INCREASING THE QUALITY AND TIMELINESS OF SCHOLARLY PEER REVIEW

A REPORT FOR SCHOLARLY PUBLISHERS

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This paper identifies strategies to accelerate the processes associated with the peer review of scholarly content across various disciplines. With increasing demands to reduce the time from submission to publication of content to the Web, trimming time off the peer review process, while maintaining or increasing the focus on quality, is a worthy goal for editors and publishers. The paper presents an overview of both common and emerging peer review practices and processes occurring within an electronic workflow environment and offers suggestions for and examples of enhancements to decrease the time from submission of content to a final decision by an editor. While the journal community is the intended audience for the paper, individuals involved in other peer-reviewed publishing venues should find many of the comments and suggestions applicable to them as well. The paper is not intended to provide a comprehensive inventory of all possible peer review practices or to discuss vendor-specific or discipline-specific practices in detail.

INTRODUCTION

OVERVIEW

Scholarly output continues to accelerate in volume, specialization, and interdisciplinary scope. Publishers sit at crossroads in this new landscape: they must absorb increased submissions, better match considered manuscripts to peer reviewers around the world, ensure the publication of quality content, while at the same time reducing the time from submission to publication. More publishers are turning to electronic management tools to help navigate and streamline workflow for both authors and reviewers. The resultant increased efficiency also frees more time for quality assurance. The benefits extend to other stages and other participants in the publishing process, easing and supporting submission and review, enriching content, accelerating publication, and opening doors to new models of peer review.

While the emerging tools available to publishers may help realize the potential for 21st century scholarship, understanding how best to incorporate these tools to meet unique needs can be challenging. Each journal must operate according to its mission and scope. Even for basic interactions, the answer is not necessarily maximum automation. Editors must be careful to maintain relationships with authors and reviewers and not burden or alienate them by externalizing in-house procedures. Editors must also be mindful of the large picture, the function behind each tool, less they risk information overload or integrating processes that run counter to their stated goals.

This report reviews the opportunities, and considerations, for leveraging electronic tools in manuscript creation and submission and in the management of the peer review process. The first step is a careful mapping of a journal's current peer review process—the points of external contact, decision-making criteria, and internal processes that move manuscripts toward publication decisions. Next, a review of the emerging tools and strategies available to publishers for each stage identifies the potential areas where improvements can be made or best practices applied. The report concludes with a survey of five emerging practices or approaches that reimagine how peer review operates in the digital era.

THE IMPORTANCE OF PEER REVIEW

The peer review process is considered an integral part of scholarly communication, helping to ensure validity, increase accuracy, and enhance content prior to publication and dissemination. New technologies and demands for early and more open access to content are supporting and driving alternative approaches to scholarly communication, including the peer review process. However, the core value provided by peer review remains widely recognized. A 2007 study, commissioned by the Publishing Research Consortium (PRC) and based on feedback from more than 3,000 authors, reviewers, and editors, reported that 85% of the respondents felt peer review contributed to better communication of science, and nearly 90% felt that peer review had improved the quality of their most recent publication.[1] By publishing high quality articles, a journal gains prestige and a reputation for excellence in scholarly communication. Citations to the journal increase, dissemination of the content broadens, and the journal attracts prestigious authors and editors. Quality becomes part of a framework and cycle for the journal and publisher.

Because scientific publications can form the basis of public policy, many governments strongly support peer review, often requiring its use. For example, the health care reform legislation enacted in March 2010 in the United States contains numerous requirements that certain decisions be based on evidence published in peer-reviewed journals.[2] Also, the U.S. Office of Management and Budget within the Executive Office of the President has required that important scientific information be peer reviewed by qualified specialists before it is disseminated by the federal government, and has required that certain "highly influential scientific assessments" meet specified standards.[3] Governments in other parts of the world have also expressed preferences for peer reviewed scientific research, and have used peer review as a mechanism of public policy coordination.[4]

For these and many other reasons the benefit of peer review to research and discovery is clear. But opportunities for improving the process and thereby the overall quality of scholarly literature that exist today were unavailable even three years ago. Close examination of these capabilities is critical to the growth of a journal.

THE IMPORTANCE OF TIMELINESS

The time required for peer review can be an important determinant of the timeliness of the scholarly publication process as a whole, and timely publication of research is important for a variety of reasons.

- Being the first to publish study results can allow individuals or organizations to claim the lead (and future funding) in a particular discipline, giving them a professional advantage in what are often highly competitive fields.
- Timely publication can also convey professional advantages to individual researchers and authors, signified through promotion and tenure decisions.
- Publishers can profit from timely publication processes, with leading researchers and organizations likely to be more inclined to submit their studies to publishers who can publish results more quickly.[5]
- Even those authors whose submissions are rejected are appreciative of timely decisions, since it allows them to more quickly submit their research to other journals. The journals receiving such submissions may also appreciate this.
- Finally, society as a whole benefits from timely publication, with the public able to take advantage of new products and innovative research more rapidly.

