

2015-01-15

Internet-enabled innovations in the scholarly peer review process

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Abstract

Peer review practices in scholarly journals evolved over the last century and have remained more or less the same since the introduction of the Internet, the one innovation having been widely taken into use being electronic manuscript management systems. Nevertheless critique of the shortcomings of the current practices (bias, slowness, etc.) have lead to many publishers and journals experimenting with novel ways of performing peer review, enabled by e-publishing and new revenue models. This article offers taxonomy of such innovations and presents a number of cases where for instance the assignment of reviewers, the acceptance criteria and the transparency of the review process are handled in new ways.

Introduction

Publishing periodical scientific journals started as early as 1665 as a means of communicating new developments in research, with learned societies as central agents. The secretary of the Royal Society of London, Henry Oldenburg, started as editor for the Philosophical Transactions, one of the first two scholarly journals in 1665. One of the tasks of the editor was to select important articles to publish (Lee et al 2013). Journal publishing of the Philosophical Transactions continued within the domain of natural sciences and in the mid-18th century the Royal Society started an editorial procedure, using the help of peers, by nominating a Committee of Papers (Kronick 1990 cited in Bornmann 2011).

The evaluation of research by peers has traditionally been a quality label for maintaining a good standard of research reporting, thus promoting new scientific knowledge. Peer review processes are common also when applying for research grants and for academic positions (Bornmann 2011). In this study only journal peer-review will be included.

The journal peer review process started in the fields of natural sciences and has traditionally been applied in science, technology and medicine research, thus naturally correlating with the preferred way of publishing research results in these fields. The reliability of the peer review process is critical for the aim of selecting the manuscripts filling the quality criteria set by the journal. To secure a fair and reliable process the reviewers for a journal are appointed either on a permanent base, covering the main topic areas and the scope of the journal, or as

ad-hoc reviewers selected for their topical expertise. A double-blind review process achieves the anonymity of the reviewers and the authors thus securing fairness and objectivity.

The review process is considered more reliable when there is a high level of agreement between the reviewers on a manuscript (Bornmann 2008). When a particular form to be filled in by each reviewer is used the review process is standardized and becomes a good help for the reviewer in forming a judgment. This is particularly common in web systems for handling the review process and greatly helps the editor in comparing the reviews and in making the final decision.

Interestingly the procedures and conventions of peer review have, even prior to the Internet, been linked to the technology in use for communication. An early shift was from hand-written to typed manuscripts. Since it was possible to produce up to three legible copies by inserting carbon paper into the typewriter, these could relatively easily be sent to anonymous peer reviewers who could work in parallel (Spier 2002).

The Internet together with data base technology has provided the vehicle for much more radical changes in the processes. One is for instance that the choice of reviewers can be automated, so that instead of an editor selecting and contacting potential reviewers this is done automatically based on the profiles of scholars in a database, indicating their fields of expertise. Another important aspect is that articles can be discussed after having been published and that such critique can be published as appendixes with the articles, at a later stage. A third very important one is that there are no longer economic limitations (in terms of printing and dissemination costs) which limit the number of articles a particular journal can publish, thus removing a significant reason for the filtering out of manuscripts in electronic-only journals. All in all the last twenty years has seen an increasing number of experiments with innovation in the peer review process, in particular in open access journals that are only available as electronic journals.

The number of scholarly articles published per year is estimated to be around 2 million (extrapolated from Mabe and Ware 2012). All of these have at least in principle undergone peer review, and in addition there are at least as many manuscripts which have been rejected, either as “desk rejects” by editors, or in different stages of the peer review process. The average rejection rate across all journals is estimated to be around 60 % with top journals in many fields accepting as few as 5-10 % of submissions. It should also be noted that many initially rejected manuscripts are eventually published in other journals. Peer review processes range from very rapid ones, ending in an acceptance or rejection decision within weeks to long-winding processes with multiple iterations and revisions that can take over a year (Björk and Solomon 2013)

The peer review system is generally accepted among scientists. In his overview of scientific peer review Bornmann (2011) mentions several studies reporting satisfaction with the peer review system and the improvements in the quality of articles that has been the result of going through the process. The quality aspect

is important since it guides the reader in choosing articles to read and cite. An advantage is that a proper peer review is able to eliminate errors and helps the author to improve the article by informative suggestions in the review reports.

