

Peer Review Software:

Has it made a mark on the world of scholarly journals?

Summary

This paper presents a brief history of peer review, results of a recent survey among journals representing numerous disciplines as to their experiences with peer review software systems, and a select reading list for those interested in pursuing the subject further. Survey results show limited impact of manuscript tracking systems on the quality of reviews and the number of reviewers. It appears that these systems have made significant impacts in three other areas: they have increased the number of submissions, especially from international authors; they have accelerated turnaround time; and they have had a positive effect on the efficiency of editorial offices by freeing up staff to attend to other tasks and responsibilities.

Produced for Aries Systems Corporation (www.edmgr.com)
by Barbara Meyers of Meyers Consulting Services (www.mcsonoe.com)

Peer Review Software: Has it made a mark?

"Peer review matters. Why? Firstly, scientific assertions can't be proved; they can only be disproved. The doubts raised by peer reviewers are therefore a crucial element in scientific reasoning."

– Frank Davidoff, editor emeritus, *Annals of Internal Medicine*

Introduction

For more than four centuries, peer review of one type or another has been (and still is) at the very heart of scholarly communication. For the last fifty+ years, an increasingly more formal approach to the process took hold. And in the last decade and a half, computerization of the various editorial functions supporting peer review has brought about the development of a number of software tracking systems focused on the editorial workflow.

The quality of peer review and certain aspects of the process have been fodder for many articles and even an international congress. But the impact of technology, specifically the new software systems, on this area of publishing has been all but completely ignored. David Kronick, the preeminent scholar on the history of the scientific journal, commented that his 1976 book seemed *"to have filled a void in the literature. I take pleasure in finding it cited from time to time, probably not because of its merits, but because there has been so little written on this important and interesting subject."* (Kronick, 1992) Kronick's assessment would be an understatement to say the least if applied to the electronic management of an individual step in the publication of those journals, that being peer review. And specific to this paper, the subset of peer review systems.

A literature search and a search of this author's own library yielded a scant number of articles specifically addressing the topic of peer review (aka manuscript tracking) software. In fact, most articles unearthed by such a search would lead one to presume that only software developers engaged in peer review and only the government and academic institutions were concerned with its rigor. I, and the gentle readers of this paper, know differently. But we have treated our industry as a shoemaker would his children in our lack of publication about the very process and progress of publishing.

After a short history of peer review in scholarly journals, we'll look at what changes may be attributed to the use of manuscript tracking software, be they negative or positive, based on current survey responses from a random sample of journals.

Peer Review Encapsulated

Spier (2002) posits that the origins of peer review can be tracked to Ishaq bin Ali Al Rahwl (ce 854 - 93). Al Rahwl described in his book *ETHICS OF THE PHYSICIAN* the manner in which the notes of a physician were judged by a council of physicians in order to determine whether current standards of practice had been followed. Legal consequences might ensue on the basis of such judgments. This type of censure resulting from review paled compared to the confinements and deaths during the post-Gutenberg era of the Spanish Inquisition in the mid-1500s. Not until 1620 when Francis Bacon published *"The New Organon"* (often referred to as *Novum Organum*) was there the hint of a structure to the review process. Bacon defined a new method for the generation and assessment of new science as he made but one request in the Preface of his work. It planted the seeds from which the process of modern-day peer review would grow.

