Reviewing the review process
Investigation of researchers’ opinions on different methods of peer review

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2018

Peer review is considered the gold standard of scientific publishing. Trust in the traditional system of editor – blind-reviewer – author is still high, but it’s authority is in decline and alternative methods are on the rise. The current study investigates opinions of alternative peer review methods, the arguments for and against, and the reasons why academics are searching for new approaches. The opinions were analysed by applying qualitative content analysis to online discussions. The findings were interpreted using two different sociological theories: the Mertonian sociology of science and social constructivism.

The results of the study show that the most discussed method was also the most traditional one: closed pre-publication peer review comprised of single-blind, double-blind and open peer review (non-blinded). Discussions of open peer review (both open publishing of reports and open discussions) were also common. All other alternative methods were discussed much less. But the discussions were lively and each method was discussed in both positive and negative terms. The reasons for preferring certain methods were also manifold, but dominant topics were bias and fairness, quality issues (regarding reviews and publications), issues concerning human resources and communication and exchange among people.

The results of this study demonstrate that while ethical norms seems to be a scientific ideal, human nature makes it impossible to accomplish this goal.

Keywords: peer review, alternative peer review methods, open peer review, closed peer review, pre-publication peer review, scholarly communication, scientific publishing, qualitative content analysis
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1 Introduction

The work of a researcher is guided by several important goals, like contributing to collective knowledge or finding solutions for pressing problems. To be of value to society, scientific investigations must also be made available to the public, or – at least – the scientific community. One less altruistic motivation to publish is to get recognised and rewarded. Usually, research results are published in academic journals. Journals should provide not just a place for publication, but should also enhance visibility of and access to the article (Björk, 2017). Last, journals are responsible for quality control, guaranteeing an author’s publication alongside articles of similar quality (Beall, 2016).

The quality of scientific work is not so easy to evaluate. What is considered to be good research is judged in relation to, for example, community standards and norms. The scientific community concentrates on several different aspects when judging the quality of publications, for example the accuracy and suitability of research methods, the originality of research questions, the correct interpretation of results and whether the discussion offers a sound scientific analysis of the results. All these aspects can only be judged by people with scientific experience - academic “peers” (Böning, 2016).

In scientific publishing, the publishers are the link between the author and the so-called consumers (readers, learners, ...). The publishers ensure quality by administrating and providing analyses of submitted material. The editor generally appoints reviewers (peers) to judge the submitted work through so-called peer review. But the technical possibilities of web publishing made it possible to change this publication order. Authors can now publish their work online without depending on a journal. Here, the quality of the published work is not determined through review. Instead, review is conducted after dissemination online by consumers acting as peers (Henry, 2003). Web publication thus provides alternatives to the traditional publishing process and peer review system (Björk, 2017). These new possibilities, along with the fact that there has been voiced critique of the traditional approaches to ensuring quality, have led to a broad, ongoing discussion of the merits of peer review.

This study investigates researchers’ opinions of traditional and less traditional methods of peer review. What are people’s arguments for or against certain peer review methods, and which methods are discussed? The following chapter will give an overview of the peer review process. Furthermore, it explains this thesis’ research problem and questions, also outlining the limitations and implications of scientific peer review processes for LIS researchers and librarians. The chapter ends with the outline of this thesis.
1.1 What is peer review?

Peer review is the method for determining whether academic papers are published, grants are awarded, academics get promoted and prizes are won. But even though it is at the heart of academic work, peer review is still hard to define (Smith, 2006). The system has been compared to democracy: “a system full of problems but the least worst we have.” (Smith, 2006, p. 178). It is often believed to serve two purposes: peer review should act as a filter to eliminate and it should improve the quality of manuscripts that are en route to publication (Kelly, Sadeghieh and Khosrow, 2014). Ross-Hellauer (2017) states that peer review is not static or singular. It can differ in several aspects. Among these are the timing of the review in relation to publication, process transparency and disciplinary practices. Smith (2006) even compares the process of peer review to love, poetry, or justice, as it is impossible to agree on a definition based in real practice.

