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Abstract

This article outlines the practices of digital scholarly communication (moving research production and dissemination online), critical making (producing theoretical insights by transforming digitized heritage materials), and social knowledge creation (collaborating in online environments to produce shared knowledge products). In addition to exploring these practices and their principles, this article argues for a combination of these activities in order to engender knowledge production chains that connect multiple institutions and communities. Highlighting the relevance of critical making theory for scholarly communication practice, this article provides examples of theoretical research that offer tangible products for expanding and enriching scholarly production.

Keywords

Digital scholarship; Knowledge production; Knowledge dissemination; Public knowledge; Publishing platforms

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**Implementing New
Knowledge Environments**
(INKE) is a collaborative
research intervention
exploring electronic text,
digital humanities, and
scholarly communication. The
international team involves
over 42 researchers, 53 GRAs,
4 staff, 19 postdocs, and 30
partners. Website: inke.ca

Modernist Versions Project
(MVP) is a multidisciplinary
research project that aims to
spark a versioning culture in
modernist studies, using
digital methods. It facilitates
publication of digital editions
of modernist works, digital
collation and versioning of
said texts, tool development,
and broad efforts to bring
digital humanities and
modernism together.

How should we approach our work
and the publishing systems that bring it into being?

– Kathleen Fitzpatrick (2014, p. 4)

Introduction

Modes of scholarly inquiry have shifted drastically in recent years. No longer is the rate of knowledge production in the academy bound exclusively to print production models and the groups that administer them. Likewise, no longer must authors comply absolutely with the gatekeepers of the academic publishing house. Now, individuals can develop and disseminate their research and ideas through various avenues, and in many forms and formats, afforded by digital means. Scholars can apply critical insight and creative practice to the development of technologies and platforms through which research is shared and disseminated, allowing an unprecedented level of scholarly intervention in intellectual and cultural exchange. Developments in knowledge creation have provoked the mobilization of ideas and access to information to those within, aligned with, and alongside the traditional university community.

By turning critical attention to the conception, development, uptake, and engagement of venues for intellectual exchange, scholars can embed the principles of free and open exchange into online avenues for knowledge access. Attention to the production and usage of emerging knowledge platforms allows scholars to develop theoretical insights into the means and materials of intellectual exchange in the twenty-first century. At the same time, scholars can actively apply these insights to the future development of the platforms in question. This critical making process recasts platforms for disseminating knowledge as social and shared environments that expand avenues for further research production, rather than close those avenues off behind artificial roadblocks and unnecessary barriers to access.

In the following article we consider two practices that are growing in popularity – critical making and social knowledge creation – as well as the intersections between these activities within the larger context of digital scholarly communication. In Part 1, “Moving publication online,” we scan the current state of digital scholarly communication, especially as a framework for innovative scholarly activities. In Parts 2 and 3, “Critical making with cultural heritage materials” and “Collaboration across boundaries,” we look at two of these innovative scholarly activities: critical making and social knowledge creation, respectively. In each section we explore an illustrative project of the activity in question in order to provide a glimpse into digital scholarly communication in action. To conclude, we ruminate on how the alternative scholarly practices detailed throughout this article signal a renewed direction for scholarly communication.

Moving publication online

Methods and tools for communicating research are evolving. For a long time, the standard model of scholarly communication – of making public and disseminating one’s research, and/or engaging in public, academic conversation – has been based on print structures well known to academic researchers, administrators, and publishers (e.g., the academic journal or monograph) and has been maintained dutifully by a print-centric academy. There are benefits to this system: within it, scholarly

communication became standardized, measurable, and routine. But as new modes of scholarly communication arise, the disadvantages of the print-centric system are brought into sharper focus: *standardization* also means perpetuating a lack of creativity and autonomy; *measurability* also means promoting a system often critiqued for its historical bias; *routineness* also means upholding the practices of a handful of mainstream publishers without adequately rewarding the content contributors (Fitzpatrick, 2011). Digital scholarly communication is an opportunity to build on publishing predecessors, as academics can incorporate the lessons learned from the history of academic publishing while reforming and remixing activities that do not serve authors or readers adequately.