In the above-mentioned PRC study of peer review in scholarly journals, 38% of respondents said that peer review was too slow. The levels of dissatisfaction rose with the time required for peer review. Where peer review took less than 30 days, the percent dissatisfaction was less than 16%. When peer review took 3-6 months, 60% were dissatisfied, and if the time required for peer review exceeded 6 months, 80% were dissatisfied.[6]

VARIATIONS BY DISCIPLINE

Although all authors likely prefer to see the results of their work published as quickly as possible, it appears that the speed of publication of research is particularly important within certain disciplines. In an April 2010 article published in the *Journal of Scholarly Publishing*, Mary Waltham compares scholarly publishing paradigms in the humanities and social sciences (HSS) with paradigms in the scientific, technical, and medical (STM) disciplines, discussing, among other things, perspectives and demands for rapid publication.[7] She notes that although speed is a "critical success factor" for STM journals, the "*[s]peed of publication appears to be much less of an issue for this group of HSS association journals…..*" A University of California, Berkeley study based on views from scholars in seven diverse academic fields reported similar findings: "Speed to publication is essential for astrophysics, biology, economics, and political science. Archaeologists, historians, and music scholars are not generally concerned with speed for its own sake, although some lament the extensive time lag to publication."[8]

BALANCING QUALITY AND TIMELINESS

The speed of the peer review process, and of the publication process as a whole, is somewhat a function of the amount of care and attention taken during the content preparation process. If the submitted manuscript is of high quality, both in format and in content, the peer review process can proceed smoothly and quickly. Conversely, if the manuscript contains errors of style, substance, or both, then the process can take much longer and seem interminable to all involved. Although the intent of this paper is to suggest ways to make the peer review process go faster, those improvements cannot be made by sacrificing the underlying purpose of peer review – to ensure that the information in published articles is accurate and based on sound research. In practice, however, improvements in quality can come at the cost of speed, and vice versa. Therefore, after certain minimum standards are satisfied, a balancing of those two objectives is required.

MAPPING THE PEER REVIEW PROCESS

Before discussing ways to improve the timeliness of peer review and associated processes, it is important to first establish (1) the basic elements and vocabulary associated with those processes as it occurs in many editorial offices and (2) the role that formal peer

Figure 1. Basic Elements of Peer Review and Associated Processes
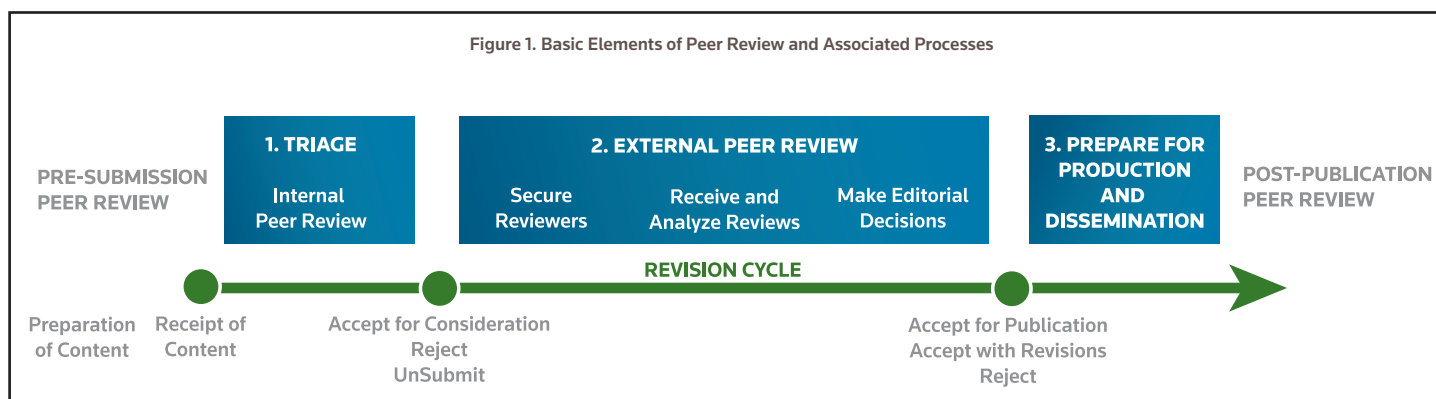
review plays in the process. Figure 1 below illustrates the essential elements of peer review within the publication process, from before content is submitted for consideration to post-publication review. As the figure indicates, even before submitting content for consideration, most authors voluntarily engage in a pre-submission review process in which they solicit comments and suggestions from colleagues and others engaged in similar research. Feedback may be solicited in person, via content on preprint servers, or through other mechanisms which are not generally provided or supported by the publisher or journal. Many members of the mathematics and physics communities have long posted preliminary versions of their research on the arXiv e-print service, which provides a more formalized platform for pre-submission review and is operated by Cornell University.[9] Similar services such as COGPRINTS serve scholars in psychology, linguistics, philosophy, and several other fields.[10] As discussed in more detail later in this article, pre-publication review, along with manuscript submission tools and information provided by the publisher, can help smooth the path for manuscript consideration and peer review, particularly if those reviewers are considered knowledgeable in the field and have previously had manuscripts accepted by that journal or publisher.

