholar Robert McLeman, in studying "microbursts", aberrant weather conditions in rural Ontario (2009), in the absence of historical records, turned to Susanna Moodie's *Roughing It in the Bush*, a seminal work of Canadian literature, to find evidence that they had existed in the nineteenth century. The preservation and open electronic dissemination of such materials will ensure that such valuable products of the past are increasingly accessible for a wide range of anticipated and unanticipated uses (LAC 2001).

Studies attempting to assess the economic value of arts and cultural activities routinely admit the extent to which such activities cannot be measured in exclusively economic terms: the spin-off impacts of "quality of life" cannot be quantified, and yet clearly have economic and social value (Singh 2004; Melo 2002; Dayton-Johnson 2000). Digital knowledge and its dissemination offer improved quality of life for scholars, researchers, students, teachers and others, but measurements of this improvement are difficult to quantify through monetary measures or immediate payoffs such as the generation of patents or products. In economic terms, "consumption of domestic cultural products generate important and heretofore unrecognized externalities" or ancillary effects, though explicit valuation is not feasible. Where ancillary impacts have been tracked in relation to particular arts activities, public arts investments have been found to have a high rate of return (Sandhu 2006). The social cohesion contributed by cultural activities has also clearly documented a strong contribution to economic growth (Dayton-Johnson 2000; Arts Research Monitor). The quantifiable data alone, however, make it clear that the growing cultural sector is "indispensable" to the Canadian economy, contributing more than \$33 billion in GDP (about 3.8% of the total), on average, from 1996 to 2001 (Singh 2004). Moreover, when the impact of the cultural sector on other sectors of the economy is taken into account, the economic footprint is much larger, estimated at \$84.6 billion (7.4% of the GDP) in 2007 and responsible for 1.1 million jobs in Canada (The Conference Board of Canada 2008).

## INNOVATION AND KNOWLEDGE MOBILIZATION

An estimated 80% of online information takes the form of unstructured text. To transform this information into knowledge we require new ways of processing text. One of Canada's premier software corporations, Open Text, originated in a pioneering digital humanities project, the *Oxford English Dictionary*. XML, the pervasive technology for storing and manipulating online text, also has its origins in Tim Bray's work on the *OED* project and in work by Michael Sperberg-McQueen, a PhD in Comparative Literature from Stanford University. Universities have begun to collaborate on developing open-source software to their mutual benefit, pooling their resources to create truly innovative products often in partnership with commercial affiliates (Butterman 2007). Canada's digital edge is bound up with the future of research and development connected with textual processing, and the digital humanities, communications and media studies, literature and performance are all rich fields of new problems and methods.

Curiosity-driven scholarship is an important complement to private-sector R&D. A research project such as Implementing the New Knowledge Environment can experiment freely with tool creation and then move the

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work over to the private sector, either through partnerships or through open-source development, for refinement and production. Spin-offs from university research and development contribute to economic growth (DiscoveryGarden, based on the UPEI library's innovation on the open-source Fedora repository software ["About Discovery Garden"]; Half-Baked Software, a University of Victoria spin-off ["Half-Baked Software"]). The academic community creates an invaluable knowledge pool for innovation. Even in commercial R&D the time from research to profit can be a lengthy one, as the case of Xerox PARC emphasizes, and the value of academic research and creation is such that major IT corporations such as Intel and Cisco are increasingly partnering with academic researchers rather than maintaining in-house research programs (Duke 2004; Chesbrough 2003). Public-sector and academic research are of particular importance in Canada, given its relatively low private-sector R&D activity. Moreover, spillovers from public research and innovation are estimated to have more than 40% greater impact than private-sector research (Department of Finance 2005).

## SCHOLARSHIP AND THE CULTURAL SECTOR

The concept of the "creative economy" embodies the links among knowledge creation, cultural creativity and economic development, all of which are permeated with technological creativity (United Nations 2008).

The role of humanities research in relation to the larger cultural sector is understudied, but can be deduced from qualitative evidence. The Research Excellence Framework pilot project began the work of quantifying links between scholarship and culture in the form of "partnerships with public cultural institutions, theatre companies, museums and galleries" as well as impact on the publishing industry (Simons 2010). Most obviously, academic research — both that produced by members of the academy and that produced by those the academy trains in research methods — produces much content for academic and mainstream presses. The spin-off effects of literary and research projects are often multidirectional and extensive. Elizabeth Smart and Gwendolyn MacEwen, two mid-century Canadian writers, were given new currency by Rosemary Sullivan's recent award-winning literary biographies, which in turn resulted in the republication and translation of Smart's and MacEwen's works, theatrical productions and options for film rights.

The research-teaching link in areas such as Canadian literature, theatre and creative writing has multiple impacts: it sustains sales of Canadian-produced books as textbooks, keeping them in print long after their primary sales opportunities have subsided; it provides self-employed writers, actors and directors with opportunities for consultation and collaboration; and it produces life-long arts consumers. Canadian arts festivals are frequently organized by or in partnership with researchers. Online, new modes of circulation and dissemination of Canadian-produced books, such as BookNet Canada and Canadian Bookshelf are working to innovate the ways in which scholars approach and use texts (BookNet Canada 2010; Canadian Bookshelf 2010). New incentives initiated by SSHRC and other national funding bodies foster further development of a radical interdisciplinarity that blends creative practices with research models. The humanities and creative arts are ideal sites for developing exciting new design formats for intellectual production and dissemination in the new digital media, with extensive potential benefit to other sectors.

In sum, the open circulation of academic knowledge is a public good paid for by taxpayers' dollars, which also has significant impacts in the cultural industry. It helps to sustain both private-sector innovation and the cultural sector, a valuable factor in turbulent economic times.

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## HIGHLY QUALIFIED PERSONNEL (HQP)

Employers in the new economy are demanding workers who combine domain-oriented knowledge with intellectual and practical skills: in a US survey of several hundred employers “written and oral communication” and “critical thinking and analytic reasoning” top the list of desiderata well above skills such as quantitative reasoning (Hart Research Associates 2010). Humanities research, in employing graduate students, incubates personnel with exceptionally advanced skills in these areas. Research in the digital humanities, communications, design, multimedia and other technically-oriented fields within the humanities combines such skill development with technological literacy and development training.

Sustaining digital research in the humanities will produce HQP with this combination of crucial skills. Expanding the innovative and interdisciplinary graduate programs in these fields will sustain knowledge development, produce a higher volume of these uniquely qualified personnel and produce conduits for knowledge transfer from academy to industry and public sector.

Research is transferred, along with skills, by advanced training in digitally-oriented humanities programs. The Humanities Computing Program at the University of Alberta, for instance, offers an innovative blend of research activity with technical experience and project management. The Masters of Digital Media Program at Great Northern Way University provides a model of building student projects around industry-driven problems, philanthropic causes, or social-change initiatives. Gaming companies are asking for programs to produce students with a combination of creative writing and technical backgrounds. The Canadian Film and Television Production Association has asked for a longstanding commitment on the part of the government to ensure the training of highly qualified digitally skilled personnel under Canada’s National Digital Economy Strategy (CMPA 2010). The combination of humanities research with technical know-how injects uniquely qualified personnel into Canada’s knowledge economy.

## GENERATING CONTENT; PRESERVING HERITAGE

One policy analyst notes: “the Internet is important for public policy because — perhaps *primarily* because — it is a medium for delivering culture” (Dayton-Johnson 2002). Canada’s digital footprint is modest despite our high rate of Internet connectivity. About a decade ago, it was estimated that Canadian sites garnered only 16% of our domestic traffic on the web (LaPierre 2002). The production of a critical mass of content with longevity, high production values and strong links to Canadian national identity is key to engaging citizens, creating contexts that can promote national creativity and innovation and raising our international profile. Indeed, the availability of Canadian content on all digital platforms has been identified as a key component of Canada’s national digital strategy by Industry Canada (Meahan 2010).

Authoritative content balances mainstream web technologies’ privileging of the popular (Brabazon 2007). The digital humanities as an interdisciplinary field of research brings together technical skills with cultural content preservation, dissemination and creation, enriching the quality of nationally produced digital content. Humanities scholars, and their “lab” of the academic library, are essential to the preservation of Canadian heritage and the expansion and maintenance of our national archive. That archive serves not only academics but the public. One of the great advantages of the digital turn is the extent to which it is strengthening library and researcher partnerships beyond the academy. Digital archives reach out to local groups, secondary school teachers and members of the arts communities. Academic researchers and libraries have a key role to play in partnering with First Nations groups to foster and preserve cultural materials in an environment of mutual respect and equality.

