# The importance of peer review

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**Abstract:** Peer review is the evaluation of research outcomes by experts working in the same field. It is one way, through the closest scrutiny, to put into the public domain reliable knowledge with the agreement of our peers. Design typically evidences research outcomes in multiple ways including artefacts, prototypes, drawings, and patents. The means of research publication are equally diverse and include exhibitions (both juried and curated), websites (both private and corporate), and online publishing ranging from fully reviewed web journals to individually curated portals. Whereas some means of dissemination have excellent peer review, many are inadequate and in some cases there is no third party scrutiny. The growth of digital communications has facilitated personal online publishing, and it has become increasingly difficult to differentiate between robust quality assured publication and vanity publishing. This paper argues that peer review is necessary but not always sufficient. It analyses some principles that identify excellence in review policy across differing types of dissemination. In doing so it clarifies the need for evidence of robustness in all forms of peer review, and suggests that peer review is a major developmental tool for the emerging field of design research.

*Key words: Peer Review, Standards of Publication, Journals, Exhibitions, Conferences*

## 1. What is peer review?

This paper argues for the adoption of strong principles and practices of peer review for all types of research publication, which it compares and contrasts. It draws upon extensive experience of reviewing for journals, conferences, and national research assessment, and developing peer review processes and guidelines.

Peer review is the evaluation of scientific, academic, or professional work by others working in the same field. It is intended to be a control measure, a way to ensure that only research findings above an agreed threshold are disseminated through conventional publishing or other means. It is one way, through the closest scrutiny we can manage, to put into the public domain only reliable knowledge. As we shall see, it is not perfect, but it's the best we can do. The ideal characteristics of peer review are that it should be: independent; unbiased and fair; be conducted by experts in the subject specialism; and provide justification for the decision taken. Depending on context, this justification may take the form of written feedback setting out clearly why the decision was taken to reject, or offering advice about improvements that would make the application successful.

This paper concerns itself primarily with peer review in 'design' in the academic sector usually known as 'art and design'. The term 'design' is broadly interpreted to include: applied arts and crafts; spatial, two- and three-dimensional design, including product design and architecture; textiles, dress and fashion; animation, time-based and digital media; related critical, historical and cultural studies; contributions to policy, management and entrepreneurship in the creative industries; contributions to the construction of a scholarly infrastructure for design through, for example, collections, archives, curation and pedagogy; curatorial practice; and related pedagogic research [1, 2]. There are many overlaps with cognate disciplines such as architecture and in cross-disciplinary working. Discussion of other forms of designing such as those observed in engineering, business studies etc. is beyond the scope of this paper.

Since about the turn of the last century, design has been very successful in professionalising practice and the teaching of design practice. In addition, over the past three or four decades, design research has grown in volume and maturity, with an increasing expectation that academic staff will be active in some form of investigative activity. Research is also increasingly utilised in consultancies and in industry. However, relative to other long established fields, design is still at an early stage of development, and remains subject to challenges, misconceptions, improvements, and further clarity as time passes. The assessment of our research by our peers is widespread and affects us in diverse ways. Drivers of peer review mechanisms include: national assessment exercises; applications for research funding from external bodies; journal papers; juried exhibitions; applications for tenure or title; and of course the special case of the PhD thesis examination. Large scale systematic peer review may be evidenced in national research assessment exercises such as RAE/REF [1, 2] among others. In these exercises, panels of experts in various fields assess the quality of research outputs submitted by thousands of academics every few years. Based upon their judgement, government allocates core research funding to universities. Consequently, as much money hangs on the result, university management puts considerable resources into gaining the best possible scores. In the academic year 2013-14 the UK government agency will allocate £1.6bn for research through this mechanism. From the beginning, third party scrutiny was seen as an important aspect of the validation of research that is made public [3].

When it succeeds, peer review often goes unnoticed, but when it goes wrong it is often a topic of hot debate, perhaps especially in the sciences. We may think of rigorous scientific review as being above reproach, but it is often the subject of much dispute. For example, the 'Climategate' affair - where it appeared that climate scientists impeded peer review to stop papers critical of their work being published - had the potential to damage public perception of climate change science, to affect policy at the international level, and to lead to the withdrawal of urgent governmental actions and resources [4]. There are many other well known examples including false or mischievous claims [5]. From time to time review processes have been called into question. The online journal PLOS ONE, though having an exemplary peer review policy, publishes "all papers that are judged to be technically sound" rather than perceptions of importance to the field: judgement of the *importance* of the paper is left to readers. There are several cases where, due to disagreement over peer review policy, publishers have removed editors, triggering resignations from the editorial board [7].