After content has been submitted to a journal (via Web-based submission system in most cases), the journal editor reviews it (labeled as *Internal Peer Review* above) for scope and quality of content and editorial staff review it for adherence to journal requirements. An early "triage" determination is then made:

- Accept the content for consideration
- Immediately reject the content from consideration
- "Unsubmit" the content, sending it back to the author to correct certain errors or omissions prior to consideration

After the content is accepted for consideration, it goes forward to the external peer review process. The editor, sometimes supported by editorial staff, will select and secure reviewers, provide them with the content, receive and analyze their reviews, and make an editorial decision based on the feedback provided through those reviews – to accept the content for publication, to accept the content pending certain revisions, or to reject the content. Editors may serve as reviewers as well if the content falls within their area of expertise. Manuscripts that are accepted are then prepared for transfer to journal editing and production staff prior to their publication. Within that process, a quality check is made to ensure full compliance with journal and publisher guidelines.
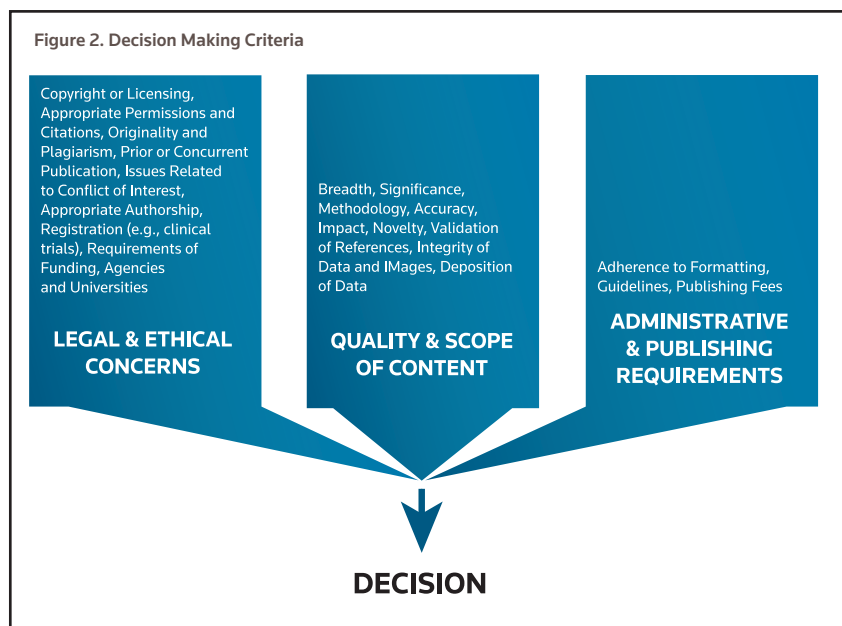
With the advent of Web 2.0 tools, post-publication review may be available as a complement to more traditional pre-publication peer review. The Public Library of Science (PLoS), for example, supports the posting of notes, comments, and ratings on published articles in PLoS journals.[11]

PEER REVIEW WORKFLOW VARIATIONS AMONG PUBLISHERS

Although Figure 1 depicts the basic elements of the peer review process, actual workflows vary greatly among journals and publishers, reflecting the communities and disciplines they serve. The initial triage process at the editorial office may be complex and resource intensive or may be perfunctory. Editors may seek agreement to review from reviewers or may simply assign manuscripts to reviewers. The review process may be single blind, double blind, triple blind, or open, and may involve individuals, editorial board members, or panels of reviewers.[12] Accepted manuscripts may move into editing and production prior to web posting or post-acceptance versions of articles may be made available within hours or days of formal acceptance, with an edited and final version available later.[13]

PEER REVIEW DECISIONS AND CRITERIA

Within each of the steps in the peer review process depicted in Figure 1, an array of separate yet interrelated decisions are made in reaching a decision on submitted content for publication. Figure 2 below depicts three sets of factors that go into that decision-making – quality and scope of content, legal and ethical considerations, and administrative or publishing requirements. Determinations in each of these three areas can often be made by more than one of the individuals involved (e.g., editors, peer reviewers, or editorial office staff) and at various stages of the peer review process.

Figure 2. Decision Making Criteria

Copyright or Licensing, Appropriate Permissions and Citations, Originality and Plagiarism, Prior or Concurrent Publication, Issues Related to Conflict of Interest, Appropriate Authorship, Registration (e.g., clinical trials), Requirements of Funding, Agencies and Universities

LEGAL & ETHICAL CONCERNS

Breadth, Significance, Methodology, Accuracy, Impact, Novelty, Validation of References, Integrity of Data and IMages, Deposition of Data

QUALITY & SCOPE OF CONTENT

Adherence to Formatting, Guidelines, Publishing Fees

ADMINISTRATIVE & PUBLISHING REQUIREMENTS

DECISION

Quality and Scope of Content

Determining the quality of the content being submitted for publication consideration is both an objective and a subjective process, and the specific attributes of quality can vary from discipline to discipline. A threshold consideration is whether the content falls

within the scope of the journal. Other relevant factors include the originality of the content, the validity and reliability of the data, the methodology used, the significance of the issue being discussed, the novelty of the research and findings, and the potential impact of the research on the relevant scholarly community and society. Accurate citations and acknowledgements with appropriate references and data and image integrity are also components of quality. Journals in each discipline define quality in formal terms within author and reviewer instructions, but the quality of content is often "earned" over time, providing an article with a stamp of high quality and a journal with a reputation as a premier journal.