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The production of digital media is public-facing by nature. Public heritage contributions make knowledge portable and accessible, reaching out to the marginalized, such as Canada's rural and indigenous communities, and preserving the records of some of our most evanescent or fragile cultural productions, be they in theatre, oral history, or avant-garde performance. Such activities need to be understood by academic assessors not as ancillary to serious scholarship but as key transfers of scholarly knowledge.

## DIVERSITY IN THE CULTURAL SECTOR

The academy is in some very real ways a key player in the preservation of certain sectors of Canadian culture. Theatre is an example: major works of Canadian drama are often produced only once, and find their enduring cultural impact not through repeated performances but through their presence on university syllabi (the work of Judith Thompson and Sharon Pollock and anthologies such as Jerry Wasserman's *Modern Canadian Plays* [1994], are cases in point). Digital humanities work can make marginalized materials more central and widely available, thus sustaining them.

The diversity of Canadian culture requires a flexible model for sustaining digital heritage. The cultural inflection of sustainability is seen most keenly in relation to indigenous cultures, whose notions of property and community demand innovative solutions. The emphasis on the linkages between environmental and cultural sustainability within First Nations knowledge systems, moreover, offers an opportunity to research and develop new community-based models of digital sustainability. The proliferation and dissemination of indigenous languages online shows the extent to which indigenous communities, once connected, will seize new media as a means of sustaining knowledge, culture and community; this in turn is leading to new socially networked modes of scholarship (Tamez 2010a; Tamez 2010b). Just as multicultural and aboriginal television programming functions as "bridging social capital" that contributes to social cohesion and understanding of diversity (Roth 2006), diversity in digital media will constitute a public good, enhancing engagement through interactivity. Such diversity is fostered by academic research.

In an age of information, we are in the ironic position of facing the loss of much of the richest knowledge of the past couple of decades, when research first began to migrate to digital form. Canada will miss a major opportunity if it does not sustain and circulate its digital wealth. To take a prominent example of national story-collecting, the Truth and Reconciliation Commission is recording impact statements from survivors of Residential Schools. Preserving the wealth of knowledge and depth of history embedded in those stories and readying them for dissemination, would provide both a rich mine for scholarly knowledge and an invaluable cultural archive (for research already underway on the TRC and the importance of archiving as a form of cultural memory, see the work of Naomi Angel [Angel 2010]). Within academia, there is a wealth of data in first-generation scholarly resources whose creators face, with retirement, the loss of the institutional resources to sustain their databases or websites.

## DEFINING SUSTAINABILITY

The literature points to the complexity of the concept of sustainability itself (Bradley 2007; Selfe et al. 2009a). It encompasses not only the demand for ICT industry activity and employment but also considerations such as quality of life, Canada's national and international digital identity and what will survive for posterity. It implies a broader concern for the natural environment (DeVoss et al. 2009). Sustainability is always culturally inflected; for instance, conventional understandings of ownership and authorship are productively challenged by indigenous participation in the digital economy (Alexander 2001; Brown 2007; Christen 2005; Seadle 2002; Sullivan 2002). The move to develop an explicit national digital strategy is welcome insofar as it opens up

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discussion of how to achieve sustainability that looks to the long term. Such a strategy will encompass universities and colleges, libraries and archives, granting agencies, government at the federal, provincial and municipal levels, the private sector and a cultural sector that includes creative practitioners as well as museums, community groups and cultural organizations. A consideration of cyberinfrastructure by the American Council of Learned Societies identified a need to invest in training, services and the production and maintenance of digital resources and tools (ACLS 2006).

Sustaining scholarship thus extends beyond the dissemination of research outcomes. It involves thinking beyond maintaining traditional scholarly output such as open-access journals (Downes 2007; Fitzpatrick 2009; Lorimer and Maxwell 2007; Lorimer 2010), to conserving raw materials or data through digital preservation, supporting non-traditional forms of scholarship that are not instantiated as finished products but continue to expand and change over time and exploring new modes of research dissemination.

Nor is sustainability the same as storage (Fitzpatrick 2009; Jantz and Giarlo 2005); a genuinely sustainable digital preservation model will therefore require a greater infrastructural investment. Similarly, the move to large-scale digital scholarship presents major challenges in terms of maintenance and updating if these important sites of current research are to survive (SDS 2004; Brown et al. 2009). Other central concerns for the development of a national digital strategy include the development of standards to support interoperability, as well as sustainable models for training emerging scholars to adapt to the digital workplace (Sinclair and Gouglas 2002).

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## Research Opportunities

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- What are the cultural spillover impacts of digital scholarly activities in Canada?
- How might we investigate the intimate interlinkages between scholarship, artistic creation and public cultural activity? Understanding the impact of digital scholarship on culture would contribute to a national digital strategy.
- How is the sustenance of digital activities related to the growing sensitivity to environmental sustainability?
- Indigenous peoples' engagement with digital media deserves particular attention in future analyses.

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## PRESERVATION

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Only 4% of our cultural heritage is currently online. This number only refers to text content. If all of Canada's documentary heritage were included, the percentage of digitally preserved Canadian cultural heritage would be less than 1% (Canadiana.org 2009). Non-digital knowledge is increasingly marginalized, so sustaining a vibrant knowledge economy means ensuring swift digitization of our physical archive material. Such an initiative would boost the economy through job creation and HQP training, while putting Canada's digital economy on a firm foundation. Further, our recent and current intellectual capital, in the form of ongoing digital scholarly and cultural production, is particularly at risk due to its unstable and transitory nature ("LAC"). A whole generation of research and creation — from born-digital scholarly research through interactive poetry to computer games for which consoles are no longer made — is in danger of being lost because adequate preservation strategies have yet to be devised for now-obsolete recording technologies ("Digital Poetry Archive"). New media and born-digital scholarship provide unique opportunities for both sustaining and mobilizing cultural heritage and creation (Kalay et al. 2008), but also present unique challenges for archivists, scholars and creators dealing with new technologies (Russell 2007; Jantz and Giarlo 2005; Fitzpatrick 2009).

The library and archives community is tackling digital preservation for long-term access and sustainability as an extension of its longstanding commitment to preserving and curating the human record. Libraries have the expertise and resources to maintain digital materials and ensure their availability over a long period of time through initiatives such as institutional repositories; indeed digital libraries are an integral component of knowledge infrastructure (Larsen and Wactlar 2003), and have contributed to such influential initiatives as the Public Knowledge Project, which works to establish a sustainable and globally accessible body of high quality digital scholarship (Public Knowledge Project 2010). Cultural memory institutions like Canadiana.org are working to ensure access and extensive digitization (Canadiana.org 2010). Beyond these models of intentional preservation, open standards and open distribution involve communities in the process of sustaining materials in which they have an interest (Morrisey 2010). This synopsis covers:

- The creation and implementation of national metadata standards;
- The advantages of distributed digital preservation networks for large-scale digitization;
- The national importance of preserving culture and heritage;
- Some examples of successful preservation strategies.

## NATIONAL METADATA STANDARDS

Digital archives offer new opportunities for discovering relevant content in documentary heritage. With evolving online search tools, metadata — or "data about data" — takes on new and increased importance as part of the archive by enhancing findability and hence access. The access to "relevant" digital archived content is enhanced significantly when the metadata has been expanded to facilitate online searching (Cantara 2006). For example, metadata enhancements include searchable text from optical character recognition scanning, crowd-sourced descriptions and tags, as well as user- and system-generated cross-artifact linkages. The organization and classification made possible by metadata increases the audience for digital texts by making them easily available to readers and customers (LAC 2001). Integrating and enhancing metadata as part of the digital archival process, adopting preservation metadata standards and leaving the metadata open for ongoing enhancements makes Canada's documentary heritage more accessible and thus more valuable (Webb et al.

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2003; Tjiekka 2007; PREMIS). Jantz and Giarlo (2005) conclude that “preservation and access are inextricably linked.” Sustainability involves archiving in a way that allows information to continue to circulate.

