Stuck to the Static Word:
Trust and the Phantom Limb in Scholarly Communication

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Introduction

This paper examines historical factors that keep scholarly communication static thereby delaying adoption of new technologies, and suggests ways to move forward. While technology has not been an impediment to systemic change, the conformity of academic culture keeps faculty publishing practices largely static.[1] Specifically, the promotion and tenure process incentivizes narrowly defined forms of impact for university faculty and stagnates the acceptance of new services and technologies in scholarly communication. This conformity restricts the spread and impact of scholarly communication innovations. Current academic culture developed with the spread of the print journal as the record of authority, and although technology has moved beyond the bound periodical, evaluation of scholarship is stuck to the static word.

To effectively work with faculty stakeholders, librarians must understand the cultural underpinnings of the current system of scholarly communication. To that end we discuss the evolution of scholarly communication within the context of print culture, the factors that prevent the widespread adoption of new technologies in the context of historical antecedents, and how the paradigm shift towards a digital media culture reflects fluid aspects of earlier knowledge sharing cultures. Finally, we argue that the library community, by investing in the trustworthiness of new tools, can ease the transition to new modes of scholarly communication.

Background

The Association of Research Libraries (ARL) defines scholarly communication as "the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly community, and preserved for future use."[2] While technological advances have changed informal scholarly communication through channels like blogs, listservs, wikis, and online forums, formal scholarly communication still occurs through peer-reviewed journals and books.[3]

Kling and McKim[4] write that scholarly communication includes three dimensions: publicity, access, and trustworthiness. Publicity and the verb "to publish" are both etymologically derived from the same Latin word *publicare*—to make public or generally known. Publicity is measured by the degree to which audiences become aware of the thing that is published. Access is a corollary of publicity, though long-term accessibility depends upon a commitment of institutional resources devoted to stewarding published knowledge. Library-based scholarly communications programs have emphasized access and publicity through repositories and notification systems. Trustworthiness in scholarly communication involves both institutional and communal elements. Institutional trustworthiness might come from longevity of a publication masthead, or the sustainability of a library program. Communal trustworthiness is the trust communities place in shared norms, such as scholarly

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peer review. The absence of long-established trustworthiness remains the biggest impediment to widespread acceptance of new forms and venues of digital scholarship by academic researchers.

Advances in digital technologies have drastically changed programs and services offered by university libraries and publishers alike, and they offer opportunities to continue to transform scholarship. Several well-documented phenomena influence current trends in scholarly communication—advances in Internet publishing, open access, open peer review, open data,[5] and versioning continue to change the way we produce, consume, and evaluate research in the academic journal market and beyond. In spite of libraries and publishers offering these new services, academic authors continue to use traditional journals and books to disseminate their findings.

Since the launch of the *Journal des Sçavans* and the *Philosophical Transactions of the Royal Society* in 1665, the printed word has been "the primary, formal, means by which scholars have communicated the results of their work."[6] The journal, as an access point, provided a mechanism for promotion of research, and was a lasting institution that built trust. Today, the journal retains its place in the scholarly ecosystem. Within the academy, a scholar's success is measured in terms of articles published in high-impact journals, citations, patents generated, and grant dollars received. This success is then realized in accolades including tenure, promotion, and accreditation. The criteria for evaluating and recognizing performance along these lines are inextricably bound up in a self-perpetuating prestige-based system: more submissions are made to prestigious journals based on their visibility and perceived superiority, those journals are able to be highly selective in acceptance decisions as a result of the high number of submissions, and their low acceptance rate reasserts their prestigious standing. This selectivity originated in print publications that limited publication based on the physical restrictions of a bound journal and perpetuates as a measure of trust in a digital environment. Some journals and conferences limit the number of accepted manuscripts to works that are relevant, rigorous, and valid, but also novel enough to generate a high volume of discourse and level of interest. A consequence of this artificially restricted system is that many submitted articles, which meet high standards of rigor and validity, are never published, or they are published months or years after the research is complete. As a result, beyond creating a value system for academic articles, this system needlessly restricts the flow of knowledge in academia.

Journals have proliferated as a container for academic research that provide both a medium to distribute papers and a means to evaluate their merit. As stated in the Budapest Open Access Initiative, "the old tradition is the willingness of scientists and scholars to publish the fruits of their research in scholarly journals without payment, for the sake of inquiry and knowledge. The new technology is the internet."[7] The low cost of reproducing and digitally distributing the papers allows for open access to papers, utilizing the capabilities of digital environments to remove the limits of the physical item. Value and prestige are still assigned by the original publication, but access is not limited to a physical copy. Opening access to research papers is an ongoing process and movement, yet it already serves as an example of the possibilities of digital publication and the process of academic acceptance of new practices.