Legal/Ethical Issues

Many of the legal or ethical issues confronting publishers are tightly related to quality. What appears to be a promising publication in terms of its content can quickly unravel if claims of copyright infringement, plagiarism, or failure to disclose conflicts of interest arise. Issues related to authorship can surface before or after publication, and often involve complex fact finding at various levels within publishing houses and in institutional settings. Journals sometimes require that each author of a manuscript complete and sign an authorship form certifying, among other things, his/her role in the research and preparation of the manuscript.[14]

The Committee on Publication Ethics (COPE), established in 1997 and based in the United Kingdom, focuses on these types of issues.[15] Membership in COPE is required for full benefits, but constructive information, including flowcharts, guidelines, case studies, newsletters, and blogs, are available for viewing by all. Browsing the COPE site or reviewing the ethical guidelines of publishers or associations offers a broad view of the legal and ethical issues confronting publishers.[16]

Adherence to Journal Requirements

Journals and publishers establish guidelines for submitted content, many offering authors templates to help compliance with the guidelines. Requirements address areas such as acceptable components of a manuscript, reference style, length of manuscript, instructions for presentation and inclusion of author names and affiliations, acceptable article types, publication of color figures, submission of cover art, and preparation of figures, schemes, and tables, etc. Consistency in content presentation and formatting supports editors and reviewers in the peer review process and sets the stage for being able to quickly move the accepted content through editing and production and onto the Web.

STRATEGIES TO IMPROVE PEER REVIEW TIMELINESS

A variety of strategies, occurring during the phases of peer review as outlined in Figure 1, can be used to improve the timeliness of a publisher's peer review process during the following stages:

- Preparation of content prior to submission
- Submission process, including submission of content, author names and affiliations graphics, supporting information, manuscript components, and declarations or commitments required by the journal
- Initial review and triage by editor and the editorial office
- External peer review process
- Final administrative review and preparation for production

At each of these stages, adoption of electronic technologies and tools, and the revision of peer review processes and workflows can often shave hours, days,

Table 1. Publisher Web Sites Focused on Author Experience

Publisher or Journal	Author Site	URL
American Geophysical Union (AGU)	Author Resource Center	http://www.agu.org/pubs/authors/
American Chemical Society (ACS)	Author & Reviewer Resource Center	http://pubs.acs.org/page/4authors/index.html
Elsevier	Authors Home	http://www.elsevier.com/wps/find/authorshome.authors
Institute of Electrical and Electronics Engineers (IEEE)	Author Digital Toolbox	http://www.ieee.org/publications_standards/publications/authors/authors_journals.html
The New England Journal of Medicine (NEJM)	Author Center	https://cdf.nejm.org/misc/authors/
Royal Society of Chemistry (RSC)	Author and Referee Services	http://www.rsc.org/Publishing/ReSourCe/index.cfm
Taylor & Francis	Author Services	http://journalauthors.tandf.co.uk/
Wiley-Blackwell	Author Services	http://authorservices.wiley.com/bauthor/default.asp

or even weeks off the time required from submission to a final decision. However, before initiating those improvements, two other steps are important – documenting the existing process and understanding expectations and the publisher's operating/competitive environment.

As noted previously, although the basic peer review process outlined in Figure 1 is common, no two publishers' processes are exactly the same. Therefore, the first step in a publisher's efforts to improve its peer review process should be to fully document the existing process from start to finish. That documentation should include enough detail to know not only what steps are involved in the peer review process, but also the individuals and roles involved in those steps and the amount of time currently required for each step. Doing so will allow the publisher to identify which procedures are candidates for enhancement efforts.

Another key part of improving the peer review process is understanding the expectations of the various constituencies involved in that process. A brief survey to authors, reviewers, and editors, benchmarking what they most value, what they feel are acceptable timeframes, and what they find troublesome with the current process, will help focus decisions on features to incorporate. The survey should look across the full publishing continuum to pinpoint steps that are time consuming or frequently problematic to identify areas that if addressed, can provide significant improvements. For example, incorporating the transfer of copyright or license to publish into an electronic workflow frees up time for authors, editors, editorial staff, and production staff, saving time and resources across the full publishing continuum. It is also important to note that some tools may actually add to the timeframe required for review, but are implemented if the added delay is balanced by higher quality content or time savings during subsequent steps in the publication process, or both.

Part of this data gathering effort can involve looking for ideas and practices from other publishers. Many publishers now consolidate and brand their services to authors with author-focused Web sites. The sampling of author sites highlighted in Table 1 (on previous page) provides an overview of how publishers are improving and customizing the author experience. From the American Geophysical Union's (AGU) translation of author guidelines into multiple languages to IEEE's "toolbox" for authors and Taylor & Francis' author guides for before and after acceptance, publishers are seeking feedback, providing robust tools and information, and cultivating the author community. Many of the tools can be used at various or multiple points in the peer review process.

STRATEGIES FOR CONTENT PREPARATION PRIOR TO SUBMISSION

Providing authors with clear instructions and robust tools and services for preparation of manuscripts can alleviate many of the time consuming steps associated with peer review in the editorial office. The sampling of features listed below, while not only applicable during content preparation, can help ensure that submitted content is in an acceptable format for the peer review process, improve the experience of reviewers, and contribute to verification of originality and integrity of data and images.