This thesis is primarily focused on the peer review system applied in journals for quality control of submitted manuscripts. In the case of journals, the peer review system involves two checkpoints that determine the fate of a publication: editors and peer reviewers. Editors are not just in charge of selecting reviewers but also make the final decision about acceptance or rejection. But who is a good peer reviewer? It could be either an expert in the same research field, somebody from the same general research area or an expert in methodological questions (Smith, 2006). Reviewers are usually selected based on their expertise and their willingness to review. If they accept, they are in charge of evaluating the manuscript. They give recommendations for acceptance, rejection or revision depending on the novelty and possible technical, qualitative and stylistic flaws of the manuscript (Benos et al., 2007). The peer reviewers are thus responsible for quality control of individual manuscripts.

Generally, the classical peer review process follows a certain procedure: when the scientist finishes a research project, a manuscript of the conducted study is submitted to one or several specialised scientific journals in the field. The first people to judge the quality of the paper are the journal editors. The editors decide whether the manuscript meets the general requirements of the journal and is written by a credible source. If this editorial decision is positive, the editor selects suitable reviewers and sends out the paper for formal peer review. The reviewer is supposed to judge the manuscript based on several basic criteria like scientific validity, quality of the experimental design, and the appropriateness of applied methods. The reviewer should also assess the research significance and decide whether the proposed work will contribute to the broader academic field. After this assessment, he/she recommends whether the paper should be rejected, accepted or revised. The editor acts on the recommendations of the reviewers. After the paper is finally accepted, it is formatted, optimized and published (Kelly, Sadeghieh and Khosrow, 2014).
1.2 Problem description, research questions and limitations

1.2.1 Problem description

The traditional peer review system is widely criticised for several reasons. Among others its reliability (reviewers are rarely completely in agreement), lack of fairness (reviewers are biased), lack of predictive validity, and inefficiency (delaying publication and inhibiting innovative research). Last but not least is the fact that harsh reviews can be “personally damaging” (Bornmann, 2011, p.204), which can be especially disturbing for unexperienced authors.

Based on these criticisms, it is perhaps unsurprising that the satisfaction with traditional peer review is decreasing and openness to new methods is increasing. But according to Ware (2016), there are indications that satisfaction with the traditional peer review system and openness to new publication methods varies between scientific fields. This variation leads to the question of how opinions of peer review methods differ across scientific fields?

Online publishing is rapidly changing the approach to information and scientific publication. The huge amount of publications makes it impossible to keep an overview. This has implications not just for the assessment of information quality but also for the way in which people deal with scientific information. The traditional approaches of securing high scholarly publishing quality is based on human review, which, beside peer review, also includes editorial control and selection by librarians (Arms, 2002). Peer review is a label that users of scholarly publications trust, but when traditional peer review methods cannot keep up with the number of publications, the system runs the risk of losing quality and trust. According to Ware (2016), the desire for improvement in the current peer review system is increasing, though the vast majority of researchers prefer conventional pre-publication peer-review to open peer review methods. But how do scientists and people connected to science actually discuss newer approaches to peer review? And how do they square a lack of trust in non-traditional publication practices with demands for new methods?

Considering the big changes in the publishing system recently, more research on peer review is needed and, as David Moher states in his published peer review report on Tennant et al. (2017), “there is limited data to inform about current peer review systems and innovations...” (Tennant et al. 2017, p. 51). Much effort has been put into proposing new peer review systems - or at least ideas to improve the traditional system – but data on alternative methods are still far from sufficient. We still lack data on how alternative methods improve the current system (Kovanis et al., 2017). An improvement of the system cannot be done without an overview of up- and downsides to alternative approaches to peer review. Therefore, the current study addresses this lack of information and investigates how alternative methods are actually viewed
within the research community. Why do people support or reject certain methods?

1.2.2 Aim and Research Questions
This study will contribute to the understanding of how and why researchers approve or disapprove of different methods of peer review. The goal is to identify which peer review methods are under debate and how support for or rejection of these methods is phrased. Furthermore, the study will investigate if there are discernible differences between discussion foci between different research areas.

In order to address this aim, the following research questions will be answered:

Q1. What are the main proposed alternatives to traditional peer review suggested by researchers?

