Quality Assurance in the Age of Author Self-Archiving

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> "The refereed journal literature needs to be freed from both paper and its costs, but not from peer review, whose 'invisible hand' is what maintains its quality."
>
> Stevan Harnad (Harnad 2000)

Preprints

A preprint can be characterized as a version of a paper intended for submission and publication in a peer-reviewed journal and not a final version (Kramer 1985, 3). As defined by the Office of Scientific and Technical Information (OSTI) of the US Department of Energy (DOE) preprints are

> manuscripts intended for publication that have not yet been published but may have been reviewed and accepted for publication; or they may be in the process of being circulated for comment prior to publication (U.S. Department of Energy, Office of Scientific and Technical Information 2004).

Historically, the physical distribution of preprints was an informal method by which some researchers kept abreast of the professional activities of their colleagues (Hurd 1996, 68). In her seminal work on preprints and their role in scientific communication, Kramer described the preprint as "a record of research distributed among scientists prior to formal publication" (Kramer 1985, 4; see also Hurd 1996, 68). As a primary means of communicating new research ideas and results, preprints were traditionally sent to interested individuals and institutions by ordinary mail, using an established exchange system at the time they were submitted to journals for consideration (Ginsparg 1994, 390).

arXiv.org

Long before the widespread availability and adoption of the Internet and the World Wide Web, Kramer predicted the emergence of electronic processes by which it would "be possible to write, review, edit, classify, retrieve, and transmit information" (Kramer 1985,

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40). Several years later in 1991, Paul Ginsparg, a particle physicist then associated with the Los Alamos National Laboratory, New Mexico, created arXiv.org (http://www.arXiv.org), a physics, mathematics, and computer science electronic 'preprint' service (McKiernan 2000). Ginsparg wrote supporting software that would enable authors to submit and replace preprints on a central server, to search, and retrieve the full text of these documents, among other functionalities. Ginsparg is now affiliated with Cornell University, where the primary arXiv.org server is currently based. Preprints generated and circulated in electronic form have come to be known as 'e-prints.' Such e-prints may be electronic versions of research papers or presentations submitted for dissemination and review among peers prior to publication, or versions of published work or conference presentations (U.S. Department of Energy, Office of Scientific and Technical Information 2004).

Self-Archiving

The submission of versions of publications to a central or institutional server, or linking to the associated full text from a personal or departmental homepage represent primary examples of the processes of 'self-archiving.' Generally, self-archiving can be defined as the process of depositing "a digital document in publicly-accessible Website." Ideally, "depositing involves a simple Web interface where the depositer copy/pastes in the 'metadata' (date, author-name, title, journal-name, etc.)" in addition to links to associated full-text documents (ePrints.org 2004a). "The purpose of self-archiving is to make the full text of the peer-reviewed research (emphasis added) output of scholars/scientists and their institutions visible, accessible, harvestable, searchable and useable by any potential user with access to the Internet" (ePrints.org 2004b).

For Steven Harnad—a vocal proponent of author self-archiving and a leader in the Open Access movement—and others, however, e-print archives are not, and have never been, "merely 'preprint archives' for unrefereed research (emphasis added)." As he notes,

> Authors can self-archive therein all the embryological stages of the research they wish to report (pre-refereeing preprints … through successive revisions), till the peer-reviewed journal-certified postprint (emphasis added). These could be complemented with any

subsequent corrected, revised, or otherwise updated drafts (post-postprints), as well as any commentaries or responses linked to them (Harnad 2003, 337).

For Harnad, "[t]he essential difference between unrefereed research and refereed research is quality control (peer review) and its certification (by an established peer-reviewed journal of known quality" (Harnad 2003, 337). "Peer review is not a luxury for research and researchers, for certification is essential. Without peer review, the research literature would be neither reliable nor navigable, its quality uncontrolled, unfiltered, un-sign-posted, unknown and, unaccountable" (Harnad 2003, 338).

Invisible Hand of Peer Review

For Harnad, "Human nature being what it is, it cannot be altogether relied upon to police itself. Individual exceptions there may be, but to treat them as the rule would be to underestimate the degree to which our potential unruliness is vetted by collective constraints, implemented formally." If one were to "[r]emove that invisible constraint—let the authors be answerable to no one but the general users of the Archive [arXiv.org] (or even its self-appointed "commentators")—and watch human nature take its natural course, standards eroding as the Archive devolves toward the canonical state of unconstrained postings: the free-for-all chatgroups of Usenet…, that Global Graffiti Board for Trivial Pursuit—until someone re-invents peer review and quality control" (Harnad 2000). While Harnad acknowledges that the conventional peer "… system is not perfect, [in his view] … it … has vouchsafed us our refereed journal literature to date, such as it is, and so far no one has demonstrated any viable alternative to having experts judge the work of their peers, let alone one that is at least as effective in maintaining the quality of the literature as the present imperfect one is" (Harnad 2000).