## DISTRIBUTED DIGITAL PRESERVATION NETWORKS

Libraries increasingly work to preserve materials beyond their own collections as archival preservation increasingly becomes predicated on the philosophy of replication or the LOCKSS (Lots of Copies Keeps Stuff Safe) principle. For example, Canada Research Chair Dr. Cynthia Patton’s research with the Downtown East Side of Vancouver involved the creation of a repository of materials for DTES partners’ use that is housed in Simon Fraser University Library’s online site. This work has been done in collaboration with interested researchers and members of the cultural communities and other institutions. A collaboration between publisher Alan Twigg and the SFU library made the *BC Bookworld’s* Author Database and past issues available online for the first time (“About ABC BookWorld”). Software tools and policies standards and practices have led to increasingly successful projects. A good example of such a project is the Alabama Digital Preservation Network (Trehub and Wilson 2010).

One reality that has emerged, however, is the very large cost of this preservation, particularly if longevity beyond a few years and existing formats is envisioned. Walters and Skinner (2010) argue for the economic viability of distributed digital preservation networks. The recent CARARE report on the sustainability of digital curation of heritage data also points to the fact that long-term preservation models require truly sustainable funding models that are limited neither to public sector funding nor to the monetisation of cultural goods. Just as collaborative preservation initiatives prove more sustainable, so do collaborative funding models (Moore et al. 2010).

## PRESERVING HETEROGENEOUS DATA AND LIVING KNOWLEDGE

Much digital scholarship, particularly that from the humanities, emerges in forms that pose particular challenges to preservation due to the granularity of the data, the heterogeneity of the digital objects, the complex relationships amongst them and the tendency of projects to remain living and dynamic rather than reaching a point of completion and stability (SDS 2004). “Living archives” is a term increasingly used to describe a rather heterogeneous set of practices, from the UPEI-based and Canadian Heritage-sponsored Living Archives mobilization of secondary-school students to document social history and artifacts (“A Living Archives”), to partnerships between scholars and living Canadian artists to produce multimedia online archives of the artist’s work (Wah). All share, however, a sense that digital media enable a continuous and emergent mode of knowledge production with exciting potentials for moving substantial bodies of contemporary cultural production online. The “living archive” also poses fundamental questions about sustainability since “the question of technology, of access and therefore inevitably of funding are as central to a ‘living archive’ as the aesthetic, artistic and interpretative practices” (S. Hall 2001: 91). Adequate funding and resourcing of digital archival practices, including extensive rapid technological expertise acquisition, is therefore central not only to sustaining our cultural heritage but also to sustaining our thriving cultural sector.

## PRESERVATION STRATEGIES

There are numerous international examples of successful digital preservation strategies, including the US government-sponsored National Digital Information Infrastructure and Preservation Program (NDIIP), run by the Library of Congress (Beagrie 2003). In Canada, however, there has been little government-sponsored activity specifically directed toward preservation and access on a national scale, two notable exceptions being

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the Canadian Heritage Information Network (CHIN) Virtual Museum of Canada that harvests metadata and thumbnail images from some Canadian Museums and the Canadian Archival Information Network (CAIN) that performs a similar function for archives' content-level metadata. Organizations such as the Canadian Association of Research Libraries (CARL), with its Institutional Repository Harvester that provides support for institutional repositories, and Canadiana.org, with its Canadian Metadata Repository and Portal that point to content held in institutional repositories, enabling one to search multiple repositories from one search engine, have established projects which go some way in aiding the preservation and access of our national content (Jordan 2006; McGovern and McKay 2008). Innovative models for dynamic archival practices include decentralizing curation through participatory practices such as user tagging (Huvila 2008; Denard 2002; "Brooklyn Museum"). On a more immediate level, we need to establish protocols that will allow researchers to "hand off" completed digital projects to archivists and librarians in a manner that will ensure ongoing access.

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## Research Opportunities

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- Open and distributed models of preservation, such as Canadiana.org's crowd-sourcing initiative, encourage long-term sustainability, which will require careful and systematic evaluation in terms of their long-term viability as well as the resources needed to sustain them.
- Library and Archives Canada's impending certification, in conjunction with the libraries of the Universities of Alberta and Toronto, as a Trusted Digital Repository presents an opportunity to test the robustness and reliability of this sustainability model using the example of our heterogeneous body of texts and artifacts (interfaces, performances, etc.). Can the use of these cultural forms as test cases function as an opportunity to enhance a national digital preservation strategy?
- Canada lags behind other countries in the creation of a high-profile public contemporary creative digital archive. Such an archive would showcase Canadian cultural innovation and stimulate creativity and knowledge production within and beyond the academy.

## INTELLECTUAL PROPERTY: RIGHTS, CREDIT AND CONTROL

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Innovation and research creation in the arts and humanities are directly linked to the circulation of knowledge, yet the fair circulation of knowledge demands that intellectual property rights be acknowledged (Murray and Trosow 2007). Virtually every participant in the debate regarding creator's rights and cultural or intellectual property comes to the table with a vested interest and a model of intellectual property that caters to their own proprietary and oftentimes curatorial, creative and economic self-interest. Borgman (2007) accurately states the case, however, in noting that the obsolescence of print-based preservation which allowed libraries to preserve out-of-print materials has created a crisis. The shift to digital dissemination and the resulting changes in rights management mean that: "The gap in responsibility and rights for permanent access to published materials is a huge concern for the continuity of the scholarly record" (Borgman 2007). A number of models for addressing the diverse interests of industry, artists, scholars and communities have been proposed (cf. CHPC Hearings on Digital and Emerging Medias; CFHSS on Bill C-32, November 2010) in an attempt to balance access and copyright in the area of "knowledge work." Initiatives such as ArtMob explore alternative rights protocols. This section will look at the current state of creator's rights in Canada as an aspect of sustainability by discussing:

- Current initiatives that link the academic and cultural sectors
- How community rights must inflect Canadian discussions of copyright;
- Fair-use practices enabled by partnerships between scholars and artists;
- Sustainable policy models for the academic and cultural sectors.

## ALTERNATIVE MODELS

Knowledge-based economies thrive on the free exchange of information, and restrictive copyright laws are inimical to this growth (Vaidhyathan 2001; Lessig 2004). Without the freedom to cite and otherwise draw upon cultural materials, academic knowledge production is unsustainable. At the same time, the interests of industry and individual cultural sector producers such as artists must be respected. Both Vaidhyathan's and Lessig's research support the notion that an open or "leaky" approach to copyright, which increases circulation and mobilization of knowledge, is actually more beneficial to markets than an airtight copyright regime. Further, research suggests that making scholarship and creation available in digital formats "actually increases the profile of that publication, and creates sales of both print and digital publications" (LAC 2001). Several major ongoing projects are pioneering rights models that foster circulation.

Public licensing (e.g. Creative Commons such as a "Share and Share Alike License") attaches a series of clauses to a copyrighted object that insist that people who make use of that object to create something must also release their creations under a public license so that others can do the same. Open access journals and knowledge repositories at universities and other venues that use public licensing are vitally important to the circulation of knowledge (G. Hall 2008). There is an increasing number of tools available for academics interested in public licensing. One is the SPARC Canadian Author's Addendum, a file that can be added to a publishing contract to ensure that scholars retain select rights to permit wider circulation of a scholarly publication, for instance through inclusion in an open institutional repository, than is usually allowed by such agreements.

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ArtMob — a non-profit, university-hosted and CFI-funded Canadian site for digital archives of artistic work — is an example of an innovative sustainability research project that studies ways in which artistic practices produce useful challenges to current rights frameworks. The various sites that ArtMob hosts, including [bpnichol.ca](http://bpnichol.ca), [fredwah.ca](http://fredwah.ca), [moderndrama.ca](http://moderndrama.ca) and UbuWeb show how proceeding according to fair dealing principles has a trickle-down effect that opens up cultural content to public dissemination and use (“Online Archive for bpNichol”; “Fred Wah Digital Archive”; *moderndrama.ca*). Its aggregation of the cultural output of the avant-garde into a public archive, only possible through using a fair dealing model of copyright, has in turn attracted writers, performers, actors and film- and video-makers to contribute their works to the archive on a gift basis, further enriching the public archive. Kenneth Goldsmith, one of the founders of UbuWeb, has argued that the free distribution of low-resolution digital renderings of films indirectly generates income for artists and distributors through shows and viewings and by encouraging the purchase of higher quality films in DVD format (Goldsmith 2010). In this context it is clear that free dissemination of cultural goods can function as a form of promotion and a means by which small publishers, presses and individual artists can compete in a cultural economy that has become increasingly centralized over the past decade (Whittall 2009; Sedo 2008; Lanham 2006).