The common policy for scientific journals to only publish manuscripts not submitted or published elsewhere, thus requiring monopoly rights for a manuscript as long as it is being under consideration in the journal was “codified” in the so-called Ingelfinger rule practiced in *The New England Journal of Medicine*. The Ingelfinger rule according to Angell and Kassirer (1991) is an agreement between the publisher and the author of the submitted manuscript, that only manuscripts not submitted earlier or published elsewhere are considered for publication.

Critiques of the traditional peer review

Several aspects of the current peer review system have been criticized, although it has remained the main process to seek validity and quality in scientific publishing. As Grainger argues, the process is depending on the scientific field and the willingness of researchers to enlist as reviewers (Grainger 2007). The large number of manuscripts produced today requires a huge numbers of reviewers and their commitment, time and effort to identify high quality manuscripts that make a contribution to science.

The increasing number of manuscripts submitted to scholarly journals has made it difficult and stressing for editors to find, in the ideal situation, three experts conducting timely and fair reviews for each submission. One effect of this is that the process becomes slow and thus slows down the publishing of research results. A short time from submission to acceptance is in fields like medicine seen as critical and long peer review processes might lead the author to inform colleagues and media about the results before acceptance and against the Ingelfinger rule and the policy of the journal. Angell and Kassirer (1991) again argue that the discussion has been more on the value of early news of medical research and less on the risks.

The review process has also been criticized for poor reliability, which is exemplified in the lack of agreement between the reviewers. Bias and fairness in judgements are serious shortcomings that undermine the reliability of peer review (Lee et al. 2013; Bornmann 2011). Also the trend that leading commercial publishers, due to the monopoly they have on the central scholarly content, make huge profits, essentially based on the free labour provided by editors and reviewers, has caused arguments against moral aspects of how peer review is organised.

The huge volume of scholarly literature available through the web has changed the habits of scholars. The decisions on what to read are increasingly based on electronic links and cites outside the traditional citations in journals, and the term altmetrics has come into use. Scientist thus rely more on judgement of the

whole collective of readers to find quality, rather than on the filtering capabilities of just a couple of experts.

In the world prior to the birth of the World Wide Web and electronic publishing the established peer review system worked well but currently critique of its shortcomings and experimentations with new types of peer review have increased. The purpose of this study was thus to take a closer look at cases where journals are experimenting with new approaches to peer review and to report on the experiences with these.

By necessity the identification of journals with differing peer review practices was a bit like detective work. The authors are very familiar with Open Access publishing and some cases were known based on this, in addition cases emerged due to mention in different articles and news items that were encountered during the process. Due to this method there is no guarantee that interesting journals could not have been missed or that the chosen journals and their peer review methods represent all interesting variations. For each of the chosen cases the journal web pages were studied as well as any discussion about them in scientific publications, conference presentations and news items.

Innovations in peer review

In order to provide some structure to the discussion we constructed a classification or taxonomy of different variations on peer review, related to different aspects of the peer review process and it's management (table 1). This classification is below used as a synopsis for the more detailed presentation of the cases.

Table 1. Different variations of peer review in scholarly journals

Aspect	Alternatives		
Assignment of reviewers	By editor	Automated from reviewer database	Open peer review
Acceptance criteria	Technical soundness & Scientific Contribution	Technical soundness only	
Transparency of peer review results	No information	Statistics about acceptance rates, length of process	Review reports available with the articles
Reuse of review reports	None	In other journals of same publisher	

This taxonomy is by no means comprehensive, and there may have been aspects that we missed, but we hope that it provides a useful framework.

Assignment of reviewers

By the editor

The standard way of assigning reviewers is for the editor to assign them, based on his knowledge of the field, the references in the manuscript etc. In some journals the authors are also given the opportunity to suggest reviewers as options for the editor. Increasingly in higher volume journals editors are also supported by data bases of potential reviewers, where academics have indicated their area of specialization.

Automated from reviewer database

There is thus a short step towards the next stage, where the assignment of reviewers is automated using such data bases. In such a case the number of requests sent out must be substantial in order get enough volunteers, since the invitations to review lack a personal touch. This is a practice difficult to document based on the journal websites since few journals would like to openly admitting to using it. One good example is offered by the OA publisher Hindawi and its ISRN series of journals. This was a series of journals for different scientific disciplines operating under the same brand name (Peters 2011). For each journal the publisher assembled an editorial board of between 100-300 academics and also collected their publications lists. After a cursory first check the bibliographic reference list of a submissions was compared to these and 5 best fits where algorithmically determined (reviewers who had co-authored papers with the submitter were excluded) and request for reviews were automatically sent out. There were always some who declined, but due to the commitment of the editorial board members to be available for reviewing, this effectively lead to a sufficient number of reviews. Due to the set-up the review process was very fast.