The purpose of the present paper is to step through the various forms of peer review common in design, to discuss the strengths and weaknesses of the various approaches taken, and to offer suggestions on principles of peer review that may be adopted irrespective of the means of publication. In recent years there have been significant challenges to the hegemony of traditional academic publishing. This has opened up new publishing outlets including websites, online journals, blogs, ebooks, as well as the potential for online discussion of issues through social media and the established academic discussion forums such as jiscmail [8].

## 2. Reviewers and reviewing

So, who reviews? Reviewers are - or at least should be - people selected for their subject expertise, their standing in the community of research practice, and their ability to be fair and reasonable and to make sound judgements. Reviewers may or may not fulfil all these requirements, and this raises issues of attitude, competence and bias. There may be a number of factors that lead to less than satisfactory assessments of research quality. In competence, some reviewers are excellent in assessments of research quality and they justify their reasons for the judgments they come to, whereas some do not. Not all reviewers behave in exemplary ways for whatever reasons, and others may not be quite so expert in the sheer diversity of research in design. All reviewing is to some extent subjective, therefore research outcomes are open to interpretation, and this can lead to divergent opinions. Some reviewers simply misunderstand what they see and read.

This is often seen in reviewers' differing reports, where one reviewer has taken an opposite line because they have misinterpreted an author's key concept.

Bias is a predisposition either for or against something. To avoid bias, blind review is employed where the identity of the researcher is not known to the reviewer. This aims at obtaining a more impartial judgement as personalities and historical baggage should play no part in research assessment. Similarly, in double blind review the identity of the reviewer is unknown to the researcher, thus candid comments may be made without recrimination. Double blind review in journals is usually held to be the gold standard, having all the comfort of anonymity. Empirically it has been demonstrated that the quality of blind reviews is higher than non-blind reviews but not by a large margin, for example 3.5 versus 3.1 on a 5-point scale [9]. However, blind reviewers are more likely to reject work and - perhaps importantly for the art/design sector - more likely to give good feedback. Where reviewers tend to favour research results that confirm their own views, this is termed 'confirmatory bias', for example a "...*tendency to emphasize and believe experiences which support one's views and to ignore or discredit those which do not*" and similarly "...*reviewers were strongly biased against manuscripts which reported results contrary to their theoretical perspective*" [10].

Reviewers often do not give adequate feedback in quality or quantity. Sometimes they say nothing. This is unhelpful for two reasons. Firstly there is no justification for the decision they have made, therefore editors have little basis for understanding the judgments provided. Secondly the author has no guide to improve the paper. This is especially problematic for early career researchers who may not be in a position to obtain expert critique of their work. Experienced reviewers can do a great deal in bringing their knowledge and advice to early career researchers to help them improve. Advice should also be polite and constructive, though this is not always the case. Occasionally reviewers make abrasive or otherwise inappropriate comments. Reviewers have been removed from lists for such actions. Expert reviews, with professional and constructive feedback, are vital for developing our field, and the impact of such advice should not be underestimated.

Some regard the selection and training of reviewers, and the updating of skills on a regular basis, as essential to maintain good quality judgements and to provide adequate feedback. For example, the UK's Arts and Humanities Research Council established a College of Peer Reviewers some years ago [11]. Reviewers undergo initial training which covers the various AHRC schemes and what is expected, in judgement and feedback, to both applicants and to the committees that make final judgments on which projects to prioritise for funding.

Before working through the various areas where review by third party experts is beneficial, it will be helpful to start with a clear example of robust review, the research journal.

## 3. Journals

In many disciplines, research journals are often seen as the primary means of dissemination of high quality research. In some disciplines, journals are often the ***only*** means of publication. Journal editors and their review teams are therefore expert gatekeepers of what gets published or is rejected. They also play an important part in advising on the improvement of texts that may be subsequently accepted for publication. Though there may be other means for placing work in the public domain, journal peer review processes have come to be seen as the standard beyond reproach for fairness and assurance of quality.

