

Understanding and Supporting Anonymity Policies in Peer Review

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Abstract

Design of peer-review support systems is shaped by the policies that define and govern the process of peer review. An important component of these are policies that deal with anonymity: the rules that govern the concealment and transparency of information related to identities of the various stakeholders (authors, reviewers, editors, and others) involved in the peer-review process. Anonymity policies have been a subject of debate for several decades within scholarly communities. Because of wide-spread criticism of traditional peer-review processes, a variety of new peer-review processes have emerged that manage the trade-offs between disclosure and concealment of identities in different ways. Based on an analysis of policies and guidelines for authors and reviewers provided by publication venues we developed a framework for understanding how disclosure and concealment of identities is managed. We discuss the appropriate role of information technology and computer support for the peer-review process within that framework.

Keywords: peer review, referee, anonymity, human-computer interaction, research community

Introduction

Designing a peer-review process and a system to support it is an example of designing for adversarial collaboration, where stakeholders have conflicting goals. Each group of stakeholders would like to promote its own interests and in doing so stakeholders in a group strategically disclose information to or conceal it from other stakeholders (Cohen, Cash, & Muller, 2000). Often, publication venues design their peer-review process and the policies around it to better serve the goals of the system as a whole, while still being considerate of the different interests of the parties involved. Policy decisions could be affected by the power structure within a research community (Lipworth & Kerridge, 2011) and by the various goals that the publication venue tries to achieve, including earning a reputation for quality by attracting the best articles and the best reviewers. Usually the policies include rules for whether the identities of each type of stakeholder will be known to other stakeholders.

A traditional definition of anonymity is “the condition of not being identifiable to the other person” (Derlega & Chaikin, 1977, p. 109). However, absolute anonymity is rare in the context of peer review. During peer review it is common for members of research communities to be familiar with each other’s areas of research and approaches to research; hence, both reviewers and authors might be able to guess each other’s identities even when the identities are concealed. Anonymity is thus a relative term and might best be defined probabilistically, as the complement of the probability that an outsider will correctly identify the correct individual as the person of interest (Reiter & Rubin, 1999).

Studying anonymity policies is one lens through which we can understand the variety of peer-review processes in order to guide the design of future peer-review support systems. Identity management is one of the most important aspects of a peer-review process; indeed, the anonymity policies adopted for a peer-review process are commonly used to label that process. For example, processes may be referred to as *blind* (identities of reviewers are not known to authors), *double blind* (neither reviewers nor authors know each other’s identify), etc., depending on the type of anonymity policies implemented in the process.

We conducted a study of anonymity policies within peer-review processes to develop an understanding of the current landscape of how peer-review processes deal with anonymity. This landscape has changed significantly over the last few decades. In response to increasing criticisms of the traditional peer-review process, several publication venues have adopted non-traditional anonymity policies, some of which were enabled or facilitated by online peer-review support systems. The main questions addressed by our study are “What is the range of anonymity policies in peer review?” and “How can the design of peer-review support systems better support these policies?” After an initial review of the anonymity policies of 112 publication venues (including both journals and competitive conferences), we chose 25 for detailed analysis. We then used thematic analysis to gain a better understanding of the anonymity policies by identifying key themes. We present the resulting framework for characterizing anonymity policies in peer review, and we discuss the appropriate role for information technology and computer support in managing concealment and disclosure of identities during peer review.

Related work

We first summarize the findings of previous studies of anonymity in peer review, and then we briefly review studies of support for anonymity in online computer-mediated communication systems used in contexts other than peer review.

Anonymity in Peer Review

Numerous scholars have argued for or against concealing the identity of reviewers or authors and the discussions continue unabated even today. We review selected studies of anonymity management in the context of the peer review of manuscripts. Shatz offers a comprehensive analysis of arguments for and against anonymity of authors and reviewers for those who are interested in why the various management strategies might be used (2004).

Masking reviewers' identity.

Transparency can promote accountability, while anonymity can encourage frankness. Both accountability and frankness of reviewers are desirable. When there is a lack of transparency, abuse of

editorial power is difficult to detect. When such abuse or hints of it do occur, it is rarely publicized because of a fear of legal action (Altman, Chalmers, & Herxheimer, 1994; McCarty, 2002). If an ombudsman or other adjudicator intervenes, a significant percentage of appeals lead to the reversal of editorial decisions (Campanario, 1998; Simon, Bakanic, & McPhail, 1986). A survey of academic psychologists revealed that many have reported encountering as authors “strictly subjective preferences of the reviewers (76%), false criticisms (73%), inferior expertise (67%), concentration on trivia (60%), treatment by referees as inferior (43%), and careless reading by referees (40%)” (Bradley, 1981).

Walsh et al. (2000) found that signed reviews were more polite, of higher quality, and more likely to recommend acceptance, whereas van Rooyen et al. (1998) did not find any effect of signing reviews on their quality. Van Rooyen et al. also found that unmasking reviewers increased the chance of reviewers declining review requests (23% vs. 35%) and that most authors preferred knowing the identity of reviewers (55% in favor vs. 26% against). In a survey, Melero, and López-Santoveña (2001) found that 75% of reviewers were in favor of masking reviewers and 17% were against it.

Revealing the identity of reviewers might reduce some of the possible misbehaviors over the course of the peer-review process, such as editors requesting reviews from competing researchers or from researchers with conflicting stances, or delaying the publication of research that competes with a reviewers’ research (Campanario, 1998). However, these problems are probably inevitable in narrow research areas if only a few researchers are qualified to serve as reviewers (Riggs, 1995). According to Weicher’s review of the literature, anonymity of reviewers encourages candor, honesty and impartiality, and promotes freedom of expression; however, it also can protect reviewers from the consequences of their actions, hence it intensifies concerns about reviewer bias, negligence, favoritism, self-interest, enforcement of disciplinary orthodoxy, advancement of political agendas and hiding conflicts of interest (Weicher, 2008).

Masking authors’ identity.

Anonymity of authors may reduce reviewers’ biases, whereas revealing authors’ names may increase accountability for what authors submit, and may help reviewers communicate more effectively

based on a more accurate knowledge of authors' experience and background. Several studies have investigated the effects of anonymity of authors on the peer-review process.