Provide Manuscript Templates

In addition to clear and easily navigable author instructions, manuscript templates can help ensure that submitted content meets stated requirements. Even a simple template that guides authors in high-level style requirements can result in more consistently formatted content. Use of reference management tools such as EndNote and relevant style and citation templates can further compliance. Robust XML-based templates and document mark-up and redaction tools (such as eXtyles) are also available and provide a more seamless experience for the author while also creating a document that better supports editors and authors in their review of content. Microsoft's Article Authoring Add-in for Word tool also captures metadata, allowing creation, reading, writing, and saving of Word files to the National Library of Medicine's DTD format.[17]

Offer Editing and Language Publishing Services and Translations of Author Guidelines

If manuscripts are often returned because of problems with readability, publishers should consider offering editing services. Elsevier offers language-editing services staffed with individuals of discipline-specific expertise.[18] Other publishers such as ACS and Wiley-Blackwell point authors to language editing companies.[19] In addition, some publishers provide translations of author guidelines to better support authors who are not native English speakers. *Nature* journals offer a guide, *English Communication for Scientists*,[20] "on how to communicate more effectively in English, no matter how much previous experience you have," and many publishers and associations offer formal style guides for communication.[21 22] Some online peer review management systems offer publishers the option of including direct links to content-editing services directly within the system or the ability to create multi-language submission sites.

Check the Accuracy of References and Provide Links from Citations to Content

Software tools to create and validate references prior to submission adds immediate value and benefits authors, reviewers, and the overall publishing process. Some tools automatically create reference links, allowing authors to add citations to their manuscript as they write and format them according to a journal's specifications. Tools such as ScholarOne

Manuscripts Optima offer linking from the submitted manuscript to the citation from within the system, allowing editors and reviewers to view the citation in full context. Reference validation can also be handled at other points in the peer review and publishing process, so publishers should decide the most appropriate point(s) for this tool, but there are benefits to helping and ensuring authors submit correct references at the beginning of the peer-review process.

Screen Content for Potential Plagiarism
Plagiarism is an increasingly troubling issue for a variety of disciplines, although it is unclear whether the amount of plagiarism is increasing or if online publishing and new tools just allow it to be discovered more readily. Authors can use various online services to review their manuscripts for duplication or plagiarism prior to submission.

Publishers use plagiarism detection services at a variety of points in the peer review process. Use of these services serve dual purposes - providing a mechanism to detect non-original content and encouraging authors to avoid plagiarism in the first place. Many publishers now participate in 'CrossCheck powered by iThenticate' (CrossCheck), a CrossRef initiative for screening content for plagiarism that was launched in June 2008 and now includes over 120 members.[23] CrossCheck can be integrated with a number of peer review management systems, including those from Bench Press, Editorial Manager, eJournalPress, and Thomson Reuters ScholarOne.[24]

In July 2010, *Nature* published a news update on the use of CrossCheck by a number of publishers, noting that publishers are embracing the service and providing some early indications of the levels of plagiarism detected.[25] By experimenting with various approaches to plagiarism screening (e.g., random or targeted screening), publishers are able to optimize the benefits of the service and discourage authors from attempting to submit plagiarized content.

Validate the Integrity of Data and Images
Based on journal requirements, various tools are available for validating data and checking graphics for compliance to guidelines. The *Journal of Biological Chemistry (JBC)*, for example, provides authors with access to Cadmus KnowledgeWorks Rapid Inspector™ for checking graphics files against JBC standards for format, resolution, color space and other figure requirements before submission...."[26] RSC's Experimental Data Checker allows authors to check experimental data for consistency prior to submission.[27] Several publishers provide links to the CheckCif utility, made available by the International Union of Crystallography, for validating Crytallographic Information Files (CIF) prior to submission.[28]

STRATEGIES FOR WEB SUBMISSION OF CONTENT
The Web submission environment can be customized to better capture important content elements and author information and to ensure adherence to legal and ethical requirements. Publishers can incorporate some of the strategies described below to:

- Ensure that information needed for communication and tracking is captured appropriately
- Provide editors and reviewers with enhanced content features
- Provide potential reviewer names and contact information
- Capture information and signatures for forms, collect fees, and better ensure association of appropriate authors with the content.

Collect Metadata for Communication and Tracking
If XML-based templates or document mark-up tools have been used to prepare a manuscript, much of the collection of metadata (e.g., author names and affiliations, title, abstract, acknowledgements, etc.) can be automated. If templates are not used, there are still opportunities to identify key pieces of information to gather during the submission process, incorporating custom questions which utilize check boxes, radio buttons, calendars, and text fields to gather information. Many journals collect information related to prior publication, conflict of interest, and adherence to ethical guidelines. By collecting the information as metadata, the journal and publisher are able to quickly incorporate the information in communications and reporting.

Capture and Track Completion of Legal or Ethical Forms and Collect Fees
Electronic forms (eForms) can be developed to replace printed forms that serve as the basis for copyright transfer, license to publish, funding information and deposition requirements, conflict of interest disclosure, and other legal or ethical forms. By integrating eForms into the peer review review workflow, journals can request, collect, and track forms, sending automated reminders as needed. For authors, eForms are pre-populated with relevant author and manuscript information, easing the burden of completing the forms. Coupled with electronic commerce (ecommerce), eForms can be used to collect submission fees, color and page charges, and other fees. Some peer review management systems offer the capability to incorporate eForms and eCommerce within the submission and peer review environment, allowing this vital part of the process to be tracked.

Ensure Appropriate Listing and Presentation of Authorship
Ensuring the complete and accurate listing of authors and their affiliations at the time of submission is a critical step. Web-based submissions systems can be configured to require the entering of all co-authors' names, along with their contact information, prompting an acknowledgment email sent to all

co-authors at the time of submission. Although this process may not identify missing authors, it can ensure that all listed authors are aware of their authorship of the submitted content. Authors submitting the content can also be asked to formally confirm that a full and accurate listing of authors has been supplied.