So, how does this work? Let's take a well known example from the design field. ***Design Studies*** is published by Elsevier. Its editor is one of the most influential scholars in the field [12]. The journal is perhaps seen as a senior design-

specific journal, and is associated with the Design Research Society, a scholarly group set up in 1967 to further design research. The journal has a reputation for high quality publication with a relatively narrow focus on design processes, creativity, and design thinking. There is a good deal of transparency about the review process published on the journal website. There is a clear explanation of the editorial policy. Prospective authors (and readers) know who the editor and regional editors are and we can ascertain their standing in the community of scholars. There is adequate detail on how to submit an article, when a prospective author can expect a decision, and details of what may be required to hone the paper for publication. We know that there is a double blind review process where reviewer and author are not revealed to each other. We do not know who the reviewer(s) might be, but we can see acknowledgments to a group of reviewers in previous editions many of whom are themselves well known. Authors will  not know whether reviewers of their work will be expert in the specific topic of their research, but may take comfort that the editorial team comprises known individuals who are presumably skilled in choosing appropriate reviewers to maintain the high standard of the journal. There is also clarity for reviewers about the manner in which they should review, and expected outcomes. Reviewers are asked to ensure that proposals are: appropriate to the journal; original; methodologically sound; follow appropriate ethical guidelines; have results that are clearly presented and support the conclusions; and that the paper correctly references previous relevant work. There is therefore both selection of skilled reviewers and clear guidelines to assist them in making their judgements.

All reputable journals work in a similar way, where there is transparency about editorial and review policy. It should be clear what kind of research the journal accepts, and how reviews are conducted. The decisions are not made by one person, but as a team effort with some coming to their judgements completely independently on the basis of what they read, and on the basis of their expert understanding of the topic. One offshoot of this process is that usually reviewers will give advice for improvement of the text. This advice is often helpful, but is especially so for early career researchers perhaps publishing their work for the first time. Traditionally, journals have also had the reputation of being well reviewed due to promotion and distribution by reputable publishing houses with stringent editorial requirements.

However, recently there are significant challenges to the hegemony of the established publishing houses, including the growth of digital publications, systems to support online journals, and the ease with which websites, blogs etc. may be set up by just about anybody.  There is perhaps a recognition that traditional methods of journal publication are coming to an end, with interesting consequences that paper based journals increasingly have an online presence with at least some papers available free of charge. Research councils are increasingly insistent that dissemination should be free at the point of reading, and are willing to directly fund open source publication [13]. In any case, journals are not the only way to disseminate research findings in design. They may not even be the best way. We will meet some challengers below.

## 4. Conferences

Symposia are of various kinds and intentions, and have both similarities and dissimilarities to journals. The essence of symposia is to meet others in the field, to present latest research, and to receive feedback. Some events therefore may be small scale affairs with an invited audience operating in a single track, for discussion with little or no publication of presentations. On the other hand, major conferences may have multiple tracks, and though less opportunity for delegate interaction, may have full proceedings openly available after the event, together with information about the presenters and the themes addressed. In each case, in accord with the original sense to ***bring together***, social interaction is important in conferences. Meeting old friends, taking stock of what is happening in the field, getting a variety of opinions, hearing inspirational keynote speakers, are all part of the pleasure of conferences. In the best conferences this social side is coupled with the publication of good quality research which has been subjected to peer review and is

available to future scholars. Conferences are also an important means for research students to experience current work and to meet senior researchers in their field.

There are differing views of the value of outputs from conferences. Some research managers with an eye on national research assessment league tables regard them as worthless, favouring instead top ranked journals and citation data. In some disciplines, journals remain the ***only*** means of publication. There is also some influence through the criteria established for national research assessment exercises where a small number of governmental bodies have attempted to rank journals so that only the 'best' are included for the purposes of assessment. The more mature exercises such as the UK RAE/REF [1, 2] have not generally required either ranked journals or citation data for design, favouring instead expert judgement based upon the quality of research in the public domain irrespective of the means of dissemination. However, where conferences are not accepted, one criterion is poor review processes. In this respect, conferences probably differ much more widely than comparable journals.There may be several reasons for this.

For example, the process is sometimes based upon the selection of abstracts. Although the abstract may show promise, the paper may be of lesser quality. Even where there is subsequent review and selection of full papers with adequate feedback, the pressures of time and volume of proposals may mean that conference papers are not refined to the extent expected of journal papers. Therefore conference papers are often seen as means to get new work disseminated rapidly with feedback, and these are sometimes worked up into a journal paper later. Some conferences are poorly reviewed in other ways. The pressure for delegate numbers, coupled with a weak or nonexistent review process, can lead to all or nearly all applicants being accepted for presentation. These papers, of variable quality, may then be found in the conference proceedings. Conference audiences have from time to time experienced presentations of work that is outside the scope of the conference, is not research, cannot be understood, or lacks methodological rigour. These papers nevertheless become published in proceedings, poor work is seen by students and early career researchers, and is trusted because it is 'published' [14].