Q2. Are there discernible differences in preferences for alternative peer review methods between different research fields?

Q3. Which pros and cons for alternative methods are raised in the discussions?

Q4. What are the main reasons why researchers suggest alternative peer review methods?

Q5. Can the arguments be understood as expressions of different theoretical views on science?

1.2.3 Material and Methods
The data used as a basis for this study originated from discussions among people connected to science. The basic data used are comments on threads from freely accessible scientific online discussions on two different forums (ResearchGate and Reddit). The data were analysed applying qualitative content analysis.

1.2.4 Limitations
The findings of this study are based on discussions on the internet. Two accessible and free online forums were used to collect the data. Due to the fact that the data was freely available and researchers were not chosen or invited to participate in the study, it was not possible to select a particular geographical distribution of participants, nor a research area distribution. Further, the richness and homo- or heterogeneity of information could not be influenced. As a result, both the depth and the amount of information varied.

The limited time frame combined with the chosen method to prevent the gathering of huge amounts of data. Most of the other studies discussed in connection to the results of this study applied different approaches to data collection, allowing these studies to address a higher number of participants (for example using internet surveys like Mulligan, Hall and Raphael, 2013;
Ward and Monkmann, 2008; Ward, 2016; Ross-Hellauer, Deppe and Schmidt, 2017). In general, a larger dataset provides a stronger basis for conclusions.

The current study focuses solely on peer review in connection to scientific publishing. It does not consider the role of peer review in other situations, such as research funding. The role of peer review in this area is, of course, as important as in publication reviews. Research funding evaluation systems in general are based on peer review and, in the opinion of some researchers, this actually has more influence on research outcomes than the quality control of publications (Bornmann, 2011). The criticism about weaknesses involved in the peer review of project proposals is similar to that of manuscript peer review. According to Gallo et al. (2018) more needs to be done „to understand the decision-making processes of reviewers in evaluating risk and innovation in research” (Gallo et. al, 2018, p. 216).

1.3 Different approaches to peer review

The first part of this section provides a short introduction to the important issue of anonymity in peer review. The second part focuses on alternative peer review methods that oppose or supplement the traditional system.

1.3.1 General Introduction

The methods of peer reviewing a submitted manuscript varies a lot between journals, publishers and scientific disciplines. These policies shape the whole peer review process and govern the importance of its components. One important aspect is policies that are concerned with anonymity. There are numerous approaches to transparency within peer review. The policies of anonymity have been debated in the scientific community for several decades, and the traditional system of blind review (single or double) has been widely criticised. Academics have numerous arguments against anonymity, including the belief that anonymity can lead to misbehaviour or that it supports bias. Opponents of open review claim the contrary, arguing that anonymity allows the reviewer to express his or her honest opinion without the threat of retribution (Nobarany and Booth, 2017).

Generally, there are three ways of conducting peer review, which vary in their degree of anonymity: open, single-blind and double-blind review. In cases of open peer review, the identities of both the author and the peer reviewer are revealed. In the single-blind method, the authors are known to the peer reviewer but not vice versa. With double-blind review, all identities are hidden. A study by Kelly, Sadeghieh and Adeli (2014) showed that single-blind peer review is still by far the most common, followed by double-blind peer review. This approach to reviewing and judging the quality of scientific work has dominated since the 1750s (Spider, 2002). The debate over traditional peer review is unprecedented. New web technologies have led to experimentation with and new methods of quality control (peer review) (Tennant et al., 2017).
1.3.2 Alternative approaches

In the following section, I will describe different approaches to peer review. The section will start with an introduction to open peer review and then move to different approaches to peer review (a priori peer review systems, post-publication methods, collaborative methods, portable peer review methods, peer review recommendation services and hybrid peer review methods). This list of different approaches and their definitions is based on the analysis in Tennant et al. (2017). The same categorisation of methods will be used when gathering and analysing the data.