A journal may go a step further and require completion of an author eForm from each author that includes confirmation of authorship according to the authorship guidelines for the journal.[29]

Solicit Names of Potential Reviewers

Most Web submission sites have the capability to solicit and/or require names of a specific number of potential reviewers from authors, with functionality built in to alert the editor if the suggested reviewers are from the same university or organization as the author(s). It is the editor's choice as to whether those individuals are invited to review the content.

STRATEGIES FOR THE INITIAL TRIAGE PROCESS

Approaches to the initial filtering of submitted content vary greatly. Some of the underlying considerations include:

- Does the content fall within the scope of the journal?
- Does the research and methodology appear to be original and at a level of quality appropriate for the journal?
- Is the content readable?
- Does the content meet basic journal requirements (e.g., number of pages, organization, and the inclusion of an abstract)?
- Do there appear to be legal or ethical issues?

As noted before, journals may use a process referred to as "unsubmit" for those manuscripts that appear to meet scientific requirements but not other basic ones, with authors asked to address the needed requirements prior to returning the manuscript. Use of the "unsubmit" process can have multiple benefits including savings in terms of timing and resources, accommodation of authors' desire to receive decisions quickly, and support of reviewers by being more selective in what they are asked to review.

Define the Goals and Parameters of Triage

The previously mentioned 2009 PRC study reported that editors (across disciplines) rejected 21% of initial submissions because of quality concerns or inappropriate scope of content.[30] However, that percentage varies greatly across journals, with some declining to consider well over 50% of initial submissions. Defining the goals and parameters of triage will help define the most appropriate process. If the journal is highly selective and has a high volume of submissions, a more sophisticated process involving tools and additional experts in the process is needed. For a journal with fewer submission and a goal to filter out only content that is clearly not appropriate, the process can be less complex.

Defining the level of adherence to journal formatting requirements during triage is another important step. Some formatting requirements are more important than others, and some can as easily be addressed during a revision process. It can, for example, be time consuming within the editorial office and disappointing to an author to have content unsubmitted to address formatting problems and resubmitted, only to have it then rejected for scope of quality during the initial triage period.

Development of a decision tree for the triage process is a worthwhile initiative and helps to find efficiencies and better support and communicate with authors.

Involve Experts in the Triage Process

The triage process (and subsequent peer review processes) may also involve experts such as statisticians or safety experts, who identify issues that may preclude publication or require revision prior to considering the content for publication.

Some journals use editors, panels of experts, or advisory board members to validate that content is appropriate and ready for consideration. A triage editor (or editors) may review all initial submissions, making recommendations on whether the content should be considered for publication, with the editor-in-chief making the final decision.

All of these approaches are designed to filter content that is not appropriate and allow editors and reviewers to focus on the best content.

Utilize Tools

The tools and services mentioned in the section on page 4, "Strategies for Content Preparation Prior to Submission," (e.g., plagiarism and reference validation tools and abstracting, indexing, and citation services) are often employed during the triage process. Peer review management systems offer historical views of author submissions and publications and may be used to confirm that similar content has not been previously considered. Editorial staff may check various databases to validate author names and affiliations.

STRATEGIES FOR THE EXTERNAL PEER REVIEW PROCESS

External peer review is the most critical part of the overall process, providing the editor and the author with substantive input on all aspects of the content that has been submitted for consideration. Editors select peer reviewers based on their relevant expertise, and while the input from those reviewers frequently focuses on the quality, scope, and originality of the content, their input may also address legal and ethical issues, formatting, and readability. Strategies are available to decrease the amount of time required for external peer review, but implementation of those strategies must always consider the expectations and requirements of the external reviewers, who in most cases are volunteering their time and talents.

Identify and Secure Appropriate and Available Reviewers

One of the best ways to ensure timely external peer reviews is for the editor to select appropriate reviewers in the first place— both in terms of their expertise with regard to the content and their availability.

Identifying Appropriate Reviewers

As noted previously, journals frequently solicit names of potential reviewers from authors at the time of submission, with the decision of whether to extend an invitation to review to the suggested individuals totally at the discretion of the editor.

Editors can use a variety of tools to match prospective reviewers with the content that has been submitted for consideration. Many journals have developed reviewer databases, asking potential reviewers over the years to self-identify their areas of expertise. To remain effective, however, the data in these databases must be continually updated and the lists supplemented with new potential reviewers. Applying semantic tagging to reviewer names and areas of expertise enriches the database and supports more effective and efficient identification of relevant reviewers.

Combining reviewer databases with journal submission and publishing histories can provide an excellent basis for identifying appropriate reviewers. Services like ResearcherID allow authors to build and maintain their publication list, which can be helpful particularly if reviewers are recommended by authors but unknown to the editorial office. Even more powerful are abstracting and indexing products (e.g., Thomson Reuters Web of Knowledge[SM] and Elsevier's Scopus) covering multiple fields and disciplines, or more specific products focused on the fields of science, medicine, humanities, etc. (e.g.,SciFinder®, International Political Science Abstracts, Sociological Abstracts). Freely accessible databases such as MEDLINE® and Jane (Journal/Author Name Estimator) are also sources of names for potential reviewers.

Many peer review management systems have the capability to automate the search for reviewers by exporting searches to databases using various search fields collected during submission, such as title, author name(s), suggested reviewer name(s), keywords, abstract, etc.