There is sometimes linkage between conferences and related journals. For example, one model works like this: an author proposes a paper, and as a condition agrees to be a peer reviewer for others' work; the conference presentation is made, and then there is a similar process to select papers that are subsequently published in a related online journal. The weaknesses of this form of peer review are obvious. Being an author does not equate to having peer review skills or even being an expert in any field of the conference. An undergraduate student might propose a paper, and find themselves reviewing work by experienced research professionals or doctoral students. Later, the same student might be called upon to make judgement about journal papers too. This is not review by peers, at least not in any professional sense of the term. In a model of this kind there is little or no check on the expertise of reviewers, and at best reviewing may be variable, and at worst incompetent. There has been much criticism of the organisation of the journals themselves [15].

Over more than a decade the Design Research Society (DRS) has organised a peer reviewed international biennial conference. Arising from this experience, the Society has developed a more rigorous model for its conferences and subsequent publications. It has established a cohort of reviewers that are vetted by organisers. After each event this list is reviewed, and poorly performing reviewers are removed. As each conference is hosted in various parts of the world, often by organisers who are hosting the event for the first time, quality of review is guaranteed by a similar body of reviewers, and a review committee is overseen by an experienced DRS nominee. In this way, expertise is transmitted from one event to the next. The process is clearly set out for organisers in published guidelines [16].

The editorial for a recent event [17] stated:

*"One firm principle of these DRS conferences, which has been honed over several events, is to ensure the highest standards of selection of papers that will be presented at the event and subsequently published in the proceedings. This principle is important for two reasons. Firstly, delegates tell us that they prefer to attend conferences where only the strongest research is presented that is appropriate to the audience, is communicated clearly, and demonstrates research that has reached a stage where there are findings worthy of transmission. Secondly, as the oldest learned society of its kind, the DRS believes that the interests of the community of scholars - including early career researchers and doctoral research students - are best served by adequate screening of submissions to include only work that is demonstrably robust research worthy of publication.*

*Review of proposals is overseen by a small internationally based Review Committee comprising several skilled reviewers, which is appointed by the DRS. This committee is chaired by a member of the DRS Council and operates independently of the host organisers. In this way, the focus is rightly on academic judgement of the research."*

*"DRS considers that maintaining a high standard of acceptance to its conferences both sets a benchmark for peer review of research papers, and attempts to provide a solid body of work to which future scholars, including research students, may refer."*

In this process, all reviews are double blind, and full papers are reviewed by at least two independent reviewers plus at least one member of the review committee. Based upon reviewers' comments and grading, the committee makes a final choice of papers and sifts them into streams suitable for presentation. The attrition from initial proposals to final papers presented has been about 4:1 and in this respect is similar to a good journal. Reviewers are encouraged to provide adequate feedback to authors by justifying their grading and offering advice on ways in which the paper might be improved. Often, improvement of the paper is a condition for final acceptance. Feedback to authors is an area where further development is needed, with intentions for better instructions to reviewers, and possibly some training in the type and quality of feedback. As with journal submissions, advice for improvement may be very helpful for early career researchers. Another condition of DRS is that full papers are put into the public domain online as open source documents soon after the conference. Delegates get all papers at the time of registration. These are established as an enduring and locatable record either through a university repository [18] or through the DRS archive [19]. More recently there is a discernible trend in major conferences toward submission of full papers without the abstract selection stage.

Conferences on this scale require considerable human resource to be effective, with typically over 150 reviewers in support of the editorial team. However, judging by comments received, the payoff is that delegates value effective quality assurance. Research managers are satisfied that the process of peer review is transparent and aims for good quality published outcomes, therefore they are more likely to fund staff to attend. An unexpected benefit has also been a number of mainly USA-based authors requesting details of the quality assurance policy as a significant part of their application for tenure.

## 5. Exhibitions

In design, exhibitions have a long history as a primary means of dissemination of new ideas exposed to a wider public through the display of artefacts. Contingent upon the type of artefact and purpose, such exhibitions may be: commercial trade shows (paid for); curated shows (by invitation) for example in galleries and museums; or juried shows (competition judged by expert panel). Some exhibitions are toured, some exist in a fixed location for a period of time. In areas such as crafts, exhibitions are preeminent in showing and selling new work. In fashion, the catwalk may be seen as a dynamic and highly influential exhibition with wide press coverage. Exhibitions may be archived in some

form for the benefit of future scholars. Often this is in the form of a catalogue which is published in a limited edition, though sometimes a book is published as a result of the show and may constitute an enduring record. Without a traditional publication or a web archive, there may be no trace of an event in later years. In the UK's most recent national research assessment exercise (RAE2008) the largest type of output was by exhibition (32 percent versus 14 percent for journals) thus making the profile of art/design quite different to most other units of assessment [20]. Given the growth of research where visual communication is at least important - if not paramount - it seems likely that the exhibition will remain a primary means of dissemination.

