



Protecting the Health and Longevity of the Peer-Review Process in the Software Engineering Community

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PEER REVIEW IS the evaluation of scientific, academic, and professional work by other experts in the same field. The main purpose of the peer-review process is to maintain the integrity of the scientific process and increase the quality of the work product by providing timely, professional, and unbiased feedback. The most substantive scientific activity that relies on the success and integrity of the peer-review process is, by all means, scientific publications. All software engineering conferences and workshops as well as all journals and magazines, including *IEEE Software*'s focus and feature articles, select which articles to publish after a peer-review process.

In any given year, as the software engineering community, we produce

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in the neighborhood of at least 30,000 peer reviews. I conducted a very crude “back-of-the-envelope” estimate of the number of peer reviews we need to generate as a community each year to arrive at this number (Table 1). These numbers are definitely conservative, as I did not check for accuracy but instead sought a ballpark estimate. The conference and journal list is also by no means complete but represents those I am most familiar with. The estimates

of Table 1 include all the paper submissions to all the tracks and workshops. The software engineering community is a small one; hence, often, many of these 30,000 reviews are conducted by a small collection of experts in our field due to their generosity, timeliness, quality of reviews, and expertise. However, we are on the verge of a potential crisis: those who accept the honorary task of volunteering as program chairs, editors, and associate

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Table 1. The estimated number of annual peer reviews needed for the software engineering community.

Venue	Number of papers
International Conference on Software Engineering	1,200
International Conference on Requirements Engineering Conference	700
Symposium on the Foundations of Software Engineering	700
International Conference on Automated Software Engineering	500
International Conference on Software Maintenance and Evolution	500
International Conference on Mining Software Repositories	300
International Conference on Software Architecture	300
International Conference on Software Analysis, Evolution, and Reengineering	200
International Conference on Agile Software Development	150
Newer and regional conferences (let us assume 10 at 75 papers each)	750
Journals and magazines (the main ones include <i>IEEE Transactions on Software Engineering</i> , <i>Journal of Systems and Software</i> , <i>Journal of Empirical Software Engineering</i> , and <i>Journal of Information and Software Technology</i> , so let us assume an average of 500 after desk rejects)	2,000
<i>IEEE Software</i>	300
Total	7,600
An estimation-error correction of ~30%	10,000

Typically, each paper is reviewed by three reviewers, so we end up with a minimum of 30,000 reviews that we need to generate each year.

editors are increasingly challenged to find reviewers fit for the papers at hand. Even when it is possible to select reviewers, the quality and timeliness of the reviews can at times miss the expectations. Similarly, reviewing papers is voluntary; when many priorities abound, a review task often receives the least amount of attention.

There are two important aspects of protecting the health, integrity, and longevity of the peer-review process, that is, the scientific output of a community. The first is review quality, and the second is process sustainability. Achieving review quality

without process sustainability or process sustainability without review quality will both result in a failed scientific process.

Review Quality

Software engineering researchers have focused on what constitutes a good review, both from the reviewers’ as well as from the authors’ perspective. Lessons learned and guidelines exist. For example, Sheppard outlines, in detail, the different focus areas of an industry track versus a research track paper review.¹ A number of editors in chief as well as program chairs at major

software engineering conferences have also focused on improving the quality of our publications by refining the review quality as well as establishing other strategies, such as shortening review timelines.² Recommendations for how to write papers also help provide guidance on how to review those papers.³ Previous editors in chief of *IEEE Software* have given advice for

much to be done to enhance our ability to sustain a healthy review process. The issues center around diversifying the reviewer pool so that it is not the same individuals who are in program committees as well as improving the timeliness of reviews, and willingness to review. It is not uncommon for an editor to reach out to a dozen or more

There is no question that the ability to sustain the review process boils down to whether the correct incentives are in place for both academics and industry practitioners.

how to write papers that are fit for the magazine.^{4–6} These recommendations drive our review criteria.

Empirical research in understanding authors' and reviewers' perspectives on review quality has provided interesting insights. A recent study of 932 authors from 2014–2016 International Conference on Software Engineering concluded that their perception of the usefulness of our current peer reviews is fairly negative.⁷ As the software engineering community, we have also started to accumulate reviewer best practices, which include selecting papers that match their expertise and interest areas and focusing on rigor and validity.⁸ Although we can always improve as a community, we seem to understand what makes for a good review.

Process Sustainability

Although the software engineering community has made progress to improve review quality, there is still

potential reviewers to fill the recommended three reviewer allocations and still be unable to fill these spots. When potential reviewers do accept and their other responsibilities take precedence, the review assignment keeps falling down the list, resulting in delays, rushed reviews, and further-impacted publication timelines.

Finding industry reviewers is even harder, given that their incentive structure is not at all tied to the number or quality of reviews they provide. Responsible reviewers who have suffered through the embarrassment of being late with their reviews or have rushed a below-par review respond by declining reviews. Although, on one hand, this looks like an honest position, in the end, it results in taxing the same individuals who have accepted and conducted the reviews to help out. Sustainability of the review process is a key risk to the quality and progress of software

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REVIEWERS' OATH

I propose we embrace the following actions as part of our scientific responsibility to ensure the sustainability of the peer-review process. I welcome your feedback on these points.

- For each paper I accept to review, I will provide a concrete, actionable, and relevant review with high-quality feedback. I will ask to be re-assigned when I discover that my personal biases or conflicts of interest for the topic prohibit me from providing a relevant, high-quality review.
- For each paper I accept to review, I will understand the review criteria and will review based on that review criteria, not my natural comfort zone.
- For each paper I accept to review, I will meet the schedule of the conference or the journal. I will work closely with the program chair and the editors when I cannot so that they can reassign the paper in a timely manner if needed.
- For every paper I submit, I and all my coauthors promise to review at least three papers at a relevant venue.
- For each review I have to decline, I will provide at least three alternative colleagues who are experts in the field but who may not be as well known and were hence not asked.


engineering research and its impact on the practice. We, the software engineering community, have to put our review processes through a reform.

There is no question that the ability to sustain the review process boils down to whether the correct incentives are in place for both academics and industry practitioners. There are many avenues to explore, but unless the challenges are addressed at the organizational level, collectively, by publishers such as IEEE, the Association for Computing Machinery, Elsevier, and Springer-Verlag, the issues are likely to persist. The incentive behind publishing is the advancement of science in one's field of passion and, of course, the road to promotion and tenure. Although being selected for prestigious review committees is recognized in this process, the output or quality is not discernible. And, in fact, young academics, correctly, are often encouraged to be

selective with their volunteer time and not sacrifice the progress of their scientific work in exchange for volunteering. There is, by all means, a contradiction: unless we figure out a fair way to put a value on review quality and quantity, we are likely to not make progress and be increasingly challenged to sustain the high magnitude of quality reviews we need in any given year.

We should start by asking whether we, as the software engineering community, have the correct measure of productivity. Are more peer-reviewed papers really better for the scientific process, or are our research progress metrics misaligned? You might find this odd coming from an editor in chief, who must assess the number of submissions as one measure of success to demonstrate the visibility, relevance, and popularity of our publication. Yet,

as an editor in chief, I would prefer to boast a higher acceptance rate, where the submitted papers are better aligned and meet our practical impact criteria, than reject a majority of the papers.

While we work toward realigning and understanding publication expectations and put the correct incentives in place for a sustainable scientific review process. I invite us to all take the oath of the reviewer (see "Reviewers' Oath"). 

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