

# Weaving an Open Web

## Innovation and Ethics in the Virtual Commons

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The concept of openness is nothing new to modern computing. During the advent of mainframes in the post-war period, software was distributed by means of source code printed on paper, whereby a programmer would manually input the code into the device, line by line. However, the rise of commercial applications for computing brought with it new types of non-technical (end-)users and business models focused on maintaining control over the ways in which software was made. Today, two general approaches to software computing exist alongside one another: the closed source model, which maintains a degree of secrecy and proprietary right over source code, providing only an end-product to users; and the open source model, which makes available the application source code to enable collaboration and knowledge-sharing among developers and communities interested in technological change.

The re-emergence of openness is interdependent with the rise of the Internet and the World Wide Web – much of the server and infrastructure of the Internet is based on open source technologies. Moreover, the rising popularity of web-based content management systems such as Drupal and WordPress has pushed the parameters of the debate further into public consciousness, prompting the everyday user to make decisions about closed and open source models when launching a new blog, extending their business online or building a community forum. As such, this chapter seeks to cover extensive ground, providing a look into the state of open source. After briefly appraising how copyright and proprietary models came to drive the development of open source approaches embodied by a moral economy of openness and an ethic of fair dealing, I focus on the open web – a term used to describe the collection of open source technologies and techniques that form an integral part of an increasingly ubiquitous online experience. In particular, I examine the maturation of content management systems and their role in pushing forward new conceptions of innovation and ethics through a discussion of technologies and techniques such as peer review and modularization, and concepts such as communities of practice, recursive publics and cultural usability. In Canada, open source activity remains low, even though the country ranks high in terms of Internet penetration (Red Hat 2009). As the Government of Canada and several sectors of the economy and society begin to consider implementing new online technologies, it is necessary to

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consider successes of open source and the open web, as well as components and approaches that remain works in progress. While recent high profile projects such as Mozilla's Firefox have helped bring open source computing and development into the spotlight, its future remains unsettled and its implications remain unclear.

## **Opening the web: Successes of open source**

*"Infrastructural technologies offer far more value when shared than when used in isolation"* (Carr 2003: 6).

The concept of open source software finds its contemporary origin in a clash of ideologies – between the commercialization of software, and the free exchange of information and cooperation. In the early 1980s, a shift towards commercial, closed source software brought with it new limits to collaboration and knowledge sharing for large communities of independent developers, including academic research departments. In what was previously an open domain, uncertainties and ambiguities surfaced concerning the legality of sharing what could now be considered proprietary technologies. This tension, compounded by the widespread emergence of personal computing, set off a series of events discussed throughout this volume that would lead to what we understand today as the open source movement.

At the 1997 Linux Congress, Eric Raymond drew critical attention to the dynamic practice among a growing community of developers of dealing openly and fairly in collaborative projects. Raymond's pivotal lecture, "The Cathedral & the Bazaar," compared two different models of software development: the traditional "Cathedral" model, where source code development is restricted to an exclusive group of developers; and the emerging "Bazaar" model, based on an open community of developers from across the Internet working on source code that is continually and freely distributed (e.g. Raymond 1998). This moment marked a (re)discovered awareness of the potential embedded within open models of development, which helped bring about a new period in software engineering and computer culture. For example, it led to the open sourcing of the Netscape browser, which would eventually become Mozilla Firefox, as well as the coining of the phrase "open source," which was previously known as "free software."

The turn of the millennium saw the rise of new software technologies focused on online content creation, information sharing and collaboration – sometimes referred to as "Web 2.0." Open source contributed to this evolution conceptually, in that software developers and entrepreneurs invoked ideas of collaboration and an ethic of fair access and free information exchange in the wake of the open source movement's heightened visibility and demonstrated ability to build communities based on voluntarism. The first online social networks were created. Open source's technical contribution to the new web was not only in forming part of the infrastructural foundation, but also in playing a vital role in pushing the web forward with the engineering of new technologies for the production of knowledge and online collaboration, such as Drupal, WordPress and MediaWiki. Previously, contributions to the visible body of the web required an intimate knowledge of code and a certain degree of expertise in computer programming. As access to the Internet became more widespread, web-based content management tools were developed to fill the gap between content

creators without the adequate technical expertise and those well-versed in programming languages and network protocols.