Most previous studies found no effect of masking the identity of authors on review quality or on time spent writing reviews (Isenberg, Sanchez, & Zafran, 2009; Justice, Cho, Winker, Berlin, & Rennie, 1998; van Rooyen, Godlee, Evans, Black, & Smith, 1999; van Rooyen et al., 1998). One exception was a study by McNutt et al. (McNutt, Evans, Fletcher, & Fletcher, 1990) that found blind reviews (those in which reviewers do not know the identity of the authors) were of higher quality. However, several studies found that masking authors' identity affected recommendation scores (Godlee, Gale, & Martyn, 1998; Isenberg et al., 2009). In a retrospective study of reviews of anonymized manuscripts, Isenberg et al. (2009) found that reviewers gave lower recommendation scores when they had no idea who the authors were in comparison with when they suspected or knew the identities of authors. Similarly, in a controlled study, Blank found that anonymized papers received lower scores and were treated more critically (Blank, 1991). In contrast, in another controlled study, Godlee et al. (1998) found that anonymized papers were less likely to be rejected. Several studies found that when the identity of authors was not masked, reviewers favored authors from English-speaking countries and from prestigious institutions (Blank, 1991; Peters & Ceci, 1982; Ross et al., 2006). While such biases are easy to operationalize and study, the potential effects of other types of bias such as biases in favor of positive results (Mahoney, 1977) or of results that match the reviewers' stance (Abramowitz, Gomes, & Abramowitz, 1975) or of results that corroborate previous work (Ernst & Resch, 1994) are largely unknown.

Requiring anonymity does not guarantee anonymity. In a study of submissions to two radiology journals, editors found that 34% of the submissions contained information that could help reveal the identity of authors, such as authors' initials, references to work "in press," and references identified within the text as the authors' previous work (Katz, Proto, & Olmsted, 2002). In 74% of those cases the editors were able to successfully identify the authors. In another study, editors were able to identify authors of over 45% of anonymous submissions, while wrongly believing to have identified another 5%

(Blank, 1991). Mulligan et al. (2012) found that despite the difficulties in implementing double-blind peer review, 76% of researchers consider it to be effective.

Public disclosure of reviews.

Public disclosure of reviews has moved into the spotlight over the last decade. Van Rooyen et al. (2010) found that telling reviewers that their signed reviews might be published (on the web) did not affect the quality of reviews, but it increased the time spent on composing reviews. Bornmann and Daniel (2010) analyzed public reviews submitted to the journal *Atmospheric Physics and Chemistry* and found that the level of inter-reviewer reliability was low, comparable to that of traditional peer-review processes. Bingham et al. (1998) found that post-publication reviews by online readers can provide valuable feedback, but those reviews are often short and specific, and thus do not adequately replace full editorial peer review. The journal *Nature* found similar results and received little interest in this type of review from either authors or reviewers; only 5% of papers were made available by their authors for open review (sometimes for fear of being scooped or of compromising patent applications) and only 54% of those received any comments, most of which were not of editorial value (“Nature’s trial of open peer review,” 2006).

Lastly, Lee et al (2013) and Weller (2001) offered critiques of the incomplete picture painted by the studies of bias in peer review and the observational nature of most of these studies and called for randomized controlled experiments that might help tease out biases more reliably. Lee et al (2013) also questioned the assumption that social influences of peer review are necessarily detrimental to science. See Campanario (1998), Lee et al (2013), and Shatz (2004) for a more comprehensive review of studies of, and perspectives on, bias in peer review.

The numerous studies of anonymity in peer review look at perception of various anonymity settings and individuals’ behavior in them. To our knowledge, our study is the first to provide a comprehensive overview of anonymity policies used by multiple publication venues across disciplines.

Anonymity in online communities

Numerous studies have looked at effects of anonymity in online communities and computer-mediated interactions. In this section we present a brief overview of those studies.

In a study of an online community of soldiers, Kilner and Hoadley found that removing anonymity options decreased antisocial comments, but that the community was divided in attitudes toward offering anonymity options (Kilner & Hoadley, 2005). Several other studies have similarly found that anonymity could facilitate violation of social norms (Millen & Patterson, 2003; Postmes, Spears, & Lea, 1998; Siegel, Dubrovsky, Kiesler, & McGuire, 1986; Vrooman, 2002). Diakoupoulos and Naaman (2011) studied the quality of comments on online news, and found that editors felt anonymity of comments was an important cause of low quality comments; however, about 40% of commenters thought they would not have commented if their real names were associated with the comments. Other studies found that “flaming” (expressing inflammatory opinions to others) is a more severe challenge in anonymous interactions (Siegel et al., 1986; Vrooman, 2002). Similarly, antisocial behavior in online games has been found to be associated with anonymity (Chen, Duh, & Ng, 2009). On the other hand, anonymity is found to encourage self-disclosure and honesty (Bargh, McKenna, & Fitzsimons, 2002). Kang et al. (2013) interviewed users who had experienced anonymity online and identified several pros and cons for anonymity. Some of the benefits to individuals of anonymity that were found in the study were avoiding embarrassment, feeling comfortable, honesty, having control over personal image, and freedom. In contrast, some of the benefits of being identified were reputation building, stronger connections, feeling real, and avoiding irresponsible behavior. Based on previous research, Stuart et al. (2012) proposed a framework that characterizes the effects of transparency of identities, contents, and interactions. They concluded that requiring users to disclose their identities leads to higher information accuracy (due to increased accountability and desire for building reputation) and lower creativity (due to increased conformity).

Anonymity policies are imposed to reconcile various concerns of different parties. These concerns are context-specific; we therefore decided to conduct a study of anonymity policies in the

context of peer review policies to shed light on how various communities balance concerns through such policies.

Methods

We used thematic analysis (Braun & Clarke, 2006) to study anonymity policies in the peer-review processes of various publication venues. In this section we describe details of our data collection and data analysis methods. Results are presented in the next section.