In the worst case the requests are not even sent out to academics who have volunteered but as “spam” based on crawling the web for author names. This type of requests are annoying as they do not necessary apply to the research interests of the receiver. This seems to be a practice of many so-called “predatory” OA journals. A negative effect of such emails is also that they tend to give Open Access (also the journals performing peer review according to normal standards) a bad name.

Open peer review

In open peer review the determination of which articles are significant enough to be considered for publishing in the journal is left to readers. This means that the manuscripts, after a cursory editorial check to see that they are within the

scientific scope and meet basic requirements of scientific soundness as well as language, are openly published on the journal web site. Published manuscripts remain on the web, but it is only after “voting” by readers that they get the status of having been published in the journal itself. In a way such journals combine a preprint or working paper server with a full journal.

A good example is the OA publisher Copernicus which has started a number of journals with two parallel titles each, for instance Atmospheric Measurement Techniques (AMT) and Atmospheric Measurement Techniques Discussions (AMTD). Submitted manuscripts are published after only a cursory quality check by the editor in AMTD. After that readers are able to comment and provide feedback about the manuscript. After a few months of feedback from readers, from appointed referees and possible revisions by the author, the manuscripts that meet the quality criteria are published in the journal proper (AMT). Both AMT and AMTD are ISSN-registered, archived and citable, but only AMT has an ISI impact factor. The review process is illustrated in figure 2.

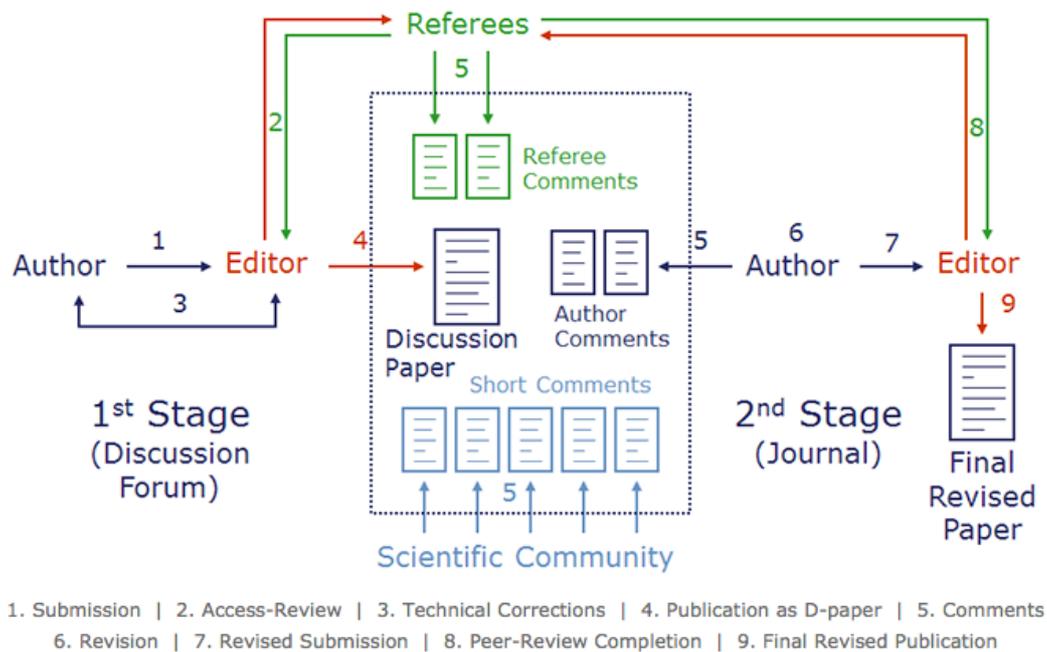


Figure 2. The review process of the OA publisher Copernicus (http://publications.copernicus.org/services/public_peer_review.html)

Acceptance criteria

Technical soundness & Scientific Contribution

One of the most important functions of current mainstream peer review has been the allocation of scarce publication space to the qualitatively best

submissions or those most likely to be of interest to the readership. This has been a necessity in paper journals for purely economic reasons (costs of printing and shipping) and is still a necessity in journals publishing a parallel paper version. And even if a journal only appears electronically there are many reasons why subscription based journals want to continue with the restrictions in publication volume. For purely electronic open access journals whose revenues consist of article processing charges (APCs) this restriction no longer applies. Instead there may be strong reasons to expand the publication volume as much as possible, since there are clear economies of scale involved.

