Locally Controlled Scholarly Publishing via the Internet: The Guild Model

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Many librarians and scholars believe that the Internet can be used to dramatically improve scholarly communication. During the last decade there has been substantial discussion of five major publishing models where readers could access articles without a fee: electronic journals, hybrid paper-electronic journals, authors' self-posting on web sites, free online access to all peer reviewed literature, and disciplinary repositories where authors post their own unrefereed articles. There have been numerous projects within each of these models, as well as extensive discussions about their strengths and limitations. While some of these projects have become important scholarly resources in specific disciplines; none of them has become commonplace across numerous disciplines. There is a sixth model that has been quietly adopted and developed in a number of disciplines -- the research publication series called working papers or technical reports that are sponsored by academic departments or research institutes. Many of these manuscript series are available to readers, online, and free of charge. This model -- which we call Guild Publishing -- has a distinct set of advantages and limitations when compared with the other five publishing models. This article explains the Guild Publishing Model, provides some examples, and discusses its strengths and limitations.

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Introduction

The Internet is widely viewed as a potential facilitator of scholarly communication -- including communication via research articles. There is considerable debate about which publishing models should organize these communications. Some often proposed candidates include: field-wide e-print repositories (Harnad, 1999), free online access to all peer reviewed literature[1], peer reviewed pure-electronic journals (Walker, 2000), hybrid paper-electronic journals (usually an electronic version of the paper journal), and author self-posting their articles on their own web sites (Okerson & O'Donnell, 1995). Several of these models, such as author self-posting and e-print repositories (for example arXiv.org), have no direct paper precursors. There are now important examples of each of these practices. However, only one of these five major architectures has become dominant across variety of scholarly fields -- the hybrid paper-electronic journal, which is a conservative extension of the traditional paper journal (Kling & McKim, 2000; Kling & Callahan, in press).

These five models dominate the published discussions about how the Internet may facilitate improved scholarly communication via research articles. But at least one other important model -- with important projects that illustrate its viability and value, is strangely missing from the current discussions. Our article examines this model, one that is based on the practice of academic departments and research institutes publishing their own locally controlled series of working papers, technical reports, research memoranda, and occasional papers. We believe that scholars will have a better chance to use Internet resources to improve their communications if a wider array of publishing models -- both old and new -- are available as models for new projects. The reliance on a narrow range of models yields

less value than many have hoped for. For example, arXiv.org began as an e-print server for high energy physics in 1991, and expanded throughout the decade to include other fields of physics, mathematics, computer science, and chaos theory. It has become an important communication forum in some of those fields. It may seem like the best new publishing model for "the Internet era." However, a proposal by then-director of the National Institutes of Health (NIH), Harold Varmus, to develop an e-print server modeled after ArXiv.org for bio-medicine in 1999, was effectively opposed by some leading bio-medical scientists (Kling, et. al., 2001). The original proposal for an archive of e-prints that were posted by their authors was transformed into PubMed Central, where scientific societies and journal review boards decide which articles will be posted; and all of the posted materials must be substantively reviewed before they are posted.

The case of PubMed Central vividly illustrates that publishing models that work well in one field, such as high energy physics, may not be viable in other fields such as biomedicine. Further, the case of PubMed Central suggests that efforts to transfer a very open publishing model from one field to another may be much too ambitious when the prior publishing models in the second field use more stringent practices for credit assignment, quality indicators, etc[2].

Scholars use various criteria to evaluate alternative models of scholarly communication including: their short and long term costs, speed of communication, accessibility to authors and readers, credit assignment, the strength of article quality indicators, readers' abilities to identify articles that are most relevant to their interests, ownership of intellectual property (and the relationship of a given electronic venue to other electronic or paper publishing venues), and long term access to articles (archiving). Of these criteria, the strength of the quality indicators is the most important to individual authors and readers, and is most frequently cited as a barrier to the use of various new forms of publishing.

Paul Ginsparg (2000), founder of the arXiv.org repository and a noted enthusiast for centralized open e-print servers, poses this question about quality indicators: "Is there an obvious alternative to the false dichotomy of 'classical peer review' vs. no quality control at all?" Our answer to the question is a resounding "yes!"

In this article, we describe a publishing model that provides some indicators of article quality, more such indicators than does the arXiv.org exemplar[3], for example, and of a different kind than the traditional peer reviewed journal model. Ironically, this model is currently part of the publishing practice of many different fields, and, is likely to be incrementally acceptable and usable by scholars in many other fields. However, being neither new nor grand in scale, it seems to be ignored in most discussions of scholarly electronic publishing.