Data collection

We were interested in understanding the range of anonymity policies used in peer review, so we used a purposive sampling method, Maximum Variation sampling (Patton, 1990, p. 169; Teddlie & Yu, 2007). We first briefly reviewed 120 different journals and conferences across a number of fields and selected 25 of them that we felt offered the most diversity for further analysis. The initial list of 120 publication venues was collected based on mention in the literature of their novel peer-review processes, an online search for alternative peer-review policies, and lists of the top five journals based on impact factors in various disciplines spanning natural, formal, and social sciences including medicine, biology, math, physics, chemistry, psychology, neuroscience, cognitive science, business, economics, law, history, and sociology. Appendix A has a complete list. Because conferences are often primary publication venues in computer science, we also included the top 20 conferences in computer science based on Microsoft Academic Search Field Ratings. We used three key characteristics for constructing our sample for detailed analysis: use of unconventional anonymity policies (policies other than single blind or double blind), use of unconventional ways of implementing a policy, and the presence of a detailed justification or description of the anonymity policies. We used a combination of these criteria to choose a diverse sample that includes deviant cases. We decided that saturation had been reached after choosing 25 venues. Our corpus included guidelines and instructions by editors or program committee chairs that were publicly available on the Internet. We included in the corpus reports and clarifications that were published by program chairs or editors in the form of online documents or blog posts that detailed some of the

policies of the venues under investigation, where available. Table 1 shows the list of the publication venues we selected.

Table 1. Publication venues selected for thematic analysis of anonymity policies

Publication Venue	Short name
Atmospheric Chemistry and Physics	<i>ACP</i>
alt.chi (a submission track in the ACM SIGCHI Conference on Human Factors in Computing Systems)	<i>alt.chi</i>
Behavioral and Brain Sciences	<i>BBS</i>
Biology Direct	<i>Bio Direct</i>
British Medical Journal	<i>BMJ</i>
British Medical Journal Open	<i>BMJ Open</i>
Bulletin of the Seismological Society of America	<i>BSSA</i>
Computer Communication Review	<i>CCR</i>
Cochrane Reviews	<i>Cochrane</i>
European Molecular Biology Organization (EMBO) Journal	<i>EMBO</i>
Faculty of 1000	<i>F1000</i>
Frontiers	<i>Frontiers</i>
GigaScience	<i>GigaScience</i>
Harvard Law review	<i>Harvard LR</i>
International Conference on Computer Vision	<i>ICCV</i>
International Conference on Software Engineering	<i>ICSE</i>
International Joint Conference on Artificial Intelligence	<i>IJCAI</i>
IEEE Information Visualization	<i>InfoVis</i>
Leonardo	<i>Leonardo</i>
Neuron	<i>Neuron</i>
Neural Information Processing Systems	<i>NIPS</i>
PeerJ	<i>PeerJ</i>
PLOS Biology	<i>PLOS Bio</i>
PLOS Medicine	<i>PLOS Med</i>
Stanford Law review	<i>Stanford LR</i>

Data analysis

The thematic analysis approach described by Braun and Clarke (2006) was the foundation for our analysis to provide a detailed account of anonymity of authors and reviewers. The goal of our analysis was to develop our understanding of the ongoing evolution of anonymity policies deployed in peer review. We identified themes using an inductive ‘bottom up’ method, primarily focusing on extracting semantic

(as opposed to latent) themes for the corpus. We selected publication venues on the basis of capturing a diversity of practices, not to provide a balanced representation of the space of journals and conferences. For this reason, the repetition count of deployment of policies is not informative and thus no quantitative data is reported.

Findings

The five main themes identified in the corpus of anonymity policies are summarized in Table 2. They correspond to various aspects of behavior or identity of individuals that could be concealed or disclosed. The themes shared two primary dimensions: timing of the disclosure/concealment, and level of enforcement of the disclosure/concealment. These dimensions are described after the overview of the aspects of identity that we uncovered in our study.

Table 2. Summary of themes and common dimensions of anonymity policies

Themes	Description
1. Names	Disclosure/concealment of who the reviewers, editors, and authors are.
2. Relationships and conflict of interest	Disclosure/concealment of relationships and connections between authors and reviewers and editors involved, as well as between them and the research that is conducted and is being reviewed.
3. Contributions and roles	Disclosure/concealment of roles and contributions of authors and other contributors
4. Reviews, decisions, and other communications	Disclosure/ concealment of contents of reviews, discussions about submissions, and the other communications that occur as part of the decision making process
5. Reviewers' performance	Disclosure/concealment of assessments of quality, timeliness, and other aspects of reviewers' performance)
Common Dimensions	Description
1. Level of enforcement	How a disclosure/concealment policy is implemented and communicated to the parties involved.
2. Temporality	Temporal aspects (or schedule) of disclosure and concealment of information regulated by anonymity policies

Theme 1: Names

Almost all peer-review processes have policies that address the way they handle names of authors and reviewers during the process. ACP, BBS, and Frontiers use multi-phase peer-review processes, where the first phase follows traditional blind peer reviewing and the second phase uses a more open discussion forum. ACP allows both anonymous and named comments by reviewers. BBS's post-publication commentaries include the names of reviewers and are treated as publications. Frontiers allows close collaboration between authors and reviewers in a discussion forum for achieving a decision on a manuscript; however, it does not disclose the identity of reviewers until after acceptance of the manuscript. Several venues disclose identity of reviewers to authors (e.g., BMJ, BMJ Open, Bio Direct, alt.chi, F1000), and sometimes to the general public after the completion of the peer-review process (e.g., BMJ Open, F1000, alt.chi, Bio Direct, Frontiers).