As the academy goes online, new modes of research dissemination are becoming increasingly legitimized. Practitioners are developing innovative platforms for disseminating research, arguments, and conclusions. Experimentation with electronic scholarly publishing, in particular, is on the rise. Electronic scholarly publishing practices vary between schools of thought and according to usage and application, and relevant activities range from digitizing print sources to prototyping new, alternative platforms for content production and peer review. For example, in 2010 Daniel J. Cohen and Tom Scheinfeldt facilitated a digital publishing experiment called *Hacking the Academy* (hackingtheacademy.org). Cohen and Scheinfeldt crowdsourced content and invited contributions with a turnaround time of only one week, May 21 to 28, 2010 – an unheard-of timeline in the academic publishing world. They pitched their challenge as follows: “Can an algorithm edit a journal? Can a library exist without books? Can students build and manage their own learning management platforms? Can a conference be held without a program? Can Twitter replace a scholarly society?” (Cohen & Scheinfeldt, 2013, n.p.). The final output comprises an online collection of articles and blog posts hosted at the above link, as well as a printed book (Cohen & Scheinfeldt, 2013).

Another example is *A Social Edition of the Devonshire Manuscript* (https://en.wikibooks.org/wiki/The_Devonshire_Manuscript), a public Wikibook edition of the sixteenth-century miscellany the Devonshire Manuscript. Led by Ray Siemens, a group based at the Electronic Textual Cultures Lab at the University of Victoria developed this project, and we discuss it in further detail when we return to this edition as an example of social knowledge creation, below.¹ Other initiatives function at an institutional or organizational level: the Public Knowledge Project (PKP; pkp.sfu.ca), for instance, based out of Simon Fraser University and Stanford University, has created an entire software suite for digital scholarly communication (Open Journal Systems [OJS], Open Monograph Press [OMP], Open Conference Systems [OCS], Open Harvester Systems [OHS]). There are various other examples of new scholarly communication environments, including the Advanced Research Consortium (ARC; <http://idhmc.tamu.edu/arcgrant>), Canadian Writing Research Collaboratory (CWRC; <http://www.cwrc.ca/en>), CommentPress (<http://futureofthebook.org/commentpress>), and MLA Commons (<http://commons.mla.org>). There is also an urge for nationwide formalization of scholarly communication, as exemplified by the Canadian Research Knowledge Network’s (CRKN’s) proposal for an Integrated Digital Scholarly Ecosystem (IDSE) (Ridley & Pagotto, 2014).

Although the implementation and widespread uptake of digital scholarly communication methods may seem relatively recent, the impetus is not new: nearly 20 years ago, Nancy Fjällbrant detailed the history of the scientific journal and ruminated on the possibilities of electronic publishing (1997); in 2002, Ray Siemens, Michael Best, Elizabeth Grove-White, Alan Burk, James Kerr, Andy Pope, Jean-Claude Guéron, Geoffrey Rockwell, and Lynne Siemens released a report on scholarly communication in Canada titled “The Credibility of Electronic Publishing: A Report to the Humanities and Social Sciences Federation of Canada”; in 2004, John Erickson, Carl Lagoze, Sandy Payette, Herbert Van de Sompel, and Simeon Warner targeted the academic journal system and persuasively argued for an improved digital-based system; in 2007, Christine Borgman published a thorough analysis of scholarly communication infrastructure and the role of technology in its development and future. Furthermore, prominent scholars and editors including Jerome McGann (2006), Peter Shillingsburg (2006), and Martha Nell Smith (2004) have long purported the social and academic benefits of digital editions and digital editing. The strong development in these areas, and others, points to the transformative capacity of the digital for scholarly communication purposes. The significance of this transformation cannot be overstated: academic practices are moving online, and this heralds an exciting opportunity to shape the future of scholarly communication through inventive, open, and accessible electronic scholarly publishing (Fitzpatrick, 2007, 2011).