For example, in 2001, Dries Buytaert produced an online message board system that would quickly come to be extended by a large community of developers into a full-fledged content management system (CMS) called Drupal. Today, Drupal ranks among one of the most widely used open source content management systems. Acting as a graphical user interface to enable the creation of content in a fashion similar to how one would produce a word processing document (for example in Microsoft Word or OpenOffice), web-based content management systems do not require the traditional level of technical programming knowledge previously required for creating, updating or maintaining webpages. This degree of accessibility works to uphold an ethic of openness and fair access, extending the capacity for the production and dissemination of knowledge to new demographics and expanding the reach of open source.

Open source content management systems such as Drupal, wiki software like MediaWiki and its implementation as Wikipedia, as well as browser platforms released under open source licences such as Mozilla Firefox are part of what I suggest be termed the “open web.” The history of the open web is part of the most recent history of open source, denoting an expanded scale of accessibility and representing a movement towards an increasingly user-centred experience, as opposed to the traditional approach focused predominantly on the developer and programmer. The technical and conceptual achievements of open source are long-standing and have not changed significantly in the last decade. However, the advent of new software projects directed towards an open web, which have come to be influential due to the immense expansion of the Internet, allows us to evaluate some of the activity in the open source domain from a fresh perspective, and to explore the ways in which open source communities are sustained. From this lens, the successes of open source can be described in terms of potentials, stemming from three features characteristic of the approach: increased reliability and security due to peer review, active communities of collaboration, and modularization employed to mitigate the complexity of a considerable number of people participating in large projects (not discussed here are the low cost of entry and the total cost of ownership; see Wheeler 2007 and, for an opposing perspective, Driver 2008).

The transparency of code in open source software enables and promotes expanded prospects for peer review and, consequently, an ethic of fair dealing. In this sense, making an application’s source code widely available can result in improved reliability and stability. Peer review is not limited to the discovery of functionality defects (or “bugs”), but also works to bring forward possible improvements and foster consistency in implementation, often according to design standards established by the developer community or larger governance organizations. The adherence to “best-practices” in combination with the availability of source code ensures that the software can be maintained without the participation of the original developer. Thus, when defects or flaws are discovered, the response time and availability of developers to repair open source software can be shorter than that of closed source counterparts. Because much of the interaction involved in peer review occurs via the Internet in open forums and list-serves, the referee function in weighing contributions is able to limit some of the social contextual factors, or at least provide transparency in making visible whose contributions carry weight and why (Weber 2006). The peer

review capacity of open source technologies also facilitates security and privacy auditing. While both open source and closed source developers often make claims to providing secure systems, the open source approach enables third-parties to verifiably identify and evaluate potential security problems. In-depth and widespread code-level auditing by third parties is an alternative to the problematic approach of relying upon the secrecy of source code to achieve or maintain “security through obscurity” (see Diffie 2003).

The availability and accessibility of source code also enables active community and entrepreneurial participation for development and support. Because the code is available to the public, organizations using open source can adapt their software as institutional or individual needs change. Development flexibility to customize the application, and freedom from vendor lock-in provide a multitude of alternative sources for support if the original development company ends its software engineering operations. This flexibility and freedom effectively enhance and extend the life of the software product, and are critical in making possible the collaboration resulting from the capacity to share code combined with the increasing ubiquity of the Internet. The development of proprietary software, with a limited number of employees, has difficulty committing itself to the increased workload that often accompanies improvements or new feature sets. Thus, according to Johnson (2006), employees are frequently hesitant to offer suggestions for enriching the software product. In marked contrast, the voluntary nature of most open source projects indicates that ideas are more freely shared since “an agent voluntarily supplying labor to an open source project cannot be compelled to work beyond his natural inclination.” The ethic of openness and a practice of dealing fairly to accommodate various degrees of ability and engagement therefore work to produce technologies that are both flexible for developers and appealing to large numbers and types of people.

The contribution of fresh ideas and the production of new development goals inevitably increases the complexity of a project. During the dot com bubble, there were suggestions that the Internet and open source would render managing this complexity unnecessary, enabling the formation of “episodic communities on demand, ... virtual organizations that come together frictionlessly for a particular task and then redistribute to the next task just as smoothly” (Kelly 1998, cited in Weber 2004; also Tapscott et al. 2000). However, standard arguments contending that formal organizational structures necessarily arise out of increased complexity have proven to be more accurate. Large open source projects follow along these lines and generally have three types of participants: users, who are not involved with the development of the software, but who may ask and answer questions in online forums; contributors, who provide bug reports, patches, tutorials or documentation to compliment the work of the core development team; and committers, the core developers who act as gatekeepers in determining what code is implemented into the body of the software. Within this general framework there are sub-groups that form a degree of modularization, in the same way that a large program works by calling on other smaller independent modules. As such, the organization of people in a large open source project has come to reflect the structure of the software project itself.