"I have on my own part made it my care and study that the things which I shall propound should not only be true, but should also be presented to men's minds, how strangely soever preoccupied and obstructed, in a manner not harsh or unpleasant. It is but reasonable however, (especially in so great a restoration of learning and knowledge) that I should claim of men one favour in return; which is this; If any one would form an opinion or judgment either out of his own observation, or out of the crowd of authorities, or out of the forms of demonstration (which have now acquired a sanction like that of judicial laws), concerning these speculations of mine, let him not hope that he can do it in passage or by the by; but let him examine the thing thoroughly; let him make some little trial for himself of the way which I describe and lay out; let him familiarise his thoughts with that subtlety of nature to which experience bears witness; let him correct by seasonable patience and due delay the depraved and deep-rooted habits of his mind; and when all this is done and he has begun to be his own master, let him (if he will) use his own judgement." (Bacon, 1620)

Scholarly societies founded in the mid to late 1600s published manuscripts in their journals on the basis of the editor's judgment and the judgment of others whose help he might seek. By 1731 the Royal Society of Edinburgh instituted a procedure whereby materials submitted for publication were *"subject to inspection by a select group of members who were knowledgeable in such matters, and whose recommendation to the editor was influential in the future progress of that manuscript."* (Spier, 2002)

In 1752 the Royal Society in England, publisher of one of the first journals, *Philosophical Transactions*, followed suit and adopted the same peer review procedure. From then until roughly fifty years ago, little to no changes occurred in the administration of the peer review process. After

WWII, more formal and structured procedures for review became commonplace throughout scholarly journal publishing. But it wasn't until roughly 20 years ago that any significant changes occurred.

Peer Review Software

The advent of the computer has brought about numerous changes since the late 1970s to every step in the scholarly publishing process. But not surprisingly, few articles report those changes and what effect, if any, they are having on scholarly journal publishing.

Regarding peer review, the first published reference I could find was a presentation by Lorrin Garson (then a member of the American Chemical Society Publications R&D Department, now Publishing Technology Consultant) at the Second Annual Meeting of the Society for Scholarly Publishing (SSP) in 1980. Garson reported the installation of a microcomputer desktop system in 1979 for the ACS journal *Biochemistry* *"to aid in the selection of appropriate reviewers and to accelerate the processing of manuscripts."* (Garson, 1980)

The ACS system incorporated word processing, data files (for reviewers, Editorial Advisory Board members, and manuscript information), and indexes at the desktop. Initial user reaction was discomfort with the technology but was shortly replaced by the routine of moving a manuscript through the various stages of peer review. Garson noted that the system did not reduce labor costs but rather freed staff to take on other assignments so that *"overall efficiency and productivity were improved."* (Garson, 1980)

At the Fifth SSP Annual Meeting in 1983, Basil Walby of CSIRO presented his organization's experiences in this area of publishing. Walby noted "electronics is making our operations more efficient, but at each stage we must evaluate the costs and the benefits. Those who say that we can dispense with paper and rely entirely upon silicon chips have quite obviously never run an editorial office or a production department for journals, books or any other type of printed matter." *He further expounds on that by explaining "[t]hey .. do not understand how difficult it is in practice to connect an editor in Madison (Wis.) with an author in Australia to a referee in a remote part of Scotland. The cost of such an operation is still prohibitive."* (Walby, 1983)

Finally in terms of historic accounts relating to the desktop version of manuscript tracking software, Jan Fleming (then Manager of the ACS Manuscript Office, now Vice President, Cadmus Professional Communications) spoke on the topic "Automation for a Peer Review Office" at the Seventh SSP Annual Meeting updating her and Charles Bertsch's report two years early on the society's progress with its peer review system. By this time the

system had been given a name, Peer Review Plus, as it *"not only was written to take a generic approach to automating editorial operations, but at the same time was upgraded and enhanced beyond the earlier version. . . the software can handle the following:*

- 3 different main offices per computer system plus many remote units for each
- 25 journals per office
- about 25,000 author records per office, and
- about 25,000 reviewer records per office." (Fleming, 1985)

Fleming concluded her report with this comment concerning performance: *"this software has improved office efficiency, improved the quality of reviewer selections, and improved manuscript processing times, all of which are major goals for a peer review office."* (Fleming, 1985)

Fast forward a few years to 1990 and we see the beginnings of the commercial development of software systems for manuscript tracking. Vendors strive to offer increased productivity, enhanced efficiency, improved management, and ultimately higher quality journal content through the application of their systems to the peer review process. Over the next dozen years, sporadic reports from individual journal offices, the occasional publisher of multiple journals, and the infrequent overview article relating to peer review (manuscript tracking) systems dot the landscape of literature about publishing with all presenting a relatively positive opinion. Most especially as these systems move from the desktop and become Web-based thus allowing for increased functionality and online submission and transfer of manuscripts.