The open peer review method of assessing scientific papers emerged with the rise of Open Access publishing. Open Access publishing – and connected to this, the release of OA journals – emerged as part of a broader Open Access movement. Manuscripts and papers published as OA are defined as “digital, online, free of charge, and free of most copyright and licensing restrictions” (Suber, 2012, p.4). The development of this movement was a reaction to increasing dissatisfaction with the rapid monetization of academic research facilitated by digitization. From the 1990s forwards, journal subscription fees and copyright concerns have mounted. The OA movement tried to provide two different strategies to solve these issues: self-archiving and reform of journal practices. The former promotes authors’ right to make publications freely available in open repositories prior to and after publication and in many cases prior to peer review (Van de Sompel et al., 2004).

The development of open peer review is based on the criticism of traditional blind peer review processes, an attempt to balance transparency and blind review (Nobarany and Booth, 2017). Ross-Hellauer (2017, p. 16) provides a standardised definition of open peer review (OPR) based on a meta study of this ambiguous term. He defines it as an umbrella term “for a number of overlapping ways that peer review models can be adapted in line with the aims of Open Science, including making reviewer and author identities open, publishing review reports and enabling greater participation in the peer review process”. Open peer review (not in the sense of non-blinded-review) in different forms can be applied in all peer review systems later described in this chapter.

A priori peer review includes a number of different methods of peer review prior to publication. Closed pre-publication evaluation is one version of a priori commenting. It is done by experts in the field which are editorially selected and formally invited (Tennant et al, 2017). This way of a-priori commenting system is part of the traditional way of conducting journal reviews.

There are different versions of a priori peer review. Open pre-peer review commenting includes informal commenting on and informal discussions of a publicly available draft of the manuscript. It has several benefits: the process is rapid, transparent and cheap, but there is a risk of research being scooped, authors fear rejection and there is a risk of inappropriate comments since there is no editorial control(Tennant et al., 2017).
Rather new and considered more radical is post publication review, which provides new opportunities for discussion of and feedback on already published research. Post-publication review methods provide both informal (for example, blogs, Twitter) and formal (for example, F1000, PubPeer, PubMed Commons) ways of commenting on publications. Experts are invited to provide a published peer review report. In the case of open peer review, commenting the peer review is open to anyone. But it is too early to be able to assess the impact of these methods on publishing quality, since its use is still too limited (Editorial Nature Microbiology, 2018).

Post publication peer review, as already mentioned, is a formal process where selected experts evaluate research within their relevant field after its publication. This method has the advantage of speeding up publication. This approach is transparent and continuous, while also facilitating editorial control. The disadvantages stated are that one of the main functions of peer review – the detection and exclusion of bad research – happens after publication. (Tennant et al., 2017).

Post-publication commenting is yet another option. This approach is sometimes used not as a replacement for the formal peer review but as a useful addition (Ware & Monkman, 2008). As with a priori review, different models emerged combining pre-publication review and crowd-judgment, or public comments from readers or experts of the field and reviews provided by the journal (reviewed in Lee et al. 2013). Compared to the more formal publication peer review, this approach allows for informal discussion, independent from formal peer review. The advantage of open-peer review commenting is that this can be done on third-party platforms, and anybody is able to contribute. A disadvantage is that comments are not subject to quality control, and existing platforms (like PubMed Commons, PeerJ or PLOS) lack compatibility (Tennant et al., 2017).

One more approach of peer review is based in crowd sourcing via open platforms: decoupled post-publication. This is an annotation service that adds comments directly to the work and those added notes can be done in private or publicly. It is a rapid and collaborative method with a low entry threshold (like, for example, Wikipedia). The disadvantage is that it is not very interoperable, and efforts are easily duplicated (Tennant et al., 2017).

The so-called collaborative model combines referees, editors and external readers who can interact by commenting simultaneously in a discussion forum where they can reach a consensus. This approach is regarded as very transparent, maintaining a publication quality due to editorial participation. The approach can be time-consuming, the discussion quality can vary, and peer pressure can influence outcomes (Tennant et al., 2017). But this model can also be useful in learning how to collaboratively review a manuscript, and studies prove that it has the potential to refine reviewing (Kwon et al., 2018).