Approximately 250 computer science departments worldwide, and all of the major computer science departments within the U.S., have research manuscript series (Computer Science Technical Report Archive Sites, 2002), which are called technical report series. Every major experimental high energy physics research institute has also organized a local research manuscript series that represents the publications of their research teams. The research manuscript series model is taken very seriously in these fields and some others (such as economics). However, this model is not yet taken seriously in the discussions of scholarly electronic publishing. Ironically, this model may have been overlooked as inconsequential, seeming mundane or frivolous in much the same way that e-mail was viewed (and the way the use of the telephone as a means of interpersonal communication was seen as frivolous).[4]

We refer to this model as guild publishing. It is based on the relatively well-understood concept of the research manuscript series sponsored by some academic departments and research institutes. As defined by WordNet ® (1.6, © 1997 Princeton University) a guild is "a formal association of people with similar interests." Academic departments and research institutes contain such groupings of people interested in, and working on, similar topics. They are formal, meaning that membership in academic departments and research institutes is well-defined and selective, based on experience, education, and other qualifications. In this article we use the term research manuscript, or simply, manuscript, to refer to what are diversely referred to as working papers, preprints, technical reports and memoranda. For manuscripts in electronic form, we sometimes use the term e-script. The nomenclature for research manuscripts in situ is quite diverse and thus we use the terms above in an attempt to clarify this discussion of scholarly communication. For a more detailed discussion of scholarly communication terminology, see Appendix A of this paper.

Ginsparg (1999) proposes that we develop publishing systems that "are entirely scientist driven, and are flexible enough either to co-exist with the pre-existing publication system, or to help it evolve into something better able to meet researcher needs." We see the Guild Publishing Model (GPM) as an important scholarly communication model that has been applied in many disciplines. We make no claim that the GPM will resolve all of the current major problems, such as the serials crisis, in scholarly communication. Instead, we view the GPM as an important

adjunct to journals and other forms of scholarly communications already in place.

Benefits of the GPM which we will examine later in this article include: rapid access to new research, some quality indicators of articles posted through current practices of restricted guild membership (more than on arXiv.org -- different than in peer reviewed journals), localized, small scale set up of the GPM, and, compatibility with other forms of online and journal publishing. Finally, the GPM is also a relatively low cost model of publishing for many university departments and research institutes to set up and maintain. In the next section we will examine the varying degrees of publishing, publishing restrictions, and the journal system.

The Continuum of Publishing

The term publishing is used contextually, though often treated as binary; a research article is either published or not, in academic settings. A "publication" is often used as a trading term. It is useful for academic career advancement, enhances the prestige of the author (and even the department of the author), is examined in grant funding, and increases the credibility of the author in the field. There are varying degrees of strength of publishing. Posting an article on a research manuscript series is one form of publishing, albeit a relatively weak form (Kling & McKim 2000, 1999). Once a manuscript is available on a research manuscript site, it is public, since it has become widely accessible to an appropriate audience.[5] This degree of strength of publishing also implies that the author has lost control of the manuscript as it becomes accessible to many people, for many uses.

Journals vary in their definition of publishing and their treatment of previously "published" manuscripts. Though posting a manuscript on one's own web site is a relatively weak form of publishing, offering relatively low public visibility, some journal policies state that this level of publishing is sufficiently strong to preclude submitting a manuscript self-published in this way to their journals (for example: *The New England Journal of Medicine*) (Kassirer, & Angell 1995) and *Science*. In contrast, some other journals do not let electronic publishing prevent publication in their venues. One intriguing example is *Physical Review D* which actually instructs authors to post their submissions on arXiv.org, but state that they will not accept manuscripts that have been previously published in other journals, or that are being considered for publication elsewhere (Physical Review Web Submission Guidelines, 2001). Many journal editors do not want to publish articles that have been widely circulated. Some fields such as medicine and chemistry generally have stronger taboos against any form of prior publishing in order to submit research manuscripts to their key journals. The fields of computer science, physics, economics, and demography, on the other hand, do allow some forms of prior publication.

The Harvard Business School's Working Paper site illustrates how some academic organizations want to distinguish their research manuscript series from "real publishing:"

> A "working paper" summarizes original research in a narrow segment of a field of study, and *is intended for publication* within a period of one to three years. If the original assumptions are justified, the scope of the working *paper may be expanded to a published book or article* (HBS Working Paper Series, 2001)(emphasis added).

The Semantics Archive delineates between posting on their site and journal publishing, and has this disclaimer regarding publishing:

> Archiving a paper is not considered a form of publication, but instead is analogous to circulating a manuscript, preprint, or offprint. Therefore it is not appropriate to cite a paper as appearing on the semantics archive. (About Semanticsarchive.net, 2001).

