Online Publishing, Technical Representation, and the Politics of Code: The Case of *CJC Online*

Michael Felczak, Richard Smith, & Rowland Lorimer
Simon Fraser University

Abstract: The *Canadian Journal of Communication* (*CJC*) began to experiment with online technologies in 1994, in part as a response to the increasing commodification of scholarship by commercial academic publishers. This article reviews and reflects on the *CJC*'s online publishing efforts over the past decade and suggests that online publishing technology is a site of struggle that is situated by and situates academics, publishers, and readers along interdependent axes of agency, citizenship, and commodification. Today, the *CJC* uses and contributes to the Open Journal Systems (OJS) publishing technology developed by the Public Knowledge Project. We argue that academic-initiated undertakings such as OJS and the Canada-wide Synergies project present academics with strategic opportunities to define and control online scholarly publishing.

Keywords: Sociology and philosophy of technology; Sociotechnical; Technology assessment; New media; Scholarly publishing; Online publishing

Résumé : En 1994, le *Canadian Journal of Communication* (CJC) a entamé l'essai de technologies en ligne, partiellement en réponse à la marchandisation croissante de la recherche par les éditeurs académiques commerciaux. Cet article fait le point sur les efforts d'édition en ligne de la part du CJC dans la dernière décennie et suggère que la technologie d'édition en ligne est un site de lutte situant universitaires, éditeurs et lecteurs le long d'axes interdépendants d'action, de citoyenneté et de marchandisation. Aujourd'hui, le CJC utilise, tout en y contribuant, la technologie d'édition « Open Journal System » telle que développée par le Public Knowledge Project. Nous soutenons que des initiatives académiques comme l'OJS et le projet national Synergies offrent aux universitaires des occasions stratégiques de définir et contrôler l'édition savante.

Michael Felczak is the online editor at the *Canadian Journal of Communication* and a PhD student at the School of Communication at Simon Fraser University. He is also a researcher at the Centre for Policy Research on Science and Technology and at the Applied Communication Technology Lab at SFU. E-mail: mfelczak@sfu.ca. Richard Smith is the publisher of the *Canadian Journal of Communication* and Professor in the School of Communication at Simon Fraser University. He is also the director of the Centre for Policy Research on Science and Technology at SFU. E-mail: smith@sfu.ca.Rowland Lorimer is Director of the Master of Publishing program and the Canadian Centre for Studies in Publishing at Simon Fraser University. He is Professor of Communication and past editor and past publisher of the *Canadian Journal of Communication*. E-mail: lorimer@sfu.ca.

***Canadian Journal of Communication,* Vol 33 (2008) 271-289**

Mots clés : Sociologie et philosophie de la technologie; Socio-technique; Prospective; Nouveaux médias; Édition savante; Édition en ligne

Introduction

Over a decade has passed since the first experiments with online publishing at the *Canadian Journal of Communication (CJC)*. Many changes have taken place since that time, and today the Journal is published simultaneously in print and online. Just as importantly, the entire editorial process, including manuscript submission, peer review, and editing, now takes place via the Internet. Although the *Canadian Journal of Communication* has remained unchanged in certain respects, notably in terms of the print copy of the *Journal,* other areas, such as the management of workflow and online publishing, bear little or no resemblance to the *Journal* of the past.

The purpose of this article is twofold. First, we document the recent changes and developments that have taken place at the *Canadian Journal of Communication.* We think that a description of these developments is not only informative for the *CJC* readership, but also may be of relevance to other academic journals that are considering online publishing or that already publish online in some form. Second, we reflect on the political significance of technology design and independence vis-à-vis the commercial academic publishing industry. We suggest that by maintaining control of the development of online publishing technology, scholars have an opportunity to ensure that their values, interests, and priorities are materialized in the design and workings of this technology.

We begin by revisiting the initial motivations for experimenting with online publishing technologies and briefly outline the political economy of academic publishing and its implications for non-profit academic journals. We then summarize some of the key insights from sociology of technology scholarship to draw on conceptions that foreground the social character of technical development and the co-production of society and technology. These conceptions form the basis for a description of recent changes at the *Journal* and some observations regarding online academic publishing more generally.

The latter half of this paper is devoted to a broader consideration of the politics of technology. We consider the differences between proprietary and non-proprietary technology development models and suggest that non-proprietary forms of development make possible democratic interventions into technical design by providing participants with an opportunity to define the direction and nature of this design such that it is representative of their interests and needs. We argue that academic communities within the social sciences and humanities can make use of these alternative development models to ensure that technologies reflect their priorities and mandates. In turn, we suggest that public funding agencies need to continue to be responsive to technology research and development efforts within the social sciences and humanities to ensure that scholarship, public participation, and citizenship are prioritized over the commodification of public knowledge.

The political economy of academic publishing

The *CJC*'s initial experimentation with online publishing began in 1994 and was motivated in part by the increasing concentration of ownership in the commercial

publishing industry and the attempts of commercial academic publishers to commodify scholarship increasingly through online technologies (Borwein & Smith, 1997; Lorimer, Smith, & Wolstenholme, 2000). Although there were differences among individual commercial publishers, in general the commercial academic publishing industry defined readers as potential consumers and academic content as a commodity that could be sold, ideally on a steadily increasing subscription-rate basis. New online publishing technologies were being developed to materialize these conceptions and relations. Once a journal's issues were scanned into a digital format and the initial cost of this scanning was recovered, commercial publishers could sell back to academics their own work at increasing rates and profit margins (Lorimer, Smith, & Wolstenholme, 2000).

Given the higher prices that science, technical, and medical journal publishers were charging at the time (Lorimer, Smith, & Wolstenholme, 2000), it was our view that the commercialization of knowledge circulation in journal form represented an unacceptable burden on postsecondary research institutions and created an unacceptable barrier for scholars, students, and individuals who wish to access publicly funded knowledge. In addition, control of knowledge circulation by commercial academic publishers rendered the academic community relatively powerless, since there were few means for academics to define the terms of online publication and distribution.