Tracking Availability

Replacement of peer reviewers, either because of an inappropriate match between their expertise and the content, or because of their inability to provide the necessary time and attention, can greatly slow down the overall process. Peer review management systems can capture and display periods of unavailability of reviewers.

In addition to being able to view a reviewer's availability, some peer review management systems can be configured to display the current and past reviewing statistics of a prospective reviewer, including number of reviews accepted, declined, and completed during a specified period and the number of reviews currently assigned. The view can be from the perspective of the journal, a family of journals, or all journals associated with the publisher. Monitoring and taking into account a reviewer's workload can build allegiance from reviewers and avoid delays in securing reviewers and reviews.

Set and Monitor Deadlines for Completion of Reviews

The amount of time allocated for completion of reviews varies by discipline, journal, and article type. A journal may ask for reviews for articles to be completed in three weeks, but request a one-week completion date for communications. In the 2009 PRC study, respondents reported that "...the average elapsed time to complete a review was roughly 24 days," with 15% reporting completion of reviews in 7 days or less and 14% reporting that reviews took in excess of a month.[31] Journals can carefully experiment with tighter timeframes, especially if in turn a better reviewing experience is provided for the author, as noted under the following section on utilizing tools.

Automated reminders for reviewers, as reviewing deadlines approach, can be configured within peer review management systems, but should be used judiciously. Also, in acknowledging receipt of a review, a journal can build allegiance and engender adherence to deadlines in the future by referring to the reviewer's timely review.

Revise and Update Peer Review Guidelines and Forms

Reviewing and updating review forms or environments to better solicit needed feedback is a relatively easy, but often overlooked, mechanism for enhancing and speeding up the decision process. Many journals continue to use review forms and questions similar to those available in the print world; small changes can introduce big wins. For example, instead of asking if the content represents significant research with "yes" or "no" answers, a journal can make the question more granular, requesting that the reviewer rank the significance as falling in the top 10%, bottom 10%, etc. The Web can also provide a more flexible display for complementing questions to the reviewer with comments on journal criteria and can also capture a reviewer's willingness to review a revised version of the content.

Utilize Tools

A variety of tools can be (1) used by editors in selecting and communicating with reviewers and (2) offered to reviewers to support their work.

Tools Used by Editors

Reporting on feedback from reviewers, Elsevier notes that "90% of Reviewers would like to be able to see the final decision and other Reviewers' comments."[32] Although adopting this feature would not directly impact the timeliness of the process, it could serve to encourage reviewers to accept future invitations and review in a timely manner. Peer review management systems may offer the ability for editors to prioritize a list of reviewers for a manuscript and stage the invitations, inviting a subset of the reviewers to

review, and automating an invitation for subsequent reviewers if an initial invitation is declined.

Tools Available to Reviewers

Providing reviewers with manuscripts and associated content that is readable, well presented, and organized eases the peer review process. Applying plagiarism detection, reference validation, and data integrity tools to content prior to sending it to reviewers further supports the reviewer, allowing the focus to be on the quality of the content. Some publishers go a step further, providing reviewers with limited access to abstracting, indexing, and citation services. For example, Elsevier gives reviewers 30 days of free access to Scopus and ScienceDirect,[33] and journals using ScholarOne Manuscripts have the option of providing reviewers with limited access to Web of Science[SM].

Clearly Define Revision Requirements and Set and Monitor Deadlines

Clear and detailed communications to authors on decisions regarding manuscripts are appreciated by authors, even when a manuscript is rejected, and in the case of decisions indicating revision, facilitate the revision process. As with the review process, establishment and monitoring of reasonable deadlines with automated reminders are important.

Secure Timely Reviews for Revisions

When content requires subsequent reviews following revisions, editors often request that one or more reviewers of the original version of the content review the revisions. Making this clear in the original review request and seeking agreement sets the stage for subsequent reviews. Peer review management systems may have the capability to bypass reassignment of reviews and automatically request reviews from the original reviewers.

STRATEGIES FOR PREPARING ACCEPTED MANUSCRIPTS FOR TRANSFER TO PRODUCTION

In the same way that there is pressure to make the peer review process as timely as possible, there are also demands to speed the timeframe from acceptance of content to its availability on the Web. Production staff take advantage of automated workflows resulting in a streamlined process, and they rely on editors and staff to ensure that:

- Content they receive is final and ready for production and includes all of the needed manuscript components (e.g., abstracts, graphics, etc.) in required formats and designated file types All legal and ethical considerations have been resolved, As noted before, implementation of eForms early in the process can alleviate many of the issues associated with completion of forms, including those forms associated with legal and ethical issues
- Any special circumstances (companion papers, special issues, embargoed content) are clearly captured and communicated

Partnering with production staff to document requirements and identify and address problematic areas supports faster publication. Many of the peer review management systems can be configured to highlight and track requirements for production, supporting a seamless and comprehensive transfer of content from the editorial office to production staff.

EMERGING AND EVOLVING PRACTICES IN PEER REVIEW

The importance and value of peer review have stood the test of time, but the models and practices of peer review will continue to evolve. In a March 2010 post in the Scholarly Kitchen, Kent Anderson asks the question, "What does it mean when you claim a journal is peer reviewed?"[34] Indeed, peer review practices vary widely from journal to journal and article to article and the stamp of "peer reviewed" does not always equal the same level of quality content.