There is much evidence to show that online access is not leading to the demise of journal publishing.[6] The journal publication system provides a valuable set of services: publicity, accessibility, ranking of interest and importance, editing, long term access, and legitimacy (see Kling & McKim, 1999). Thus, the scholarly journal remains a convenient package for many scholars. Thus, from a journal publisher's perspective, there is no legitimate reason why a manuscript having been previously published in a research manuscript series should preclude it from being subsequently published (more strongly) in the journal. In the next sections, we will illustrate some instances of guild publishing, describe the GPM analytically, and demonstrate why it is a reasonable approach for this era.

Some Examples of Guild Publishing

Since our concept of guild publishing is defined inductively from examples of contemporary practice, we will defer discussing a formal definition until after we have provided some vivid examples. These examples will be drawn from a few fields: economics, business, demography, and high energy physics. However, there are other fields, for example computer science, mathematics, logic, economics, and information systems, in which guild publishing practices are also common in North American research universities and research institutes. There are other fields

such as business and political science in which we have found some examples of the GPM; however, they are not as common in these two fields. All of the research manuscript series we are listing below are publicly accessible: many manuscripts are available for free, and most published in the last 5 years are available online.

Economics example
Economics research is read by economists, and non-economists. The field of economics has a history of sharing research manuscripts; economists realize that it benefits them to have a wide readership, including high-level policy-makers. The likelihood of continued support (and increased research funding) is increased with public knowledge of their contributions. The Berkeley Roundtable on the International Economy (BRIE) is a research institute that is comprised of faculty at the University of California Berkeley and selected members from a few other elite universities. The following passage, from the BRIE working paper series, notes who authors BRIE manuscripts, "All of the papers posted are written by BRIE members -- or are from BRIE conferences" (About BRIE, 2000).[7]

Business example
An example of a business research manuscript series is at The Harvard Business School (HBS). The HBS research manuscript series is available at: http://www.hbs.edu/dor/papers.index.html. The HBS research manuscripts are permanently archived at the HBS Baker Library. HBS manuscripts are exclusively authored or co-authored by HBS faculty.8

Demography example
While there are many examples of demography research manuscript series, the following is one that we chose because it clearly illustrates the GPM. The University of Western Ontario's (UWO) Population Studies Centre "Discussion Paper Series" is available at: http://www.ssc.uwo.ca/sociology/popstudies/dp.html. This series, beginning in 1987, with electronic versions beginning in 1994, has research manuscripts listed (the latest 5 years) and is searchable by subject, title, and author (http://www.library.hbs.edu/workpaplink.htm). The print versions are available for five dollars per copy. There is no internal review of the research manuscripts that are posted (Sheil, 2002). Authorship is limited to faculty and doctoral students in UWO's Population Studies Centre, and others if they are affiliated with UWO in some way, e.g. (for example: hold honorary appointments, emeritus professors, or working on projects in conjunction with UWO staff).

High Energy Physics examples
FermiLab is a major experimental particle physics facility that supports over three dozen active collaborations. One major collaboration is DZero, which has its own web site (http://www-d0.fnal.gov/www_buffer/pub/publications.html) within the FermiLab site (FermiLab Experiments and Projects (http://www.fnal.gov/faw/fermilab_at_work.html#Experiments). The DZero Web site offers options for selecting "published (appeared in print)," "accepted (accepted for publication)," or, "submitted (paper submitted to journal)" manuscripts. All of these manuscripts appear to be available online. According to Harry Weerts (1997), who was the top level science manager for the DZero collaboration, "The general criterion for determining authorship on any publication is whether that collaborator is a "serious" participant in DZero." Weerts (1997) goes onto describe the criteria for a "serious member of DZero":

> To become eligible for authorship on a physics publication, a scientist is expected to contribute "significantly" to DZero for one year prior to the submission of that publication. ...To maintain good standing after the initial year (that is, to remain an active author), all scientists on the experiment are expected to continue to contribute the major fraction of their research time to DZero ...

By restricting authorship to guild members, and having tightly controlled guild membership, the research manuscripts that are listed on the DZero site contain relatively strong quality indicators.

Another FermiLab collaboration that illustrates strict membership guidelines is BteV. The process of becoming a BTeV collaborator includes: discussions with the membership committee, recommendation by the executive committee, and acceptance (by a 2/3 majority vote) of the full BTeV collaboration (http://www-btev.fnal.gov/btev/membership_rules.txt). Public BteV research manuscripts dating from June 1996 through December 2001 are listed at: http://www-btev.fnal.gov/cgi-bin/public/DocDB/ListDocuments. This site includes a list of some conference proceedings, published manuscripts, abstracts, publication information, talks, figures, photographs, and reference information.