Given these developments, efforts were initiated to explore the development of online technology that could serve as an alternative to that put forth by commercial publishers. Ideally, such a technology would enable the *Journal* community to control online publication and would reflect the community's priorities and interests (Lorimer, Smith, & Wolstenholme, 2000). We proceeded with the belief and understanding that the technology and organization required to publish a journal online was not beyond the technical reach and expertise of faculty and students in our discipline.

In terms of approach, we were inspired by the action research of educators and documentary filmmakers on Fogo Island, Newfoundland (Lorimer, Smith, & Wolstenholme, 2000). In the context of this documentary filmmaking project, educators and filmmakers gave up control of the filmmaking process to the local islanders and in so doing facilitated a process whereby the islanders were able to define their own identity and needs on their own terms. In the spirit of Fogo Island, our guiding research question was: What would online scholarly communication look like if it were controlled by scholars? In what follows, we explore this question with specific reference to the *Canadian Journal of Communication Online* (*CJC Online*, www.cjc-online.ca) and reflect in greater depth on the nature of technology development and the political stakes and implications inherent in this process.

Society and technology

Over the past three decades, researchers working under the broad umbrella of sociology of technology have produced a rich and diverse collection of detailed case studies that document the social character of technology development. According to this body of work, technological development must be understood as an ongoing and historically contingent process that is constituted by the under-

standings, interactions, and conflicts of the involved social actors. We may discern at least three approaches under this umbrella that have inspired and continue to guide significant programs of research.

First, the social construction of technology approach, outlined initially by Pinch and Bijker (1984), takes as its focus the social groups involved in technology construction and their understandings and interpretations of a technical artifact. Different social groups understand a given artifact in different ways and prefer designs that address their concerns. Consequently, technology exhibits multiple paths of development that correspond to the various interpretations of the groups involved in the design process.

Extending insights and concepts from the sociology of science, Pinch & Bijker argue that the success or failure of a technology must be understood as a social outcome. The extent to which various social groups understand their concerns to be addressed by a given design corresponds to the degree to which the design may be said to be stable. As a result, stabilization may not only differ across groups involved in the development of a technology, but may also vary in terms of degree (from less to more stable or vice versa) for any given group.

Whereas social construction of technology research takes social groups and the technical artifact as its focus of analysis, systems approaches to technology construction, as initially outlined by Hughes (1979), focus on technology as a system and technology developers as system builders. Despite this difference, systems approaches acknowledge the interpretive character of technology, especially insofar as system builders understand and formulate problems in a certain way and use these formulations as the basis for development and system building.

According to Hughes, developers of technology are first and foremost problem solvers who do not hesitate to cross disciplinary boundaries in order to arrive at solutions. Modern technological development involves the co-ordination of the technical, the economic, the political, the cultural, and the scientific into a coherent system or, in Hughes's words, a "seamless web." The construction of technology is not simply the design and development of an artifact, but an attempt to establish a system.

Building on some of the insights of systems-oriented approaches, proponents of actor-network theories suggest that technology construction is best understood as "heterogeneous engineering" (Law, 1987), that is, in terms of the strategies used by technology builders to mobilize and juxtapose human and non-human elements into stable arrangements. From the perspective of the heterogeneous engineer, indifferent or unhelpful human and non-human elements must be controlled and associated with each other into a durable actor-network for the technology to be successful.

More than those of any other approach, actor-network case studies have highlighted the dynamic character of social groups, as well as their interests and interpretations. Although stable social groups and interests may be a starting point for analysis, it is important to account for the various ways in which interests are translated and groups are associated with non-human elements throughout the process of technology development. As a result of these strategies and associa-

tions, social groups and technologies are transformed, and often new groups and new interests emerge from the process.

In terms of this co-production of the social and the technical, we may discern some convergence across the various approaches over time. In particular, Bijker (1993) extends the original social construction of technology formulation and suggests a movement away from the technical artifact and toward the "sociotechnical ensemble" as the focus of analysis:

> Each time *machine* is written as shorthand for *sociotechnical ensemble*, it should, in principle, be possible to sketch the (socially) constructed character of that machine. Each time *social institution* is written as shorthand for *sociotechnical ensemble*, it should be possible to spell out the technical relations that go into making that institution into a stable setup. Society is not determined by technology, nor is technology determined by society. Both emerge as two sides of the sociotechnical coin, during the construction process of artifacts, facts, *and* relevant social groups. (Bijker, 1993, p. 125)

There is thus a movement away from the "society shapes technology" focus that was the basis of much early work in the sociology of technology and an attempt to account for the co-constitution of the social and the technical. Bijker distinguishes the concept of "sociotechnical ensemble" from that of "sociotechnical network," prevalent in actor-network approaches; however, for our purposes the two concepts are interchangeable—both terms foreground sociotechnical relations and the co-production of society and technology.

Given that technology development involves both technical and social content, Callon (1987) suggests that we not limit our understanding of engineers and reduce their activities to the technical domain. To the extent that design and development involves engineers continually forming and testing hypotheses about the social world, engineers should be understood as "engineer-sociologists." As Law and Callon (1988) point out, "[e]ngineers are not just people who sit in drawing offices and design machines; they are also, willy nilly, social activists who design societies or social institutions to fit those machines" (p. 284).

From small steps to online publishing

If engineers are also sociologists, then the efforts expended to develop *CJC Online* can perhaps be understood, symmetrically, as a form of sociologist engineering, since we have attempted, as social scientists, to engineer technology suited to the online publication of the *Journal*. Generally speaking, this development may be roughly divided into three phases, which we outline below.

Initial experimentation with online publishing began in 1994 and involved mostly the conversion of existing *Canadian Journal of Communication* print material and files into a format suitable for the Web (Borwein & Smith, 1997). At the time, the focus was mainly one of presentation and conversion: How can we generate online versions of articles reliably and consistently, and how can we take advantage of the affordances of the Web, and hypertext links in particular, to present content online? Several graduate-student projects and collaboration with Wilfrid Laurier University Press and professional publication designers

yielded an online edition of the *Journal* that mirrored the print edition in content and style.