## COMMUNITY RIGHTS

There is a vast archive of cultural material in Canada and around the globe that is not directly the property of scholars, living individuals, or corporate entities but the product of communities of people. For example, First Nations and Inuit documents that are now out of print spring from a knowledge economy inimical to notions of individual creators’ rights (Alexander 2001; Christen 2005; Seadle 2002; Sullivan 2002). The Federal Government’s November 12, 2010 signing of the United Nations Declaration on the Rights of Indigenous Peoples signals that Canada has reached a major crossroads on the subject of community and cultural rights. The Declaration confirms the rights of Indigenous peoples “to maintain, protect and develop the past, present and future manifestations of their cultures” including “technologies and visual and performing arts and literatures” (Article 11). The Declaration implies an intellectual property model that accounts for community rights.

This problem is not unique to First Nations cultural products, however. The University of Alberta’s project “Community Return in the Digital Age” is investigating three instances where “community return” poses a conceptual problem: literature from Onitsha, Nigeria that is out of copyright but still arguably belongs to a national community, while the archives lie in a Canadian institution; Aboriginal and Inuit documents that are out of print; and the archives for *Branching Out*, a feminist journal of national significance published from the mid seventies to the early eighties in Edmonton that cannot be made available because of the difficulties of tracking down individual authors and publishers to secure the rights for these materials. These examples demonstrates the need for an open and agile approach to copyright that balances community rights with the importance of circulating and disseminating knowledge.

## PARTNERSHIPS OF SCHOLARS AND ARTISTS

A number of projects across Canada right now incorporate the author or creator as an integral part of the creation of a digital knowledge resource (“Fred Wah Digital Archive”). In addition to providing a digital calling card for the artist, these sites demonstrate the potential of digital media to reshape the ways in which texts are defined and made available to audiences (Jennings et. al 2006; “Electronic Poetry Center”; “Electronic Literature Organization”; “Digital Poetry Archive”). Partnerships between scholars and artists provide a means of overcoming the strictures of copyright while respecting both the users’ rights and creators’ rights, and

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pioneering work outside of Canada has brought dance into the digital archive (Birringer 2002). However, most scholarly projects in Canada continue to segregate creation, research and preservation. While projects such as ArtMob (Coombe et al 2010) and the Canadian Writing Research Collaboratory (“CWRC”) are developing partnerships with artists, new models that spur digital dissemination of contemporary Canadian cultural content are needed.

## OPENNESS

One of the keys to sustaining digital knowledge is to circulate it. Scholars including Lessig (2004), Vaidhyathan (2001) and Geist (2010), have argued against the model of intellectual property as leading to strict monetization for the creation of wealth. Such a model of intellectual property can serve to consolidate corporate rights over data products, but can also restrict the free flow of knowledge within the economy.

The restriction of scholarly knowledge is often inadvertent. For example, the methods by which Tri-Council agencies evaluate research work can be in direct conflict with open dissemination because these evaluations often privilege patents and monetized knowledge products. Whereas corporate entities require an efficient and transparent patent system for continued growth (see, for example, the patent infringement lawsuit brought against Research in Motion by NTP, settled in 2006), cultural products call for a rights model that balances fair use and monetization. The increasing turn to open-source models of software development (some products of which, such as Linux and Apache, are workhorses of the digital economy) is another strong indicator that innovation thrives in open environments: collaboration and creativity flourish in digital environments with minimal restrictions, what Chesborough (2006) calls “open innovation” (cf. Goldman and Gabriel 2005). Without the circulation of knowledge, the creation of new knowledge is impossible (Murray and Trosow 2007).

At present, the policies designed to assist researchers with data preservation and dissemination vary greatly from institution to institution. Even with the recent Tri-Council statement on open access, many institutions are not equipped to support the technical conservation of data, the documentation, standardized formatting, ethical clearance, confidentiality requirements and communications of the terms and conditions of use that are necessary for meaningful dissemination of work online. This confused policy framework serves as a disincentive for researchers to share their data online (CARL/ABRC 2008). Without clear frameworks and resources to support the open dissemination of research, the benefits of broad dissemination do not yet outweigh the costs, which may include, in some cases, litigation.

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## Research Opportunities

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- How can researchers maintain systems of authorization for their contributions to the knowledge economy while at the same time encouraging the mobilization of knowledge? Are traditional quality-control systems, including the filtering roles played by peer review and publishers, adaptable to the new knowledge economy?
- What measures can be taken to guard against the privatization of public cultural heritage?
- What models of intellectual property rights can accommodate the range of interested groups from industry to First Nations peoples, academics to artists?
- How can a digital economy effectively enable remuneration for creative intellectual property? Strategies ranging from Access Copyright to micropayments require evaluation.

## Lasting Change

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- What means most effectively promote the circulation of scholarly and creative work? Is public licensing a viable alternative to current copyright policies?

## NEW MODES OF RESEARCH CREATION

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Digital modes of creation are producing rich scholarly content in response to the possibilities of digital tools and modes of expression (McGann 2010a). Socially networked research communities, cutting-edge arts journals and online poetry collections, “living archive” partnerships of scholars and creative practitioners and dynamic research sites that reflect the changing state of knowledge are examples of innovative scholarship that poses new challenges in terms of both sustaining the research activity itself beyond the start-up phase and preserving its output. New digital forms of research and creation face unique problems, including the difficulties of academic validation and financial sustainability (Cohen 2010). Digital humanities, as an interdisciplinary field of inquiry into the application of computer tools to humanistic pursuits, has developed standards for producing digital scholarly content, but viable models for sustaining research activity in the long term are still elusive. Growth in digital humanities graduate programs will promote digital literacy and help to meet the specific challenges of sustaining research. Issues surrounding the evolution of scholarship in the digital era include:

- New forms of scholarship that are not conducive to being “done”;
- Changing models of peer review and assessment of scholarly value;
- The move toward strategic partnerships and collaboration.

### WHEN IS DIGITAL SCHOLARSHIP “DONE”?

Scholars have drawn attention recently to how notions of scholarly research as “done” are a relic of traditional printing and dissemination models that do not pertain to new forms of digital research and cultural production (SCI 08; Brown et al. 2009). The printed monograph and journal are reeling from outdated models of production, dissemination and stewardship, and themselves require new approaches to sustainability (Boismenu 2010; Lorimer 2010). Furthermore, these forms so strongly associated with tenure are ill-suited to “scholarship based on collaborative knowledge production or using dynamic data, visualizations, 3D models, and audiovisual formats” (SCI 8 2010). Scholars and creative practitioners are increasingly engaged across disciplines in extensive collaborative work that embraces the array of possibilities offered by digital media to produce and disseminate knowledge in new ways; such work offers new challenges in the technical expertise and design required at the production stage, as well as with respect to sustainability.

These emergent modes of research are not necessarily instantiated as finished products but can continue to expand and change over time; in these cases their value is better measured in terms of their impact on other researchers and their spin-off impacts on the cultural sector than in terms of achieving stasis. Such projects present major sustainability challenges because they require ongoing maintenance and updating (Nowvieskie and Porter 2010; SDS 2004). Further research is needed to determine whether the best response to these challenges is an institutional setting capable of providing continuity and baseline resources (Kretzschmar 2009), or other possibilities such as open-source-like models of sustaining through community. A key policy consideration is how to sustain the creation process of a digital resource while also, perhaps simultaneously, preserving and maintaining it.

In other cases, a scholarly project may finish, but if it is in digital form it can become an albatross around the neck of a researcher who has neither the expertise nor the resources to archive it effectively. The current generation of scholars is the first faced with the concern of sustaining their own scholarship (Fitzpatrick 2009). The strength of humanities scholars lies in research production and initial dissemination, but they lack the infrastructure, technical and editorial expertise and resources to do what, in the age of print, was done almost

# Lasting Change

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entirely by libraries and archives. As a result of this new situation, much research in the digital humanities has focused on archiving, editing and dissemination, all practices that connect to the preservation of humanities data, objects of study and research outcomes. As scholarship continues to go multimedia, however, a distinction between scholarship and preservation must be established to maintain the integrity of both and rationalize the distribution of expertise and resources (Ball 2004; Jankowski 2009).

