Full Access and Review:

Applying Socio-technical Practice to Academia

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Abstract

Social computing application innovations develop faster than academics theories about them. While online computing changes radically every few years, academic publishing typically takes 3-5 years to produce "new" publications, which often address issues relevant a decade ago and increases the gap between the worlds of theory and practice. This paper suggests that using social computing technologies helps narrow this gap by applying socio-technical principles to our own knowledge exchange system (KES). We propose an open electronic KES that not only increases dissemination (by publishing all) but also increases discrimination (by rating all). This would go beyond current repositories like CoRR by providing an electronic portal that not only disseminates but also reviews computing research. It would address reviewer bottleneck problems by involving more people in more ways. The goal is an online research community where theorists, analysts and practitioners can freely contribute, converse and create knowledge in a vibrant, supportive and timely knowledge commons.

Categories and Subject Descriptors

H.4.3 [**Communications Applications**], H.3.7 [**Digital Libraries**]

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Electronic publication, knowledge exchange system, electronic archive

1. INTRODUCTION

In an earlier publication [1] we critiqued the traditional "gate-keeping" approach of current academic journals and attributed the following problems to excess rigor over relevance:

1. *Less innovation:* Computing innovations like blogs and wikis do not connect with academic theory.
2. *High rejection rates*: Current top journals reject over 90% of submissions.
3. *Long cycle times*: Currently papers in good journals take 3-5 years from submission to publication.
4. *Small audiences*: Fewer people are reading academic journal articles, especially practitioners.

We attributed these "rigor problems" to the business practice of using publishing to promote, select and allocate exclusive grants and positions. We then suggested that since good research is good business, a knowledge exchange system (KES) strategy that served research would yield more benefits. Rather than a system suited to authors seeking professional advancement, we suggested one suited to knowledge creation, discrimination and dissemination. In such a system authors would be encouraged to innovate genuinely, to read as well as publish, and to discriminate not just by rigor but also by relevance.

This paper now aims to provide more detail to that vision. We suggest how social computing tools from blogs, wikis and social networking systems can restore the academic balance between rigor and relevance. First attempts at e-journals have not been that successful, and while a successful repository like Los Alamos archived over 100,000 physics papers

between 1991 and 1999, this was only a minute proportion of all published papers in the field over that time [2]. The good news is that current socio-technical systems have been highly successful, with online worlds like World of Warcraft having more members than the population of a small country [3]. General socio-technical systems like web-mail and social networks like Facebook have hundreds of millions of members, more than most countries have citizens. These tools are not just theory but demonstrated practice.

However transferring these successes to academic publishing is not simple, as the academic goals of creating, developing and transmitting knowledge are not the same as those of a system like a wiki for example. In particular, means are needed that fit the academic purposes of anonymous review, namely to generate *true* knowledge. We now discuss how social computing can combine with current knowledge repository systems to create a full-access, full-review KES.

2. SOCIO-TECHNICAL INFORMATION EXCHANGE

First we look to psychology for a knowledge exchange development three-part schema based on linkage [4]:

1. *Informational:* A one-way, one-to-many (1:m) linkage that is optionally signed. People broadcast knowledge to many usually unknown others, e.g. Web blogs, home pages.
2. *Personal:* An interactive one-to-one (1:1) linkage, usually signed, where people exchange knowledge by direct transmission operations between personally known participants, e.g. email, chat.
3. *Group:* An interactive many-to-many (m:n) unsigned linkage, where "the group" transmits knowledge to "the group", e.g. online reputation systems, online voting.

The Web, it is suggested, began with informational exchange, as people broadcast their home pages, giving an Internet that looked like a large library of facts and information. It then evolved personal contacts as email connected people to people in relationships, which then made the Internet seem more like a large social network that connected everyone to everyone beyond time and space. Now we are entering the third stage of Internet evolution, where group knowledge exchange is allowing the formation of genuine social communities, making the Internet more like a new unexplored world, where people can "homestead" to form new social groups. Academic publishing is similar, in that it first allowed web broadcasting (1:m), with e-journals that promised open access. However this had the unintended social consequence of cheapening the perceived value of publishing – free publishing devalued the act of publishing. Hence e-journals struggled and print journals remained dominant. Today most print journals use email (1:1) to speed up publishing transmissions, but this "computerization" has left the social structure largely unaltered – it is still authors petitioning a centre of control for the privilege of being published. Socio-technical change involves changing both social and technical aspects together.