In the following section, we will draw from the examples above (and others) to characterize the GPM in more detail. First, we will examine the nature of guild membership and the quality indicators in place within guilds, then we will detail three aspects of the GPM.

Formal Characterization of the Guild Publishing Model

We derive the GPM from the formal research manuscript series that are sponsored by academic departments and research institutes. In examining a number of such formal research manuscript series, we have found that very few

departments and institutes explicitly identify the relationship of their manuscript authors to the formal membership of the authors. In practice there occur several variations, which we will describe.

We will start with the simplest model--that of a department (or school) which limits publication in a manuscript series to its faculty. For example, The Harvard Business School working paper site restricts the ability to submit papers...to current HBS faculty; there is no review before a working paper can be submitted to the The Harvard Business School (HBS) Working Papers Series; the (HBS) Working Papers Web Site reflects only working papers that have been submitted to the HBS Working Papers Series.[8]

All authors of the HBS Working Paper Series are HBS faculty. If someone wants to publish a research manuscript in the HBS series, she need only become a member of the HBS faculty!

In contrast with HBS, some major computer science departments allow their doctoral students with faculty sponsorship, as well as their faculty, to author articles in their research manuscript (frequently called "technical report") series. For example, to author an article in Stanford University's Computer Science technical report series, one must be a Stanford Computer Science faculty member or a computer Science Ph.D. student whose manuscript has been approved by a Stanford Computer Science faculty member. In each case, the quality of research represented in each of these manuscript series is indexed by the professional status of the respective guild. Each guild controls its membership by the selectivity of appointments and promotions for faculty (full guild members), care in selecting and educating their Ph.D. students (partial guild members), and care in review of students' manuscripts by sponsoring faculty.

We characterize this publishing selectivity as a *career review* model rather than a *peer-review* model. The full guild members -- faculty in a university department or school -- have their entire careers reviewed at the times of their initial appointment and promotions. When a person holds the position of a faculty member of a department or school that sponsors a research manuscript series, they may publish whatever manuscripts they wish within that series, without substantial scrutiny. In contrast, the peer reviewed journals accept articles for possible publication from authors who may be employed by a wide variety of colleges and universities (or other organizations), and each article is supposed to be independently reviewed "on its own merits" by specialists who are not in the same department as the author. Prior publication in a journal does not insure future publication in that journal.

Scholars, who are potential readers of research manuscript series, can select which series to search or browse, based in part, on their professional judgments of the quality of the research produced by that department or school. In short, the academic unit's reputation acts as a quality indicator. For example, if an artificial intelligence researcher doesn't trust the quality of research being published by MIT's computer science department, she can avoid reading their AI Memo series.

Research institutes often have less thorough career reviews than do academic departments. Many university-based research institutes are interdepartmental. This is common in fields like demography, where the major research institutes can draw faculty from their universities' departments of sociology, economics, anthropology, and health sciences. The full guild members -- the institutes' faculty participants -- have undergone career reviews in their academic departments and schools that usually involve extramural evaluations. Some university-based research institutes also appoint faculty from other universities to their guilds. For example, The Berkeley Roundtable on the International Economy includes faculty at its host institution --UC-Berkeley, and also a few selected members from other universities. Some research institutes are not university-based, but draw their guild members from universities. We have discussed the stringent reviews of FermiLab. In economics, the National Bureau of Economics Research draws faculty from many universities, and publishes a highly respected report series. We have been using relatively elite examples to illustrate the ways in which guild publishing has been institutionalized in some fields at major universities. However, the Guild Model can work at minor universities as well. Readers will use their professional judgments in selecting which Guilds to follow most closely. The following sections will illustrate the economics, the local essence of, and further detail, the quality indicators in place, within the GPM.

Formal Conception: Economics of the GPM

The business model of the GPM is generally simple: GPM sites are typically free to readers and free to authors, with local sponsorship provided by individual departments or institutes.

When research manuscript series were published in paper and organized with a GPM, it was common for some sponsoring departments or institutes to mail them without charge to people who requested them, while others charged modest amounts to recover the costs of printing and mailing. In contrast, the e-script series that we have found to be organized under the GPM all seem to require no payments by their readers. The typical guild manuscript series is much smaller in scale than the holdings of the repository that is most often discussed in the literature --

arXiv.org. For example, ArXiv.org, after almost eleven years, has approximately 180,000 articles -- well over two dozen identified topics -- and each topic has links to new, recent, and searches for all listed postings. In contrast, a typical academic department or research institute would produce a number in the dozens or low hundreds in the same time. Also, the search architecture could be much simpler. Clearly the GPM has been affordable by many computer science departments, demography, and mathematics departments for example, and is within typical budgets of academic units within many research universities.