Portable peer review methods allow the author to submit already conducted reviews obtained from former submissions of the manuscript. In the case of
submission of the manuscript to another journal, these reviews are attached. This procedure can even be a service provided by a third party. This method saves time, minimizing redundancy. Nevertheless, it is not highly accepted or applied (Tennant et al., 2017). There are companies emerging based on this service, which give researchers the option to “pay for a fast, independent peer review that could travel with the paper from one journal to another” (Van Noorden, 2013, p. 161).

Another approach to peer review is recommendation services. This is a combination of post-publication evaluation and the recommendation of important articles. This service is performed by a consortium of nominated members. It is, of course, prestigious for a scientist to be part of such a consortium. But this service has been implemented for only a few different journals and platforms, and is thus for subscribers only (Tennant et al., 2017).

Hybrid Peer Review systems combine elements of the previously discussed systems – often openness (for example, in the form of public comments) – with a traditional form of review (for example, blind review). But such methods are most often used to supplement, not replace traditional peer review methods (Lee et al, 2013). The goal of this system is first to retain the advantages of a public review process by openly commenting on the methodology, content, writing quality and relevance of the work, and secondly to combine this with an additional private peer review to further refine the manuscript (Mandernach, Holbeck and Cross, 2015).

Tennant et al. (2017) discusses also potential future models as an alternative model for peer review. These new developments are closely connected to the technical possibilities provided by the Web 2.0 and new social media platforms. Those models point towards a shift to a more open system in scholarly evaluation. But the new platforms also bring new difficulties. For instance, there must be a sufficient number of participating researchers to make such systems work. And Tennant et al. (2017, p.21) note that for such totally new approaches to work, innovators also need to keep in mind that cultural inertia “leads to low adoption of anything innovative or disruptive to traditional workflows in research”. Among others, Tennant et al. (2017) list a Reddit-based peer review model, where links to scientific research can be shared, commented on and receive up or down votes. Everything in a link or text can be discussed (methods, context, implications, …). Moreover, the comments can be up- or down-voted, which would bring the most valuable comments up to the top of an discussion. Tennant et al. (2017) state that such a public commenting system could, in the end, result in the same depth of peer evaluation as more formal systems. Another model discussed is the amazon star-rating system, which is based on filtering by five-star user rating in combination with comments. This approach’s application to scientific texts is widely criticised, as it allows abuse and more accurately evaluates popularity rather than quality. Rating systems are employed on several scientific platforms (for example ScienceOpen and Publons), but Tennant et al. (2017, p. 24) note that “how such rating systems translate to user and community perception in an academic environment remains an interesting question for further research”.

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The Wikipedia-style model allows anyone to edit the published texts, thus the text is never really finalised. An interesting aspect is that a wiki-style model means a shift from traditional static outputs (as non-editable articles) to an output that is “continuously evolving” (Tennant et al., 2017, p. 28). New insights could be added to an article, which would reduce the so-called peer review burden, because this method does not require the reviewer resources. But the implementation of such a model implies a seismic shift in the assessment criteria of academic institutions, funding assignments, intellectual property and commercial publishers, as academic knowledge would be released for free to the public, and it would be difficult to assess who contributed what to a publication (Tennant et al., 2017).

Reading through descriptions of all these methods makes it clear how diverse peer review practices are. This section provided information about major ideas and experimental approaches in use in one way or another at journals or on review platforms. The appendix (App. 1) provides a short description of all the above-described peer review methods applied in the data coding.

1.4 Peer review and LIS

The topic of scientific peer review and quality control in scholarly publishing is of prime importance for the field of Library and Information Science. First – as in any other field of research – different methods of peer review have implications for LIS researchers when deciding on how and where they want to publish their research to ensure that their publications are used and regarded as high quality. This importance had led to substantial research from the perspective of the field of LIS, published in LIS journals (for example: Ford, 2016; Ford and Bean, 2012; Bornmann and Daniel, 2010; Bornmann, 2011).

Second these methods have implications for librarians. Librarians are supposed to advise researchers regarding publishing, which includes guidance when it comes to review practices in different disciplinary fields (Ford, 2016). Librarians disseminate knowledge, and they must be absolutely certain that the quality of the literature they work with is sufficiently high.