Some venues had distinct policies about identities of editors and program committee members. For example, the PLOS Bio policy states that "*Academic Editors retain anonymity unless a paper is accepted for publication. The name of the Academic Editor is noted on each published paper.*" Cochrane's policy is more complex involving both identified and anonymous editors. "*Two editors, one with primary responsibility for supporting the authors and one anonymous, provide ongoing support and peer review.*"

Most double-blind venues such as NIPS emphasize anonymity of authors to reviewers but not to program committee members. The NIPS policy states that "*area chairs do know the author identities, to avoid accidental conflicts of interest and to help determine novelty.*" Similarly, the InfoVis policy states that "*When submitting your paper you will be asked to provide a complete list of authors even when submitting an anonymized version of the manuscript. This is required to avoid potential conflicts of interest when assigning reviewers.*" However, IJCAI and ICCV are two conferences that conceal the identity of authors even from area chairs (equivalent to associate editors in journals). As mentioned in our review of the literature, the effectiveness of concealing authors' identity is limited. This problem has been exacerbated due to traces that people leave behind on the Internet. For example, according to ICCV,

publication of technical reports on Arxiv.org, or on institutional repositories is not a violation of anonymity. To alleviate this problem, ICCV and NIPS discourage or prohibit reviewers from searching the Internet to discover the identity of authors.

Concealing the identities of program committee members from the authors of papers that are managed by the program committee members could be challenging if the authors (or those who are in conflict) are committee members as well, because they often attend in person face-to-face program committee meetings where they might sit next to each other. Sometimes program committee chairs (e.g. at ICSE) assign seats so that each program committee member is not sitting next to those who are in conflict with the papers managed by them. This could be done manually or with the help of constraint-satisfaction software. Some publication venues use online program committee discussion boards to replace or complement physical program committee meetings.

In our sample, ICSE was a conference that recently changed from having a single-tier reviewing process (a committee but no use of external reviewers) to a two-tier model (a higher-level committee that shepherds the process and makes the final decisions, and external reviewers who each review one or more papers). An online discussion board is used to reach consensus among reviewers for each paper. A face-to-face physical meeting of the higher-level committee finalizes decisions. The online discussions were not anonymous, as had been the case for the face-to-face committee discussions in the earlier single-tier process. The program co-chairs for the ICSE 2014 conference, in the report they published of experiences with the online discussion board (Briand & van der Hoek, 2014), mentioned that “*Some ‘power games’ took place among reviewers and we should consider keeping reviewers anonymous.*” In this case, the move away from a single-tier process that involved a physical program committee meeting to a two-tier process in which initial decisions were made online, without face-to-face physical meetings, introduced behavior that worried the program co-chairs. The program co-chairs suggested that making the online discussion board anonymous might inhibit the worrisome behavior. This type of anonymity is not an option in physical committee meetings, but it may not be necessary there because of the social norms in face-to-face meetings that might not be present in online discussion boards.

None of the venues that we analyzed allowed anonymity of authors after publication, except for Harvard LR that imposed anonymity on their student authors because “*many members of [Harvard LR], besides the author, make a contribution to each published piece.*” Identity of other authors does appear on non-student articles in Harvard LR.

Some venues have policies that require disclosure of biographical information or resumes for authors. For example, Stanford LR provides a field in their submission form for uploading authors’ resumes.

Theme 2: Relationships and conflict of interest

Most publication venues have policies governing disclosure of relationships between authors and reviewers, or between authors and their research. The alt.chi peer-review system asks reviewers to sign an agreement that includes “*As reviewer, I agree to provide full information on my relationship to the authors of each submission I review, as well as any other information that may influence my objectivity.*” For 2007, alt.chi disclosed the competing interests of reviewers publicly. While reviewers are expected to decline reviewing if there is a conflict of interest, ICCV uses the DBLP Computer Science Bibliography System to automatically identify authors’ and reviewers’ collaborators within the past 3 years to better manage conflicts of interest. In addition, ICCV uses Microsoft’s Conference Management Toolkit that identifies conflicts of interest by matching the “*domains of the academic department or institution where [authors and reviewers] currently work or study.*”

Several journals ask for disclosure of conflicts of interest by authors. For example, F1000 warns that the competing interests of authors will be disclosed publicly. “*All financial, personal, or professional competing interests for any of the authors that could be construed to unduly influence the content of the article must be disclosed and will be displayed alongside the article.*” Publication venues sometimes delimit which relationships need to be disclosed. For example Neuron wrote that “*financial benefit exceeding \$10,000 p.a. or 5% ownership of a company or research funding by a company with related interests would constitute a conflict that must be declared.*” GigaScience asks authors “*Are there any non-financial competing interests (political, personal, religious, ideological, academic, intellectual,*

commercial or any other) to declare in relation to this manuscript?” This definition takes into account intellectual and academic conflicts. This is important because paradigm conflicts or conflicting research agendas reflected in manuscripts are discussed as a source of bias in the literature (Abramowitz et al., 1975). GigaScience also asks for disclosure of “*any non-financial competing interests that may cause them [authors] embarrassment were they to become public after the publication of the manuscript.*”

As mentioned in the examples of NIPS and InfoVis in the previous section, disclosing identities of authors to editors or program committee members for processes in which authors are anonymous is argued to be necessary for the purpose of identifying conflict-of-interest issues. Use of processes where reviewers’ names and their relationships with authors are publicly visible (e.g. alt.chi 2007) could be more effective, because it allows the research community to verify that full disclosure has taken place and to read the reviews and the papers in light of the disclosure(s).

Theme 3: Contributions and roles

Another aspect of identity is the role of the people and organizations involved in a research project. The F1000 policy state that “*individual contributions of each author to the manuscript should be detailed.*” PLOS Bio, F1000, and GigaScience ask for disclosure of identities of all those who contributed to a submission. For example, the PLOS Bio policy states that “*People who contributed to the work, but do not fit the criteria for authors should be listed in the Acknowledgments, along with their contributions. You must also ensure that anyone named in the acknowledgments agrees to being so named.*”

Interestingly, the two parts of the policy (inclusiveness and consent) could be in conflict; however PLOS Bio appears to put more emphasis on consent rather than inclusiveness (“*must*” vs. “*should*”). In contrast, NIPS asks for concealment of any acknowledgments until a paper is accepted for publication to preserve the anonymity of authors.

Regarding the role of research sponsors, BMJ asks for disclosure of “*the role of the study sponsor(s) or funder(s), if any, in study design; in the collection, analysis, and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.*” In addition to asking

for acknowledgment of the funding agency that has supported the research under review, F1000 asks authors to declare which specific grant has supported the work and who is responsible for the grant.

