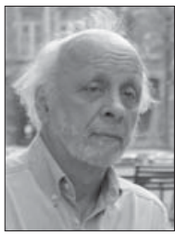
Learned Publishing, 28: 15–21
doi:10.1087/20150104

Peer review: still king in the digital age

David NICHOLAS[1], Anthony WATKINSON[2], Hamid R. JAMALI[2], Eti HERMAN[2], Carol TENOPIR[3], Rachel VOLENTINE[3], Suzie ALLARD[3], and Kenneth LEVINE[3]

[1]*Tomsk State University, Russia*
[2]*CIBER Research*
[3]*University of Tennessee*

ABSTRACT. The article presents one of the main findings of an international study of 4,000 academic researchers that examined how trustworthiness is determined in the digital environment when it comes to scholarly reading, citing, and publishing. The study shows that peer review is still the most trustworthy characteristic of all. There is, though, a common perception that open access journals are not peer reviewed or do not have proper peer-review systems. Researchers appear to have moved inexorably from a print-based system to a digital system, but it has not significantly changed the way they decide what to trust. They do not trust social media. Only a minority – although significantly mostly young and early career researchers – thought that social media are anything other than more appropriate to personal interactions and peripheral to their professional/academic lives. There are other significant differences, according to the age of the researcher. Thus, in regard to choosing an outlet for publication of their work, young researchers are much less concerned with the fact that it is peer reviewed.



David Nicholas

Introduction

This paper provides a window into a recently completed international project on trust in the scholarly digital environment, conducted for the Alfred P. Sloan Foundation,[1] that investigated the views and practices of around 4,000 academic researchers. The formative stages of the project were reported previously in *Learned Publishing*,[2] and here we focus on probably its biggest finding: that peer review is not only alive and kicking, but apparently increasing its influence, despite the many potential (or invented) threats posed by a rapidly unfolding and enveloping digital environment: threats such as social media, new information behaviours, and the growing number of proxy trust metrics (e.g. impact factors, usage, and altmetrics). When publishers heard about our findings, their typical response was, 'We could have told you that, so what is new?' Well, we think what is new and very important is that the digital transition, flood, or tsunami, call it what you like, far from burying or significantly changing peer review, has actually empowered and strengthened it.

Without peer review there has to be a big question mark over whether researchers could navigate the virtual scholarly world effectively. The implicit trust that comes with peer review is very effective for reducing the complexity of today's disintermediated, overly abundant scholarly information environment because it enables scholars to come to decisions without first considering every possible eventuality.[3,4] It is important to understand why peer review has proved so effective, especially when thousands of academic researchers in the survey questioned its functioning; suggesting that while it is working, it could work better. And, more importantly, perhaps there are divergent voices among some key communities that deserve consideration, and especially those of early career researchers who are the most critical of all.

The data reported in this paper come mostly from an international questionnaire survey, which formed the major data collection instrument for the Sloan project. Participants were

© David Nicholas, Anthony Watkinson, Hamid R. Jamali, Eti Herman, Carol Tenopir, Rachel Volentine, Suzie Allard, and Kenneth Levine 2015

recruited by six scholarly publishers who agreed to send an email invitation to authors who had contributed to their journals. The online survey was run between May and July 2013. Participants were asked questions regarding their use of scholarly information and reading habits, dissemination practices, citation practices, and personal demographics. 3,650 researchers responded to the questionnaire, making it one of the biggest surveys of its kind. Focus groups and one-to-one interviews with more than 150 UK and US researchers were used to scope the questionnaire and help frame its questions. Data from the focus groups and interviews are also used in this paper to provide context and explanation for the survey data.

Peer-review merits

peer review remains the central pillar of trust

From the survey, peer review remains clearly the central pillar of trust. As one respondent explained, it provides 'a degree of certainty about the quality of the product. It shows that someone has put in an effort and that it has been validated by a community of scholars.' It is a familiar, reliable, and traditional practice and, as a result, is thought to be an important scholarly attribute that enables researchers to search, use, cite, and disseminate with confidence. On the one hand, researchers want to be published in journals that have robust peer-review mechanisms (despite the heartaches involved), and, on the other, they feel secure in citing peer-reviewed material.