This positivism contrasts sharply with investigations into the quality and validity of peer review undertaken primarily among biomedical journals. This parallel and much more public examination of the peer review process was sparked by the First International Congress on Peer Review in Biomedical Publication (1989) convened by Drummond Rennie and Annette Flanagin of the American Medical Association and the biannual subsequent congresses.

A significant and growing body of literature now reports on the continuing debate about the strength and weaknesses of the peer review process (e.g., Sun, 1989; Weller, 2001), how to measure its effects (e.g., Jefferson, Wager, and Davidoff, 2002), and the fact that the process is flawed but necessary (e.g., Kassirer and Campion, 1994). A much smaller, but increasing, number of publications are shining a spotlight on the effects of computer applications on the peer review process (e.g., Mathews and Jacobs, 1996; Pope and Miller, 1998). Commenting on the impact of Web-based systems, Beebe and Meyers point out *"the primary outcome of a*

computerized review system is a bank of accepted manuscripts in digital form ready for editing. A valuable ancillary outcome is the information created as a result of the process.

Publishers can gather statistics such as:

- Average time for review
- Number of submissions
- Number of manuscripts accepted, rejected, accepted with revision
- Number of reviews per referee
- Performance by individual referee including turn around time, quality of reviews, and consistency with other referees, who are usually assigned by editors and/or a Peer Review Board.” (Beebe and Meyers, 2002)

This article in the *Journal of Electronic Publishing* presents another attempt to report on the impact of manuscript tracking systems on the peer review process and ultimately scholarly journal publishing.

Results

Responses to the survey were provided for thirty-nine journals (one organization gave separate response data for three titles). Given the respondent bias inherent in the survey’s response rate, the results will be presented in a simple narrative form. Individuals interested in detailed response data to a particular question are encouraged to contact the author.

Major Findings

- Twenty-seven of the thirty-nine journals (69%) are using peer review software in their editorial offices. The earliest system was installed in 1984. Two systems were installed in the 1980s, three in the 1990s, and fourteen between 2000-2003. Seven were installed this year with an additional installation in process as this is written.
- Of the twelve journals currently without a system, half expect to have one installed within six to twelve months. Submission figures for twenty-six journals were provided for both before and after their system’s installation.

A Survey of Journals

A survey of randomly selected journals from the Council of Science Editors (CSE) Membership Directory 2002-2003 was conducted via email to 145 organizations in the first week of July 2004. A single follow-up email was sent two weeks later. A total of 37 organizations responded. Removing the 34 undeliverable email addresses from the original number leaves 111 organizations that were in receipt of the questionnaire. Based on that number, the overall survey response was 33%. The survey questionnaire is presented here.

Survey of CSE Member Journals re: Impact of Peer Review Software on Scholarly Journal Publishing.

Where necessary, providing approximations and/or ranges in your responses would be appreciated if exact figures are unavailable.

1. Have you installed a peer review software system for your journal?
2. If yes, when? [Skip to Question 5.]
3. If no, do you expect to do so in the next 6-12 months?
4. If no, why not? [Skip to Question 15.]
5. How many submissions did you receive annually before the systems installation?
6. How many submissions do you receive annually now?
7. How many reviewers did you have in your database before the system?
8. How many reviewers do you have now?
9. Has there been a significant change in the quality of submissions since the system was installed?
10. Has there been a significant change in the quality of reviews since the system was installed?
11. What areas of your journal operation have changed because you are using the software?
12. Which one of these areas has changed the most?
13. Which of these changes have been beneficial to your journals operation? In what ways?
14. Which of these changes have been detrimental to your journal’s operation? In what ways?
15. What is the subject specialty of your journal?
16. What is the frequency?
17. What was the total number of published manuscripts in your last full volume of the journal?
18. Do you have any comments regarding your experience with peer review software systems that you would care to share?