Such structures are largely based on the approach adopted by older open source projects such as Linux, and partly explain how the open source community, a dispersed group of developers

possessing varying degrees of ability and availability, can come together to create a complex product. Modularization, a large active community of potential auditors and a preponderance of voluntarism follow closely along the design principles laid out in Jean Lave and Etienne Wenger's concept of "communities of practice" that call for an allowance of different levels of participation (see Wenger et al. 2002, Lave and Wenger 1991). This concept describes a long-standing process whereby people who share interests come together, and by sharing information and experience acquire expertise and knowledge fundamental to the formation of a communal identity. More than simply producing software, the open source model of development "also produces the interacting system of knowing, learning, and doing that organizes the community and its relations with other communities" (Tuomi 2001). This type of system is described in reference to modern information technologies by Chris Kelty in the concept of "recursive public." Defined as publics that are "constituted by a shared concern for maintaining the means of association through which they come together as a public," recursive publics are concerned with moral-technical order – with hardware, software, networks and protocols which are conceptually interdependent with codes of conduct and the organization of economy and society (Kelty 2008). The recursivity of the open source movement is illustrated in recent attempts by Canadian OSS creators, web developers and advocates to mobilize social networks and make, maintain and modify open source technologies in lobbying for the procurement and implementation of open source in government. As Kelty notes (2008): "They argue *about* technology, but they also argue *through* it. They express ideas, but they also express *infrastructures* through which ideas can be expressed (and circulated) in new ways."

Thus, while the general structure of large open source projects has seemingly come to mimic traditional commercial software organizational practices, the significant difference is that it has done so *because of* a dispersed community from across the Internet consisting mainly of volunteers who increasingly feel a sense of membership the more they participate – with a level of recursivity and transparency, a degree of openness and fair dealing not present in the world of commercial software engineering. Steven Weber argues that transparency in open source is a key component in the longevity and resilience of the community and its projects (2004), since it "makes transparent the pressures [e.g. of demands for new features, or deadlines] and the costs of not meeting them, thus pressing trade-offs out into the open where developers are forced to deal with them in a self-conscious way." Openness and transparency, peer review and recursivity, and the knowledge production and identity formation that occur as projects play out are central to answering the question of how open source communities hold together.

### **A tangled web? Usability and open source as a work in progress**

*"Good programmers know what to write. Great ones know what to rewrite (and reuse)"* (Raymond 1999).

As both physical and virtual globalization continue to expand, politics and sociality, particularly in the Canadian social imaginary, are increasingly concerned with the tension between cultural diversity and social inclusion. The open web and broader open source communities, constituted largely by an ethic of openness and a culture of fair dealing, must therefore critically engage with questions of socio-political scale as open source technologies reach new demographic sectors such as local arts groups or various levels of government. Openness, and more significantly the ethic of

fair dealing are constitutive but not necessarily a foregone conclusion in the evolution of open source. While the organizational structure of many open source projects are conducive to software production and community development, the open web raises further questions in its expansion of open source into these new demographic territories. Open source projects have often been criticized for overlooking non-expert users and the corresponding necessity of considering interface psychology. Additionally, as the open source communities of users and programmers expand, the roles of culture and sociality in relation to openness and fair access are increasingly being called into question. Thus, the remainder of this chapter focuses on usability, one particular critique of open source development that comes in various forms, some of which are in the process of being addressed by open web communities such as Drupal and WordPress, and some of which have yet to be taken up. While there are numerous researchers studying traditional forms of usability (e.g., Nielsen 1993; Nichols et al. 2001; Drupal 2008; WordPress 2008), what follows is a brief analysis of two more recent types: cultural usability, a recent stream of human-computer interaction studies (HCI) that expands the scope of usability research by examining the impact of cultural (understood as nationality-based) background; and what we might call “social usability,” in order to account for the expanded scale of new open web technologies.