Beyond online academic journals, digital editions, and the platforms that generate or host these artifacts, there is a range of other digital scholarly communication activities. This diversification requires an epistemological paradigm shift, and this shift challenges previously established concepts of access, authorship, and ownership (Cohen, 2010; Fitzpatrick, 2013). The commitment to open source, open access, and open data, for instance, is both a more ethical and more practical option for knowledge production (Guéron, 2008) than standard, heavily licensed print production. From an ethical standpoint, these types of openness represent a core tenet of scholarship: to create, share, and disseminate knowledge. Cohen considers this “a more simple – and virtuous – model for the future of scholarly communication” (2010, last para.). From a practical standpoint, these activities create a more efficient work environment: practitioners can borrow, repurpose, and build on already-developed code instead of starting from square one. Paradoxically, open access is often perceived as being at odds with traditional publishing and scholarship practices, as these practices are frequently defined by paywalls and copyrighted knowledge. The move toward openness, however, has allowed researchers to become more involved with each other professionally, as well as with other interested stakeholders and the public at large.

We should not underestimate the value of researchers productively sharing their intellectual labour and output across what have been considered as disciplinary, institutional, and even social barriers. The intellectual history of scholarly communication, and the renewed attention to and uptake of its modes and methods, often by digital humanities practitioners, bodes well for the future of knowledge dissemination (Jones, 2014). There is no arguing that scholarly communication is vast, multifarious, and prone to change; despite the mutability of digital scholarly communication, at its core lies an opportunity to harness new tools and modes of

scholarship. The following section explores one of these new modes of scholarship: critical making.

Critical making with cultural heritage materials

Online models for knowledge exchange enable the fluid sharing and dissemination of research materials, methods, data sets, and other output. In turn, digital scholarly communication invites theoretical inquiry into the means and methods of scholarly publication, while critical making offers an opportunity to transform and recirculate research materials that figure into such publications, particularly in online environments.

Critical making undertakes cultural and political engagements with material objects by working with and through those objects. This results in research processes where theoretical insights emerge through material transformations in cultural heritage materials, expressed, in turn, through both written scholarly output and the transformed materials themselves. The material application of theoretical inquiry can be traced back to the field of book history; Alan Galey and Stan Ruecker argue: “Like design, the field of book history offers a perspective on the ethos of thinking through making which informs much digital humanities research and pedagogy generally” (2010, p. 407). Through their mutual investment in transforming the means and modes of knowledge exchange, publishing and critical making function as allied practices concerned with interrelated material objects (e.g., written research findings and multimodal research materials).

Although traditionally associated with the print book and its pre-Gutenberg predecessors, the blend of material production with critical thinking concerns has received renewed scholarly interest in response to technologies including desktop fabrication, physical computing, and mixed reality. Considered as part of the Internet of Things, these technologies enable scholars to close the loop between material production and theoretical engagement by extracting digital information from archival and cultural heritage materials, developing theoretical insights based on that information, and expressing those insights by re-materializing that information in the physical world. As Matt Ratto notes, such digital/material feedback loops enable scholars to critique the modes of production and labour concerns associated with emerging technologies through hands-on engagements with those technologies, thereby bringing humanist critique to bear on the real-world and material practices under examination (2011, p. 253). In this way, critical making projects position theoretical argument within the sphere of community-based intellectual engagement. Just as electronic publishing remakes the means through which scholars engage with intellectual publics online, so too does critical making rethink the ways in which readers, researchers, and practitioners alike experience scholarly arguments with source materials. As a practice, critical making invites scholars to embed humanities theories and values into technologies used by others (Drucker, 2012), situating research production within an ongoing and iterative process and public engagement.

Currently, Implementing New Knowledge Environments (INKE; inke.ca) and the Modernist Versions Project (MVP; mvp.uvic.ca) are collaborating on a critical making

project that transforms and remixes books and maps housed in special collections libraries. The team pairs these critically remade cultural heritage materials with publishable writing on the theoretical insights they enable. Titled “z-axis research,” this work transforms archival maps of modern cities into 3-D-printable versions that enable literary interpretations of modernist novels set in those cities.² To create these literary maps, the project uses geographic data taken from modernist novels to warp and deform the maps in 3-D. The data tracks each location described by the novel in question, with the specificity of the geographic reference expressed as radius and the length of the description expressed as height. The maps are then three-dimensionally transformed using the geographic data for each novel, resulting in wide, circular deformations that represent a general neighbourhood or area and thin, granular deformations that represent specific locations described by the text. The warped map produced using this data expresses the spatial experience of the city as described by a given novel, emphasizing critiques of urban life in the modern period.