In spite of these issues, the scholarly communication system remains more trustworthy among academic researchers than any alternative.[8] Trust is qualitatively and quantitatively measured through reputation, and impact is measured by citation counts for individual articles, authors, and academic journals. As Kling & McKim[9] observe, peer review serves a critical function in scholarly publication that is not effectively replaced by self-publication in a blog or repository. While those forums can provide publicity and access, without trust they do not fulfill the needs of academic researchers for advancement. There are transformative possibilities of linked digital content in all three dimensions of publicity, access, and trustworthiness. In order to succeed however, proponents of new advances in digital scholarship must be aware of the vestiges of print that academics trust as measures of quality.

Methods

In order to guide transformation in scholarly communication and work with faculty stakeholders, librarians should be aware of the culture that drives the current system. To that end, this paper uses comparative historical analysis supported by secondary sources to compare current cultural impediments to technological change with those of previous phenomena. We chose this approach because of the argument that "in order to explain the structures of contemporary societies, one must investigate their historical origins and development."[10] The adoption of this lens helps us better understand current technological stagnation in scholarly communication and provides a new frame for approaching current challenges. Therefore we examine factors that keep the scholarly communication system static, and compare them to the limitations of knowledge sharing in previous communication paradigms in order to suggest ways to move forward.

Analysis

Cultures of Communication

Tredinnick[11] defines four cultural paradigms of knowledge communication, including oral culture, scrivener culture, print culture, and digital culture. In oral and scrivener cultures, authorship is often anonymous and authority is attributed to classical and scriptural sources. Scribes did not create texts but edited and interpreted them. This system perpetuates a lack of textual stability as bards change a narrative, as scribes make errors in transcription, and as texts are added to or removed from a canon.

Print culture is stabilizing by comparison. Print culture emphasizes formal, structured communication. Since the widespread adoption of the printing press, mechanical reproduction allowed texts to be copied more faithfully, securing the idea of authority in print. Ong writes that, "Print encourages a sense of closure, a sense that what is found in a text has been finalized, has reached a state of completion. This sense affects literary creations and it affects analytic philosophical or scientific work … The printed text is supposed to represent the words of an author in definitive or 'final' form."[12] In academic culture a stable platform of knowledge is a prerequisite condition for the notion that science and knowledge advance.[13] This stability is represented and reinforced in the practice of citations that build upon prior foundations of knowledge.

Role of Technology and the Phantom Limb

Digital culture shares certain attributes with oral and scrivener cultures. In all three cultures, texts are not stable, progress is not necessarily seen as linear, and in some cases, authorship is anonymized. Digital media "undermines the textual stability introduced by printing, and reasserts some of the characteristics of text that were evident in the age prior to print."[14] Since print culture and academic culture are strongly linked in history, it is difficult to divorce the two since authorship is a key underpinning of both. Without the normalized level of stability unique to print it is hard to judge the progress or advancement of an idea.

Some segments of the academic community are slow to adopt these technologies as non-traditional forms of research dissemination do not convey the same legitimacy[15] as peer-reviewed journals and monographs when university promotion and tenure processes measure success. This is especially the case in situations where research quality and impact are quantified. Advancement in academia is often contingent upon these measures of prestige and the quality they infer.[16] Advances in Internet publishing have long been suspect in the academic community due to the perception that there are no filters or guarantees for quality. Previously, the electronic versions of traditional journals were viewed with suspicion and it was speculated that electronic journals might remain, "marginalized and be perceived as representing lower division outlets for minor league research."[17] As a consequence, electronic journals were careful to maintain the aesthetics of

print materials as much as possible to reinforce the perception of stability to maintain trust for readers and researchers.

We like to call this phenomenon the "phantom limb" effect. A phantom limb is a sensation that a missing limb is still attached. One treatment, known as the "mirror box," allows patients to see a reflected image of the good limb in the place of the absent limb, and then use artificial visual feedback and "adjust" the limb to reduce painful sensations. Similarly, electronic journals helped ease the transition to non-print journals by reflecting visual elements of print. In spite of an increasingly digital environment, the ritual of print is so embedded in scholarly communication that some electronic journals still rely on vestiges of print publication such as color printing fees (*Proteomics*[†]) and page charges, (e.g. *Evolution*, *The FASEB Journal, The Journal of Biological Chemistry*[‡]). The components of year, volume, issue, and page number are clear indicators of physical and temporal states with an essential function in print format but that lack corresponding meaning in a digital environment. Their transitory purpose was to impart trust by maintaining a visual illusion that alleviated the sensation that something was different, and now they are vestigial parts that serve as a reminder of a former necessity. As a result, electronic journals gained acceptance and prevalence but remained largely unchanged beyond their new digital format.