Technical soundness only

The practice of defining the acceptance criteria of a manuscript as scientific soundness alone was already used in some of the journals of BCM in the early years of the first decade of this millennium, but the real breakthrough for this method was the phenomenal growth of the journal PLoS One since around 2007. Inspired by its success many leading commercial and society publishers have since launched their own “megajournals” and the number of articles published in such journals is now in the order of 50,000 per year (Binfield 2013). The justification for this type of peer review is rooted in the critique of the current mainstream peer review paradigm, for the strong element of bias and arbitrariness in determining the “contribution” or importance of an article. It is thus considered much better to leave the judgement of that to readers who will vote with downloads and citations. This type of review also tends to lead to shorter publication lead-time and in particular to authors being more assured of publication in this type of journal compared to more traditional ones.

This model might however be reaching the limits of its impact. One of the key reasons could be the difficulty in finding motivated reviewers for this type of review in huge volume journals where their efforts are becoming more and more anonymous, thus not providing the sort of social capital that reviewing on the request of colleagues in more restrictive journals does..

Transparency of peer review results

No information provided

Usually very little information is given about the details of the peer review process in scholarly journals. Sometimes journals name reviewers annually (without linking them to individual articles). The peer review is usually either double blind or single blind, depending on the field of science. In many fields where the authors argument depends on references to their own previous work, or where the academic community is small only single blind is practical.

Statistics about acceptance rates, length of process

Average acceptance rates and publication delays are important parameters when authors choose where to submit. Automated workflow systems also greatly facilitate the production of statistics of this sort and for this reason such overall statistics are starting to be more common. Some Open Access publishers, for whom speed of publishing is a strong sales argument, present data at the journal level. For instance Dove Press includes data about the time from submission to first decision visibly on the home page of the journals. The globally leading publisher Elsevier has also for instance recently started to publish continuously updated statistics for many of its journals, including the average time from submission to first decision and from submission to the final decision to accept.

The American Psychological Association produces information about acceptance rates for all of its journals in a yearly report (<http://www.apa.org/pubs/journals/features/2013-statistics.pdf>), but the data is not available with each journal on its web site. PLoS has published the acceptance rate of PLoS One on the journal home pages.

It is evident that it would nowadays be technically easy to report average delay times and acceptance rates for any journal run using a major workflow system. But whether to do so or not is mainly a marketing decision. Slow journals don't want to advertise this aspect of their operations and journals with higher than average acceptance rates may not be so keen to flag this fact.

Review reports available with the articles

The perhaps most transparent review process information is being implemented provided in BMCs open access journals where the exact review history is transparently reported with the published article.

Figure 2. Example of full transparency about the review process on the level of the individual article (<http://www.biomedcentral.com/1741-7015/10/73/prepub>)

Full reporting of the reviews reports including reviewer names, as good as it may sound in principle, is a double-edged sword, since the awareness of this openness may have impacts on reviewer behaviour.

Reuse of peer review reports

No reuse

This is the totally dominating practice, the review input is strictly for the submission to the particular journal in question.

Portable peer review

“Portable peer review” is a somewhat controversial practice started by some major publishers of megajournals (Clarke 2013). This means a practice in which a publisher or even a consortium of publishers offers authors whose manuscripts have been rejected by one of their top-of-the-line journals the opportunity to be rapidly resubmitted to one of their lower impact journals, in particular open access megajournals that charge article processing fees. The resubmission is very smooth in the web system and the editor of the new journal can reuse the already available reviews as a basis for the decision. All this saves time for the author. Examples of publishers using cascading peer review are BMJ and Nature Publishing Group, that are very prestigious publishers, who can offer attractive options for papers rejected by the highest impact journals in their portfolios.