Figure 1: Z-axis map of Djuna Barnes’s *Nightwood*, set in Paris

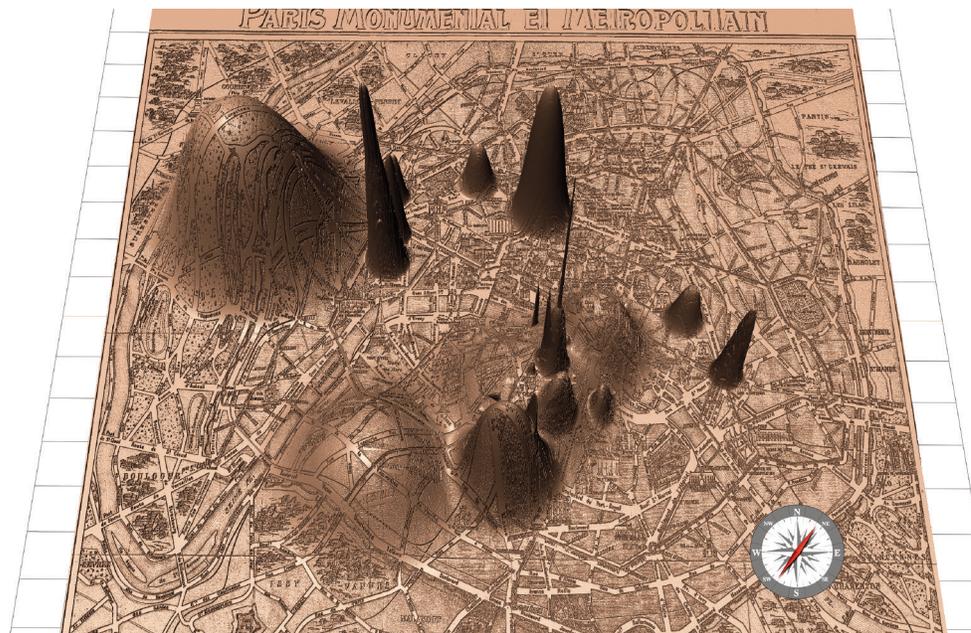


Figure 1 expresses data for the modernist novel *Nightwood* by Djuna Barnes (1936). The warped map visualizes a Paris divided by class, with cumulative warping effects visible on the Left Bank (south of the Seine) and granular, isolated warping effects on the Right Bank (north of the Seine). The aesthetic differences between the two areas on the map correspond to class distinctions between the two parts of the city, as confirmed by Barnes’s novel: the area south of the river is a working-class and student neighbourhood, and the neighbourhood north of the river is inhabited by wealthy and foreign residents (Griggs, 1938). This historical and literary description of the city is not only of interest to scholars studying modernist literature, but also offers a mode for those in geography, museums, and libraries to show the cultural importance of their cartographic materials and invite a general audience to approach those materials with intellectual curiosity. At the same time, scholars may deploy a critical making approach

to generate new research products and insights using the z-axis materials for Djuna Barnes's novel.

The map (Figure 1) is produced using an interwar tourist map of Paris, the *Paris Monumental et Métropolitain*, that emphasizes wealthy and profit-generating areas of the city. Critically remaking these research materials, scholars may express the geographic data for Barnes's novel through a different historical map (emphasizing a cultural issue other than class) or apply geographic data from a novel other than *Nightwood* to the tourist map. By allowing scholars to repurpose and remix research materials to produce new research findings, z-axis research positions critical making as a social and shared enterprise that unites the efforts of multiple scholarly communities. As it continues to develop this critical making project, the INKE/MVP team is blending theoretical thinking with material production processes that scholars, librarians, students, and publishers can re-create, critique, and share across multiple intellectual communities (Christie, Ross, Pilsch, & Tanigawa, 2014).