- Nearly three-fourths (73% =19) of the journals experienced an increase in submissions ranging from 3% to 226% with the average change being +53%. Submissions for the other seven journals remained the same.
- The number of reviewers before and after their system's installation was given by eighteen journals. Six journals maintained the same number of reviewers. Twelve experienced changes. Four saw a decrease in reviewers (range = -10% to -27%; average = -14%) and eight had an increase (range = +15% to +275%; average = +114%).
- Among the twenty-seven journals with systems, there was no change reported in the quality of submissions for over half (59% = 16) of the publications. Six experienced an increase in quality. Three noted a decrease in the quality of manuscripts being submitted with one respondent adding that the journal was receiving "more borderline papers" since the installation of their system.
- Even fewer journals experienced any change in the quality of reviews and none experienced any decrease. Seven journals noted an increase in quality with one respondent commenting that "we are getting a higher percentage of 'good' reviews. Because of the electronic system, we are able to better instruct reviewers with helpful reminders and guide tools, thereby improving the overall quality of reviews."
- A wide range of areas were identified as having changed with the most frequently cited being:
 - Decrease in fax, postage, and FedEx costs (7 journals)
 - Some change in editorial and/or production workflow or staff workloads (7 journals)
 - Faster turnaround time (6 journals)
 - Ability to publish online ahead of print (4 journals)
 - Ability to do more with fewer (or no extra) staff (4 journals)
 - Ability to deal with international authors (4 journals)

One journal reports that "the greatest changes have come in using the electronic system."

Submission - Instant gratification for the author

Assignment - The paper is in the hands of the Editor and Associate Editor, quicker, sometimes in a matter of minutes or hours, versus the old method of days

Peer-Review - Reviewers have instant online access and electronic return of reviews

Decision - Authors are notified of a decision by email (after reviews have been returned) instead of snail mail

Reports - More detailed reports are available to the Editor, Associate Editors, and the Editorial Office. Not only can paper status be tracked, but times from submission to assignment of an associate editor, to assignment of reviewers, to review time, acceptance rate, rejection rate, etc. The area cited most frequently as having changed the most is the change in staff workflow/workloads (8 journals) followed by the increased speed of processing (5 journals).

Faster turnaround time was the number one benefit of the system for nearly half (48% = 13) of the journals using a tracking system.

There were few instances of detrimental changes cited. An increased refusal rate among potential reviewers (3 journals) and a steep learning curve (4 journals) were the top two drawbacks cited.

The comment from one respondent seems especially descriptive:

"It was the best of times, it was the worst of times... I believe the greatest misconception we had when we switched to the electronic system was that it would be paperless and less work."

The range of subject areas represented by all responding journals is extensive from aerospace to zoological systematics. (See Figure 1) In this regard, the survey broke new ground for peer review research. Up to this point much of the reported peer review research focused primarily on journals in a single discipline or closely

Figure 1

Subject Specialty	
Aerospace	Endocrinology/Diabetes/Clinical Care
Aerospace Medicine	Fish and Fisheries
Agriculture & Natural Resource Sciences	General Medicine
Allergy/Clinical Immunology	Hematology
Anesthesiology	Obstetrics & Gynecology
Aquatic Studies	Otorhinolaryngology/Head & Neck Surgery
Biological Affects of Electromagnetic Fields	Pediatrics
Cardiology/Neurology/Peripheral Vascular Study	Pharmacology
Cardiothoracic Surgery	Plant Sciences
Civil Engineering	Reproductive Biology & Health Issues
Clinical Chemistry	Seismology
Computer Science	Urology
Continuing Medical Information	Veterinary Medicine
Earth Sciences	Zoological Systematics

connected specialties. Twenty-eight distinct subject specialties were cited with nearly one-third (32% = 12 out of 38) being outside the areas of biomedicine and clinical medicine.