1.5 Outline of the thesis

The present study is organised into eight chapters. The introduction of the thesis in chapter one layed out the research topic. The section has also explained the term peer review and described the importance of the topic, the research questions, and the study limitations. Further, chapter one included explanations of the different alternative approaches to peer review that provide the basis for terminology classification in this study and an analysis of the implications of peer review for the research field of LIS. Chapter two includes the literature review and tries to unravel the ongoing debate about peer review,
while also providing an analysis of empirical studies examining the attitude of researchers towards peer review in general and, more specifically, the traditional methods of peer review. Chapter three provides an explanation of the theoretical framework used to interpret the results of this study. The two theoretical approaches used to interpret opinions of peer review come from two schools that have addressed definitions of the concept “science” and sociological theories about how science should be conducted – namely (1) the Mertonian sociology of science and (2) social constructivism. Chapter four presents the methodology applied in this study. It provides an overview over the methods applied, the data under analysis, and how this data has been examined. The last part of this chapter presents ethical issues connected to this study. Chapter five presents the results. The chapter comprises two main parts. First, it provides an overview of the study’s methods and the analysis of the comments and, second, the chapter focuses on the data describing commentators’ attitudes towards the investigated methods, with an emphasis on distinctions between areas of research. Chapter six focuses on answering the research questions and provides a discussion of conclusions. Chapter seven concludes the discussion and outlines implications for further research. The conclusions of this thesis are summed up in chapter eight.
2 Literature review

This chapter gives the reader an overview of the debate about peer review. The first part focuses on a literature overview of material examining the problems with peer review. A review of relevant literature investigating the reasons for the continued use of the current peer review model despite longstanding criticisms follows. After this comes a section reviewing peer review improvements suggested in literature.

This first part of the chapter does not discuss empirical studies in detail, but rather focuses on highlighting the arguments put forth in empirical studies. Unlike the first part, the last part of the chapter gives an overview of several empirical studies that have been conducted on researchers’ opinions about peer review and alternative peer review methods.

2.1 Peer Review – a debate

2.1.1 Problems with peer review

Peer review in general is subjective, making it an inconsistent process. Scientific studies are usually very complex, and it is unavoidable that different people will have different views of the weaknesses, strengths and importance of any given study (Smith, 2006). In reality, peer review cannot guarantee accurate results. Research published has to be new and original and, in many cases, only the author can say if a piece of research is truly correct (Mulligan, 2005).

One of these “defects” to which Smith (2006) refers is the slowness and expense of the traditional peer review process. Getting data on the actual costs of peer review is not easy. But he concludes that though the reviewer does not get paid and therefore does not cost the system money, the time a researcher spends a review could be spent doing research.

Beside wasting money, the current system is also criticised for being time ineffective. A long review process delays the publication of new ideas that could be valuable to the whole research community (Bornmann, 2011). Jennings (2006) states that among the measurable costs of peer review, the delay “in the dissemination of new knowledge” is considerable. It is more important than the loss authors might experience when they are not recognised for a novel idea because of publication delays due to peer review.

As already mentioned, the traditional peer review system is also criticised for not being consistently reliable and fair (Smith, 2006). Reliability in peer review is measured by the congruence of reviewer verdicts. Judgements are called reliable when the level of agreement amongst reviewers is high (Bornmann, 2008). The threat of bias is troubling, as it shakes the foundation of the social legitimacy of peer review. Peer review signals that the scientific world is taking
its role of social responsibility and self-regulation seriously, collectively enforcing strict standards (Lee et al., 2012). Bias is defined as prejudice that prevents an objective and accurate view of scientific studies; traditional, common forms of bias include, for example, status, gender and research topic prejudices. It has been found that famous researchers have a higher chance of getting their work accepted. Also, ideological differences and conflicts of interest can influence a reviewer. Furthermore, there is evidence that unconventional and new ideas are more prone to rejection than conventional research approaches (for a review see Benos et al., 2007).