This is quite different from hypertext, which can be edited, deleted, built upon, and redistributed. It also differs from published data streams that are dynamic rather than static, and that represent the natural world in an active state. Whereas academic publishing relies on and enforces concepts such as stability, authority, and physical permanence, digital technologies rely on and enforce the spread of connections between ideas.

REPOSITORIES

Libraries have traditionally provided access to purchased materials, in first print and now digital formats. More recently many libraries have invested in Institutional Repositories (IRs) to capture and preserve the research products of their faculty and provide access to those materials. As the culture of libraries evolves, digital mediums have been utilized to expand access to and visibility of materials. Institutional repositories[18] serve a variety of purposes. Buckland writes, "Noncommercial provision of information sources is of particular interest because it provides empirical evidence of the values and social goals of individuals and groups providing information and of perceptions of the cost-effectiveness of information systems."[19] In other words, a university invests in an institutional repository to demonstrate the institution's value and impact to the community it serves. While IRs do not adhere to the traditional measures of trustworthiness and prestige, libraries that invest in them believe they will enhance institutional prestige through increased publicity and access to information.

While repositories improve access to research that was previously limited to readers at institutions with subscriptions or local copies, and while they have made some strides in improving publicity through dissemination services, they have been less successful in establishing trust for faculty researchers who question their reputation as scholarly venues. Properly framing them as preservation and access venues may help encourage trust in repositories in regard to their actual function, instead of a false perceived role in the scholarly communication system.

PEER REVIEW

Peer review is a defining feature of trustworthiness in scholarly communication.[20] It provides a necessary element of external validation to reduce various forms of bias and to ensure that an author's findings are rigorously

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† http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1615-9861/homepage/ForAuthors.html#charg

‡ http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291615-9861/homepage/ForAuthors.html#charg; http://www.fasebj.org/site/misc/onlinesub.xhtml#costs; http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291558-5646/homepage/ForAuthors.html; http://www.jbc.org/site/misc/ifora.xhtml#charges

supported. Suber[21] argues that peer review and brand, as proxies for quality and prestige, are the most meaningful forms of added value for journals. Brand and prestige are concepts that are built over time by community consensus. Sustained community consensus is stabilizing, so new technologies, as a function of their novelty, challenge the status quo. Prestige of peer review is assumed based on a journal's brand—long-standing and respected journals, affirmed by their continued existence, are assumed to have more rigorous peer review. While it is possible that longevity and quality of peer review go hand in hand, there is little historical basis for that assertion.

Peer review is a static, linear process that still functions as if a paper manuscript were being passed back and forth for review. The phantom of paper manuscripts drives the speed and limit the opportunities for advancing the process of peer review. Innovations that attempt to utilize the capabilities of digital systems for increased benefit to the community are often referred to as "open peer review". These innovative processes seek to increase transparency by changing the system in a way that would allow readers to judge the quality, rigor, and effectiveness of peer review, hold the reviewers accountable to their revisions of the manuscript and increase transparency in the publication's peer review process.[22] Proponents of open review hope to raise standards of quality while also introducing greater transparency to avoid the appearance of or opportunity for abuses in the peer review process. Emily Ford's[23] (2013) literature review discusses alternative definitions of open peer review, including a process in which the author and the reviewers know each other's identity, or as a process in which readers' reviews and comments appear alongside solicited expert reviews. Open peer review challenges the claim that double-blind peer review ensures the greatest rigor in scientific evaluation.

OPEN DATA

Another social shift allowed by new technologies is the open data movement. Traditionally data are kept obscured and stored privately for strategic purposes: only the bare minimum are made public as supplementary files to support journal articles. As the ease and capacity of digital storage grows, it has become possible, and in some journals, required, to make data available for reference, reuse and replication of research methods. This availability allows for more rigorous peer review, while increasing the transparency of data after publication so that readers and reviewers can attempt to replicate the author's findings. This transparency enhances trust in new scholarship, and enriches the scholarly communications landscape with valuable information. Data repository managers have worked to "develop criteria enabling the identification of digital repositories capable of reliably storing, migrating, and providing access to digital collections."[24] These criteria offer clear guides to academics attempting to assess the trustworthiness of a data repository. An international collaboration of organizations leveraged existing trust to reinforce the merit in these criteria.