## ASSESSING SCHOLARLY VALUE

The gulf is growing between traditional scholarly publication modes and their accompanying metrics of value such as peer review, and more open-ended and diverse digital scholarly publication (Sewall 2009). New forms of digital dissemination such as the Orlando Project — which has been praised for pushing the boundaries of collaboration and interdisciplinarity (Ede and Lunsford 2001) — demonstrate that there is value in the academy far beyond the monograph (Williams et al. 2009), but these new forms demand new rubrics for assessing value. Software development is perhaps the most extreme example of a kind of scholarly activity unaccounted for within the traditional humanities evaluative system.

As discussed above, digital scholarship breaks down the apparent boundaries between teaching and learning. A difficulty that plagues large collaborative projects, however, is the difficulty of tracking and acknowledging the often invisible labour of both student researchers and technical assistants. As humanities scholarship moves increasingly in the direction of experiential learning models, collaboration and interdisciplinarity (HASTAC), the issue of tracking and rewarding labour for innovative or non-traditional work must be of central concern. Current rubrics of academic value discourage some of the work most capable of enriching the cultural sector, communicating with the public beyond the borders of the institution, engaging in community conversation and challenging traditional notions of scholarship (Menand 2010).

Anecdotal evidence suggests that the forms of research with the greatest cultural impact are often those least rewarded by institutional rubrics of value such as peer review, hiring, tenure and promotion committees. Methods for assessing the impact of humanities scholarship that moves beyond the academy are inadequate. Fitzpatrick (2009) notes that “a critical study of peer review might require empirical work of a sort for which humanists are neither trained nor rewarded,” yet such evaluation is crucial to understanding how to sustain scholarship for the future. Nonprofits such as the Trudeau Foundation emphasize the importance of creating “opportunities for engagement with a broader public, which “in turn leads to a better informed citizenry, new ideas, and heightened opportunities for democratic participation” (“Public Interaction Program”).

Peer review is a major point of contestation among scholars who are debating its continued relevance as a form of academic gate-keeping versus its resistance to recognizing groundbreaking work and the shifting nature of authority (Fitzpatrick 2009). Peer review still has a place in authorizing the work of emerging scholars, but it faces unique challenges in dealing with new media texts (Bogost 2008). At the same time, there is a concern that persistent adherence on the part of hiring and tenure and promotion committees to the scholarly monograph or print journal will discourage innovation (Siemens 1999), particularly in a difficult job market.

## COLLABORATION

As scholarship goes multimedia it is also going collaborative. Knowledge and knowledge production are more extensively networked than ever before and are deeply embedded socially. The digital turn has led to the advent of increasingly large-scale and ambitious projects within the humanities. This trend brings with it the challenges of funding collaboration and interdisciplinarity, which can require enhanced resourcing, but at the

# Sustaining Digital Scholarship and Culture in Canada

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same time, networked knowledge offers new possibilities for sustaining scholarship (Selfe et al. 2009b). In addition, digital media are breaking down the barriers between academic knowledge production and the public: the potential for partnerships with communities, for crowd-sourcing and for “citizen science” to contribute to scholarly endeavours is immense, but needs to be better understood.

A sustainable digital environment will encourage a further pushing of the boundaries of academic disciplines by cultivating strategic partnerships both across disciplines and beyond the academy. Menand (2010) has pointed out that collaborative and interdisciplinary scholarship is uniquely capable of connecting scholars “to the culture and the society that is being created and lived all around us,” and of breaking down “the institutional armature we once may have desired to secure us.” Indeed digital creation and dissemination frequently produce collaborations with designers and technicians, permitting cross-fertilization. Mozilla’s Drumbeat Festival is a prominent example of just such an innovative practice, bringing together the private sector with academics and community in a conversation made possible through the openness that defines much digital work (Mozilla).

Similarly, digital media carry with them the potential for increased collaboration with various publics. As Richard Barbrook influentially observed, many interact with technology in terms of a gift economy rather than a market economy (2005). “Free” labour and the revival of the notion of the “commons” have created considerable value in the digital economy (Terranova 2000; Hardt and Negri 2009). Community engagement and crowd-sourcing have the potential to help to sustain scholarship, broaden dissemination, improve digital literacy, expand the quantity of quality online content and promote exchange globally. A key example of this is the thriving digital community of HASTAC, a digital forum that harnesses the energy of emerging scholars to generate sites of community collaboration and innovation (“HASTAC”). However, we are only beginning to see the results of early experiments in combining the work of diverse knowledge communities as a mode of producing academic research (in, for instance, the Bentham Project), and the results of various models require careful assessment.

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## Research Opportunities

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- How can institutional rubrics be changed to account for the impact of new forms of scholarship?
- What new means of recognition for participation in large projects are required by the modes of collaboration and creation enabled by digital scholarship?
- Can voluntary labour help to sustain scholarship in ways that both enhance the value of what is produced and value the labour that is donated?
- Could alternative forms of authorization and credit, for instance a “microcredit” system within a contributory scholarly environment, enable the legitimation and higher valuation of collaborative scholarship?
- What are the most effective means and agents by which to bridge the gap between scholarly research and preservation?

## INSTITUTIONAL INVESTMENTS, PARTNERSHIPS AND RESOURCING

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Canada's knowledge society serves as the foundation for our continued economic growth in the twenty-first century, but at present we lack a considered evaluation of the place of humanities scholarship within that economy. Some of Canada's best corporate citizens, such as Mike Lazaridis, founder of RIM and the Perimeter Institute, have seen the importance of the links that connect research, culture and economic production. Every sector benefits from greater mobilization of knowledge between areas of the economy that have been traditionally separated. This section examines three contexts within which these benefits can be realized more fully:

- Within universities;
- Through training of new scholars, creators and knowledge workers,
- Between academic institutions and corporations or other bodies.

### INSTITUTIONAL INVESTMENTS

Sustainable digital scholarship relies upon the support of institutions, particularly universities and colleges. The use of digital media has become pervasive within universities and colleges, but few institutions have developed policies and resources to encourage digital scholarship (McGann 2010b). From the intradepartmental level of tenure and promotion committees to interdepartmental changes in how IT departments are mandated, change is required in academic infrastructure.

Hiring, tenure and promotion standards require rethinking, as indicated above. In the humanities, co-authored papers and monographs are often undervalued and most evaluation bodies are ill-equipped to evaluate the quality of digital scholarship (MLA Task Force 2007). Revision of policies as well as education is required. Moreover, there is resistance to open content practices from within the academy. One branch of an institution may officially endorse open access while departments still privilege for-profit over open-access journals, even though studies suggest the latter provide greater research impact (Gargouri et al. 2010). Institutional valuation may push academics to disseminate their work via journals and repositories that demand relinquishment of copyright (Davidson 2003). Scholars who choose new channels of dissemination to maximize the mobilization of their research are often penalized for using non-traditional media such as blogs, podcasts and magazines (Ball 2004).

Institutions can promote the efficiency and long-term sustainability of digital projects by coordinating interdepartmental resources. Yale University's Office of Digital Assets and Infrastructure, which seeks to provide a unified management strategy across the university, is the exception rather than the norm within higher education (Bellinger et al. 2009). At present, relationships between a digital project and an institution's IT support are usually individually negotiated. Effective digital infrastructure includes both technology and technical personnel, yet few institutions provide much digital research infrastructure (CDMN et al. 2010; STIC 2008). Too often the staff necessary for the development of a digital project are lodged within IT departments, forcing scholars to draw on disengaged labour, if they can access it at all, rather than partnering with technical colleagues invested in humanities research. It is apparent that where there are academic and non-academic technical staff with a mandate to incubate and sustain digital scholarship, creation and multimedia activities, they will thrive and expand.

# Sustaining Digital Scholarship and Culture in Canada

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Digital projects in the humanities are at present quite evenly housed by research centres or institutes, libraries and academic departments (Porter and Nowvskie 2010). Both centres and libraries provide spaces of institutional continuity with a mandate for sustaining digital scholarly results beyond the individual scholar or scholarly team. Proactive preservation plans emerging from digital humanities centres involve partnerships with libraries (Zorich 2008; “Sustaining” 2010). Putting digital research infrastructure in place should be a priority for universities. However, to develop effective sustainability we need to assess varying approaches to institutional support, inter-institutional collaboration and working across institutional silos to provide a breadth of expertise that only the very largest universities might hope to provide alone.