Building on those early experiences and positive feedback from the *Journal* community, efforts were undertaken to design and implement an online journal system that would allow us to move beyond the static presentation of content, in the form of fixed files that could be viewed online, and toward more dynamic content presentation that would enable readers to perform full-text searches of articles and display content based on their needs and criteria (Lorimer, Smith, & Wolstenholme, 2000).

In comparison with early experimentation with file conversion and layout, the increase in complexity was significant. We developed custom software that managed the storage of issues and articles in a database and that was capable of retrieving this content based on user-supplied parameters, including search criteria. In addition, we added online support for keywords in the form of article metadata that would enable search engines to index the *Journal*'s contents.

The in-house-designed journal system was used to publish the online edition of the *Canadian Journal of Communication* until February 2004, when we began to use the Open Journal Systems (OJS) software developed by the Public Knowledge Project (PKP). The PKP was founded in 1998 by John Willinsky at the University of British Columbia to improve access to scholarly content beyond traditional academic venues. Today, the Public Knowledge Project is a partnership between the Faculty of Education at the University of British Columbia, the Simon Fraser University Library, the Canadian Centre for Studies in Publishing at Simon Fraser University, and the School of Education at Stanford University.

In addition to Open Journal Systems, the PKP also develops and maintains the Open Conference Systems software for the online management and publishing of conference proceedings; the Open Monograph Press software, which provides online monograph development and publishing tools; the Open Archives Harvester software, which enables institutions to index online content and provide readers with search capabilities; and the Lemon8-XML document conversion tool that enables publishers to convert Microsoft Word and OpenOffice files to Extensible Markup Language (XML) files that can be used for archiving and to generate files (i.e., XHTML and PDF) suitable for online publication (Public Knowledge Project, 2007d).

The rationale for the transition of *CJC Online* to the PKP's Open Journal Systems software was threefold. First, unlike our in-house-developed system, OJS supported full online management of the editorial process, from author submission through to online publication, including peer review, copyediting, and layout. This capacity would eliminate the need to maintain separate systems for the management of reviewers and the tracking of peer reviews. In addition, for accepted articles, OJS would provide a single system for tracking manuscript revisions, edits, and galleys. Second, the Public Knowledge Project made available all of its software using a free software licence. As a result, journal publishers were welcome to modify OJS and change it to suit their unique circumstances and needs. And lastly, all of the PKP software was made available free of charge. Any journal publisher could obtain a free copy of OJS via the Internet.

Since our editorial team was already familiar with the Web and online applications, the transition would require only familiarization with the specifics of the OJS software and the associated user interfaces. In addition, since a database was already being maintained, it could be used as a basis to export existing online *CJC* content that could then be imported into OJS.

The transition to the Open Journal Systems software was completed on February 5, 2004. Since that time, we have also imported into OJS older back issues of the *Journal*, spanning volumes 1 through 15, that were previously only available in print. With the help of the Simon Fraser University Library, which performed the actual scanning of the issues and the generation of the corresponding PDF files, we were able to make use of the OJS import facility to systematically add previously print-only articles to the online system. An undergraduate student was hired on a part-time basis to prepare the necessary OJS import files, which include the metadata—title, authors, abstract, keywords, and so on—for the imported issues and articles.

The sociotechnical ensembles of *CJC Online*

In the three years since the *CJC*'s transition to OJS, we have received encouraging feedback from authors, reviewers, editors, and readers. All in all, over a decade has passed since our first experiments with online publishing, and we believe that significant and positive changes have taken place in that time. The following evidence and examples detail this success.

To begin with, despite major technological and economic changes in the academic publishing industry, we have managed to define our online publishing technology and consequently have been able to retain control over the *Journal*'s online publication and distribution. Today, online visitors to *CJC Online* with a personal or institutional subscription may access and read all articles online. Likewise, visitors without a subscription may nonetheless access most of the *Journal*'s content online. With the exception of the most recent volume, online visitors have access to the full text of all articles in all volumes of the *Journal*, which are now online in their entirety, from the first volume, published in 1974, forward. In this respect, readers are able to remain readers and are not positioned, first and foremost, as consumers of information commodities.

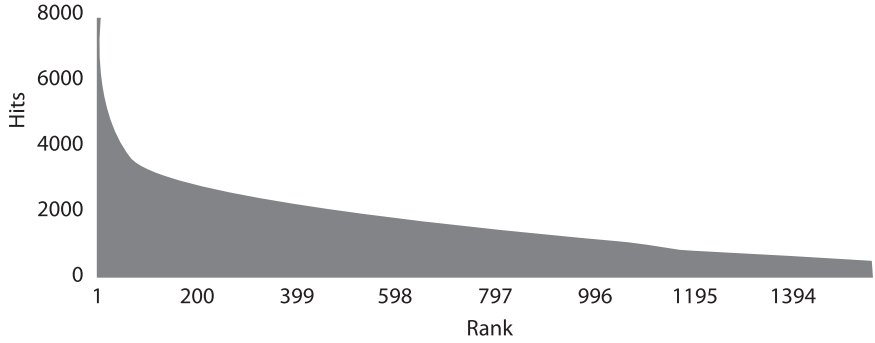
Table 1: Top 10 most accessed articles at *CJC Online*, from February 5, 2004, to December 15, 2007[1]

Rank	Publication Year	Hits
1	2002	10200
2	2003	7839
3	2001	6247
4	2001	5996
5	2000	5924
6	1991	5905
7	1998	5654
8	2005	5643
9	1996	5475
10	2005	5314

This "delayed open access" publishing model makes available to readers both newer and older journal content. Although at first glance one might assume that readers would have little use for older content, article access statistics suggest otherwise. For example, as of this writing, the top 10 most accessed articles include seven articles that are at least five years old. Table 1 shows the publication year and the number of times that the top 10 articles have been accessed online since February 5, 2004.