We now argue that group-to-group information exchange will now make possible a third generation of academic publishing systems. If computing supports the group-to-group (m:n) transmissions at the heart of group interaction [5] an online knowledge exchange system where everyone contributes, everyone reads and everyone reviews is possible.

3. DISCRIMINATION AND DISSEMINATION IN KNOWLEDGE EXCHANGE

As argued earlier [1], electronic repositories like Los Alamos let more people produce and consume more knowledge, i.e. they increase knowledge innovation and dissemination. Yet since repositories publish both "good" and "bad" papers based primarily on author upload, this is publishing without discrimination. In the print publication model this is an expected trade-off, as it is assumed that dissemination and discrimination are mutually exclusive. However, for electronic publishing this assumption is not valid. The KES earlier described allows unlimited submissions that are subject to ratings by far more individuals and in more diverse ways than print journals' (and their e-journal counterparts) accept/reject dichotomy. Participants in an open KES could rank all papers on a multi-point scale, say from Limited to Excellent, given that, unlike print publications' passive readers, in an online KES every reader is a potential reviewer, and reader downloads or views can be used to measure relevance value. Figure 1 shows the difference between the current traditional print-based selection and a full-access, full review electronic repository-based KES.

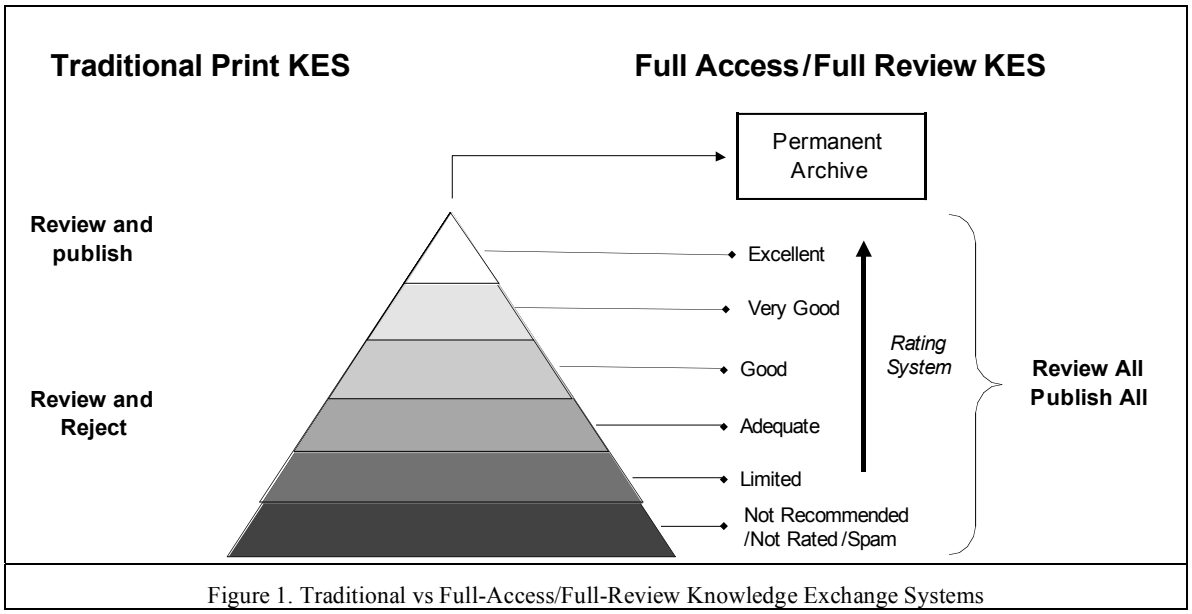

Figure 1. Traditional vs Full-Access/Full-Review Knowledge Exchange Systems

A KES design that accepts, rates and publishes all submissions would combine the functions of electronic repository and reviewed journal. While current reviewed journals effectively waste (by rejection) 90% of the knowledge submitted to them, a full-access, full review journal would use it all. While the literature seems huge, a particular topic may have only a few papers, and certainly many papers with value fail to cross the 90% rejection barrier. In these cases a researcher may find even weak submissions useful, as even a "bad" paper may contain a good idea. Some key aspects of this design include:

1. *Reduced spam.* Only registered readers can submit. New submissions are checked and spam diverted based on *who* is submitting rather than *what* is submitted.
2. *Preprints.* Authors choose if they want to just publish (a preprint/post-print), or review then publish. If just publish, the system makes the paper visible to readers (as an electronic repository does).
3. *Anonymous review.* If an author chooses review the editor initiates an anonymous online review. The paper stays invisible to readers until the author decides to publish. Reviews determine the rating level, so that papers with good reviews can immediately become top rated, but if an author with bad reviews decides publish anyway, it may display in the "Not Recommended" section.
4. *Reader ratings.* All papers can be reader rated, e.g. readers could vote on papers, or measures like number of downloads (as in CACM) could measure value, as opposed to print journals' editorial boards measuring value for readers.
5. *Commenting/Reviewing.* Like Wikipedia, where influence is shared among many rather than being restricted to the few, a KES comment function could give readers a natural path to participating in the review and editing process, i.e. recruit and assess reviewers by merit from the reader base.
6. *Archiving.* To enable continuous growth, the KES could retain a publication cycle (e.g. week, month or quarter) and "publish" its top rated papers to a paginated permanent archive, removing "published" papers from the dynamic rating process, thereby making room for others to rise.
7. *Anonymity.* In traditional reviewing "anonymous" reviewers are still known to the editor. Likewise in a KES anonymity means the review is not *signed*, not that the reviewer is not *known* (or registered) to the system.
8. *Balance.* The KES design aims to rebalance the rigor and relevance criteria in assessment. Ratings by respected reviewers could direct readers to useful but hard to read papers, while reader interest could focus attention on papers about important issues.
9. *Pre- and post-publication assessment.* This system supports both pre- and post-publication metrics. While excellent papers may by review rise quickly to the top, others may rise only slowly after years of public comment and work.

We then suggest that a *full-access, full-review system* could be developed from successful repositories like Los Alamos (http://xxx.lanl.gov).

4. SOCIAL COMPUTING TOOLS

The following social computing tools could be *adapted* into a KES design:

1. *Reader commenting.* Like the newspapers "Letters to the Editor", readers can add comments of any size. This encourages input from practitioners, for whom full scale academic

writing with its format and reference demands is prohibitive. Commenting is useful if the total reader experience/knowledge outweighs any expert. Readers can then correct errors of fact, supply references and suggest examples.

2. *Reviewer reputation.* Like Amazon's reviews and used booksellers, reputation systems are a social form of quality control. A reputation KES could not only let authors rate their reviews but also let reviewers rate each other.

3. *View filters* Rating systems also allow view filters. Likewise KES readers could set their view filter to show any quality level, from low to high. One would expect most readers to set filters high, but some may choose to "bottom feed" on specific topics.

4. *Same again functions.* Same again functions let readers who find something valuable find more of the same. KES readers could use the papers they value as ways to find similar others.

5. *Social networks*. Systems like Facebook succeed by letting people network. Academic groups like ACM let members present biographies to others and list the authors with whom they collaborate. A similar system within a KES could let academics relate on a personal as well as an informational level.

6. *Version control.* Wikis illustrate version control that both allows updates and keeps previous versions visible. Despite the supposed rigor, blatant errors still slip into print, where they then remain permanently. A KES with this function could allow the correction of errors of fact.

Socio-technical systems address the "*participation problem*" by offering a social hierarchy of roles (like "steward", "bureaucrat" and "sysop" in Wikipedia) that participants can aspire to through right action.

One cannot simply copy tools from one domain to another, e.g. wikis support anonymous knowledge creation but in academic publishing we quote and reference rather than simply copy and use. A wiki style KES editing tool could let commentators show rather than tell proposed changes, but authors could still choose to accept or not proposed changes. This suggests *open source methods with attribution,* e.g. papers could invite comments and authors respond yes/no to suggested reader upgrades, perhaps with replies like "Thank you, I never considered that." The system could recognize *micro-contributions* - small numbers of words contributed to a document, and address the question of how to recognize commenting effort [6]. Aggregating micro-contributions could over many papers recognize the contribution of those who help by making small amends as well as those who contribute large creations. Of course useful comments could also be *acknowledged* in the paper, or the commenter invited to be a co-author if they are very helpful. Seeing comments produce revisions would encourage more comments and suggestions.