Theme 4: Reviews, decisions, and other communications

What happens during the peer-review process is sometimes disclosed to authors or to the general public. Sometimes only aggregate information is disclosed. For example, the preface to the proceedings of IJCAI 2011 mentions that the conference “*received 1,325 papers in total, and accepted 400 papers (30.2 percent), 227 for oral and poster presentation (17.1 percent) and 173 for just poster presentation (13.1 percent)... Each paper received at least three reviews from the Program Committee. Where issues remained, additional reviews were commissioned. One paper (which was eventually accepted) received a record of six reviews.*” In contrast, sometimes the process that each individual submission has gone through is disclosed. PeerJ, EMBO, BMJ Open, ACP, and alt.chi all provide a complete record of communications during the peer-review process. For example, BMJ Open publishes “*all previous versions of the manuscript [and] the reviewers’ comments and authors’ replies to those comments.*”

BMJ asks authors to provide copies of previous reviews if a manuscript has been initially submitted to another journal. Publishers such as Cell press, EMBO, and BioMed Central allow authors to transfer the reviews they receive from one of their journals to their other journals. Neuron discloses reviews to other reviewers of a manuscript; alt.chi, BMJ Open, EMBO, and ACP disclose the reviews to the general public. The NIPS conference publishes anonymous reviews. CCR, instead of disclosing the original reviews, publishes a “*public review*” that points out “*the contributions and interesting aspects of the paper, mentioning perceived shortcomings.*” BMJ occasionally publishes commentaries to “*help readers interpret the research or place it in context.*” In addition, BMJ publishes rapid responses to publications and then archives them on the BMJ website. BBS invites commentaries and, if accepted, treats them as archival publications. The journal Frontiers also accepts commentaries and reviews them before publication. Some journals such as BMJ Open, PLOS Med, PLOS Bio, and PeerJ allow readers to add informal comments on publications. In contrast, Stanford LR “*will never reveal their review to the authors*” to ensure anonymity of reviewers.

Confidentiality of communications during peer review is not limited to the reviews and contents of a paper. For example, the PLOS Bio policy states that “*we regularly confer with potential reviewers before sending them manuscripts to review. [...] even these initial messages or conversations contain confidential information which should be regarded as such.*” Even though BMJ discloses identities of authors and reviewers to each other, its policy nevertheless states that “*all queries should still be directed through the editorial office,*” perhaps to ensure that all the communications are disclosed to the editorial office. Neuron mentions that some communications between reviewers and editors can be concealed from authors. “*If some specific aspects of the report seem inappropriate for presentation to the authors, they can be sent as comments for the editors’ eyes only.*” In contrast, the EMBO policy states that “*To further facilitate transparency, The EMBO Journal has removed the ‘Confidential Comments’ field from our referee reporting forms*”, but EMBO still allows for sending confidential emails to the editor to communicate concerns about ethical violations.

Theme 5: Reviewers’ performance

As discussed in the previous section, venues such as PeerJ, EMBO, BMJ Open, alt.chi, and ACP publish reviews with the reviewers’ names. These records could be considered one form of record of a reviewer’s performance; however, the full content of a review is not required for recording an assessment of the performance of a reviewer. In a guide for program committee chairs, Alan Bundy, program chair of IJCAI 1983, mentioned recording of information about late reviews by IJCAI chairs (Bundy, 1983), before the advent of electronic peer-review support systems that have significantly facilitated such record keeping. In an editorial note by four editors of computer science journals, they warn about the consequences of more elaborate record keeping. “*Electronic manuscript systems easily provide time data for reviewers and some offer rating scales and note fields for editors to evaluate review quality. Many of us (editors) are beginning to use these capabilities and, over time, we will be able to have systematic and persistent reviewer quality data. Graduate students, faculty, chairs, and deans should be aware that these data are held*” (Marchionini et al., 2007). While basic review assessment mechanisms are offered by some peer-review support systems (see Figure 1), BSSA was the only venue that we found encouraging

use of those features, stating that rating reviewers “*is an important step that will help us identify reviewers who regularly do a poor job so they can be avoided in the future.*” Surprisingly, BSSA explained how to rate reviewers in instructions for associate chairs, but not in the instructions for reviewers.

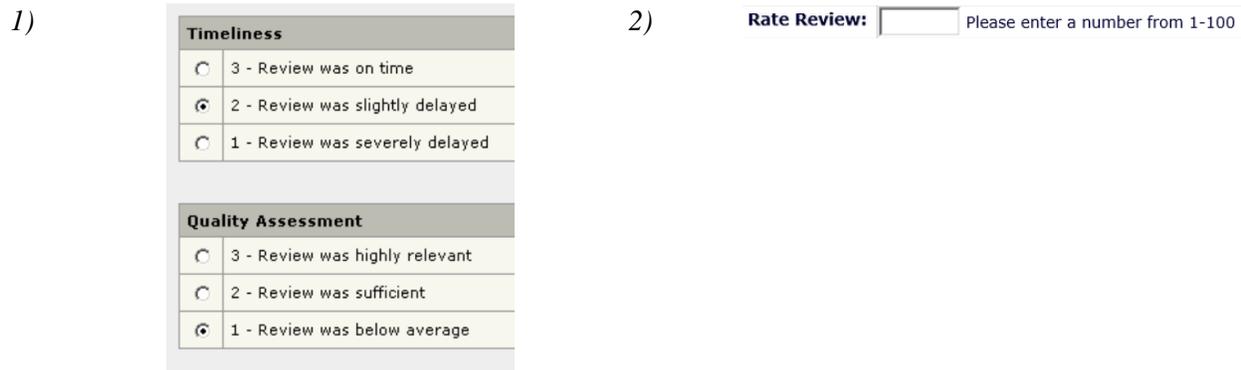


Figure 1. Interfaces for eliciting reviewer performance: 1. ScholarOne, 2. EditorialManager

Another form of disclosure of reviewers’ performance is the awards given to best reviewers (“Outstanding referees program,” 2013). For example, NIPS gives “*up to 100 Reviewer Awards to reward high quality reviews.*” While many publication venues focus on the positive side of the spectrum to avoid potential defamation claims, one could argue that being in a community that offers such awards and not winning any awards after years of participation could signal poor performance.