In true "long-tail" fashion (Anderson, 2004), there are popular articles that are accessed more than other articles. However, once this subset of popular articles has been accounted for, access statistics indicate that the remaining articles are also accessed quite regularly, albeit at a lower frequency than the popular articles. As with the top 10 most accessed articles, access patterns suggest that all articles, old and new, have some relevance to the *Journal*'s readers. For example, approximately 70% of articles that are ranked between 400 and 500 in terms of access are at least five years old. That is, approximately 70 of these 100 articles were published prior to 2003. Figure 1 shows the number of times that all *CJC* articles have been accessed online since February 2004.

Figure 1: Article access statistics at CJC Online, from February 5, 2004, to December 15, 2007[2]



Although these numbers are encouraging, article access statistics need to be understood in terms of both how they are collected and what they are able and unable to report. The number of times that an article has been accessed is tallied by the Open Journal Systems software. The current version of the software does not identify users or distinguish between actual people and Web crawler software utilized by search engines to index content on the Web. As a result, the number of times that each article has been viewed by actual readers will be less than the reported totals. It is equally important to note that article access statistics cannot report on the value or perceived quality of the articles to readers. An article "hit" is registered regardless of whether a visitor skims an article's introduction and moves on to another website, stays at the site, reads an article in its entirety, or finds the contents meaningful.

Given current Internet usage trends, it is important to understand *CJC Online* and online journals more generally as closely intertwined with search engines and

portals. According to the latest available data from the U.S., using search engines is the second most popular Internet activity following email (Rainie & Shermak, 2005). People use search engines to navigate to content that they are already aware of, but journal articles that turn up in search-engine results also have the potential to attract readers who may otherwise not know of the *Journal*.

Our website access statistics indicate that search engines, and Google in particular, are the most popular points of entry to *CJC Online*. More specifically, between January 2007 and November 2007, approximately 50% to 60% of online visitors arrived at *CJC Online* by way of search engines. In comparison, approximately 20% to 25% of readers arrived at *CJC Online* through non–search engine websites (via Web links), and approximately 20% to 25% of readers navigated to *CJC Online* directly, that is, by typing "www.cjc-online.ca" into their Web browsers. Table 2 includes a detailed comparison of entry points to *CJC Online* during this time period.

Table 2: Visitors to CJC Online by entry point, from January 1, 2007, to November 30, 2007[3]

Month	Search Engines	Websites	Direct
January 2007	6464 (54%)	2756 (23%)	2719 (23%)
February 2007	6998 (56%)	2788 (22%)	2732 (22%)
March 2007	8399 (54%)	3670 (24%)	3509 (23%)
April 2007	6575 (57%)	2411 (21%)	2458 (21%)
May 2007	6217 (62%)	1975 (20%)	1839 (18%)
June 2007	5110 (61%)	1476 (18%)	1737 (21%)
July 2007	4029 (59%)	1443 (21%)	1392 (20%)
August 2007	3941 (58%)	1386 (20%)	1509 (22%)
September 2007	4587 (54%)	1867 (22%)	1999 (24%)
October 2007	6695 (51%)	3111 (24%)	3203 (25%)
November 2007	7215 (52%)	3194 (23%)	3438 (25%)

In the case of a search engine such as Google Scholar, most readers are likely students, academics, or professionals. However, in the case of the more general search engines, readers may include students, academics, and professionals as well as readers that do not fall into any of these categories. We believe that the data are encouraging and may suggest an expansion of the *Journal*'s readership, which includes both individuals who are familiar with the *Journal* and individuals who find or discover *Journal* articles through search engines.

The high proportion of visitors that arrive at *CJC Online* via Google suggests that the *Journal* has a strong dependence on the commercial search engine, which continues to maintain a ubiquitous position online. With the exception of improving content exposure and visibility for search-engine crawlers, online publishers have little control over how content will be indexed, stored, and subsequently referenced by Google and other search engines. For example, if Google were to expand the prominence and weight of sponsored links in its search results, there would be very little that non-profit journals could do to compete with large, commercial online publishers willing to sponsor links and search results. Given that many Google users click on links on the first page of search results, being rele-

gated to subsequent pages in the search results may have a significant impact on a journal's reach and visibility.

In a similar way, given that most commercial search engines do not publish the details of their indexing and search algorithms and continually modify these algorithms according to internal criteria, all online publishers are to a large extent dependent on a "black box" that is off-limits in terms of both design and operation. Among other criteria, search engines typically perform a calculus that takes into account the links that point to a website and, in turn, the prominence of the websites from which these links originate. Algorithms of this sort favour established publishers with high impact factors—their articles will percolate to the top of search results, regardless of whether the content is freely available.

The creation of online portals and search engines that provide an alternative to mainstream, commercial search engines has the potential to remedy the situation somewhat, since both the indexing and search algorithms may be made available publicly and subject to criteria and priorities established by academic publishers themselves. For example, the Ontario Scholars Portal aims to ensure that aggregation and searching of scholarly content is available to academics in addition to, and regardless of, similar functions provided by commercial search engines (Scholars Portal, 2007). In a similar way, the federally funded Synergies initiative, which will be discussed in greater detail below, will include an online portal as well as aggregating, indexing, and searching capabilities for social science and humanities journals in Canada.

The relationship between *CJC*'s authors and readers continues to be international. In 1999, requests for online content were received from the U.S., Europe, Asia, and South America (Lorimer, Smith, & Wolstenholme, 1999). Although the majority of content requests today continue to be from North America, recent access statistics indicate that *CJC Online* continues to be accessed to some extent from all continents. Table 3 shows the origin of all online visitors during November 2007.