Purpose of Peer Review

In general, peer review can be defined as "the assessment by an expert of material submitted for publication" (Olson 1990, 356). Overall, "the underlying strength of editorial peer review is the concerted effort by large numbers of researchers and scholars who work to assure that valid and valuable works are published,

and conversely to assure that invalid or non-valuable works are not published" (Weller 2001, 307–8).

Problems with Classical Peer Review

While established peer review has its supporters, it has long been criticized as "…slow, expensive, profligate of academic time, highly subjective, prone to bias, easily abused, poor at detecting gross defects, and almost useless in detecting fraud" (Smith 1999, 4–5). In a recent review article on the peer review process, Rowland analyzes and briefly characterizes many of the deficiencies of classic peer review as follows:

• Subjectivity. Summary rejections by editor without sending the paper to referees; choice of referees by the editor (choosing for example, a known harsh referee for a paper the editor wishes to see rejected);

• Bias. Discrimination against authors because of their nationality, native language, gender or host institution; situations where author and referee are competitors in some sense, or belong to competing schools of thought;

• Abuse. Too many articles out of one piece of research, or duplicate publication; intellectual theft: omission or downgrading of junior staff by senior authors; plagiarism (stealing others' yet unpublished work that has been sent for review), delaying publication of potentially competing research;

• Detecting defects. Identification of factual errors within submission; and

• Fraud misconduct. Fabrication of results; falsification of data false claim of authorship for results (Rowland 2002, 250–51).

Invisible Hand(s) of Peer Review

Conventional peer review is not the only mechanism for assuring the quality of scholarship. There are forces, factors, and influences other than pending classical peer review that can assure the quality of scholarship before formal publication. These include personal reputation, institutional review, professional respect, peer pressure, critical peer response, the Invisible College, institutional repositories, self-correcting dynamics, self-archiving process, Action Learning, and Total Quality Scholarship (McKiernan 2003a).

Institutional Review
The Guild Publishing model is "based on the practice of academic departments and research institutes pub-

lishing their own locally controlled series of working papers, technical reports, research memoranda, and occasional papers" where "[t]he quality of research represented in these manuscripts series relies on the professional status of the sponsoring guild." Indeed, as observed by Kling, Spector, and McKim (2002), "[t]he reputation of a guild is as likely an indicator of the quality of the research manuscripts it publishes as the reputation of a journal is of the manuscripts it publishes." The guild model offers several major benefits that include:

• rapid access to new research;

• quality indicators through restricted guild membership;

• localized, easy setup;

• compatibility with other forms of online and journal publishing; and

• relatively low cost

(Kling, Spector, and McKim 2002).

Guild Model initiatives are well represented by the following publication series:

• Berkeley Roundtable on the International Economy Working Papers (http://brie.berkeley.edu/~briewww/research/workingpapers.htm);

• DZero Physics Papers (Fermi National Accelerator Laboratory) (http://www-d0.fnal.gov/www_buffer/pub/publications.html);

• Harvard Business School Working Papers (http://www.hbs.edu/research/workingpapers.htm); and

• University of Western Ontario Population Studies Centre Discussion Paper Series (http://www.ssc.uwo.ca/sociology/popstudies/dp.html).

(Kling, Spector, and McKim 2002).

Action Learning

"As any practitioner in the total quality field will agree, trying to build in quality a t t h e end of the production process is far too late. The obvious answer is to consider the quality aspect of the paper before starting to write." (Literati Club, n.d.)

In his review on 'Action Learning,' Brown (n.d.) observes that "[t]he obvious solution [to the inherent limitations of conventional manuscript preparation and review is] … to intervene closer to the point of assembly to help authors get their thoughts into bet-

ter focus and to do it before they … [write] their first draft." As he further notes:

> Manuscripts are traditionally reviewed by experts at arm's length … [and] [r]eviews by journals are usually anonymous. Only occasionally does an author have the chance to work through a paper in person with a reviewer so that they can elaborate on points and explore alternatives, and it is rare to do this as a group exercise where reviewers can build on each other's comments.

For Brown, an 'action learning set'—"a group that meets regularly to talk about common problems and to look for solutions"—offers a forum for assistance. As he recognizes, a "learning set of authors provides face-to-face reviewing by friends, most of whom lack preconceptions about the content of a paper or its context … [and] provides an immediacy and support that allows authors to get deeper into their papers than they would otherwise do" (Brown n.d.).

Total Quality Scholarship (TQS)

As succinctly stated by Brown, "in TQM, the most elementary trap is to try to inspect (edit) in quality at the end of the assembly-line rather than building it in at the outset" (Brown, n.d.). TQM incorporates a variety of the components of the philosophies and theories of W. Edwards Deming, an Iowa native whose views on quality and its improvement assisted in the transformation of the Japanese manufacturing sector after the Second World War and later became incorporated within a variety of TQM approaches (Wikipedia 2004). The views of Deming have been formally summarized in his 14 points, Point 3 of which notes that one should "cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place" (emphasis added) (W. Edwards Deming Institute 2000).