However, the appropriateness of the exhibition as a *research publication* has been challenged. An exhibition may have no intention to demonstrate research findings, for example a trade show where the primary purpose is to sell goods. It has been argued that display does not of itself provide the meta narrative that adequately explains the knowledge arising from the research [21]. It has therefore been argued that simply exhibiting the outcome of research without textual explanation is not a research outcome [22]. In this regard, curatorial practice may be compared and contrasted with journal editing practices and be found wanting in objectivity and third party validation, though curators and their exhibition proposals may be subject to scrutiny by an advisory or management board of some standing in the community. Much emphasis, perhaps especially in the applied arts, is placed upon the status of the gallery or other venue. Juried shows, where a panel of experts judges the exhibits, has the form of peer review but is not conducted blinded. Exhibitions therefore vary considerably in scale, location, and the degree to which there is third party validation of the selection process for exhibits. Some may have excellent standards of peer review, in other cases it may be missing entirely. Where there is no enduring record of the research, the exhibition makes it difficult for future scholars to reuse the work, challenge findings, or build upon the work.

These problems have led to proposals for what has been termed the *research exhibition* which does have the intention to demonstrate the processes of research and make explicit its outcomes in ways comparable to a journal or conference paper [23, 24]. This form of exhibition is important, where the show can demonstrate all or some of: the investigative context for the work; its methodological framework; the methods used; and to make any new knowledge explicit. It follows that in parallel with the physical exhibition there should be an enduring and locatable record of the research (rather than simply a recording of the show) that is placed permanently in the public domain. In such a model, peer review should be an essential part of the exhibition intention and organisation, with reviewers drawn from the field and capable of robust judgements. Such a review process can, for example, be identical to a good conference process with clear acceptance criteria based primarily upon research quality, proposals that make the research explicit, and a process for judging that is double blind and impartial. There is much scope in developing a common set of protocols for exhibitions that are specifically intended as research publications.

## 6. Online

The expansion of digital communications - with online discussion forums, wikis, blogs, e-books, group and individual websites, and print on demand - has opened the world of 'publication' to anyone with a laptop computer, an internet connection, and a modicum of technical knowledge. Book publishing once meant submitting a proposal to a skilled editor working within the strict editorial guidelines of a publishing house and the local requirements of the particular market or book series. Now, software tools and some keyboard knowledge readily produce e-books, websites, and blogs which may be entirely without third party scrutiny. For scholars, this raises issues around the reliability of published work. For example, Wikipedia pages vary from excellent professionally produced entries that have the backing of expert groups [25], to amateur pages that are light on evidence yet heavy on opinion.

There is more information available than ever before, but scholars now have a harder time in selecting information that is well evidenced and validated. Anyone with a little knowledge can produce and publish a website. Social media, blogs etc. demand no more than a simple registration and the entry of text to a web template. Opinion is easily expressed through blogs, Twitter, forums etc. In this sense anyone can be an author.

Where the intention is to publish reliable research findings, there are clear challenges to notions of third party validation. For example, a web portal is essentially an act of curation, but the choice of content may be predicated on one individual's opinions which may be limited by ignorance, or the site may be a covert vehicle for political or religious propaganda. Perhaps one of the greatest challenges to traditional publishing is seen in the growth of online academic journals. In a very short space of time, new publishing enterprises have inaugurated a large quantity of new and specialist journals, many of them in design and related fields [15]. There has been much criticism of this growth, claiming that it leads to a lowering of standards. Given the demands of peer review in the better quality journals, one criticism has been that the sector cannot service such a large number of online journals to an adequate standard.

However, concatenation of the terms 'online' and 'journal' does not necessarily equal poor quality. One excellent example of a newcomer to research publishing is the International Journal of Design [26] which, in a short space of time has become popular as a regular open source means of providing good quality research outcomes highly relevant to the design field. Similarly, peer review process for the Journal of Research Practice is exemplary [27]. What such journals have in common are policies that take peer review seriously and they are transparent about the process and the people. Prospective authors have the opportunity to form an opinion regarding the status of peers who will judge their work, and the framework within which that judgement will take place. These may give pointers to the ways in which other forms of online publication may conduct themselves. Online and other publications can easily begin to emulate the robustness and transparency of the best peer review processes by ensuring that they have a published editorial policy, and by at least appointing an informed and independent advisory group with powers to shape standards and to influence the invitation of similarly informed reviewers. Such policy, process, and people should be visible online for prospective authors or readers to form their own conclusions about the focus and robustness of the publication.