Two-thirds (67% = 26) of the journals are published monthly. The number of manuscripts published in the journals' last volumes ranged from 13 to 673. (See Figure 2.)

Several respondents provided additional comments in response to the last question. These are provided verbatim here.

Figure 2

PAPERS	MONTHLY	BIMONTHLY	BIWEEKLY	QUARTERLY	QUARTERLY
UNDER 100	1			2	2
100-199	9	2		1	
200-299	5	1			
300-399	4		1		
400-499	1				
500-599	0				
600-699	4		1		

implementation of [the online system] improved the submission and peer-review process for authors and reviewers. A great advantage to an online system is that it is accessible by all (with an access code) and from anywhere. It has allowed us the privilege of creating a 'virtual office' in one location, with Editor and Associate Editors situated across the United States, Great Britain, and Italy. I appreciate the availability of reports, the speed in assignment of manuscripts, and instant contact with authors and reviewers."

"Wish I had the time to comment more fully; best advice: know thyself."

"The system gives us speed and power to improve the review process, and has been praised by many of our authors and referees."

"I would never want to go back to the previous system!"

"If converting from one online system to another, do not bother with trying to convert any but the simplest data from the old system for import into the new system."

"Using a web-based peer review system is much more efficient and reliable than processing a paper workflow."

"We have had many, many compliments from authors, reviewers and editors on [our system]. An occasional user has an (always simple) problem." -American Association of Clinical Chemistry

"We implemented two separate systems for two publishers. One was fairly cheap and the other was very expensive. Both packages worked well."

"Our system was custom made for our journal."

"I have great pride in our staff (both IT and Editorial) and our volunteer editors for the cooperative efforts that went into our in-house-developed system. We designed it with continuing input from our volunteers and to their specifications. Our IT staff was particularly remarkable for their high level of sensitivity and complete cooperation, and the success of our system is largely due to both their efforts and their attitude." - American Institute of Aeronautics and Astronautics.

"Like any new system, there are parts that will work well and those that will not. Parts of the system were put in place without thinking through the needs of the different users and seem to be put in place for the developers use. Each user of the

"Some limits of the system that we may or may not avoid: The rate of weak submissions will increase, I am afraid. Furthermore, we are thinking about human links to preserve exchanges between referees and editors, and that [is] the most important objective. Thus, we want to answer directly to the authors, referees, etc. directly when we need it."

"I think [the system] works extremely well. That said, we are still finding ways to improve the system. One of the advantages of Bench>Press is that improvements are implemented on an ongoing basis. We don't have to wait for a new software release or upgrade." – American Society for Pharmacology and Experimental Therapeutics

"We have been evaluating [one vendor] for about six months and are likely to reject it. It is clumsy, non-intuitive and poorly presented. We will go on to evaluate an alternative solution."

"The system has improved overall turnaround times and allows staff to cull data and create useful reports that were difficult or impossible to create before the system was in place. At the same time, the addition of the system has allowed us to reduce staff and save costs."

"The use of Peer Review software is as good as those who use it. When selecting software, or an online database administrator, know what you want and make sure the system is capable of filling the need.

"The use of [the peer review system] helped the Editorial Office tremendously with organization and tracking. It allowed the time for review and decision to be pared to a minimum. The

system has different needs: authors, reviewers, editors, staff. The system needs to evolve as more users work with the system to accommodate the different workflows and different skills of the users.”

Has a mark been made?

There is no question that within the movement to electronic publishing among scholarly journals manuscript tracking systems have played their part. The impact of these systems within the peer review process has been shown by this modest research effort to be of relative significance – some good, some bad, and some just different.