In contrast to the parsimonious economics of a small, locally funded departmental or institute server, consider the funding and operational effort that arxiv.org requires:

> The arXiv has operated with about $300,000 in annual funding from the National Science Foundation, the Department of Energy and LANL. For the time being, Cornell and LANL will share the costs and services previously provided by LANL. The arXiv will remain a cooperative effort between LANL and Cornell, since much key expertise will remain at the LANL library ... The existing LANL server will become a primary backup.[9]

The above figures refer only to the operating costs of running arXive.org; the total setup and development costs have cost millions of dollars since its inception. Further, many of the true costs of running arXiv.org are masked, since the technical support and technical facilities at Los Alamos National Labs are already excellent. While this may be an acceptable budget for a few elite institutions, the costs are prohibitive for most others.

Formal Conception: Localized sites and access

The guild manuscript series are set up according to each academic departments' and research institutes' interests and capabilities. The GPM may be implemented incrementally in academic departments and research institutes worldwide -- without requiring field-wide adoption, or standardization of format or rules, thus making it more practical than a more global model.

Formal Conception: Quality indicators: career review and guild membership

Career review provides some indicators of the quality of the guild's manuscript series -- but different in kind than (journal) peer review. The legitimacy of research manuscripts published via the GPM is conveyed as a function of the reputation of the sponsoring organization and of the entry barriers to membership in the organization (which are also usually correlated themselves). There must be some entry barriers to membership in the guild. The entry barriers may be relatively low (membership fee and self-affiliation with a particular field). Or they may be extremely high, such as being appointed to the HBS faculty. Though the HBS site states that no review takes place before submitting papers, it is apparent that they trust their career review for admitting members (potential authors) and do not require peer review or even internal review for a manuscript to be published in the HBS research manuscript series. The following statement from the Baker Library (2001) site demonstrates the power of career review:

> Harvard Business School working papers are popular among researchers for their strong focus on business and economic subjects, and because of HBS' academic reputation.

Consider the example of an academic department, scientific society, or school that sponsors a research manuscript series, that does not have a review process for these manuscripts, but restricts authorship to its regular faculty. The departments' tenured faculty members have undergone some kinds of career reviews that typically includes reviews of quality of their scholarly publications. These reviews are likely to be more stringent in departments with major research reputations than in departments with less distinguished research reputations. Untenured faculty may be evaluated on a more limited scholarly record and their promise of future contributions.

Guild reputations, based on career reviews in selecting their members, like the reputations of peer reviewed journals, provides some indicators of the likely quality of a research manuscript in their sponsored series. While "peer review" is the gold standard of academic publication, research-active academics also know that peer reviewed journals can differ substantially in the quality of scholarly work that they typically publish. Many specialists would be more willing to trust the manuscripts in a publication series sponsored by an academic department that the National Research Council ranks at the top of its field than those from a publication series from a minor regional university. In practice, a manuscript is marked with multiple indicators of its likely value and trustworthiness, including the author's reputation if they have some track record in a field, and the extent to which a reader values the author's research approach. These variations in the trust that specific readers place in a manuscript also apply to those that are published in peer-reviewed journals. However, the scholarly reputations of the sponsoring department or institute can mark the legitimacy of a manuscript authored by scholars who are less well-known to many readers, such as graduate students, junior scholars, etc.

Career review differs from peer review in the granularity of the review. Journal peer review examines each article as a distinct unit. In contrast, the GPM enables authors who meet the standards for guild membership to publish with little or no review in the guild's manuscript series. While critics of peer review practices have noted that authors' scholarly reputation and institutional prestige can sometimes bias peer reviews, these are seen as distortions of peer review systems, not as an essential feature of the review process. In principle, someone who has published numerous articles in a specific peer-reviewed journal cannot request that her next article be exempt from peer review because of her track record. Similarly, peer reviewed journals cannot normally reject articles for publication because an author has previously had numerous rejections, is unknown, or works for a minor university.

What is often unsaid about the journals system is the way that readers also regulate the quality of the scholarship that they read -- by selecting the conference proceedings, journals, books, and authors that they routinely examine. In a similar ways, readers also exercise some control over the quality of guild manuscripts that they read by selecting the guilds whose series that they will examine. For example, the web site of the Center for Demography of Health and Aging at the University of Wisconsin provides links to nine other demographic research centers and indirect links to two additional demography research centers. (Each of these 11 research centers is sponsored in part by the NIH's National Institute of Aging (see http://agingmeta.psc.isr.umich.edu/) and each center sponsors a research manuscript (working paper) series. A demography researcher may choose to examine the manuscripts that are published by any or all of these 11 guilds, or to read more widely from the manuscript series that are sponsored by guilds that do not have substantial NIH funding -- or not.