## TRAINING EMERGING SCHOLARS AND HQP

A sustainable model of digital scholarship requires support for training emerging scholars and HQP in digital literacies and methodologies. Indeed, digital literacies (Willinsky and Dobson 2009) are essential to post-secondary education in a digital economy: digital infrastructure development, software production and content creation also rely on advanced digital skills (Terranova 2000). Graduate programs in humanities computing and digital humanities build upon such literacies to develop highly qualified personnel who are broadly employable. These and similarly valuable programs in communications, multimedia and media studies are growing slowly as a result of lack of resources. More programs will educate humanities students to use and critique existing resources and create new and better resources in the future (Hockey 1999; Unsworth 2002).

The digital humanities has a tradition of offering short courses, such as those held at Princeton and Duke in the 1980s and 90s, those offered each summer in Victoria and across the US and Europe. The even shorter and less structured THATCamp model seems to be effective at engaging researchers from a wide range of backgrounds (<http://thatcamp.org/>). Providing such training opportunities to established scholars and artists could help make undergraduate curricula in the humanities more amenable to teaching digital skills and working with new media cultural production, as does Di Brandt in her CRC-sponsored Poetry Video Lab in Brandon.

A model of ongoing training is also effective, as seen in the participation in large digital projects of undergraduate and graduate research assistants. The list of former project participants at the Orlando Project includes a large number who have gone on to careers in the academy, publishing, IT or other areas of the private sector, taking with them the technical skills and critical thinking provided by collaboration on a large, ongoing research project (Orlando Project Team). Other examples include Brad Eccles, who segued his two-year academic research experience with the Canadian Adaptations of Shakespeare Project into an entrepreneurial venture (Canadian Adaptations of Shakespeare Project); his gaming company, HitGrab Labs, where his gaming models grew out of CASP’s ‘Speare project, currently employs more than 20 people (HitGrab Labs).

## STRATEGIC PARTNERSHIPS

Humanities scholars are ready to collaborate broadly and fuel innovation (Cunningham 2010), however they need opportunities to do so. Strategic partnerships amongst the private sector, the academy and the cultural sector could help stimulate Canada’s digital economy. The success of the Perimeter Institute’s 2009 “Quantum to Cosmos” festival of film, art and lectures could be taken up as a model for community outreach and cross-sector partnerships. The University of Waterloo’s Stratford Institute offers a new model of educational partnership among Waterloo, Open Text and the government, “bringing together opportunities for strategic, forward-looking research in the digital media space” (“Stratford”). Google is exploring the benefits of private sector support for innovative humanities research through its Digital Humanities Research Awards (Google). Within the academy, research libraries and archives have taken the lead in developing outreach programs to public museums and libraries (Adria and Mitchell 2008; Fletcher 2008; Hall 2009; Phipps and Shapson 2009).

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The 2009 joint SSHRC, JISC, NEH and NSF Digging into Data Challenge on large-scale data analysis garnered enormous response, indicating a strong desire of researchers to work collaboratively across national borders (JISC et al. 2010). This knowledge synthesis group also saw potential in a different kind of strategic partnership program that would place scholars in residence at ICT companies to stimulate knowledge transfer and synergies. The Canada Council might consider a similar model, given the antecedents for such arrangements involving the residency of creative artists at Xerox PARC and the Perimeter Institute.

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## **Research Opportunities**

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- What models for cross-sector partnerships best foster knowledge mobilization?
- How might internal university structures recognize ongoing development of digital skills at both junior and senior researcher levels, including those acquired from outside the institution? Could a digital skills portfolio help accredit training acquired through participation in research projects?
- What modes of institutional support for digital research and content creation produce the best and most sustainable results?

# Sustaining Digital Scholarship and Culture in Canada

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## FUNDING MODELS

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As the new digital economy has created new forms of cultural production and scholarship, the funding models that support and sustain these industries demand rethinking. McGann (2010b) refers to funding bodies as the fourth key institutional agent responsible for the sustainability of scholarship in the digital era, alongside the scholars themselves, publishing entities and libraries. Without this crucial financial support, developing a sustainable model for scholarship and related cultural activity would be impossible. Two major reports on sustainable funding for digital projects suggests that no single funding model is 100% sustainable, arguing instead for the sustainability of mixed funding models (Moore et al. 2010; Guthrie et al. 2008). Key considerations for funding sustainable scholarship and culture include:

- Funding digital projects post-publication;
- Incorporating sustainability and interdisciplinarity into grant requirements;
- Funding partnerships beyond the academic sector;
- Funding models that understand training as a form of apprenticeship.

## POST-PUBLICATION SUSTAINABILITY

Funding agencies must recognize that some scholarly publications are not intended to reach a point of finality like print scholarship (Kirschenbaum 2009). Current funding models privilege start-up or innovation and virtually omit the updating, maintenance and extension activities that are essential to sustaining published digital scholarship. An open-access model for scholarship would need to provide for the nontrivial costs of such activities, or we will see an increasing number of valuable digital resources produced by public research funds disappear, either into large subscription-based content aggregators or into oblivion.

Programs that recognize ongoing modes of cultural and scholarly production include the SSHRC Aid to Scholarly Journals program and the Canada Council's Assistance to Artist-Run Centres; the latter emphasizes the importance of ongoing infrastructural support for "research, production, presentation, promotion and dissemination of new works." Programs that focus on maintenance and sustainability of collections of major scholarly digital resources are also a must. Digital research demands levels of infrastructure beyond what is needed by traditional humanities scholarship. The Canada Research Chair and the Canada Foundation for Innovation programs both acknowledge the reliance of innovative research on infrastructure. Rockwell (2010) points out that the creation of the CFI in 1997 marked a major turning point in the research culture in Canada, encouraging scholars to think not only in terms of research outcomes but in terms of research infrastructure. For digital humanists, cyberinfrastructure is absolutely central to sustainable scholarship. The impact of this turn to infrastructure on humanities scholarship, however, demands further research into the benefits of collaborative infrastructure, the differences between research and infrastructure and the importance of experimental infrastructure as the basis of more long-term investments (Rockwell 2010).

SSHRC researchers produce knowledge that benefits society, and digital dissemination increases the impact of that knowledge. Many SSHRC-funded grants now include digital forms of dissemination (or "valorisation"), in keeping with digital scholarship's tendency towards dissemination (Adria and Mitchell 2008). It is unlikely that such dissemination will have long-term impact, however, unless sustainability measures are put into place to sustain research outcomes past the granting period. Funding bodies should consider incorporating sustainability plans as part of grant applications involving digital research. Likewise, provisions should for

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SSHRC grant applicants to address whether the Council's Research Data Archiving Policy applies to their project and, if so, how they plan to comply with it. Such measures would put pressure on institutions to provide the resources and infrastructure in order to assist researchers in meeting these obligations.

The National Endowment for the Humanities start-up grants demand protocols for long-term digital projects: "Applicants should also discuss how the project's ultimate product is likely to be disseminated and what provisions will be made for the long-term maintenance of the product" (NEH 2010). Similarly, many of their grants demand as a final output a white paper, which the NEH hosts and maintains on their own website. Were Canadian funding bodies to follow suit, they would open further pathways among digital scholarship, culture and industry.

### FUNDING PARTNERSHIPS

Funding models should foster partnerships beyond the academic sector. Currently there are barriers to involving participants from the cultural sector and from industry because participation is regulated. Research has emphasized the benefits of university and industry collaboration (Lee 2000), but the full potential of partnerships for and with the digital humanities has yet to be realized. The new SSHRC architecture should be assessed early on for its ability to foster such partnerships.

Large-scale knowledge creation projects that build sustainability into their design will almost necessarily involve partnerships with librarians and archivists from the outset, especially as the standards for long-term digital preservation are being defined by that community (see "Preservation"). A viable sustainability model will rely upon them, and funding models need to foster such relationships by, for instance, acknowledging the different forms of labour involved by participants from different locations within the institution, and allowing budgets to be structured accordingly. Otherwise, libraries are likely to find themselves unable to resource prospective partnerships with research projects.