Properties of disclosure/concealment related to all five themes

Each disclosure/concealment policy identifies the information that is disclosed or concealed, as well as the individuals or groups to/from whom the information will be disclosed/concealed. We tabulated these to gain insights into the range of policies that exist. In addition, we identified two properties of those policies: level of enforcement of policy, and temporality of the disclosure/concealment.

Level of enforcement of policy.

Not every disclosure/concealment request must be fulfilled. Policies ranged from being agnostic about disclosure/concealment, to various shades of encouragement, to coercion and threats of punishment. Even if a venue is agnostic about concealment of a piece of information it might clearly state that to avoid

confusion. For example, InfoVis is agnostic about concealing the identity of authors. *“The choice of complete anonymity is optional. Authors can reveal their names and affiliations in the first round of the review cycle if they choose not to anonymize their work.”* BSSA offers similar instructions regarding anonymity of reviewers, stating that *“If you choose to waive anonymity, please include your name in the ‘Reviewer Blind Comments to the Author.’”* Regardless of reviewers’ choice of anonymity, BSSA removes identification information from documents submitted by reviewers to avoid unintended disclosure of their identities. *“The online system removes identifying information from Microsoft Office files including Word, Excel, and PowerPoint files as well as Adobe PDF files.”* Stanford LR provides a field in their submission form for uploading authors’ resumes, but mentions that *“Resumes and biographical information are not required,”* without expressing any preference.

Often publication venues take a stance regarding the disclosure/concealment of information. An example of encouragement for adoption of a practice is how PeerJ approaches concealment of the identity of reviewers. *“Peer reviewers are encouraged (but not required) to provide their names to the authors when submitting their peer review.”* In addition, PeerJ mentions the benefit of adhering to such practice. *“If they agree to provide their name, then their personal profile page will reflect a public acknowledgement that they performed a review (even if the article is rejected).”* NIPS encourages reviewers not to try to discover authors’ identity. *“[B]y searching the Internet, a reviewer may discover (or think he/she may have discovered) the identity of an author. We encourage you not to actively attempt to discover the identities of the authors.”* In contrast, ICCV explicitly mandates against the behavior. *“Reviewers must not seek the identity of the authors; authors must not bias the review process by suggesting their identities.”*

Another way that venues communicate their preference is by setting a default practice, while offering a choice to opt out. For example the GigaScience policy states that *“As a default, we will pass a reviewer’s name on to the authors along with the comments. However, if reviewers do not wish to have their name revealed, we will honor that request.”* The default mode of treating reviewers’ identity is the reverse in PLOS Bio and Leonardo. For example, the PLOS Bio policy states that *“Unless reviewers have*

explicitly requested to be made known, we do not release their names either to authors or to other reviewers of the manuscript.” Sometimes, venues ask for best effort anonymity. For example, ICCV asks reviewers to *“make all efforts to keep their identity invisible to the authors. Don’t say, ‘you should have cited my paper from 2006!’”*

Some practices are required, and are enforced by venues. The BMJ policy states that *“reviewers have to sign their reports, saying briefly who they are and where they work.”* Some venues go further and threaten with punishments, especially when it is difficult to validate whether a policy is fully adhered to. For example, the PLOS Bio policy states that *“Failure to declare competing interests at submission [...] may result in immediate rejection of the paper. If a competing interest comes to light after publication PLOS journal will issue a formal correction or retraction of the whole paper, as appropriate.”* NIPS warns that it refuses to review papers that do not properly conceal the identity of authors.

Preserving anonymity of just a single party could require cooperation of multiple parties. For example, enforcement of anonymity of authors often requires the cooperation of reviewers as well. NIPS writes *“We encourage [reviewers] not to actively attempt to discover the identities of the authors [...] if you believe that you have discovered the identity of the author, we ask that you explain how and why...”*

Temporality of concealment/disclosure.

Another important parameter that defines a policy is its dynamic or temporal aspect. Anonymity can change in various stages of a process. For example, in processes that mask the identity of authors during review but not after publication, if a paper is accepted the reviewers (in fact everyone) will eventually know the identity of authors. At PLOS Bio anonymity of the identity of editors (but not reviewers) is not permanent. *“Academic Editors retain anonymity unless a paper is accepted for publication.”* NIPS 2013 only publishes reviews depending on the fate of the paper. *“Anonymous reviews of accepted papers will be made public.”*

In summary, each anonymity policy involves an aspect of identity (name, role, relationship, communication, performance) that is governed (disclosed or concealed) by the policy, a group that is blinded (or not) to that aspect of identity, a level of enforcement of the policy, and temporal properties

governing when the policy is in effect. In addition, policies can differ in how they are communicated, how they are implemented, and who makes the disclosure/concealment decision when a policy is flexible or indeterminate. While it is difficult to represent all the differences between anonymity policies, Table 3 summarizes some of the key differences between publication venues. Based on these key attributes, a peer-review process can be represented as shown in Table 4 using a table that summarizes the information that each group of stakeholders sees, in some cases at the different stages of the peer-review process.