Emerging questions of cultural usability highlight that current forms of localization and internationalization in open web technologies are insufficient. Localization and internationalization (numeronymically identified as L10n and i18n, respectively) are terms used to describe the process by which products or services are adapted to particular languages or regional differences. Drupal employs L10n and i18n synonymously with language translation, mainly from English to various other languages. However, the error of assuming that usability is understood similarly across cultures with only minute differences in terminology has consequences for the expansion of the open source technologies and the growth of the open source movement. For example, Drupal conducted usability studies in 2008 at the University of Minnesota and the University of Baltimore. In each study, the classification of individual participants is highly technical, centred primarily on the participants’ past experience in using content management systems. Such methodologies follow along the traditional HCI axiom that “usability must be considered a universal phenomenon in order for HCI to move forward as a science” (Clemmensen 2009). However, studies in social psychology (e.g. Chua et al. 2005) indicate marked differences in perception based on cultural background. For example, Miyamoto et al. (2006) found that “people of Western culture tend to engage in context-independent cognitive processes and to perceive and think about the environment in an analytic way,” while “people of East Asian culture tend to engage in context-dependent cognitive processes and to perceive and think about the environment in a holistic way” (113). One user’s focus on salient foreground objects contrasted with another user’s focus on context has important implications for open web and open source communities that seek to expand membership into new demographic constituencies. Maintaining the culture of fair dealing and openness present in the open source community, particularly within Canada’s diverse population, demands that open web developers consider culture in the conceptualization and production of communication technologies.

As such, future usability studies conducted for open source content management systems might consider factors other than age, employment and technical experience. Studies might also

use techniques other than eye-tracking, verbal feedback or written response. For example, researchers have identified areas of study in non-verbal behaviour, such as kinesics (body language) or paralinguistics (vocal cues such as pitch, tone and modulation), and applied these concepts to usability testing (Yammiyavar et al. 2008). Usability studies might also be performed in partnership with other research centres around the world, to build a more inclusive recursive public that can speak to and engage with a diversity of cultures – or, as called for by David Weinberg: to address our predisposition towards clustering and “engage with difference” (Weinberger 2009). Thus, while the open source development community has been successful at limiting the impact of some social contextual factors (e.g. Weber 2006), engaging with difference, dealing openly and fairly requires asking questions about ethics: which social, cultural, or contextual factors matter and which ones do not? Is it relevant that two developers coding a program come from different parts of the world, one from North America and one from South East Asia? Does it matter that if the Government of Canada adopts Drupal for its public web presence, users may be Canadian citizens from China, Somalia, or First Nations communities? Addressing such questions requires expanding the scope of what is currently understood by open web developers as usability, localization and internationalization.

A variant of cultural usability is what we might call “social usability.” Apart from national or regional culture, studies in cultural psychology indicate that there are historically developed ways of thinking embedded in the everyday use of computers and other interactive products by individuals and small groups (Clemmensen 2009; also Vatrappu and Suthers 2007; Sun 2004). Thus the open web community can grow its membership more effectively by considering what kinds of modules, designs or architectures can include the demands of these types of potential users or developers. This process is not, drawing on Clemmensen, a matter of choosing either evolutionism or relativism. Rather it is about accommodating the world of peoples and communities in an open and fair manner in determining that which may be universal, and that which is mutable. In what ways are small groups distinctive, and how do they (want to) communicate or publish information and produce knowledge? Archiving content that is, for example, highly performative in nature such as oral histories or traditional knowledges requires and involves more than simple digitization and record keeping. Rosemary Coombe’s Artmob project (2009) and other chapters in this volume indicate the ways in which techniques of archiving are themselves acts of creativity. In terms of the present chapter, a necessity for open web recursive publics is to embrace both diversity and inclusivity. Drupal has been successful in appealing to, among others, non-governmental organizations and creative arts groups. Sustaining the momentum of this aspect of the open source movement, and maintaining openness and an ethic of fair dealing as core and constitutive components of such a recursive public, requires further dialogue about and research on cultural and social usability.

## **Conclusion**

*“As we look ahead into the next century, leaders will be those who empower others” (Bill Gates).*

Modern computing has come a long way since the era of electro-mechanical mainframes and the invention of the integrated circuit; and the principle of openness has persisted in a sometimes

tenuous partnership. In accounting for the contemporary origins of open source computing and the growth of the open web, and appraising some of their successes and works in progress, this paper has covered a great deal of ground. However, it has illustrated a wide-ranging trajectory of open source in order to better understand and describe the current state of the movement, where copyright, innovation and ethics interact in a much larger whole. A political economy of openness is emerging, from smartphones to social networks. As the community extends its reach to new types of users and new kinds of software, peer review, active communities of practice and modular strategies remain at the core of the open source approach. And while new users and new software reawaken variations of old critiques, open source projects are making progress and have many opportunities for improving the diverse forms of usability. Addressing such concerns is not only critical to driving forward the dynamic practices of openness in cultures of fair dealing, but will also play an instrumental role in helping a recursive public consisting of researchers, developers and users understand and mobilize within the increasingly complex intersections of technology and society.

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