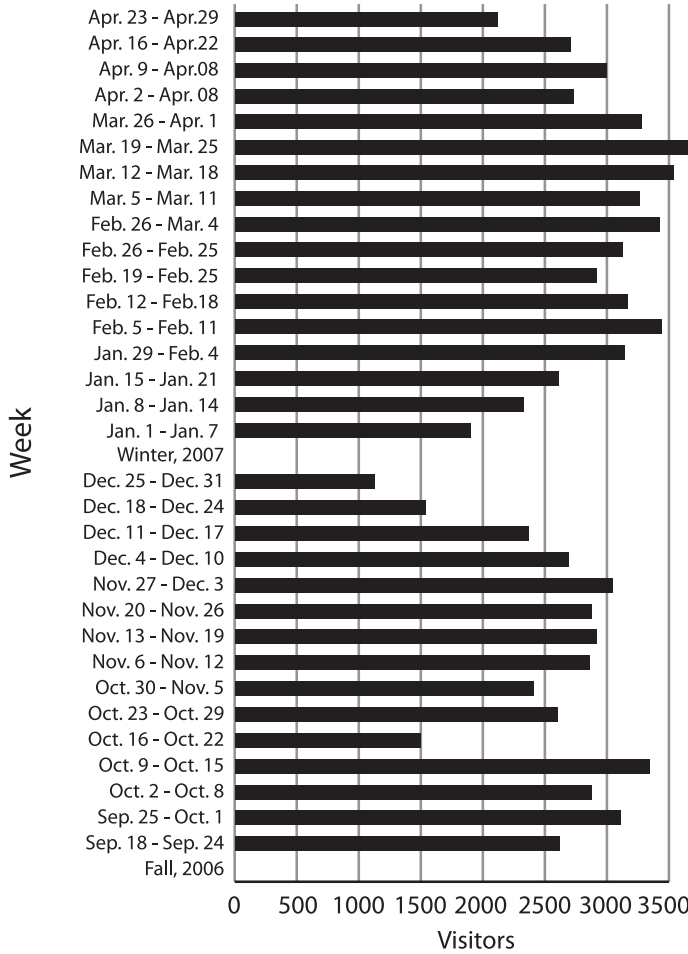
Table 3: Visitors to *CJC Online* by continent of origin, November 2007[4]

Continent	Visitors	
North America	9943	(71.81%)
Europe	1948	(14.07%)
Unknown	824	(5.95%)
Asia	582	(4.20%)
Oceania	264	(1.91%)
South and Central America	179	(1.29%)
Africa	107	(0.77%)

In 1999, students were using *CJC Online* for class-related activities (Lorimer, Smith, & Wolstenholme. 1999). Based on the most recent visitor statistics, we believe that this usage is likely continuing. As Figures 2 and 3 illustrate, there are small but noticeable peaks in the number of visitors during the penultimate months of the fall 2006, winter 2007, and fall 2007 academic semesters. Although it is difficult to determine the reason for a small peak at the start of October 2006,

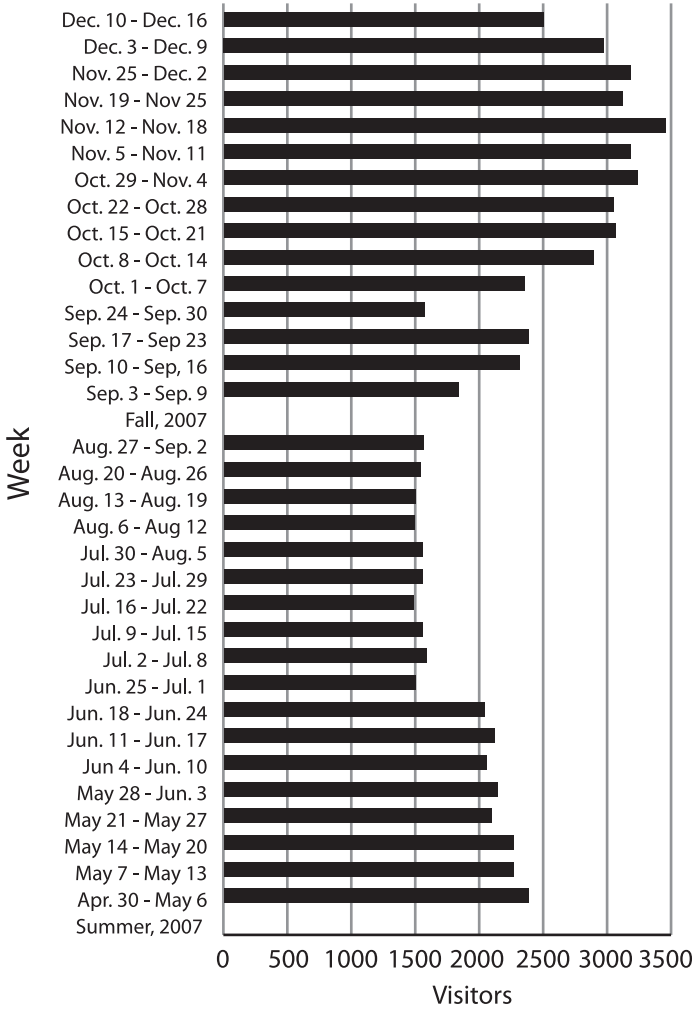
the peaks during the penultimate months of each semester do correspond with the time that end-of-semester assignments are typically written and term papers are typically due. Also, there is a noticeable decline in visitors during the summer semester, likely corresponding to both faculty schedules and reduced student enrolment during the summer months.

Figure 2: Visitors to *CJC Online* by week, from September 18, 2006, to April 29, 2007[5]



The number of visitors presented in figures 2 and 3 is tallied by an open source Web statistics software package that does not uniquely identify users, but is able to distinguish between actual people and Web crawler software utilized by search engines to index content on the Web. As a result, the reported number of visitors to *CJC Online*, unlike article views, corresponds to actual people and does not include visits generated by Web crawler software.

Figure 3: Visitors to *CJC Online* by week, from April 30, 2007, to December 16, 2007[6]



Unfortunately, at this time we only have limited data from 2006 and 2007 and cannot compare the available data with previous years. In addition, we have not confirmed our inference with research that specifically examines students' use of *CJC Online* content. A second plausible explanation for the increase in visitors during the identified time periods is that it corresponds to the timing of issue publication. In 2006, issue 31.3 was published on October 23, and in 2007, issues 32.1 and 32.3 were published on March 7 and November 12, respectively. Each of these dates falls within or near the identified time periods. This being said, issue 32.2 was published on June 6, 2007, but there is no observable increase in visitors during the subsequent weeks. However, there is also no visible increase

in visits at the end of July 2007, which would be expected to occur, albeit on a smaller scale, as a result of students enrolled in the summer semester.