The research manuscripts in the GPM may be lightly reviewed, but are not subject to the full process of extramural peer review, though if the same manuscripts are submitted to a journal, they certainly would be peer reviewed. The purpose of the light review is to protect the sponsoring organization against embarrassment (such as would ensue from a physics research manuscript that claims to specify a perpetual motion machine). Light legal review may also protect the intellectual property rights of an organization that produces patentable products (FermiLab, for example, screens its research manuscripts for patentable ideas before allowing public access).

Strengths and Limitations, or, Why Should We Develop the GPM?

We will now discuss six major benefits and three major limitations of the GPM:

Strengths

a. Strengths: Localized sites

Research manuscript series in the GPM are set up by academic departments and research institutes, based on local interest and available resources. Local control, as we have shown in our examples, allows for significant experimentation and variety for each guild site. Variations in reviews for full and partial guild members (from none to systematic internal reviews and revision process) can be set up according to each academic department and research institution's preferences.

b. Strengths: Relative ease of innovation

The repository model of publishing is broad in scope, whereas individual academic departments and research institutes tend to be somewhat narrowly focused, by fields and sub-fields. Varmus' (1999) E-biomed repository proposal, was to cover all biological and medical fields. The structure of E-biomed repository would be uniform for all participants; consequently, the model failed. The GPM allows for more incremental and strategic innovation. Individual researchers can be strategic, deciding what she publishes in her guild series; publishing in a guild series is voluntary, not mandatory. Flexibility within each institution is supported; one research institute may set up a research manuscript series, but others at the same institution may decline to do so.

c. Strengths: Quality of guild research manuscripts

Career review provides a degree of gatekeeping in the GPM. Career review ascribes legitimacy to research manuscripts based on the reputation of the departments and research institutes that host the guild site. The authorship of research manuscripts in guilds is restricted to guild members, each guild in itself having different criteria for membership. Roberts (1999) states:

> This does not mean that exactly the same quality indicators as those employed with print journals will suffice (or be wanted) in all cases in electronic environments. *Some kind of 'filtering' system will, however, be essential if the academic community is to have faith in the digital mode of scholarly publishing.* (emphasis added)

Career review provides the filtering system and quality indicators that Roberts and others see as necessary.

d. Strengths: Access

The ability for interested scholars to locate and maintain stable, long-term access to published materials is an essential dimension of a system of publication. Ginsparg (1994: 390-396) claims that arXiv.org:

> ...provides a paradigm for ... changes in worldwide, discipline-wide scientific information exchange and [serves as] a model for electronic transmission of research and other information ...

Luzi (1998) views arXiv.org as: "... a model of rapid, direct and relatively cheap interaction in which researchers participate as producers, distributors and users of information." While these observations refer to an e-print repository, they also fit the GPM. The GPM provides rapid access and other desirable qualities listed by Luzi and Ginsparg. Full text of articles may be removed in some fields after journal publication -- demography, but not physics or information science, for example.

Before long-term access becomes an issue, the materials must be able to be found by interested scholars. While the guild publication series are by definition local, and perhaps not as readily located as global central repositories like arXiv.org, they still may be easily found by researchers, scholars, and students, for several reasons. First, research-active academics usually know where key work in their field is being done and by whom, and searches by author or institution will generally yield the guild site. Second, guild sites typically themselves point to related sites, and all of these sites are linked from disciplinary resource lists. For example, The Preprint Network at Oakridge National Labs links together hundreds of physics, mathematics, and computer science guild sites that are seen as relevant to the US Department of Energy's research programs.

Wide accessibility allows for students and faculty to use research manuscripts for teaching and research. The GPM gives people in academic departments and research institutes which lack extensive library resources access to a much wider and more current pool of literature than they would otherwise have. This allows smaller, less prestigious academic departments and research institutes as well as individuals to gain wide readership and therefore enhancing possibilities of, and access to, career advancement. In many systems, authors may also track downloads of their manuscripts from the guild sites (an ability which is explicitly withheld from authors on arXiv.org!).

e. Strengths: Economy

GPM costs are manageable, but not negligible; cost structure varies considerably depending on the amount of pre-existing infrastructure (technical access, levels of technical abilities, and technical support at any given institution).