Table 3. Summary of practices around concealment of identities. In several cases the venues did not state some aspects of their practices. In these cases we assumed that they use the most common practice. Referee refers to the primary decision makers (Associate editors in most journals, and program committee members in most conferences)

Public’s view after the peer-review process				
	Authors’ identity	Reviews	Reviewers’ Identity	Referees’ Identity
Disclosed	Many	NIPS, EMBO, BMJ Open, F1000, alt.chi, Bio Direct, ACP	BMJ Open, F1000, alt.chi, Bio Direct, Frontiers	PLOS Med, PLOS Bio, ACP, alt.chi
Preferably disclosed		EMBO, PeerJ	PeerJ, GigaScience	PeerJ
Agnostic or both ways			ACP	
Preferably concealed				
Concealed	Harvard LR (Student papers)	Many	Many	Many
Author’s view during the peer-review process				
	Other authors’ identity	Reviews	Reviewers’ Identity	Referees’ Identity
Disclosed	F1000, alt.chi, Cochrane, ACP,	Many	BMJ, BMJ Open, Bio Direct, alt.chi, F1000	Many
Preferably disclosed			PLOS Med, PeerJ, GigaScience	
Agnostic or both ways		Leonardo	ACP, BSSA	Cochrane
Preferably concealed			PLOS Bio, Leonardo	
Concealed	Many	Stanford LR, Harvard LR	Many	Many
Reviewer’s view during the peer-review process				
	Authors’ identity	Other reviews	Reviewers’ Identity	Referees’ Identity
Disclosed	Many	IJCAI, alt.chi, F1000, NIPS, ACP, Neuron	IJCAI, alt.chi, F1000, ICSE	Many
Preferably disclosed				
Agnostic or both ways	InfoVis		ACP	
Preferably concealed			PLOS Bio	
Concealed	Many	Many	Many	
AE/PC’s view during the peer-review process				
	Authors’ identity	Reviews	Reviewers’ Identity	Other Referees’ Identity

Disclosed	Many	Many	Many	Many
Preferably disclosed				
Agnostic or both ways				
Preferably concealed				
Concealed	IJCAI, ICCV			

Table 4. Examples of tabular views representing three peer-review processes that differ based on anonymity policies about the visibility of reviews, authors, reviewers, and referees as described in Table 3.

alt. chi	Visibility of Authors ID	Visibility of Reviews	Visibility of Reviewers ID	Visibility of Referees ID
Public View	✓	✓	✓	✗
Author View	✓	✓	✓	✗
Reviewer View	✓	✓	✓	✗
Referee View	✓	✓	✓	✓

PeerJ	Visibility of Authors ID	Visibility of Reviews	Visibility of Reviewers ID	Visibility of Referees ID
Public View	✗	~✓	~✓	✓
Author View	✗	✓	~✓	✓
Reviewer View	✓	✓	✓	✓
Referee View	✓	✓	✓	✓

Stanford LR	Visibility of Authors ID	Visibility of Reviews	Visibility of Reviewers ID	Visibility of Referees ID
Public View	✗	✗	✗	✗
Author View	✗	✗	✗	✗
Reviewer View	✗	✗	✗	✓
Referee View	✓	✓	✓	✓

Key	
Disclosed	✓
Preferably disclosed	~✓
No preference	~
Preferably concealed	~✗
Concealed	✗

Policies on disclosure of relationships, contributions, and roles are perhaps not the most critical policies in shaping a peer-review process, so we have not included them in our shorthand representations of anonymity policies in peer review (Tables 3 and 4). Nevertheless, regulation of disclosure or concealment of such information is closely related to regulation of disclosure or concealment of identities. For example, one reason for disclosing identity of authors to editors or program committee members is to ensure that those with a conflict of interest are not assigned as reviewers. Also disclosure of acknowledgments and the role of those acknowledged could affect anonymity and introduce biases. All of these disclosures and concealments define the level of transparency required from authors, reviewers, and other participants in the process. Due to the interconnected nature of these notions and policies, we decided to include them as aspects of identity in our analysis.

Discussion and recommendations for design

We found substantial diversity in how identities are treated in various peer-review processes. In this section we review how computer support for peer review has affected and can continue to affect anonymity policies and their implementation. In addition, we discuss some of the implications of our findings for future research on peer review and systems that support it.

Technology and anonymity

We found several direct and indirect references to how technology affects anonymity practices. We also used our findings as a basis to further reflect on how digital publishing and computer-supported peer review can affect anonymity policies, so this section is an opportunity to extrapolate and envision potential future ways of supporting anonymity and transparency that arise from thinking about solutions to issues in our findings that can be generalized to situations related to anonymity.

How computer support affects anonymity.

As discussed in the review of the literature, the effectiveness of masking authors' and reviewers' identity is questionable. Technology currently in use by researchers can challenge the desire of publication venues for anonymity of authors, reviewers, or other stakeholders. For example, people intentionally or unintentionally leave traces of what they do on the Internet, so a double-blind venue such as NIPS can only "*encourage you not to actively attempt to discover the identities of the authors*". In addition, authors and reviewers may leave traces that are generated automatically in documents that they submit, sometimes in the form of document properties or metadata. As pointed out by BSSA, some peer-review support systems alleviate the problem by removing such metadata. However, various types of digital footprint on the Internet, outside the peer-review support system, could affect anonymity. For example, many researchers make available their publications on their personal websites, some of which track visitors so reviewers accessing those publications would be known to authors, who might then guess about who the reviewers might be for new submissions. As found by Rainie et al., while most Internet users are aware of these digital footprints, it is difficult not to leave such traces behind (Rainie et al., 2013).

It has been shown that it is possible to identify with high certainty the authors of a given paper using various features of manuscripts such as use of language (Basu Roy, 2013; Nanavati, Taylor, Aiello, & Warfield, 2011). In research communities that employ both blind and open reviewing, a corpus of open reviews can be used to train algorithms for identifying writers of anonymous reviews.

On the positive side, automation can help decrease the number of individuals that need to know the identity of authors, hence enabling increased anonymity. Instead of relying on manual work and knowledge of editors and program committees for reviewer assignment and handling conflict of interest, several venues now automate (often only partially) the reviewer assignment process by asking reviewers to enter their preferences, or by identifying their expertise based on their publications tracked by online bibliography systems. Such automation, in conjunction with automatic detection of conflicts of interest, allows publication venues to conceal the identity of authors from program committee members and editors but still make appropriate reviewing assignments.

Currently some publication venues such as law reviews avoid giving reviewer reports to authors to ensure that authors cannot identify reviewers based on their use of language. Computer support can alleviate this fear by enabling collaborative composition of reviews (e.g., in wiki-like interfaces) to decrease the chance of identifying individual reviewers, or by adding a post-processing (automatic, or manual with the help of crowd-powered systems (Bernstein et al., 2010)) to reword reviews.