Although the data is inconclusive and our interpretation is speculative, it is worthwhile to note that in Canada, 99% of youth in 2001 were online, and of these the majority preferred the Internet to books for research and homework activities (Crowley, 2002). Today, some of these students attend college and university, where even greater time constraints make the Internet a very attractive source of research material and information. Our own experiences with undergraduate students confirm these trends: assignments and term papers include an increasing number of online sources. Given these Internet usage patterns, *CJC Online* and online academic publishing more generally enables students—understood as learners, citizens, and potentially next-generation academics, professionals, and policymakers—to engage with authors and published work that they might otherwise pass up if it did not dovetail with their research constraints and preferences.

Copyleft, sharing, and collaboration

The Open Journal Systems software that the *Journal* now uses is licensed using a free software licence. This licence, known as the GNU General Public Licence (GPL), is "free" in the sense that users are free to use the software and modify it to suit their needs (Free Software Foundation, 1991). In addition to use and modification, the licence also governs the terms of distribution. In particular, the licence allows users to distribute copies of the software or copies of their modified versions of the software, but it requires that users grant to others the same rights and terms that were granted to them via the GPL. Consequently, the GPL is often referred to as a "copyleft" licence, since it attempts to legally prohibit others from imposing restrictions. Rather than release software into the public domain, where someone could potentially modify the software and then restrict the resulting product using a proprietary licence, the GPL uses copyright to ensure that future rights to use, modify, and distribute the software are preserved.

The GNU General Public Licence and the GNU Project that inspired it date back to the early 1980s and the work of Richard Stallman, at the time an MIT graduate student, who wanted to develop a non-proprietary computer operating system as an alternative to the commercial and proprietary operating systems of the time. In 1985, Stallman published *The GNU Manifesto* and outlined his motivations and concerns:

> Many programmers are unhappy about the commercialization of system software. It may enable them to make more money, but it requires them to feel in conflict with other programmers in general rather than feel as comrades. The fundamental act of friendship among programmers is the sharing of programs; marketing arrangements now typically used essentially forbid programmers to treat others as friends. (Stallman, 1985)

GNU is a recursive abbreviation for "GNU's Not Unix." (Unix is an operating system that at the time was only available under proprietary licensing schemes). Since the initial publication of *The GNU Manifesto* and the GNU General Public Licence, thousands of computer programs have been licensed

under the GPL and many have been made available to computer users via the Internet free of charge.

The Open Journal Systems project is an attempt to build on these historical developments and to continue a tradition of collaboration and sharing. The transition of *CJC Online* from a custom-built online publishing system to OJS not only allows the *CJC* to take advantage of new online editorial management capabilities, but also, and more importantly, enables us to join the community of academic journal publishers that also use and develop the software. Publishers are thus able to draw on the experiences of other publishers and to contribute their own experiences to the development process. Of equal importance, publishers are able to modify the software to suit their unique needs and circumstances. We think that this activity has important political implications, which we now turn to and consider in terms of Andrew Feenberg's (1999) critical theory of technology.

Participation and representation

In considering the nature of agency in the technical sphere, Andrew Feenberg develops a situational politics based on local knowledge and experience with technology. Feenberg's critical theory of technology suggests that micropolitics is well suited to the technical sphere, where diverse but converging subversive initiatives have at times been successful in challenging technocratic and economic imperatives and modifying technological systems to suit alternative goals and values.

To the extent that technologies permeate most spheres of everyday life, including habitation, medicine, transportation, communication, and work, Feenberg argues that democratic standards need to be applied to technical systems. At the same time, Feenberg acknowledges that this extension of democratic standards faces major obstacles, the most significant of which includes a technocracy that promotes passivity and often illegitimates public involvement in technical matters (Feenberg, 1999).

Feenberg argues that politics in the technical sphere cannot be conceived using traditional notions of agency, representation, and locality, since technology introduces new aspects unaccounted for by political theory (Feenberg, 1999). This is not to say that traditional forms of policy and regulation are not important, but merely to point out that they cannot be solely relied upon to guarantee that harmful designs will be avoided or that traditional forms of geopolitical representation can always be mobilized around technical issues.

In contrast with traditional forms of representation and the requirements of geography and space, Feenberg argues that technological representation in modern societies is bound temporally by means of technical designs and disciplines that embody a heritage of past interests and choices. As Feenberg points out, "technology is the bearer of a tradition that favors specific interests and specific ideas about the good life" (Feenberg, 1999, p. 139). This "technical historicity" is materialized in the "technical codes" of specialized disciplines, that is, in the seemingly neutral and value-free aspects of knowledge, practices, institutions, and designs. Typically, technologists and specialists operate with a seemingly pure and rational autonomy that is made possible by technical codes and the loss over time of the social circumstances and origins responsible for their shape and form.

In terms of locality, Feenberg suggests that we consider the technical "global" to refer to the larger sociotechnical networks in which the "local" corresponds to the institutional settings in which interventions emerge (Feenberg, 1999). Conceptualized as such, locality may include both geographically proximate as well as geographically dispersed political interventions into technological development. For Feenberg, where individuals act in these "local" settings, they re-enact a form of populist participation associated traditionally with local geographic settings.

Understood in terms of Feenberg's critical theory of technology, free and open source software development enables individuals and groups for whom particular software has relevance to participate in defining the nature and contours of this technology. Since the Internet forms the basis of most free and open source software development interactions, the "locality" of this participation is highly distributed and mediated. However, for individuals and groups that are able to satisfy the economic, technical, and social requirements imposed by this "locality," participation can take many forms and may include requests for new software features or changes to existing features, translation of software user interfaces and documentation into local languages, communication of problems or software errors, and direct contributions of new or modified software components that address needs and requirements that were unaccounted for by the system previously.