Two other merits identified were:

- Peer review led to an improvement in the quality of the article. Suggestions from referees generally improve an article, even if it is rejected. It is worth submitting to top journals, even if you have no chance of being accepted, just to obtain top quality feedback.
- Publishers organize it. Nobody wants any changes in the arrangements. Indeed, it was emphasized time and time again that this is *the* really important role for publishers.

Peer-review negatives

While there is a strong attachment to peer review, most researchers prefaced their expression of trust with a recognition that there are problems with the way it is undertaken. They are not blindly trusting of peer review and still need to examine the author, content and other internal characteristics in order to determine quality.

The biggest criticisms were:

- Its slowness. Many authors need to obtain a decision within a couple of months and many never obtain that. It is, of course, a weakness that predatory open access (OA) publishers take full advantage of (in their advertising, if not in reality).
- Hands-off editors. Editors are thought to be the ultimate judges; therefore they should be proactive and not always heed their reviewers – overturning them if they feel their recommendations are lightweight or misunderstand the peer-reviewing process or the article. Editors should also act as a release valve for the peer-review process, i.e. accepting some controversial or challenging articles that may be blocked by peer reviewers.
- Light-touch peer review. While researchers find the traditional peer-evaluation system slow, ponderous, and sometimes intimidating, they feel it actually leads to better papers. Nobody wants any changes that will result in a slacking in peer assessment. In fact, rejection rates are thought to be a sign that the peer-review system is working as it should be.
- The variable quality of reviewing. Respondents put this down to the increasing pressures on reviewers to get the job finished quickly; as a consequence, quality is being sacrificed. This means poorer papers are getting through and plagiarism not detected. This might explain why it has been recently reported that there is an increasing number of retractions and this could be because fewer 'dodgy' articles are identified by peer review.[5]

Other criticisms made were: (a) being misunderstood by the reviewers; (b) biased referees; (c) a lack of transparency in reviewing; (d) 'it is a closed shop'; (e) reviewers coming up with conflicting criticisms; (e) open refereeing, because it inhibits reviewers; (f) author-proposed referees, because authors suggest their friends (although it was also understood that authors can avoid referees whom they suspect of foul play this way); (g) the practice of post-publication peer review, which is meant to determine a paper's long-term status, because this was thought to be too easily gamed. When

attempting, however, to tackle these criticisms with researchers by delving into the mechanisms of peer review, the interviews revealed no consensus as to how the system might be improved.

Differences according to scholarly activity and persona

We found some interesting variations (and similarities) when we looked at different groups and the different activities. We looked first at how peer review impacted on use/reading, then at citing, and last at publishing.

Usage

Of the three principal scholarly activities – using/reading, citing, and publishing/disseminating – peer reviewing counts least in terms of determining what to use/read, but it still counts. Asked about the trustworthiness of specific sources and channels they use, researchers said that peer-reviewed journals are the most trusted information source of all. This was followed in importance by personal recommendations. Impact factors were generally thought to be important, but a sizeable minority of researchers, mostly from teaching-intensive universities, considered them unimportant. Despite the fact that researchers lay huge emphasis on peer review, 'internal' trust characteristics determined by personal inspection were still considered the best way of establishing what is good to use and read. This is not always possible, of course. For usage purposes researchers in some non-scientific disciplines reported using a wider range of information-seeking behaviour, looking for new ideas and stimulation, often in non-peer-reviewed resources, such as general websites.

The biggest and, possibly most controversial, issue to emerge regarding usage concerned whether OA publications can be counted as sources of quality information. Some researchers expressed concerns about poor or absent refereeing and a few worried about the status of items deposited in institutional repositories. What complicates and confuses matters is that a good number of researchers are not aware that traditional publishers also publish OA journals or articles. However, even if they wished to, it is not clear how they can easily discriminate against OA journals, because most abstracts/articles do not come with a sign saying that they are OA, and appear freely available via university library sites. Perhaps it is all to do with perception?