Desktop systems are within the financial means of just about any journal, but the cost of Web-based systems can be problematic for smaller journals. Fax and FedEx costs would be unaffected by desktop systems but are materially reduced or largely eliminated by implementing mature Web systems. Plus, reviewers have instant online access only with Web-based systems. Larger journals that can justify Web-based system costs will become more appealing to all authors (primarily due to faster times to acceptance and publication) and as a result may attract submissions that would have gone to smaller journals. Thus, in order to survive, smaller journals may have to adopt comparable software just to maintain a healthy manuscript flow.

How much of one journal’s description of the current state-of-peer-review in its office applies to yours?

“We have cut down on the amount of paper, but we have not eliminated it (the files just aren’t as thick, but there are still paper files). As for the workload, it has shifted from working with hard copies to online work. No more stacks of mail covering the desk but just as many if not more emails to be answered, papers to be processed, and reviews to be tracked. There is no less work to be done, only work of a different nature.

“Authors need help uploading papers, papers need formatting evaluation - where once we took the author’s word for it on hard copy, or asked the reviewer to suggest changes, we now verify word count electronically, check abstracts, and file format. Some authors have computer problems or don’t fully understand instructions (at last available count, 70% of our submissions were international) and must be helped on a one-to-one basis.

“Some reviewers have problems, are short of time or patience, need one-on-one instruction, and still give up and send reviews by fax or email message. We must then enter those into the web system in order to have the review for the author and decision

letter. We have found the reviewers to be the ones most likely not to adhere to the full use of the web system.

“Because authors and reviewers require more initial instruction and/or training (as well as Editors), the office requires a more intuitive and computer literate personnel. And because an author or reviewer deals more with the computer than the staff, they sometimes feel alone in the process.”

There is no doubt that manuscript tracking systems will become an integral part of the peer review system for all scholarly journals of a particular size (number of submissions) and once fully integrated into the workflow will influence the actions of all the players in the process – authors, editors, reviewers, and editorial office staff. As these software systems are developed further to connect with the systems now used in the production process, scholarly journal publishers will take another step toward an all-electronic publishing process.

I refer you to Pope and Miller’s excellent account of their work with *Conservation Ecology* which seven years ago automated “*the entire process of running a journal from submission through editing and review, to publication and distribution.*” (Pope and Miller, 1998) Their goals were to reduce costs, shorten turnaround time, and increase accessibility—much the same as all peer review systems. Pope and Miller reported success in speeding up all clerical steps, but not necessarily the time it takes for people (i.e., reviewers) to make decisions. Cost savings were realized given that all correspondence now takes place via email. However other costs were added, such as additional staff to work with HTML conversion and in system administration as well as new hardware. They didn’t address the issue of access by authors and reviewers internationally, but they did cite the unanticipated benefits of archiving (all versions of a manuscript plus all correspondence) and the ease in building metadata for application to a published article.

In the end, Web-based peer review systems will most likely impact the dynamics of scholarly journal publishing to a considerably larger extent than did their desktop counterparts. Desktop systems incrementally changed scholarly journals; full-functionality Web-based systems represent a fundamental paradigm shift in the publishing process.

If your journal has yet to convert from a paper-based review system, you might wish to explore the available commercial systems. In-house customization is certainly an option, but it is fiscally viable only if you are running a very large journals program so that the costs of development, maintenance, and technology upgrades can be shared across several titles.

Peer Review / Manuscript Tracking Systems

There are a number of peer review software systems available today. Here is a listing of major vendors.

AllenTrack, Allen Press
www.allenpress.com

Bench>Press, HighWire Press
www.highwire.stanford.edu

Editorial Assistant, EA Software
www.easoftware.net

Editorial Manager, Aries Systems
www.editorialmanager.com

eJournal Press
www.ejournalpress.com

ManuscriptCentral, ScholarOne
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