Depending on individuals' and groups' resources and particular circumstances, some or all of these forms of participation may be suitable or appropriate. For example, groups that lack the necessary expertise or resources to develop software components may nonetheless request changes to the software that other participants may then be able to implement. The quality and diversity of communities will obviously vary from one project to the next, but for the purposes of our discussion, what is most relevant is that free and open source software development provides a model and a framework for technology development that is well suited to political participation in the technical sphere. Success in this process is a measure of the degree to which participants feel that their needs and interests are represented through specific designs and features of the technology.

The *CJC* has been an active participant in the Open Journal Systems community and has been able to contribute to the project a French translation of the OJS user interface as well as several software components from our custom online publishing system, including the ability to post journal announcements, publish thesis abstracts, track online subscriptions, and manage delayed open access. The first of these components enables editors to post announcements on the front page of the *Journal* site to inform readers of upcoming events, announce job postings, or solicit calls for papers, for example. This supplement to OJS enables editors to communicate information that is relevant to the journal readership and site visitors.

In addition, the *CJC* developed the necessary additions to OJS to enable online journal publishers to accept and publish student thesis abstracts. This functionality was developed originally for *CJC Online* to enable students to announce the completion of their theses and to describe briefly their completed work to fellow authors and readers.

Lastly, we have contributed to OJS the software components necessary to enable online journal publishers to manage individual and institutional subscriptions. With this addition, OJS supports both an "open access" publishing model, where all content is freely available to readers, and a "delayed open access" publishing model, where all content is freely available to readers with the exception of the most recent volume, issue, or year's content, for example. The latter approach to publishing allows journal publishers to offer readers at no charge as much content as possible, while at the same time restricting a small amount of content to encourage subscriptions that help offset the costs of non-profit publishing and/or enable journals to receive financial support from funding institutions that require a subscription base of readers.

In sum, the *CJC*'s contributions to OJS reflect the needs and circumstances of the *Journal*. The *CJC*'s commitment to share its efforts with the wider online journal community and with other journals with similar needs and requirements, in particular, has been very rewarding. To date, there are over 1000 journals that publish online using Open Journal Systems, primarily in North America (364), Europe (287), Africa (281), and South America (191) (Public Knowledge Project, 2007a). OJS is now available in 12 languages—Croatian, English, French, German, Hindi, Italian, Japanese, Portuguese (Brazil), Russian, Spanish, Turkish, and Vietnamese—with an additional 14 languages currently in translation, including Arabic, Catalan, Chinese, Danish, Dutch, Farsi, Finnish, Greek, Indonesian, Malay, Norwegian, Portuguese (Portugal), Swedish, and Thai (Public Knowledge Project, 2007b). All of the existing and ongoing translations have been contributed to the Public Knowledge Project by journal publishers who wished to use OJS in their native language and to share their efforts with other OJS publishers.

Like the *CJC*, some journals using OJS have also contributed software components that modify and extend the system's core features and functionality, including, for example, the capacity to syndicate content, control the default layout of OJS pages, and automate the generation of article galleys. Journal publishers and editors have also made use of the PKP's public online user forums to share their experiences and needs and to suggest new and evolving requirements unaccounted for by the software that have then been implemented by PKP developers (Public Knowledge Project, 2007c).

Challenges and opportunities

Many changes and developments, both in terms of publishing at the *Journal* and in terms of academic publishing more broadly, have taken place since our initial experiments with online publishing in 1994. The last decade has seen an unprecedented commercialization of most areas of the Internet. Our desire to be able to define the terms and conditions of the online publication of the *Journal* in opposition to exploitative subscription models is still with us today, and recent trends in commercial online publishing continue to justify providing and sustaining constructive alternatives.

Non-profit online journal publishing has come a long way during this time. Software such as Open Journal Systems provides publishers with a platform for online publishing that matches or exceeds any proprietary product and may be

used as-is or as a basis for customization. The latter option is made possible and guaranteed by the free software licensing terms under which OJS is made available. The free and open source software development model is well suited to participation in the technical sphere precisely because it offers participants an opportunity to ensure that their particular values, needs, and interests are materialized in the design and functions of the technology.

Participation in this development model, while not restricted by proprietary arrangements common to commercial software development models, nonetheless imposes certain requirements on academic publishers if they wish to participate actively. In order to publish online and to develop online publishing technology, the *CJC* has relied upon not only financial aid and subsidies from the Social Sciences and Humanities Research Council (SSHRC), but also individual research grants to fund the exploration of online publishing models and the hiring of student programmers necessary to the implementation of system designs and prototypes. In addition, the *CJC* has relied upon subscription revenue and judicious financial management to ensure that publishing in print and online is sustainable both in the short and long term. Lastly, navigation of the increasingly complex technical landscape and the actual use and improvement of online publishing technology has benefited tremendously from both the expertise of the *CJC* publishing team and the ongoing feedback and commitment of the editorial team.

The financial, technical, and expertise requirements are to some extent being addressed by the recently approved and federally funded Synergies initiative to build a partnership between university libraries, computing service facilities, and Canadian social science and humanities journals to facilitate online publishing, spearheaded in Canada by five universities. The Canada Foundation for Innovation (CFI) recently awarded $12 million for the initiative in order to put in place journal publishing infrastructure in no fewer than five and up to 18 different Canadian universities to host journals on a cost-recovery basis.

Within this infrastructure, Open Journal Systems will be used by four of the five principal Synergies universities. In most cases, the systems divisions of university libraries will provide the necessary servers, software, technical support, backup, and archiving to allow journals to publish online. Since libraries will provide the necessary technical infrastructure and expertise, journal publishers and editors will be able to focus on submissions, peer review, the editorial process, and, if the journal publishes using a delayed open access model, the management of subscriptions. In addition, Synergies members will create a decentralized database that will allow users to search the contents of all Synergies-hosted journals in French or English for relevant research on any social scientific or humanities subject and to see results presented in a variety of different ways—historically, geographically, or by discipline, for example.

The Synergies project is complemented by the Canadian Research Knowledge Network (CRKN), a second university library–based initiative. Like Synergies, CRKN has received public funds to act as a consortium on behalf of its library members to purchase online access to aggregations of Canadian and foreign social science and humanities journals and other scholarly materials. CRKN is generating demand for online content and hence providing an important

stimulus to encourage journals to take advantage of the available technology and Synergies to publish and sell online subscriptions to a wide variety of Canadian research libraries.