Citing

Researchers were far less easy-going and adventurous when it came to citing. This is thought to be a formal activity and researchers much preferred to cite peer-reviewed sources, typically journals, which were thought to be the main source of authority, quality, and reliability. Journals known to have rigorous peer-review processes were especially seen as objects of trust and hence cited. Researchers, nevertheless, were aware of problems such as the time peer review might take, the bias of reviewers, and the involvement of academic politics. Open access journals were cited if peer reviewed. Conference papers were cited, often in disciplines such as engineering and computer science, but are almost always seen as less authoritative than full academic papers, especially when there are question marks over their peer-reviewing processes. Not surprisingly, perhaps, social media, seen as informal communications, were not thought citable, no matter how many mentions/likes, etc., they attracted; there was some (but not much) support for usage counts as a factor in selecting citations.

peer reviewing counts least when determining what to use/read, but it still counts

Publishing

In regard to choosing a place to publish or disseminate research, the characteristic researchers most look for, not surprisingly, is relevance to their field. But we found this was followed closely by peer review. Being published by a traditional publisher came third and being a highly cited journal was fourth. Around three-quarters of researchers felt that peer-reviewed journals are attractive because they contain high-quality content. Respondents also strongly agreed that researchers who do not have tenure have to publish in good journals to build a reputation, and that to attract research funds they have to publish in high-impact journals, which are, of course, peer reviewed. Most researchers had no problems with publishing in a peer-reviewed OA journal, although not many of them seemed to. Having a reputable publisher was important in selection, but not as important as being peer reviewed.

In virtually all cases, irrespective of discipline, when researchers talked about trusted

researchers were far less easy-going and adventurous when it came to citing

outlets for their work, they talked almost wholly about journals, and not any journals, but peer-reviewed journals. Book, report, and conference paper publishing were just a footnote in the scholarly CV, even in those social science discipline fields that treat monographs as a serious option.

Researchers are clearly pressurized by their institutions to publish in peer-reviewed journals. To obtain tenure or, in the case of the UK, do well in the Research Excellence Framework (REF), they are told they have to publish in top-ranked, peer-reviewed journals. There was overwhelming agreement that external pressure has grown in recent years and, implicitly, that this pressure interferes with the free exercise of their deployment of trust criteria when it comes to publishing. The perception was that the importance of the journal is defined by impact factor and not, as they prefer, the prestige of the journal in their specialism or the nature of the audience.

Diverse scholarly communities

young researchers are less likely to believe that peer-reviewed journals are the most trustworthy information sources

Young or early career researchers (defined as those 30 years and under) are a research community of particular interest because, although not quite the 'Google Generation' (who are only arriving as students in universities now), they will have spent their careers and higher educational years in a largely digital environment and, perhaps, been more conditioned by it. They constitute the new wave of researchers who might well be thinking and behaving differently in the scholarly environment.

In usage and reading terms, we found young researchers much less likely than their older colleagues to believe that peer-reviewed journals are the most trustworthy information sources (see Table 1). True to type perhaps, they are more likely to be swayed by easy access. When it came to citing, young researchers were much more open to citing non-peer-reviewed sources (e.g. personal correspondence, blogs, tweets) and citing sources disseminated with comments posted on a dedicated website (open peer review). And they agreed much more strongly that the impact factor is important for deciding what to cite. Interestingly, this conflicts with their previous comments about citing non-peer-reviewed sources. What appears to be happening is that younger researchers seem more willing to use any mechanism to improve their chances of acceptance and are much more pragmatic in their citation behaviour generally. Quite likely citing for them is all about getting a foot on the ladder. In regard to choosing an outlet for publication of their work, young researchers were also much less concerned with the fact that it was peer reviewed. They were, in fact, more interested in whether it was OA, highly cited, or based in a country known for the quality of its research. Young researchers clearly use all the outlets available to them in order to get their work published, and in this respect make most use of the new digital services with which they are familiar. Interestingly, when commenting on changes to the scholarly environment, young researchers believed more strongly that peer review has become less rigorous, and as a result there is a flood of poor-quality material.