f. Strengths: Compatibility with other publishing models

As we discussed in the section on the publishing continuum, we believe that the virtues of the existing journal system should not be discarded or undermined in a rush to electronic, anarchic self-publishing. In fields that do not maintain highly restrictive prior publishing standards regarding journal submissions, the GPM is an acceptable communication forum; it coexists nicely with the journal and other scholarly communication models. The GPM does not require an overhaul of existing publishing structures. The GPM is compatible with and coexists with journals, conference proceedings and e-print repositories. For example, physicists who publish in the FermiLab Dzero collaboration research manuscript series also publish those manuscripts in the arXiv.org repository, Physical Review Letters, and Physical Review. The CDF high energy physics collaboration at Fermilab, like Dzero, has a research manuscript series (Publications and Preprints (http://www-cdf.fnal.gov/physics/preprints/index.html). We found that the majority of CDF research manuscripts posted from 1994-2000 were published in journals or conference proceedings as well as being posted on the local guild site.

Limitations

a. Limitations: Reputation reinforcing

As we noted earlier, readers select which research manuscript series they read, sometimes based on the reputation of the host research department or institute. Therefore a highly regarded academic department or institute may be more widely read than a less well known department or research institute. This makes high visibility less likely for those at the less prestigious institutes. The guild model reinforces these status distinctions, and does not provide a ready mechanism for bringing interesting materials from scholars or institutions of lesser reputation to the attention of other scholars. Further reinforcing this difference, scholars working in small academic departments or research institutes, or those with very limited funding or computing resources, may not be able implement the GPM in their departments or institutes (though they may benefit from accessing online articles).

b. Limitations: Access

Though an in depth discussion of bibliographic control is beyond the scope of this paper, we believe it is a relevant topic. Bibliographic control refers to the process by which materials are indexed, described, analyzed, and classified. While an approximate and somewhat informal taxonomy of this important aspect of selection has been described (Calhoun, 2000) the process is by no means stable, because of the fluid nature of electronic resources, as well as the built-in nature of the task. Not all online manuscripts need to be indexed, leaving librarians the difficult task of selecting which series, or parts of the series to index. Then they must tackle the indexing process itself (Calhoun, 2000). There is a bias of online indexes to point to online material: not every field has such an index, nor does every field have its own paper index! Guilds, repositories and

author self-posting (sometimes) share this reduced visibility. As guild series change URLs for administrative reasons, they may become hard to find, a common case of link rot.[10,11]

c. Limitations: Prior publication limitations

In fields that have strict prohibitions against any form of prior publishing for submission to their key journals, this model is unlikely to be widely accepted. The relationship of the GPM to other venues sometimes precludes journal publication; therefore it is not acceptable in all fields today. Authors may strategically decide to publish some research manuscripts on their guild site and hold back others exclusively for journal publication in fields where prior publishing restrictions are not as flexible as in physics, mathematics, economics, business, and demography.

Conclusions

The GPM is a workable and presently working model, taken seriously in computer science, economics, business, and demography among other fields. While the GPM is taken seriously in practice in fields like these, it has not entered the discussion of scholarly electronic communication. Instead, for example, discussion of scholarly communication in high energy physics focuses on arXiv.org, the repository model. We believe that this is a mistake; the GPM is an important and significant model that is worth noting, examining, and extending to other fields. The GPM can provide rapid sharing of information, increased comprehensive research access for those in academic departments or research institutes with small libraries, and is an economically feasible model for institutions with basic computing support. The GPM is a flexible model, set up locally, according to interest, need, and available resources.

The GPM is currently common in some, but not all fields; it is more common in fields that do not place restrictive prior publication rules for their leading journals. One of its strongest virtues is that the GPM works well in conjunction with other forms of publication, in many fields. Given that the (peer reviewed) journal model appears to be a stable model, not in danger of disappearing due to the GPM, or any electronic form of communication, using less restrictive prior publication standards for all core journals is a productive, and progressive move.

Appendix A

Defining research manuscripts, manuscripts, e-scripts, research memoranda, memos, e-memos, preprints, grey literature, tech reports, e-prints, occasional papers & working papers!

The literatures of scholarly electronic communication rest on some key terms that various authors use with subtle but important differences in their meanings. These terms include: publication (which can range from a one-day posting on a web site to appearing in print in a large ciculation prestigious scientific journal), preprint (which can range from any article that a scholar circulates for comment to an article that has been submitted to a journal, accepted for publication, and that has not yet been formally published), and e-print, an electronic version of a manuscript, and used as an equivalent to an electronic preprint. Even in the paper world, publishing was viewed on a continuum. The Garvey-Griffith publishing model, based on careful empirical studies of research communications in the field of psychology, treats the appearance of an article in printed conference proceedings or in a journal as the only forms of communication that warrant the label "publication." In their model, preprints are distributed when an article has been submitted to a journal, and has been accepted for publication. The preprint precedes a formally published printed version. While many scholars believe that the trajectory of publication described by Garvey and Griffith fits many fields, there are important variations in sequence and nomenclature across disciplines.