As the z-axis project demonstrates, transforming theoretical insight into physical matter creates research products that meld the interests of contiguous communities. In doing so, critical making functions as a social enterprise whose knowledge products can be openly shared and transformed to produce new research output. Remixing cultural heritage objects allows scholars to interact with those objects via interpretation, print and online reading and viewing, and hands-on engagement in libraries, conferences, and the like. It also recasts cultural heritage objects as interdisciplinary in scope, since the expression of digital data through material objects is of interest to geographers, social scientists, data scientists, data visualization experts, desktop fabrication enthusiasts, and many other groups. Through the transformation of cultural heritage materials, coupled with the social dissemination of those materials in various forms of research output, librarians, publishers, scholars, students, and others can engage in a collective process of critical making that forms a link in a collaborative chain of social knowledge production. Critical making can serve as a catalyst for the open and online dissemination of scholarly output by recirculating knowledge exchange not through the traditional gates of access, but instead through the collective network of enthusiasm and experimentation of scholars in multiple fields and institutions. The next section examines another recent, evolving movement in scholarly communication: social knowledge creation.

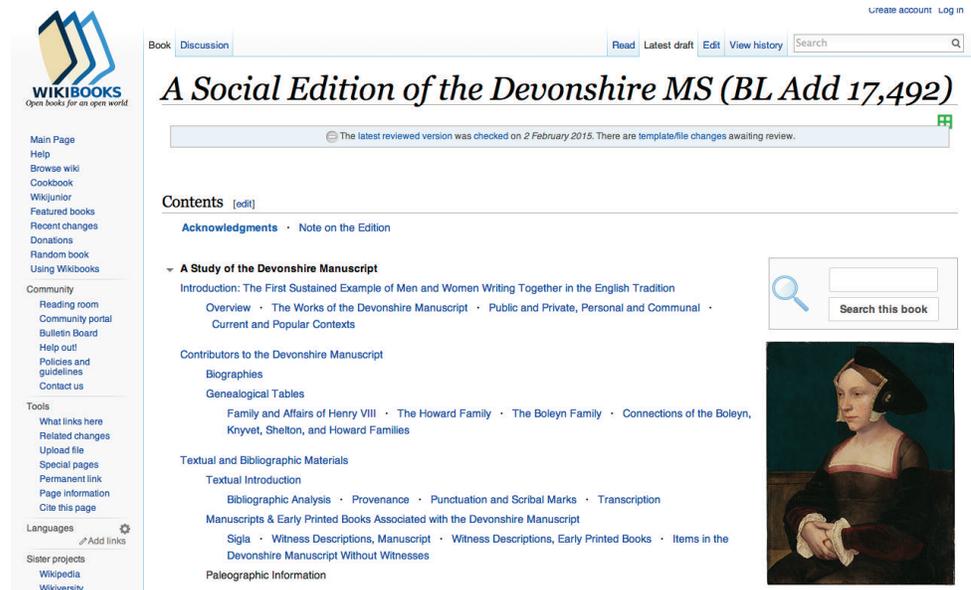
Collaboration across boundaries

Historically, knowledge production has been guided, encased, copyrighted, and re-directed by those with the means to do so (Burke, 2000). Now, in the twenty-first century – known to many as the Digital Age – we witness rapid and substantial changes in knowledge creation. Each year brings innovations in how individuals express themselves and communicate with each other. This is evident in digital scholarly communication and practices like critical making, as noted above, but it also manifests in more global, social movements. Consider, for example, how the rise of social media, the apparent ubiquity of personal computing devices, the economic turn toward prosumption (Ritzer & Jurgenson, 2010), and the shifting regulation of access to information are all changing the way knowledge is produced, shared, distributed, and

developed. Of course, there is still the opportunity (unfortunately prevalent) for those with privileged economic, industrial, legal, or social means to nefariously control the creation of knowledge, and this occurs in both academic and non-academic contexts. Lawrence Lessig (2004) and Cory Doctorow (2014), two voices of many, both offer comprehensive explorations into how the interests of a select few control contemporary knowledge creation, including through the biased legislation of digital rights and products. Seemingly, the equitable, global creation of knowledge is impossible. Despite these limitations, we (in our roles as scholars, librarian, publishers, developers, and so forth) can still instigate social knowledge creation from our seats in the humanities, as well as in the broader higher education structure, in ways not possible prior to the electronic turn of information management and production over the past half century. Here, we consider why alternative scholarly activities such as social knowledge creation are important, and how we can try to create environments and opportunities for these activities to flourish – how we can restore restrictive, tolled passages into open, transparent thoroughfares. (For an engagement and literature review on social knowledge creation, see Arbuckle, Belojevic, Hiebert, Siemens, with Wong, Siemens, Christie, Saklofske, Sayers, & the ETCL & INKE Research Groups, 2014.)