Discussion

Even after a massive move to predominantly electronic publishing by all major publishers the way peer review is performed and managed has remained largely the same as before the Internet. The single biggest advance has been the addition of manuscript management systems, which facilitate keeping track of submissions under review and communication between authors, editors and reviewers. But mainstream reviewing is still done using at least single-blind reviewing, where the reviewers are handpicked by an editor, and reviewers need to check the scientific soundness of an article as well as judging its scientific merits. An important function is thus filtering manuscripts. This process has been criticized for arbitrariness and bias, as well as slowing down the spread of new knowledge. Nevertheless most scholars are reasonably content with the status quo.

But at the same time experiments with different way of scientific quality assurance are taking place. Two major factors affect this: the electronic publishing platform and easier communication at all stages, and the new revenue models for scholarly publishing that many Open Access journals use. In this article we have reported on some of these experiments. So far the biggest success has been with the relaxed acceptance criteria offered by so-called megajournals, which clearly have found a market niche. An important factor in the submission criteria of authors in such journals is the relative speed of review and publishing of these journals (Solomon 2014), which at the same time usually offer the branding of a highly reputable publisher.

Experiments with open peer review have been less successful, and are not very common. A major problem, compared to the traditional review process, is to give equal opportunities to all manuscripts, and also reviewer motivation. Increasing the transparency of the review results, in particular concerning overall statistics about acceptance rates and speed of reviewing /publishing, could be more

promising, in particular since the production of the statistics can be automated. Opening up the actual review reports might on the other hand be difficult to accept for both reviewers and authors.

Ethical issues have always been an important aspect of peer review (Souder 2011), and new approaches to peer review accentuate this. Does for instance the APC funding model for OA journals encourage publishers to slacken the rigor of the peer review, as has clearly happened in the case of so-called predatory publishers (Bohannon 2013, Beall 2013). How do unpaid referees feel about their reviews being used for editorial decisions in other journals than the one they wrote the review for?

All in all, these experiments with peer review practices nevertheless demonstrate that no social system is rigid and fixed and that disruptive technologies can inspire important changes in the way we do things, also in academia, which is often regarded as very conservative in its own behavior.

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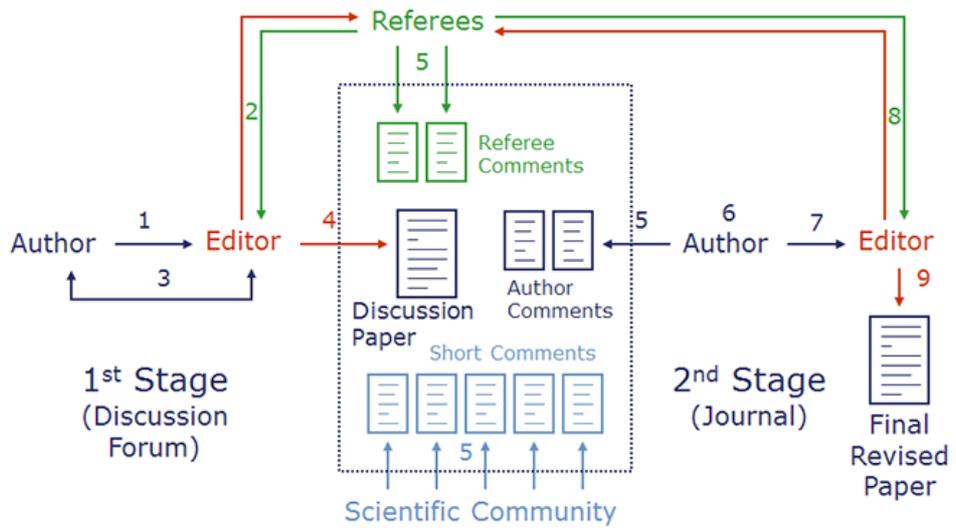
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Open access versus subscription journals: a comparison of scientific impact

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Original Submission - Version 1	Manuscript		17 Apr 2012
Reviewer's Report	Alma Swan		04 May 2012
Reviewer's Report	Elena Giglia		19 May 2012
Resubmission - Version 2	Manuscript	Author's comment	31 May 2012
Reviewer's Report	Elena Giglia		02 Jun 2012
Reviewer's Report	Alma Swan		04 Jun 2012
Resubmission - Version 3	Manuscript	Author's comment	13 Jun 2012
Editorial acceptance			13 Jun 2012
Published			17 Jul 2012