These differences in the nomenclature for research articles, such as, preprints by high energy physicists, working papers, memoranda, research manuscripts, and technical reports by others, continues today. Unfortunately, this diverse terminology clouds the discussions of alternative ways to organize Internet forums to support scholarly communication.

Unfortunately, physicists have casually used the term preprint to refer to manuscripts whose publication status is similar to that of what are sometimes called research memoranda, working papers and technical reports in other fields. For example, the PREPRINT Network at Oak Ridge National Laboratories states that: "preprints, or 'e-prints,' are manuscripts that have not yet been published, but may have been reviewed and accepted; submitted for publication; or intended for publication and being circulated for comment." The Preprint network is a valuable service in the physical sciences; but its definition of preprint is so elastic that it can refer to any research manuscript, even one that is only posted on an author's personal web site, and not subsequently published elsewhere. The Oxford English Dictionary defines a preprint as "something printed in advance; a portion of a

work printed and issued before the publication of the whole." High energy physicists gave their research manuscripts a status boost by referring to them as preprints before they were accepted for publication. For example, according to its official description, "Recently, fewer than 40% of submitted papers have been finally accepted for publication in Physical Review Letters."

In this article, we will try to use terminology that works across disciplines. Consequently, we will use the term research manuscript (or simply manuscript and e-script) to refer to articles that have not yet been accepted for publication in a specific venue. We will use the term preprint conservatively -- to refer to manuscripts in the form in which they are likely to appear in a conference proceedings, journal or book (whether in printed form, electronic form, or both).

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Notes

[1] Some of the groups dedicated to the creation of free online access to all peer-reviewed research literature include: The American Scientist Forum (http://amsci-forum.amsci.org/archives/september98-forum.html), TheBudapest Open Access Initiative (http://www.soros.org/openaccess/) , The Public Library of Science (http://www.publiclibraryofscience.org/), and the Free Online Scholarship Movement (http://www.earlham.edu/~peters/fos/).

2. High energy physics, for example, has a long history of making unpublished research manuscripts available for public access; many fields do not share this practice. For example, Valauskas (1997) noted that physicists' communication practices do not transfer well to the discipline of law:

In law, there are incredibly profound differences in the ways in which scholars communicate as compared to physicists. To argue that a digital methodology that works for physicists will work for academic legal researchers ignores the histories and social structures of both disciplines.

3. In 1991, Ginsparg, at the Los Alamos National Laboratory (LANL), began an electronic preprint archives (e-print) of high-energy physics-theory research reports. Physicists have a tradition of sharing preprints with each other. Materials in the e-prints physics archives are not peer reviewed prior to electronic publication.

4. As Peter Roberts (1999) notes:

First, and perhaps of greatest importance for many subscribers to on-line services, there is e-mail. It is easy to overlook this aspect of cyberspatial life. Computer connectivity between nations has allowed a new form of correspondence to evolve, and, while we have seldom noticed this, our daily lives have changed as a result.

5. For a nuanced examination of scholarly "publishing" read: "Scholarly Communication and the Continuum of Electronic Publishing" (Kling, & McKim, 1999)

6. For example, in a study of US scholarly scientific journals from 1977-2001:

...the journal system has remained surprisingly stable. Scientists still depend on scholarly journals for reporting research results, obtaining information and as reference sources. Also, the number of articles published per scientist, the amount of reading and the indicators of usefulness and value are virtually unchanged (Tenopir & King, 2001).

7. The BRIE research manuscripts are almost all available online beginning in 1996 (the site lists manuscripts from 1984-2001) at: http://brie.berkeley.edu/~briewww/pubs/wp/index.html

8. personal correspondence, Shear, Mandy, Division of Research, HBS, 11/21/2001

9. from an announcement regarding arXiv.org moving to Cornell: http://www.news.cornell.edu/releases/July01/ginsparg.archive.ws.html

10. For an in depth discussion of the process of bibliographic control read: Redesign of Library Workflows: Experimental Models for Electronic Resource Description (Calhoun, 2000).

11. For further information about the frequency of link rot, and tools for finding and handling this problem, see Rotten Links Hamper Learning (Dean and Mayfield, 2002) http://www.wired.com/news/school/0,1383,51700,00.html