### TRAINING AS APPRENTICESHIP

A sustainable model of funding digital and new media scholarship will recognize that training is life-long for some humanist scholars who work with rapidly changing tools and resources (Shanks 2008). The success and expansion to capacity of the Digital Humanities Summer Institute at the University of Victoria, now in its tenth year, demonstrates how active and ongoing training is vital to a thriving digital economy. The Banff Centre for the Fine Arts has hosted digital media seminars, workshops and studios for artists for several decades, and has had a major beneficial effect in fostering a vibrant experimental digital artistic practice across disciplines in our country. Large collaborative research projects have the opportunity to give emerging scholars a role that gradually moves from that of hired labour to a deepening partnership. When emerging scholars are given the opportunity to pursue their own research within the framework of infrastructural support provided by large collaborative projects, the line between research and training disappears. The Editing Modernism in Canada project is an exemplary model of such apprenticeship, as are other projects mentioned elsewhere in this report ("Editing").

A necessary component of training emerging scholars is maintaining the vital link between teaching and research (Healey 2005; Healey and Jenkins 2007). An academy in which ongoing research and learning are integrated will produce highly qualified personnel (HQP) equipped not only with new forms of digital literacy but also with the adaptability necessary to keep abreast with change.

# Sustaining Digital Scholarship and Culture in Canada

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## Research Opportunities

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- How do the parameters of funding or rubrics of value impact possibilities for innovative and cutting-edge research and cultural practice?
- How can funding models promote partnerships that include librarians and archivists, as well as participation from the public and the private sectors?
- How can research programmes be revised to make sustainability plans an explicit criterion for funding?

## THE NATIONAL POLICY GAP

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Combined efforts across disciplines, institutions and economic sectors are vital for the creation of a flexible and durable digital economy able to respond to many of the challenges outlined here. Such efforts would be substantially aided by a national digital preservation strategy, the fostering of strategic partnerships, funding and institutional support for innovative interdisciplinary research production and dissemination. These needs amount to a gap in national policy with respect to sustainability. Three possible measures suggest themselves as a means of addressing this gap:

- A national metadata portal to support interoperability between distributed preservation networks;
- A national tool repository to increase early adoption by scholars and segue digital scholarship into the private sector and the community;
- A set of national sustainability standards to guide researchers and institutions.

### NATIONAL METADATA STANDARDS AND PORTAL

The interoperability and reusability of data, research and creative productions are improved by the application of standards-based machine-readable metadata and ontologies (Jankowski 2009). While there are many different metadata standards for different types of digital objects and related to different purposes, there would be considerable advantage in establishing minimal national standards.

There are currently various initiatives underway to digitize Canadian cultural and heritage materials. The value of these initiatives can be maximized, not through centralization, but through a national metadata portal capable of leveraging interoperable metadata to make the materials searchable and thus usable. The newly launched Canadiana Discovery Portal is an excellent example of the ability of such a portal to make several of the country's largest digital collections searchable simultaneously. This is a step towards a national system for organizing and maintaining the fruits of digitization initiatives across the country.

### NATIONAL TOOL REPOSITORY

The 2005 Summit on Digital Tools for the Humanities emphasized the importance of digital tools — from text mining to visualization to geographic information systems — for enabling innovative research and teaching in the humanities and beyond. The development of tools is a form of research itself, but it also fundamentally changes how all humanities research is performed by facilitating new modes of engagement with ever-expanding bodies of texts (Unsworth et al. 2005; Crane 2006; Siemens et al. 2009). However, too often the innovative research that goes into designing tools for humanities research fails to be rewarded by a strong uptake from the scholarly community, either because of poor interface design or lack of experience on the part of potential user groups, or lack of dissemination, which also stands in the way of mobilizing the research results.

We thus propose the creation of a national tool repository capable of providing national access to new tools in a framework that would promote early adoption by researchers in both creative and scholarly fields. Features such as user guides, consumer reports and rankings would increase usability, while the ability to disseminate tools to a wider audience would serve as incentive for developers. Examples such as the Open Journals System

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and Zotero prove that digital tools have enormous potential for widespread adoption, for shifting modes of knowledge production and for further mobilizing research results.

The challenge of maintaining open source software is itself an aspect of sustaining digital scholarship (Maron et al. 2009; Courant and Griffiths 2006; Spiro 2010). Indeed, the UK has recently recognized this aspect of sustaining digital scholarship and established The Software Sustainability Institute to consult with groups on preserving software systems ([www.software.ac.uk](http://www.software.ac.uk)). The National Science Foundation in the US has likewise recognized software sustainability and reusability as an important component of cyberinfrastructure. Various sustainability models, including ones incorporating partnership between academy and the private sector, have been investigated and put forward in recent years, but no widely accepted standards have yet been developed (Stewart et al. 2010; Chang et al. 2007). A national repository would move more of Canada's technical research output into use.

## NATIONAL SUSTAINABILITY GUIDELINES

Both the importance of metadata portals and the potential value of a tool repository point to the broader need for national guidelines for digital sustainability, whether of ongoing scholarly and creative practices or of cultural heritage materials in the process of being digitized. Library and Archives Canada, Heritage Canada, the Canadian Heritage Information Network and Canadiana.org could lead the way to ensuring interoperability by setting reasonable minimum standards for both metadata and practices.

## CLOSING SUMMARY

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At this watershed moment in the transition to digital media, we are faced with a choice. Digital does not mean cost-free, and neither do open access or open source. Sustaining scholarship in the new economy will cost. It will require real cooperation amongst stakeholders, precisely because it is interwoven with other aspects of the digital economy. Private-sector interests are inimical to the preservation of digital artifacts that have no relation to their core business activities (Wilson et al. 2009; Lessig 2004; Vaidhyanathan 2001). Similarly, scholars cannot bear the burden of sustaining their objects of study and their research outcomes. However, if we as a digital society understand knowledge as a public good (Willinsky 2005), Canada will invest in sustaining access to the results of publicly funded research and the record of our past and present creativity.

Sustainability means not storage but circulation: digital materials operate without the logic of scarcity that characterized previous media (Urruita 2002). Circulation maximizes their use-value, particularly under conditions that make it possible to determine provenance and reliability. We need the humanities and academic libraries, archives and museums to work with the private sector and our other memory institutions to preserve as much as possible of the full scholarly record and cultural archive, since we cannot determine what will be valued in the future.

The pace of technological change is such that one is always tracking a moving object (ACLS 2006). Our review suggests the need for an open and agile approach to sustaining scholarship and culture, one that builds on the energy and insights emerging from cultural creators' and scholars' innovative responses to the digital environment. These include the far-reaching interdisciplinarity that digital creation and scholarship foster, digitization partnerships between marginalized communities and academics, new approaches to design devised through electronic literature creation or gaming research, and joint initiatives of academic libraries and digital scholars in support of emerging modes of scholarship and dissemination.

There are many gaps in our knowledge about the interrelationship of scholarship and the arts within the digital economy, and about how to sustain them. Yet in many respects the way forward is clear: sustaining digital scholarship in Canada will safeguard the knowledge context that ensures the continued creativity of the digital economy, contribute exemplary content to Canada's digital identity, promote the public good, boost employment and increase the numbers of flexible, highly qualified personnel. Sustainability can be initiated now through feasible measures at the levels of individual post-secondary institutions, granting councils and government agencies.

What lasts of previous cultures? While we build into the future on the foundation of their largely forgotten advances in technology and science, we remember and bring with us into that future their history, philosophy, arts and traditions. This continuous production of human knowledge and creativity provides the vital context within which we transform new information and discoveries into usable forms within the economy. Such transformation through historical and critical understanding is the province of the arts and humanities, as is the creation of digital adepts who are able to make the most of our fast-paced technological society, as citizens, consumers and producers.

## APPENDIX 1: THE KNOWLEDGE SYNTHESIS PROCESS

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This project was funded by a Social Sciences and Humanities Research Council of Canada Knowledge Synthesis Grant on the Digital Economy. The grant ran from August to December 2010 in conjunction with the federal government's development of a national digital economy strategy and was charged with identifying knowledge gaps and research opportunities associated with the digital economy.