A group of young social science researchers attending a focus group, emboldened no doubt by being in a group of like-minded people, were particularly outspoken about the traditional scholarly system. They said that the system is broken and people know it, but there is a conspiracy of silence. Some of the reviews they obtained were disturbing, 'It is so difficult navigating the ideology enforced by the journal.' It was not clear to some whether their (rejected) papers were just low standard or whether it was because of a disagreement with the journal's ideology. It was difficult for them to push new ideas; they had to spend much of their time getting the language right. They liked openness and were not convinced that blind reviewing was actually blind. They also questioned the accountability of reviewers and felt there needed to be more transparency. Counterbalancing the strong views of this group were those of the small number of individual younger researchers, largely scientists, who were interviewed on a one-to-one basis. They were all highly conservative in their practices and followed their mentors in their attitudes.

Academics from teaching-intensive universities also appeared to be less trusting of peer-reviewed journals, mentioning in their defence current news items about senior researchers faking their research in peer-reviewed journals. They said that peer review depends on honesty on the part of all the players, and that is not guaranteed, and they therefore prefer to publish in anything other than a highly ranked journal. Clearly they feel that highly ranked journals are less transparent. For them research dissemina-

Table 1. Mean rating of agreement with opinions by age using the Likert scale: 1= strongly disagree to 5= strongly agree

Item	≤30		>30		All	
	Mean	*n*	Mean	*n*	Mean	Sig
Peer-reviewed journals are the most trustworthy information source	3.85	364	4.16	2636	4.13	0.000
Importance of peer review when choosing where to publish	3.85	363	4.15	2632	4.11	0.000
I tend to blog about the findings of my research, which is a good way to test the veracity of my ideas	2.72	361	2.03	2604	2.11	0.000
Practice of citing non-peer-reviewed sources (e.g. personal correspondence, newspaper articles, blogs, and tweets)	2.14	355	1.69	2618	1.74	0.000
Practice of citing sources disseminated with comments posted on a dedicated website (open peer review)	1.98	353	1.46	2612	1.52	0.000
There is a less strict/less rigorous peer-review process now and as a result there is a flood of poor-quality material	2.92	359	2.70	2607	2.73	0.007
There are more unethical practices around now (e.g. plagiarism, falsifying, fabricating, citation gaming)	2.79	360	2.29	2606	2.35	0.000

tion is more than just peer progression or meeting some kind of (REF) quality quota – they want to publish in the most relevant places, where they might make a difference. As one researcher told us: 'We have to get away from this industrialized, packed, industrial approach to research dissemination.'

On the whole there was not much subject diversity in the responses of researchers regarding peer review, but there are some minor differences worth noting: (a) computer scientists are slightly less likely to agree that peer-reviewed journals are the most trustworthy information sources (mean = 3.93) and behavioural scientists the most likely to agree (mean = 4.36); (b) physical scientists believe more strongly that there is now a less strict/less rigorous peer-review process than there was (mean = 2.99 compared to total mean = 2.74) and that they have no problems publishing in OA outlets if they are peer reviewed (mean= 3.74 compared to total mean = 3.81); (c) life scientists are the most concerned that what they use is peer reviewed (mean = 4.03 compared to total mean= 3.83). Similarly, there are not many country differences, although Iranian researchers are somewhat less trusting of peer review.

Finally, the survey revealed that the more prolific the researcher in publication terms, the greater the belief that peer-reviewed journals are the most trustworthy information sources and most prestigious places to publish.

The (potential) agents of change

What, then, was revealed about the much-hyped agents of change: social media and OA publishing? Taking the former first, almost all the researchers interviewed made a clear distinction between formal and informal methods of communication, with social media very much in the latter grouping and peer-reviewed journals very much in the former. Often the only way researchers will trust social media material is if it is linked to a traditional source (e.g. a tweet about a peer-reviewed journal article – quite a common practice). Only a few – although significantly mostly young and early career researchers – thought that social media were anything other than more appropriate to personal interactions and peripheral to their professional/academic lives.

academics from teaching-intensive universities are less trusting of peer-reviewed journals