However, the goal of quality content continues to drive the process and the availability and adoption of new technologies and tools along with the demand for increased openness and integrity in scholarly publishing are already driving initiatives to enhance the peer review process. There are a number of areas that will likely see much activity in the coming months and years:

1. Tools and Services for Authors and Researchers. The content of most author-directed sites focus on elements required for submission, but more sites now address other aspects of interest to authors. From Taylor & Francis' Author Services site,[35] which includes newsletters, surveys, a twitter page, and interviews with journal editors to Elsevier's "Web Shop" with its language-editing services and products associated with published articles (e.g., offprints, posters, individual copies of printed journal issues, personalized article collections), publishers are connecting with the author, trying to better understand the needs around authorship and deliver relevant services.[36]

    Initiatives and businesses are also springing up to support authors. Language-editing services, especially for non-native English speakers, will become more prominent. Other services will provide more comprehensive support for authors. AuthorAID, for example, is "...a global research community that provides networking, mentoring, resources and training for researchers in developing countries."[37] Supported by the Swedish International Development Corporation Agency, The Norwegian Agency for Development Cooperation, and the UK Department for International Development, AuthorAID hosts events throughout the world on a variety of topics related to authorship and publishing.

2. Testing or Adoption of New Models of Peer Review. While a few publishers have adopted an open model

of peer review, more publishers and journals will experiment with new models. A recent case is a 2010 initiative by the humanities journal, *Shakespeare Quarterly*'', which has used open review with selected submissions for its fall issue.[38]

Some publishers will, like PLoS, adopt versions of post-publication peer review, providing opportunities for readers to comment. One approach taken by journals, such as *The New England Journal of Medicine (NEJM)*, will be to create Facebook pages to communicate with their readership.[39] Among other features, the *NEJM* Facebook site highlights content, providing an opportunity for followers to comment.

An interesting pilot, "Peer Choice," is being conducted by Elsevier. Testing the concept on one journal, Elsevier will arrange for the titles and abstracts of submitted articles to be communicated to a group of registered subject matter experts who can download the submitted content if they agree to complete a timely review. *"Expectation is, for a certain percentage of articles a decision to reject or accept will be taken more quickly – of course, without any compromise with regards the existing standards of careful decision making. For articles that have not been downloaded for such self-selected review, the normal review process will prevail anyway."*[40]

More collaborative external peer review may also evolve, with journals providing mechanisms for selected peer reviewers for a manuscript to communicate with one another using social networking tools.

3. Development of Applications to Address Name Ambiguity. Publishers are participating in and watching the progress of the Open Researcher & Contributor ID (ORCID) initiative, launched as a non-profit organization in August 2010.[41] With a mission "...to solve the author/contributor name ambiguity problem in scholarly communications by creating a central registry of unique identifiers for individual researchers and an open and transparent linking mechanism between ORCID and other current author ID schemes," ORCID has the potential to alleviate many of the problems associated with identifying and communicating with authors and reviewers.[42] Similarly, ResearcherID assigns unique identifiers to authors allowing them to build and maintain their publication list. Integration of such services with peer review management system means that journals could collect the unique identifier upon submission to review an author's previous works as well as search for potential reviewers based on their publication lists. Currently, ResearcherID has members from more than 150 countries.

4. Large Initiatives Focused on Research Collaboration and Publication. Microsoft

Research's collaboration with the British Library on the Research Information Centre (RIC) could have broad implications in authoring and publishing.[43] RIC is a Virtual Research Environment (VRE) which is in testing phase with a number of partners and focused initially on the biosciences.[44] A June 2009 description of the project, "Going to extremes: The Research Information Centre" describes the initiative as a service " to support STM researchers at every stage of the research process. From integrated searching of relevant databases, to alerts from the funding bodies that make research viable; including collaborative project-based working, analysis and modeling – right the way through to publishing and disseminating research findings."[45]

5. Submission and Publication of New Types of Content. Publishers and vendors of peer review management systems will face increasing demands to allow for submission (and subsequent review and publication) of new types of content. Journal articles, for example, are being augmented with videos, including video abstracts (e.g., the Royal Society of Chemistry's video abstracts in Nanoscale).[46] Large data sets, entire Web sites, and other content will require flexibility and bandwidth for submission, review, and publication.

6. Use of Mobile Devices and Tablet PCs. With the wide scale adoption of mobile devices and success of devices such as the iPad, expectations that some aspects of authoring and reviewing can take place on those devices already exist. Vendors of peer review management systems will likely incorporate more mobile capabilities.

CONCLUSION

For those involved in scholarly peer review, the challenges and opportunities are many. For each journal and publisher, fully understanding its current peer review process and the expectations of the community it serves, can be a springboard for implementing strategies and adopting tools and models. With an overarching goal of delivering high quality content, publishers will balance that goal with those of improving the timeliness of peer review and of the publication process as a whole. Fortunately, with today's tools and technologies, the two goals are not mutually exclusive, and many of the strategies suggested in this paper can improve the timeliness of the peer review process, but can also maintain, or actually improve, the quality of the articles that are ultimately published.

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12 In single blind peer review, the identity of reviewers is unknown to the authors; in double blind review, the identities of reviewers and authors are hidden from each other; and in triple blind review, the identifes of reviewers, authors, and editors are hidden from each other. In open or transparent peer review, identities of reviewers and authors are known.

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