VERSIONING

As journal practices and technological advances are normalized, the notion of one specific and permanent version of a text is less emphasized and can become more fluid, yet journals hang onto the phantom of the "final formatted version." The Version of Record (VoR) is defined by National Information Standards Organization (NISO), in partnership with the Association of Learned and Professional Society Publishers as a fixed version of a journal article that has been made available by a publisher by formally and exclusively declaring the article 'published.[25]' This is often an article that has already been an 'early release' manuscript for months, as it waits in queue to be assigned a journal volume and issue. Although these early release articles are often incomplete in terms of typesetting, final proofs, copy editing, or layout, the manuscript is final enough that a journal will release it. By these print based standards, it is the visual cues of the journal that brand and verify an article as if

it were a bound copy, not the scholarship presented or the peer-review process, even when posted on a journal's website. Three versions of an item may appear on a journal website, a manuscript version may appear in an IR, and both may be preceded by an archived conference presentation and the underlying data. These vestiges of print culture do little to advance the pace of scholarship, or to add trust to the system. The pace and volume of scientific discourse has increased, yet the formal structures remain static: a phantom of an outdated system. The phrase "on the shoulders of giants" implies a system of building blocks that are firm and stable enough to balance on, a system built by and for print publication. Print culture imposes a static system that limits the efficiency, speed and agility of new knowledge production. Yet, the academy trusts the static nature of print culture.

Print and Digital Tensions in Tenure and the Academy

Academic institutions, and the tenure process in particular, strongly exhibit the values of print culture. This partially explains why non-traditional research outputs are not as highly valued in university promotion and tenure processes as peer-reviewed journals and monographs. The promotion and tenure process still emphasize and value the inherited measures of print culture even though many communication channels are rapidly shifting to a digital context.

The criteria for evaluating performance are citation rates, number of articles in high-impact journals, patents generated, and grant dollars received, sometimes from a narrow list of specific funders. If research universities and academic disciplines measure impact based on those criteria, then researchers in general, and junior faculty in particular, will need to prioritize their output based on those expectations, or leave for other institutions or careers.

The promotion and tenure process as a ritual for recognizing merit is a tradition grounded in the technologies of print culture. The rules are bound by documents, and merit is based on one's ability to produce scholarly communication. The basic model for scholarly communication has not changed much the rise of academic journals (Swan, 2006) in spite of technological advances that create many possibilities for research and the scholarly record. Researchers now have the ability to produce different forms of knowledge, including data visualizations and academic blogs, yet these do not weigh heavily in evaluations for promotion and tenure. These primary rewards for researchers in higher education heavily incentivize print driven journal articles and monographs, which remain the norm.

Discussion and Conclusion

Lack of technological innovation for increasing access is clearly not the impediment, as evidenced by the proliferation of innovations in digital scholarship. The conformity of academic culture however incentives faculty to focus on the traditional publishing activities which they already trust. Citation and impact, as quantified by a few publishers, are the measures, and tenure, promotion, and accreditation are the accolades and recognition for individuals and organizations in higher education. Specifically, the inherited values of print culture in the promotion and tenure process are present in the attitudes of university faculty and in the processes by which faculty are evaluated. As stated above, innovative change does not occur just because of the presence of a good idea or useful tool. Repositories and the open access movement have come a long way, but slowly. Further change is supported by economics, historic trends, and market forces, but somewhat hampered by culture and business acumen.

Change can be problematic for those in academic culture. Some have found academic researchers' attitudes, perceptions, and behaviors towards the scholarly communication system to be largely conservative, in that they do not desire fundamental changes in research dissemination and publication.[26] Academic culture however is not monolithic. Other studies demonstrate variance between the cultures of research disciplines in scholar-

ly communication.[27,28] Additionally, Fry and Talja[29] identify a number of differences in how disciplines create knowledge in online environments—members of the physics community, for example, often work outside of formal publishing channels through the use of online preprints and disciplinary repositories. While print culture still drives the evaluation of research for promotion and tenure, the physics community has shifted practice to utilize the functionality of a digital environment.

Business acumen is also problematic, in that librarians and archivists are not especially known for it. Sustaining collections and programs are vital, and our community celebrates its ability to plan for long term management. Our ability to market our values to academic researchers however, is often lacking, and when it isn't, some of us, in our enthusiasm, occasionally oversell what we can realistically achieve.

An understanding of the historical antecedents to the current Scholarly Communication system and the pressures that formed the system and propagate its importance is vital to guide librarians as they work to move away from the phantom limb of printed scholarship and promote trustworthiness in forms of digital communication.

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