5. SOCIO-TECHNICAL REQUIREMENTS

The key principle in the above is to get more voluntary participation, which also seems to explain why democracies are more productive than aristocracies. However for the majority to get involved social conditions must be right, and in particular they must choose to do so. Socio-technical knowledge exchange is more complex than traditional designs because it includes social as well as technical performance requirements. Examples include:

1. *Legitimacy.* Legitimate interactions are fair and beneficial to the parties involved, and in physical society are supported by systems of "justice". Fairness attracts contributors, as people tend to avoid unfair situations [7] and prefer situations where they are treated fairly [8].

2. *Transparency*. With transparency (or translucency [9]) justice is seen done. Transparent social systems encourage good behavior and reduce bad simply because others are watching you.

3. *Participation*. Participation, not efficiency or usability, is the main socio-technical system success criterion. If there are too few reviewers and too many authors, the answer is not to reject more but to review more. This is possible if more people are willing to participate and are allowed to do so.

4. *Controls and sanctions:* Socio-technical systems need defenses against anti-social individuals who attack the social system. In Wikipedia and Slashdot such participants are called "trolls", and mechanisms are created to oppose them, e.g. Slashdot prevents users from posting more than once in sixty seconds.

5. *Privacy.* Just as freedom is the right to own one's own person *physically*, so privacy is the right to own *information* about one's person. Note that privacy is not just keeping personal data secret; it is the right to choose to release personal information. Hence in a full-access, full-review KES an author and a reviewer could jointly agree to release a review.

In general, to succeed, a socio-technical KES must meet both social and technical needs. Equally, in socio-technical change both social and technical aspects are changed together, e.g. in Figure 1, as well as requiring new social-computing tools like view filters, the role of editors and reviewers has changed. They are no longer the knowledge gatekeepers of publishing, as the gate is open and anyone can publish, and readers can decide for themselves what they will read. Yet they are still knowledge guides and

gardeners, as their comments and ratings will affect what is produced and read, much as for example Zagat's Restaurant guide affects which restaurants people choose to frequent.

6. CONCLUSIONS

Current publishing systems simply are not coping with the ever-increasing amount of authors seeking publication venues for ideas that support further innovations in computing. One reason is that specialization within mature disciplines is reaching a point of diminishing returns – where increasing effort yields disciplinary atomization and decreasing results. We find that break-through advances increasingly occur at the boundary of disciplines, like socio-technical design, and need multi-disciplinary efforts to expand knowledge dissemination. Problems endemic to print publication like the reviewer bottleneck, long cycle-times and excessively low acceptance rates are not problems that will go away in time. To deal with this inevitable knowledge expansion without losing quality we need to involve more people, via technical systems that meet social requirements. As Shirky (and James Joyce) warns, "*Here comes everybody*" [10], and the power of the group is something academic publishing can no longer afford to ignore.

We have argued that when business goals, supported by "rigor", dominate academia they become counter-productive, and new ideas become threats to the status quo instead of opportunities for new knowledge. To do something about the current problems of academic knowledge exchange we suggest a socio-technical approach, with two parallel goals:

1. *Social change:* Change from the current centralized gatekeeper model of academic publishing based on exclusive excellence to a democratic publishing model based on open merit.
2. *Technical change:* Develop an electronic KES based on #1 by using social computing tools to enhance currently stable repository archives.

This would firstly replace the myth that rigor is excellence with a balanced rigor-relevance model, and secondly create a full-access, full-review KES by using proven social computing tools to support open electronic knowledge exchange that accepts everything, rates everything and publishes everything. This is not abandoning the roots of academia but returning to its original goal of *seeking truth by publishing knowledge freely for mutual critique and benefit*. Such a system could form the basis of an inclusive academic community that invites contributions from other disciplines at the crossroads of technology usage. Any discipline that can establish an online research community where theorists, analysts and practitioners can freely contribute, converse and create knowledge on a vibrant, supportive and timely knowledge commons will have a bright future.

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