## 7. Conclusions

This paper has argued for strong principles and practices of peer review. This kind of review process is seen as a way of promoting reliable and agreed research outcomes, as judged by experts in the field. Peer review has its critics, and it is not guaranteed to provide sound results each and every time, yet it is the best that we have. There are many examples of challenges to review judgements, yet the consequences of failure are often profound and may be very public. It has been shown that the fact of peer review is not a guarantee of high standards of published research findings. There are differing standards of peer review, and there are limits on what it can achieve. However, it is helpful both in ensuring that rigorous work is published, and it helps in developing the field. As research intensifies in the design sector, expert review becomes ever more important.

The growth of digital means of production in its many forms has subverted traditional processes and forms of publication, and much research publication may be subject to little or no third party scrutiny. We have seen how the classic academic research journal, with its editorial policy and practices, may be seen as the finest form of gatekeeping in published research quality. It may be argued that in the design domain, the research journal takes its place in importance alongside other means such as exhibitions and conferences. There are distinct benefits and disbenefits attending all forms of dissemination. We have seen that best practices in one could influence practice in other forms of publication. Conferences cannot attain the same close attention to detail and iterative development expected in journal

papers, but have the benefit of more rapid turnaround of research in fast moving subjects, direct discussion with others, and other attributes such as the professionalising of early career researchers. One learned society has for some years been developing robust systems of review, and has published guidelines.

The exhibition, long a traditional means of demonstrating design outcomes, is a ready vehicle for research outcomes so long as attention is given to the requirement to demonstrate *research* in addition to the artefact. There is a small but growing interest in developments in research exhibitions with an attendant literature, though there are as yet few exemplars.

Excellence in peer review, and transparency of these processes to members of the design community, can percolate down to other means of publication such as online journals, websites, and web portals. The lack of control and third party validation in some areas of digital publishing calls into question the quality of some popular conference proceedings and related journals, as well as the role of the individual curator.

So, in summary, what are the principles that should be adopted for excellence in peer review and that may be applied commonly across all forms of research publication? The key points are:

1. Peer review must be taken seriously as an essential quality assurance issue.

2. Authors, exhibitors must have access to a clear and detailed editorial policy which defines its peer review process.

3. There must be a clear organisational structure for the review, including naming chairs or editors. It will be helpful if brief biographies can establish the status of organisers in the field.

4. There should be a clear purpose or focus.

5. Authors should be advised how to submit, when a decision might be expected, and any technical matters such as house style and referencing. The adoption of a style with published guidelines (such as Harvard, Chicago, APA etc.) is good practice.

6. The developmental aspects of the review process should be mentioned, for example what may be required to get a paper to publishable standard.

7. The type of review must be explained, that is: blind, double blind, and how it works in this context.

8. Consideration must be given to criteria for the selection of reviewers based on their expertise. Reviewers who perform poorly should be withdrawn irrespective of their status.

9. Reviewers must be given guidelines for what is expected of them in terms of judgement, for example that proposals are: appropriate to the publication; original; methodologically sound; follow appropriate ethical guidelines; have results which are clearly presented and support the conclusions; and that the proposal correctly references previous relevant work.

10. Reviewers should also be given clear advice about the requirement for adequate feedback to authors, as well as the benefit to authors of their advice on how to improve the work.

There is a need to encourage the evolution of expert peer review across all kinds of traditional and online publications, and transparency of editorial policies and processes. Authors should be more aware of the quality of publishing outlets by considering the principles set out here, and make sound judgements about the appropriateness of these outlets for the

dissemination of their work. Peer review, as a developing part of the emerging area of design research, should be taken seriously especially in those areas where it is not already pervasive and rigorous.

In the design sector, perhaps the most important aspect of review is the feedback that is given, especially that provided by experts to those who are less expert, including early career researchers. Such feedback should steer a careful path between being overtly critical and discouraging, and giving positive advice for improvement of the publication. In a developmental sense, in a relatively young research domain, sound advice given by peers with experience and stature is perhaps the most important contribution that peer review can make - that of helping us develop design research by harnessing experience and raising standards.

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