The digital humanities is uniquely positioned to induce social knowledge creation. As both a theory- and practice-based field, the digital humanities attracts practitioners who have a thorough theoretical understanding of knowledge creation, as well as the skills to modify existing forms of – or create new platforms for – knowledge production and dissemination (Jones, 2014). This unique position and skill set gives digital humanities researchers the tools to reach and engage members of the public, who may or may not be traditionally aligned with or be an audience for academic work, as we demonstrated in the discussion of critical making, above. Although the scope of the multidisciplinary digital humanities is wide, the core question at the heart of DH remains the same: how can we use or develop new technologies for humanities

Figure 2: Title page of A Social Edition of the Devonshire Manuscript



Source: https://en.wikibooks.org/wiki/The_Devonshire_Manuscript.

research? Closely behind that inquiry is a follow-up question: how can we make research more readily accessible to others (including students, organizations, members of industry, and the public at large) through digital means? These questions are pivotal for the current academic and social climate that demands innovation and accountability. Examples of digital humanities projects that engage the public may be found across related disciplines, including in philosophy (e.g., Transcribe Bentham), human geography and/or sociology (e.g., Mapping Dubois), linguistic cultural studies (e.g., *The Sound of First Nations Names, 1881*), and literary studies (e.g., z-axis research; *A Social Edition of the Devonshire Manuscript*).³

To elaborate on one of these examples, *A Social Edition of the Devonshire Manuscript* is a unique scholarly edition (Siemens, Armstrong, & Crompton, 2012). It includes many of the components of a “traditional” scholarly edition: textual and general introductions, biographies, sigla, witnesses, bibliography, facsimile images, et cetera. But *A Social Edition of the Devonshire Manuscript* differs from other scholarly editions in one profound way – it is a Wikibook (http://en.wikibooks.org/wiki/The_Devonshire_Manuscript).

Ray Siemens, with the Devonshire Manuscript Editorial Group, carried out the development of *A Social Edition of the Devonshire Manuscript* in the Electronic Textual Cultures Lab (ETCL; etcl.uvic.ca) at the University of Victoria (Crompton, Powell, Arbuckle, & Siemens, with Shirley & the Devonshire Manuscript Editorial Group, 2015).⁴ This edition of the Devonshire Manuscript actively promotes social knowledge creation in a way that is untenable for standard print editions. Dating from the 1530s to 1540s, the Devonshire Manuscript is a multi-authored verse miscellany compiled by a number of sixteenth-century contributors; the Wikibook form of *A Social Edition of the Devonshire Manuscript* hearkens back to the authoring, editing, and compiling activities of the Devonshire Manuscript’s original contributors. By residing on a public platform, sharing all data and content, engaging in social media, and remaining open for whomever to edit, comment on, and participate in, the *Social Edition of the Devonshire Manuscript* project and editorial team involves various communities and deviates from traditional scholarly editing practices.

As the original, multi-compiler Devonshire Manuscript reveals, the creation of knowledge has always been social in some senses. All knowledge output builds on its forebears and is shaped by many minds and hands. Perhaps the issue to consider is thus less one of social knowledge *creation* and more one of social knowledge *production, access, and dissemination*: historically, the production and circulation of knowledge artifacts, including research output, has been directed by the few for the few. Evolving modes of digital scholarly communication change both the field and the players in this process. Through privileging social knowledge creation/production/access/dissemination as necessary activities in higher education, we can engage individuals from many communities and contribute, together and purposefully, to the human record at the heart of the humanities.