The lack of interest in social media, either as a source of information or for networking, could be partly explained by the trust and validity problems that arise, but there are other reasons: (a) researchers are put off going down that route by the current higher-education climate, which they feel favours peer review, journals, and citation indices; (b) they are aware that there are no generally acceptable measures by which social media based content can be evaluated, whereas traditional content has, for instance, impact factors and peer review; (c) they do not use social media because there are no career

benefits to doing so, indeed there are possible 'reputational threats'. However, researchers were interested in the fact that tweets and the like might contribute to their citation scores. The latest research[6–8] suggests that there is some weak correlation in some cases between tweets and citations, but the studies concluded that tweets actually measure something different, so the researchers questioned in this survey may be making false assumptions about the value of tweets.

the lack of interest in social media has several reasons

What, then, of OA publishing? There was a common perception that OA journals are not peer reviewed or do not have proper peer-review systems, although many OA articles are subject to the same rigours as traditionally published ones. Being peer reviewed clearly helps the decision to publish in an OA journal, with three-quarters of researchers saying that they would publish in OA journals if these are peer reviewed. However, there was a palpable unease among some researchers about paying to have an article published. A few researchers (but there are some) considered that paying to publish inevitably leads to a distortion of the peer-review process: because you are paying, fast-tracking and lower barriers might be a feature. There was a clear hostility shown to predatory OA journals that claim to do peer review. But this hostility tended to be based on no real knowledge of the peer-review systems of these journals. Researchers are just very suspicious and wary. If they do anything at all to check the credentials of OA journals they look at the editors (and there are often no editorial boards mentioned in these journals) and if they do not know them they regard them as clearly 'foreign' and not to be used.

there was a common perception that OA journals are not peer reviewed

The one OA journal that was often mentioned by interviewees was *PLOS ONE*. *PLOS ONE* has made a big point about only reviewing the article's methodology and not the relevance or importance of it, but there was never any discussion of what this new approach meant in practice. After all, *PLOS ONE*, despite its OA credentials, seems to touch all the bases – it publishes very speedily, has a good impact factor, and utilizes what appears to be acceptable levels of peer reviewing.

More, not less, peer review

A real vote of confidence in peer review is the fact that the researchers we interviewed would like it extended to data and tightened up in connection with abstracts. Although access to full content was considered much more important than access to data when determining the trustworthiness of a piece of research, increased access to data was seen as one of those aspects of change that are positive. Because of the problems of assessing a large and complex dataset, the idea of the data being attached to an article and author, with the article giving it its authority, was much favoured. It was generally agreed that data should be peer reviewed. Abstracts are crucial to making initial and speedy decisions about trustworthiness, so the researchers interviewed wanted them to be a particular focus of the peer-review process. Researchers really need to be able to trust the abstract and wondered whether they get the full peer-review treatment – and they suspected not.

Impact factors

Impact factors (IFs) and peer review go hand in hand for most researchers, although there are those[7] who argue that impact factors as surrogates for quality and trust are on their way out because we have moved into an article-based economy. Lozano *et al.*[9] also said that by using these OA repositories, scholars will find publications in their respective fields and decide which ones are worth reading and citing, regardless of the journal. This would mean that the relationship between IFs and articles' citations will weaken and the IF will slowly lose its legitimacy as an indicator of journal quality. However, our research saw no signs of this happening; if anything, what we saw was a strengthening of the power of IFs. IFs clearly have a major role in determining what to cite and where to publish, and, as our survey showed, especially so in developing countries and emerging economies.

Conclusions

Researchers told us that there have not been many changes in the way they go about determining trustworthiness. Peer-reviewed journals are even more the place where researchers offer their finished research, except in those disciplines, mainly the humanities, where monographs are sometimes more appropriate for the longer 'messages'. However, even in the humanities, journals appear to have a greater importance than they ever had. Driven by institutional and national policy directives, such as the UK's REF, the march of the journal

has made suggestions of a new role for social media in scholarly communication irrelevant, at least for the present. Publishing in high-IF, peer-reviewed journals is very much the main way to obtain a reputation, get a job, and obtain promotion. And until that is no longer the case, nothing will change.

Researchers have moved from a print-based system to a digital system, but it has not significantly changed the way they decide what to trust. The digital transition has not led to a digital transformation. The link between peer review and quality appears stronger than ever. In fact, arguably, the main change has been the reinforcement of the established norms in the face of the rapid expansion in scholarly communications and the digital information tsunami that it has unleashed. Instead of looking to the future for a lifeboat, researchers have looked to the past and gripped established practices, traditional peer review especially, even more firmly.