Automatic tracking of some aspects of reviewers' performance (e.g., timeliness, rate of declining reviews), and allowing for assessment of reviewers by commenting on or rating their reviews could offer more transparency into reviewers' behavior. While some peer-review support systems offer these functionalities, they seem to be rarely used in practice. As we mentioned in our findings, sometimes research communities rely on secretive approaches such as maintaining blacklists of reviewers. This could be an area where lack of transparency could lead to abuse of power. In one case we observed that policies related to assessment of reviewers were clearly communicated to editors, but not to reviewers. We recommend designing peer-review support systems to always provide mutual awareness of activities, which has been referred to as social translucence (Erickson & Kellogg, 2000; McDonald, Gokhman, &

Zachry, 2012). Specifically, we recommend designing peer-review support systems that allow authors and reviewers to know what is being recorded about them and who is able to see the recorded information. Such systems can raise awareness of how a process is run, without necessarily disclosing identities of those involved. In addition, we think that investigating ways of recording reviewers' performance that balance concerns for defamation and liability with concerns for the effectiveness of the peer-review process is an important avenue for future research.

Support for flexible policies and negotiation.

One important trend that we identified is the rise of publication venues that allow for flexible self-administered policies. These venues empower authors or reviewers to decide whether or not to disclose their identities during the process. This is an important trend, because many of the concerns about peer-review processes do not apply to all situations. For example, if a less-experienced reviewer fears the repercussions of criticizing a senior author, allowing them to opt out of the default disclosure of their identity could solve the problem without requiring everyone else to conceal their identities. A reviewer may instead feel that the authors' knowledge of her identity will facilitate communication and trust. There are other situations in which authors may feel their reputation (or lack thereof) will be used against them. Each of these situations could raise concerns about fairness that need to be addressed through appropriate decision processes that include communication between the affected parties, rather than solely being based on one party's decision.

The need for flexibility in management of roles, privacy, and permissions in computer-supported cooperative work (CSCW) systems has been discussed at length in the CSCW literature (Dourish & Anderson, 2006; Stevens & Wulf, 2002). Dourish and Anderson (2006) suggests looking at privacy as a process of negotiating boundaries rather than a set of predefined rules. We suggest adopting this view in the management of identities for peer-review support systems. Current interfaces for supporting peer review use lists of permissions or a traditional access-control matrix of subjects, objects, and operations (Lampson, 1974) for representing and managing permissions (Figure 2). We think peer-review support

systems need to enable implementation of flexible anonymity policies by supporting the negotiation of identity disclosure by reviewers, authors, and editors on a case-by-case basis when appropriate.

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1. View Other Reviewer's Comments to Author
 View Other Reviewer's Comments to Editor
 View Author's Response to Reviewer Comments
2. Hide author names from primary reviewers [info](#)
Hide author names from secondary reviewers [info](#)
Hide author names from external reviewers [info](#)
Hide reviewer names from co-reviewers [info](#)
Include reviewer type in reviews [info](#)
Highlight chair conflicts [info](#)

Figure 1. Interfaces for managing anonymity: 1. Editorial Manager 2. Precision Conference System

Digital publishing can allow temporary anonymity. For example, it is possible to allow reviewers to decide to disclose their identities or reviews after a cooling-off period, similar to declassification of old once-secret documents by governments. This would help create more complete records in future digital libraries of scientific progress and of the contributions of individuals, while preserving anonymity in the process when it matters the most, which is the present.

Implication for communities and future research

Despite the wide variety of anonymity policies that we observed, some potential variations appear to be missing. For example, we found no publication venue that conceals authors' identity but discloses reviewers' identity. As discussed earlier, concealing the identity of authors could suppress potential biases, and disclosing reviewers' identity could encourage accountability. While there are downsides to this proposed policy as there are to any other anonymity policy (as discussed in our review of the literature), we recommend experimenting with this approach to expand our understanding of the effects of anonymity policies and of interactions between policies.

As noted in our review of the literature, previous studies suggest that knowing authors' identity affects acceptance decisions much more severely than it effects quality of reviews. It therefore seems crucial to conceal identities of authors from editors and from program committee members who make decisions, rather than (or in addition to) from reviewers. Yet, most of the double-blind peer-review processes that we analyzed concealed identity of authors only from reviewers but not from those who

actually make the final acceptance decisions. If these approaches are adopted, it is crucial to make sure that the implementation and communication of the policies are consistent. Most venues that describe their process as being double blind do not explicitly state who has access to the hidden identities.

Limitations of the research

An important limitation of our study is that we relied only on explicit published practices of publication venues. Much of what happens in research communities is not well documented, and some of what is documented is only available to insiders. However, we hope our study offers a first step in understanding the information practices of peer-review processes in various research communities.

Another limitation of our study is that we only looked at a tiny fraction of all scholarly journals. While we hope to have captured much of the variety in how scholarly peer review is implemented, it is extremely difficult to cover all the different peer-review processes and practices that are employed by thousands of scholarly journals considering the nuances in the implementation of policies. Moreover, what we reported in this article summarizes anonymity policies in mid-2013. Many publication venues are evolving so our descriptions may not apply to how they conduct the peer-review process even a short time after we conducted our study.

Peer-review processes can vary in selectiveness (sometimes measured by acceptance rate), as has been discussed by Grudin (2013), method of administration (offline vs. online), number of steps and phases (revisions, rebuttal, etc.), role structure (tiers of the program committee, or use of external reviewers), etc. The scope of this research was limited to differences in anonymity and transparency policies. Further research is needed to analyze, understand, and design for the numerous other aspects of peer review.

Conclusion

After decades of criticizing the traditional scientific peer-review process, several publication venues have successfully implemented variations of the process, many of which would not have been practical without the help of computer-supported information and communication systems. We found that

some publication venues have increased the level of anonymity, while others have pierced or completely lifted the veil of anonymity. We developed a framework for characterizing anonymity policies in peer review to advance understanding of ongoing developments in the design of peer-review processes and thus inform the design of future peer-review support systems.

The findings conveyed in this article are intended to illustrate the many ways that peer-review support systems should and could be flexible and customizable in their use of anonymity to allow research communities to better tailor them to their needs and policies.

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