Online journal publishing has reached a stage of being increasingly available and open to wide community participation. The Public Knowledge Project suite of software is freely available, well documented, and supported by both the PKP and an active community of academic publishers. The technology is now used throughout the world and has been tested extensively by early adopters who now possess a wealth of experience and the desire to continue to innovate and reflect on the dynamics, results, and implications of online academic publishing in Canada and abroad. As of this writing, SSHRC is drawing up new criteria for its "Aid to Research and Transfer Journals" program that will allow both online and open access journals to apply for support.

These various initiatives are reconfiguring the sociotechnical relations among funding institutions, research libraries, journal publishers, publicly funded research, and free and open source software. Given these relations and new partnerships, it is our hope that journal publishers will be able to continue to define the online publishing process and technology and, in so doing, continue to pursue their first priority of serving as a quality-assured venue for the publication of research as well as their next priority of maximizing dissemination of that research to the academy and the public (Lorimer, Lynch, & Provençal, 2006).

Acknowledgments

We would like to thank Kim Sawchuk, Nikki Porter, and the anonymous reviewers for their comments and suggestions for improving an earlier draft of this article.

Notes

1. The number of times that an article has been accessed is tallied by the Open Journal Systems software. The version of the software utilized by the *CJC* does not identify users or distinguish between actual people and Web crawler software used by search engines to index content on the Web. As a result, the number of times that each article has been viewed by actual users will be less than the reported total.

2. Please see Note 1.

3. The number of visitors is tallied by an open source Web statistics software package, phpMyVisites, which is freely available via the Internet (http://www.phpmyvisites.us). The version of the software utilized by the *CJC* does not identify users, but it is able to distinguish between actual people and Web crawler software used by search engines to index content on the Web. As a result, the reported number of visitors corresponds to actual people and does not include visits generated by Web crawler software.

4. Please see Note 3.

5. Please see Note 3.

6. Please see Note 3.

References

Anderson, Chris. (2004). The long tail. *Wired Magazine*, *12*(10). URL: http://www.wired.com/wired/archive/12.10/tail.html [Dec. 22, 2007].

Bijker, Wiebe E. (1993). Do not despair—there is life after constructivism. *Science, Technology & Human Values*, *18*, 113-138.

Borwein, Jonathan, & Smith, Richard. (1997). On-line journal publication: Two views from the electronic trenches. *Canadian Journal of Communication*, *22*(3), 135-152.

Callon, Michel. (1987). Society in the making: The study of technology as a tool for sociological analysis. In Wiebe E. Bijker, Thomas P. Hughes, & Trevor J. Pinch (Eds.), *The social construction of technical systems: New directions in the sociology and history of technology*, 83-103. Cambridge, MA, & London, UK: MIT Press.

Crowley, David. (2002). Where are we now? Contours of the Internet in Canada. *Canadian Journal of Communication*, *27*(4), 469-507.

Feenberg, Andrew. (1999). *Questioning technology*. New York, NY: Routledge.

Free Software Foundation. (1991). *GNU general public license*. URL: http://www.gnu.org/copyleft/gpl.html [Dec. 22, 2007].

Hughes, Thomas P. (1979). The electrification of America: The system builders. *Technology and Culture*, *20*, 124-161.

Law, John. (1987). Technology and heterogeneous engineering: The case of Portuguese expansion. In Wiebe E. Bijker, Thomas P. Hughes, & Trevor J. Pinch (Eds.), *The social construction of technological systems: New directions in the sociology and history of technology* (1st MIT Press paperback ed.), 111-134. Cambridge, MA: MIT Press.

Law, John, & Callon, Michel. (1988). Engineering and sociology in a military aircraft project: A network analysis of technical change. *Social Problems*, *35*(3), 284-297.

Lorimer, Rowland, Lynch, Lindsay, & Provençal, Johanne. (2006). Augmenting print: Planning for online journal publishing by social science and humanities journals in Canada. Vancouver, BC: Canadian Association of Learned Journals/ L'association canadienne des revues savantes.

Lorimer, Rowland, Smith, Richard, & Wolstenholme, Paul. (1999). Web server statistics for the *Canadian Journal of Communication*. *Canadian Journal of Communication*, *24*(2), 289-294.

Lorimer, Rowland, Smith, Richard, & Wolstenholme, Paul. (2000). Fogo Island goes digital: Taking a scholarly journal on-line, the case of CJC-Online.ca. *Canadian Journal of Communication*, *25*(3), 377-396.

Pinch, Trevor J., & Bijker, Wiebe E. (1984). The social construction of facts and artifacts: Or how the sociology of science and the sociology of technology might benefit each other. *Social Studies of Science*, *14*, 399-441.

Public Knowledge Project. (2007a). *Journals using Open Journal Systems by continent*. URL: http://pkp.sfu.ca/ojs-geog [Dec. 22, 2007].

Public Knowledge Project. (2007b). *OJS languages*. URL: http://pkp.sfu.ca/ojs-languages [Dec. 22, 2007].

Public Knowledge Project. (2007c). *PKP support: Open Journal Systems*. URL: http://pkp.sfu.ca/support/forum/viewforum.php?f=18&start=0 [Dec. 22, 2007].

Public Knowledge Project. (2007d). *What is the Public Knowledge Project?* URL: http://pkp.sfu.ca/about [Dec. 22, 2007].

Rainie, Lee, & Shermak, Jeremy. (2005). *Search engine use November 2005*. URL: http://www.pewinternet.org/pdfs/PIP_SearchData_1105.pdf [Dec. 22, 2007].

Scholars Portal. (2007). *Scholars Portal—About*. URL: http://www.scholarsportal.info/about.html [Dec. 22, 2007].

Stallman, Richard (1985). *The GNU manifesto*. URL: http://www.gnu.org/gnu/manifesto.html [Dec. 22, 2007].