The transformation of scholarly communication (much spoken about in some circles) is still something for the future. However, there are clear indications that peer review is less trusted in some quarters, and significantly so among young or early career researchers. And it would be complacent to say that was ever the case. The difference now is that there are alternative and easily accessible communication forms. However, one of the things that struck us was the lack of any plan for a transformed scholarly communication system, even among those who strongly attacked the present one. Librarians and OA advocates talk about new systems, for example based on repositories or crowdsourced peer review, but not a single researcher mentioned them as constituting the future.

Finally, this article is a taster for the full report itself where the full details and explanations of what has been said in this paper can be found.[1]

Acknowledgements

This research was originally funded by the Alfred P. Sloan Foundation. The article was prepared with the support of Tomsk State University Competitiveness Improvement Program. The authors would also like to thank Lisa Christian, Reid Boehm, Frances Nichols, and Rob Christensen from the University of Tennessee for their contributions.

References

1. CICS/CIBER. *Trust and Authority in Scholarly Communications in the Digital Era* (2013). Available at: http://ciber-research.eu/download/20140115-Trust_Final_Report.pdf
2. Nicholas, D., Watkinson, A., Volentine, R., Allard, S., Levine, K., Tenopir, C., and Herman, E. 2014. Trust and authority in scholarly communications in the light of the digital transition: Setting the scene for a major study. *Learned Publishing*, 27(2): 121–134. http://dx.doi.org/10.1087/20140206
3. Corritore, C.L., Kracher, B., and Wiedenbeck, S. 2003. On-line trust: concepts, evolving themes, a model. *International Journal of Human–Computer Studies*, 58(6): 737–758. http://dx.doi.org/10.1016/S1071-5819(03)00041-7
4. Grabner-Kräuter, S. and Kaluscha, E.A. (2003). Empirical research in on-line trust: a review and critical assessment. *International Journal of Human–Computer Studies*, 58(6): 783–812. http://dx.doi.org/10.1016/S1071-5819(03)00043-0
5. Steen, R.G., Casadevall, A., and Fang, F. C. 2013. Why has the number of scientific retractions increased? *PLOS ONE*, 8(7): e68397. http://dx.doi.org/10.1371/journal.pone.0068397
6. Eysenbach, G. 2011. Can tweets predict citations? Metrics of social impact based on twitter and correlation with traditional metrics of scientific impact. *Journal of Medical Internet Research*, *13*(4): e123. http://dx.doi.org/10.2196/jmir.2012
7. Thelwall, M., Haustein, S., Larivière, V., & Sugimoto, C. R. 2013. Do altmetrics work? Twitter and ten other social web services. *PLOS ONE*, 8(5): e64841.
8. Haustein, S., Peters, I., Sugimoto, C. R., Thelwall, M., and Larivière, V. (2014). Tweeting biomedicine: an analysis of tweets and citations in the biomedical literature. *Journal of the Association for Information Science and Technology*, 65(4), 656–669.
9. Lozano, G.A., Larivière, C., and Gingras, Y. 2012. The weakening relationship between the impact factor and papers' citations in the digital age. *Journal of the American Society for Information Science and Technology*, *63*(11): 2140–2145. http://dx.doi.org/10.1002/asi.22731

David Nicholas
Department of Russian History
Tomsk State University, Lenin Avenue 36
Tomsk 634050, Russian Federation
Email: Dave.Nicholas@ciber-research.eu.

Anthony Watkinson, Hamid R Jamali, Eti Herman
CIBER Research Ltd
1 Westwood Farmhouse
Greenham, Newbury RG14 7RU, UK

Carol Tenopir, Rachel Volentine, Suzie Allard, Kenneth Levine
Center for Information and Communication Studies
College of Communication and Information
University of Tennessee, 1340 Circle Park Drive, 423 Communications Bldg
Knoxville, TN 37996-0341, USA

Copyright of Learned Publishing is the property of Association of Learned & Professional Society Publishers (ALPSP) and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.