Our methodology combined:

- 1) **A review of the relevant literature** and reports from a range of fields, allowing us to synthesize the existing state of public knowledge; this review has been made available online as a public resource. It draws on published scholarship, on reports on cyberinfrastructure and digital scholarship, on Canadian sources such as Statistics Canada and National Data Archive Consultation sources, and reports and information from groups such as the Canadian Heritage Information Network, Library and Archives Canada, Canadiana.org, Synergies and ArtMob.
- 2) **An online forum** (<http://sustainableknowledgeproject.blogspot.com/>) allowed us to learn from and incorporate into the synthesis the knowledge and experience of participant stakeholders representing a range of types of involvement in sustaining digital humanities scholarship and literary, performance and multimedia creative practice.
- 3) **A series of interviews** with co-applicants and other key stakeholders both to ensure breadth and coverage in the literature review and to structure the summit and the topics covered by the final report. Interview participants: René Audet (Université Laval), K. Jane Burpee (University of Guelph), Julie Roy (Université Laval), Lisa Spiro (Rice University), Margo Tamez (University of British Columbia) and from the knowledge synthesis team: Susan Brown, Di Brandt, Lynn Copeland, Daniel Fischlin, Dean Irvine, Ashok Mathur, Robyn Read, Susan Rudy, Stan Ruecker, Chantal Savoie, Ray Siemens, Stephen Slemmon, Darren Wershler and Ann Wilson.
- 3) **A summit** in Guelph of expert stakeholders crystallized insights from the literature review and identified knowledge gaps and strategic research opportunities to strengthen the ability of SSHRC to contribute to Canada's digital strategy. Summit participants: Di Brandt, Andrew Bretz, Susan Brown, Lynn Copeland, Patricia Demers, Daniel Fischlin, Dean Irvine, Ashok Mathur, Hannah McGregor, Susan Rudy, Chantal Savoie, Darren Wershler, Ann Wilson and Kathryn Harvey (Guelph).
- 4) **The final collaboratively authored report** was written and revised in conversation with co-applicants and other key stakeholders to ensure that it truly represents the diverse interests and concerns of those involved in the knowledge synthesis.

## APPENDIX 2: THE RESEARCH TEAM

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### Participants

#### Principal Applicant:

**Susan Brown**, Professor, English and Theatre Studies, Guelph; Visiting Professor, English and Humanities Computing, Alberta; Director, Orlando Project; Project Leader, Canadian Writing Research Collaboratory.

#### Co-applicants:

**Di Brandt**, Professor and Canada Research Chair, English/Creative Writing, Brandon University; poet, multimedia collaborator and critic; her Poetry Video Lab experiments with and develops innovative multimedia approaches to the production of poetry and ecopoetics. Co-recipient of 2010 Roy prize for best Canadian literary criticism and 2009 Foreword Gold Medal for Fiction.

**Lynn Copeland**, former Dean of Library Services and University Librarian, Simon Fraser; President, Canadiana.org; non-profit provider of Canadiana online and leader of initiative to digitize Canada's heritage; leader in re-imagining libraries in the online environment; instrumental in bringing the Public Knowledge Project to SFU.

**Patricia Demers**, Professor, English and Film Studies, University of Alberta; Fellow and Past President of the Royal Society of Canada; Director, Digital Humanities Research Studio; PI, SSHRC SRG on Canadian Women Writers since 1950, with online and reader survey components.

**Michael Eberle-Sinatra**, Associate Professor, Études Anglaises, Montréal; President, Synergies CFI project; President (French), Society for Digital Humanities/Société pour l'étude des médias interactifs; founding editor in 1996 of peer-reviewed electronic journal *Romanticism and Victorianism on the Net*.

**Daniel Fischlin**, Professor and University Research Chair, English and Theatre Studies, University of Guelph; Director, Canadian Adaptations of Shakespeare project; co-investigator and General Series Editor of books associated with the Improvisation, Community and Social Practice, a MCRI project; co-editor of online, peer-reviewed *Critical Studies in Improvisation/Études critiques en improvisation*.

**Dean Irvine**, Associate Professor, English, Dalhousie; Leader, Editing Modernism in Canada SSRHC Strategic Clusters Project which combines innovative digital editing initiatives and collaborative scholarship with strong print publishing partnerships with major Canadian university presses.

**Ashok Mathur**, Associate Professor and Canada Research Chair, Thompson Rivers; novelist and poet; Director of Centre for Innovation in the Arts in Canada; works for cultural dissemination for disenfranchised groups; recipient of SSHRC Research-Creation grant.

**Robyn Read**, new scholar with digital humanities experience and specialization in contemporary Canadian literature; Acquiring Editor, Freehand Books, the literary imprint of Broadview Press; exploring how digital media can help small presses compensate for lack of publicity and distribution.

**Susan Rudy**, Professor, English, Calgary; scholar of contemporary Canadian writing; editor of several digital archives for living artists including currently the Erín Moure Living Knowledge Site.

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**Stan Ruecker**, Associate Professor, Humanities Computing and English, Alberta; specialist in digital humanities and innovative online scholarly interfaces.

**Chantal Savoie**, Professeure, Département des littératures, Laval; co-applicant on *La vie littéraire au Québec* project; current digital research project on Québécoise women writers and the press.

**Ray Siemens**, Professor, English and Humanities Computing, and Canada Research Chair, Victoria; Director, Electronic Textual Cultures Lab; PI, Implementing the New Knowledge Environment MCRI Project.

**Stephen Slemon**, Professor, English and Film Studies, Alberta; specialist in Canadian and postcolonial literature; Chair, Management Board, Aid to Scholarly Publication Program, Humanities and Social Sciences Federation of Canada.

**Darren Wershler**, Assistant Professor, Concordia; *Canadian Film Centre Media Lab TELUS Interactive Art & Entertainment Program*; poet; member of ArtMob project in mobilizing and publicly archiving Canadian visual and literary art; senior editor when Coach House Press became first in world to publish frontlist at once digitally and in print; digital content management consultant.

**Robin Sokoloski**, Executive Director, Playwrights Guild of Canada; background in innovative dissemination of work from the Guild's national youth arts program.

**Ron Walker**, Executive Director, Canadiana.org, non-profit provider of Canadiana online and leader of initiative to digitize Canada's heritage; successful entrepreneurial background in technology industry.

**Ann Wilson**, Associate Professor, English and Theatre Studies, Guelph; co-editor of *Modern Drama* and *Canadian Theatre Review*; organizer, 2nd International Women Playwrights Conference; leader of research project partnering with Playwrights Guild.

## Graduate Research Assistants:

**Andrew Bretz**, PhD Candidate; specialist in early modern drama; background in pedagogy and the use of digital tools in the classroom.

**Hannah McGregor**, specialist in contemporary Canadian literature; Doctoral Fellow at TransCanada Institute; Graduate Fellow for EMiC.

## APPENDIX 3: RELATED KNOWLEDGE SYNTHESIS PROJECTS

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Several other Knowledge Synthesis projects cover territory adjacent or related to the topics of concern to this group, and offer complementary perspectives on particular aspects of our topic. These include:

- Canada's Digital Heritage: The Nation's Historical Data in an International Context (P. Baskerville)
- Le livre universitaire numérique: pour un foyer d'expertise et une infrastructure de stature mondiale (G. Boismenu)
- Research and Innovation in the Invention and Deployment of Digital Technologies Related to Scholarly Communication and Knowledge Mobilization (R. Lorimer)
- Mobilizing User-Generated Content for Canada's Digital Content Advantage (S. Trosow)

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## APPENDIX 4: BIBLIOGRAPHY

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Given the scope of the topic, this bibliography is necessarily selective, with an emphasis on representing the current state of knowledge with respect to sustaining scholarship and culture in Canada, but with due attention also to flagship studies, reports and examples from the global context in which digital scholarship and creative practices are produced and circulated. The very range of resources listed here, from printed academic press monographs, online peer-reviewed journal articles, government reports, digital projects, blogs and online bibliographies, reflects the changing nature of scholarship.

A fuller public and open bibliography collected in the course of conducting this knowledge synthesis is available online at: [http://www.zotero.org/groups/sustaining\\_scholarship\\_and\\_culture](http://www.zotero.org/groups/sustaining_scholarship_and_culture). This group hopes the bibliography will be of use to others and will continue to grow to reflect new developments in this area.

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*A Knowledge Synthesis on the  
Digital Economy funded by the  
Social Sciences and Humanities  
Research Council of Canada*