In a posting to the Web4Lib electronic discussion list in late July 2003, McKiernan expanded on the philosophy of Total Quality Management in the context of manuscript preparation and quality management:

> [E]ditorial peer review is a form of inspection (Deming Point 3), and represents a quality as-

surance mechanism of an earlier era, and that perhaps internal, institutional, or individual quality improvement mechanisms…and/or digital assurance mechanisms (e.g., downloads, ratings, links) hold potential for augmenting/ improving/replacing [?] classical peer review in the era of TQM and OAI (McKiernan 2003b).

The wiki, an emerging Web-based collaborative technology, not only has the potential of facilitating institutional review and Action Learning, but perhaps most importantly, may be the ideal mechanism for realizing Total Quality Scholarship at a variety of levels.

Wiki—Collaborative Software

'WikiWikiWeb,' 'wiki wiki,' or 'wiki' is "a server-based collaborative tool that allows any authorized user to edit pages and create new ones using plain text HTML" (Chawner and Lewis 2004, 1). 'Wiki wiki' is a Hawaiian term for 'quick' or 'super-fast.' Perhaps the best known public wiki is Wikipedia (http://en.wikipedia.org/wiki/Main_Page)—the 'free content encyclopedia' and the largest public wiki with more than 438,000 articles in English (January 1, 2005). Although the current number of public, private, and personal wikis is unknown, SwitchWiki (http://www.worldwidewiki.net/wiki/SwitchWiki), a comprehensive directory of public wikis, includes entries for more than a thousand wikis. Since its initial introduction by Ward Cunningham in 1995 (Leuf and Ward Cunningham 2001), wikis have been used for a variety of collaborative activities such as agenda solicitation and distribution, minutes preparation and review, and project management, among others (McKiernan 2005). Wiki technology also has potential for transforming scholarly communication and publication in general, and the preparation and review of manuscripts in particular.

As Chawner and Lewis note (2004, 1), the wiki is an example of social software, "a type of software that makes it easy for groups of people to work together in a virtual environment." They concisely observe that

> Wikis make it possible for people to collaborate in a Web environment by creating, organizing, and maintaining a web site of automatically linked pages. At the most basic level, a WikiWikiWeb allows any authorized user to edit content and add new pages, using

nothing more than a web browser and an HTML form. Simple text-based markup is used to format pages.

"While the idea of letting anyone change anything they want may seem radical or naive, most … [wikis] have features to let community members monitor changes, restore previous versions of pages, and delete unwanted pages" (Chawner and Lewis 2004, 1). In their seminal work on wikis, Leuf and Cunningham (2001, 277) identify six types of wikis, based on access privileges (see Table 1).

Although there are currently several dozen types of wiki engines (software) with a range of features, in general, all share similar authoring and editing functionalities (Wikpedia 2005), notably page creation, text formatting, linking to external Web pages and/or resources, hyperlinked page(s) of 'Recent Changes,' 'Page History,' and 'Edit This Page.' A 'Discussion' feature that allows contributors to comment on content is also available in many wiki implementations.

Table 1. Names, Descriptions, and Restrictions of Wiki Types		
Wiki Type	**Description**	**Restrictions**
Fully open	Original, 57-flavor, open community model	No restrictions
Lockable	All pages public, but editing restricted in various ways (lockable pages)	Edit authentication
Gate	Some pages public (may be lockable); other pages restricted to registered users	Edit authentication; login sections
Members-only	All users must be registered; may involve further group restrictions	Login to wiki
Firewalled	All users must be on specific network	Login to system
Personal	Notework usage on own system or private Web site directory	Not applicable (Web site login).

Collaborative Scholarship

In view of its collaborative features and functionalities, and the nature and character of alternative methods of quality management outlined, the wiki environment could provide an outstanding framework for preparing, editing, reviewing, assessing, and publishing for a range of scholarly work, including manuscripts, articles, journals, and monographs (Guest 2003).

In one possible wiki-based publication scenario, authors would prepare a manuscript draft using locally-installed wiki engine software (or a free or commercial wiki service) that best suits their needs or preferences. In a first stage review, colleagues would be invited to participate in a review of the draft. At this stage, the author can choose to allow first-stage reviewers to edit the text, or limit participation to a discussion space. At a second stage, known specialists in the field(s) covered by the manuscript could be invited to review the revised first stage version. As in the first stage review, second stage reviewers would be granted open permission to edit the manuscript text, or be restricted to commenting on its content. At a third—and perhaps final stage—the author could request that others (such members of a professional electronic discussion list) review and edit and/or comment on the new, revised version. After final review, the revised final stage version could be locked from future discussion or editing. The locking of the final version could constitute formal publication of the work. Alternatively, the author/editor in chief at some later time could unlock the published version and invite any reader to discuss and/or edit it, thereby creating a 'living', dynamic, potentially ever-changing and improving document by doing so.

In this general scenario, there would be no editorial evaluation or judgment of the initial or subsequent versions of an original manuscript by an editor or editorial board; at each stage, the author would serve as both author and editor in chief, and ultimately as publisher of his/her work. The significance and value of the work would be based on a variety of metrics that could include a matrix of such measures as citation pattern, linking volume, and access statistics (McKiernan 2004).

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