Conclusion: Social, critical knowledge production

When digital scholarly communication is undertaken as an interrelated network of production, rather than as a set of discrete intellectual enterprises, activities such as

critical making and social knowledge creation may induce a net effect that far exceeds the impact of any one of these practices alone. Consider, for instance, how electronic scholarly communication platforms offer venues for undertaking and publishing the results of collaborative and critically made resources (e.g., heritage materials, data sets, data visualizations, scholarly articles, etc.). Critical making can function as a social knowledge production enterprise facilitated by scholarly communication outlets; this is especially evident when research outputs, including data sets, visualizations, and 3-D-printable objects, are available for uptake and reuse by scholars in multiple fields producing diverse forms of research output. This reuse may trigger an evolving ouroborous effect, where research output circles back to enrich and expand the original findings, or it may produce a ripple effect, proliferating new materials for publication, research, and hosting elsewhere. Across both instances, digital scholarly communication enables scholars to critically transform and produce research findings. These new findings, in turn, speak to the original research material while also advancing its field of inquiry in new directions, generating even more output that may be published for scholars to remix and reuse anew. The result is a network of intellectual activity in which scholars link transformable research materials to form connected chains of knowledge production.

Just as scholars can open their research findings by repositioning them as materials for critical making (e.g., through open access, open source, and open data practices), so too can publishers open their platforms to explicitly cultivate social knowledge production chains. A critical making approach invites scholars to embed humanities principles into the technologies and platforms they develop and use, and a similar approach can be taken by librarians, publishers, students, and researchers in the creation, dissemination, and archiving of digital output. The result is the application of theories and values of open knowledge exchange to both research products and the online publishing platforms that support them. By critically making research materials and publishing platforms to facilitate sharing and reuse, we shape a social knowledge landscape in which online publications can far exceed the scope and reach of their traditional, closed counterparts. By transforming contrived corridors of knowledge production into open avenues for collaboration and exchange, we can develop the reach of our local institutional initiatives in the humanities to an unprecedented scope.

Notes

1. For further reading on the intellectual basis of *A Social Edition of the Devonshire Manuscript* as an editorial experiment of sorts, see Siemens, Elkind, McColl, Armstrong, Dixon, Saby, Hirsch, & Leitch, with Holmes, Haswell, Gaudet, Girn, Joyce, Gold, & Watson, & members of the PKP, Iter, TAPoR, & INKE teams, 2010; Siemens, Timney, Leitch, Koolen, & Garnett, with the ETCL, INKE, and PKP Research Groups, 2012a, 2012b.
2. The project's title, "z-axis," refers to the third variable mapped in addition to geographic longitude (x-axis) and latitude (y-axis), which is the amount of description given to each location. This third variable enables the production of 3-D maps along a third variable, a z-axis, and literary investigation into the cultural significance of each mapped location. Broadly defined, then, the z-axis refers to the

cultural contexts for literary and historical data, advocating the inclusion of such contexts in data visualization.

3. Transcribe Bentham (<http://blogs.ucl.ac.uk/transcribe-bentham>) crowdsources the transcription of philosopher Jeremy Bentham's works. Mapping Dubois (<http://www.mappingdubois.org>) visualizes the African-American population in late-nineteenth-century Philadelphia. Based out of Vancouver Island University, The Sound of First Nations Names, 1881 (<https://www2.viu.ca/history/PROJECTS/names/names1.asp>) records diminishing languages of First Nations people on Vancouver Island for archival and future language learning purposes.
4. The Devonshire Manuscript Editorial Group includes Ray Siemens, Karin Armstrong, Barbara Bond, Constance Crompton, Terra Dickson, Johanne Paquette, Jonathan Podracky, Ingrid Weber, Cara Leitch, Melanie Chernyk, Daniel Powell, Alyssa Anne McLeod, Alyssa Arbuckle, Jonathan Gibson, Chris Gaudet, Eric Haswell, Arianna Ciula, Daniel Starza-Smith, and James Cummings, with Martin Holmes, Greg Newton, Paul Remley, Erik Kwakkel, Aimie Shirkie, and Serina Patterson.

Websites

Hacking the Academy, <http://hackingtheacademy.org>

Public Knowledge Project, <http://pkp.sfu.ca>

The Devonshire Manuscript, https://en.wikibooks.org/wiki/The_Devonshire_Manuscript.

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