Another problem of the peer review system is that several types of research cannot be validated by a reviewer, since it is sometimes difficult to judge the methodological approach simply by reading the manuscript. This is, for example, the case in experimental papers including clinical trials and computer systems. A reviewer cannot repeat the experiments, which degrades the reviewer’s ability to evaluate the quality of the research methods. Peer review varies in its effectiveness when it comes to establishing “accuracy and value of research” (Arms, 2002, p.4). And though traditional peer review still remains the benchmark for measuring scientific quality, some low-quality journals mostly, according to Arms (2002, p.4), “puts a stamp on mediocre work that will never be read”.

One critical point regarding the present peer review system is the role of the reviewers. Previously, participating in the peer review process as a reviewer led to prestige and fame, but nowadays it costs time and energy without remuneration (Benos et al., 2007). So why do scientists agree to review a manuscript? Kelly, Sadeghieh and Adeli (2014) and Hempel (2014) state that the reasons include the feeling of fulfilling an academic duty, the acquisition of personal contacts with editors or prestigious journals, becoming a part of the community and keeping up to date with the latest research.

One issue with peer review is that it lacks transparency and standardisation. According to Tennant et al. (2017, p. 2), it is a “diverse method of quality control” and “applied inconsistently both in theory and practice” (Tennant et al., 2017). Smith (2006) states that “the inconsistency can be laughable” and “can make peer review something of a lottery” (p. 180). It might, in fact, not be easy for editors to find suitable reviewers who are, on the one hand, competent enough to do the review and, on the other hand, are willing to spend a sufficient amount of time. A limited pool of possible reviewers can result in unintended bias (Sowards, 2015).

Some journals try to solve the problem of finding suitable reviewers by allowing authors to suggest reviewers themselves. This system has its downsides, and there are numerous cases where scientists reviewed their own papers or asked close friends to review. Further fraud includes tricking reviewer recruiting systems. There is evidence of citation rings in which authors both review and cite each other at a high rate (Ferguson, Marcus and Oransky, 2014). Even though fraud is a serious problem, studies show that it is not a major issue in discussions about whether and how the peer review
process could be improved. In general, not many researchers think that fraud is a substantial problem (Mulligan, Hall and Raphael, 2013).

2.1.2 Why does the current system persist?
Discussion of how to improve peer review for future research generations is vibrant – among many other discussions was for example the Springer Nature Peer Review Week 2017 dedicated to Transparency in Review (Inchcoombe, 2017).

Since the 1950s peer review has been “central to scholarly communication” (Ware, 2016, p.6). It has been one of the key pillars supporting trust in scientific publishing and scientific literature. The term “peer reviewed journal” is to a great extent seen as a proof of scientific quality, and publishing in a peer reviewed journal is still compulsory for any researcher who wants a scientific career (Ware, 2016). Proponents of the traditional peer review system argue that it is still the most effective way to conduct a critical selection of scientific publications, a crucial part of scientific knowledge development (Bornmann, 2011).

Jenning (2006) lists some measurable benefits of the peer review process. One point he makes is that the peer review system not only provides expert advice, but also urges authors to follow this advice, thereby improving academic work. Furthermore, peer review acts as a filter, regulating the quality and amount of information that is added to the system through publication. A survey on papers in the field of neuroscience found that the peer review system is predictive of the scientific community’s long-term judgments. The results showed a strong correlation between the impact factor of a journal and the rank it receives in expert evaluation. But there are discussions and there is “plenty of room for improvement” (Jenning, 2006, p.4).

But despite criticism, it is clear that the abolition of the traditional peer review system would have significant consequences in the world of science. An important point is that abolishing peer review prior to publication would take away the possibility to react to expert criticism before publishing. According to Benos et al. (2007) “this alone is sufficient reason to preserve traditional peer review” (p. 148).

2.1.3 Suggestions in literature for improvement of the current peer review system
Several authors suggest improvements to the current peer review system. But doing research on the peer review process is tricky, since it is difficult to actually test the publication selection process. There is no common agreement about what makes a good academic paper (Smith, 2006).

Smith (2006) suggests that a first step would be to hide the author’s identity. Several studies were conducted testing this procedure, but they could not find improvements in reviews. The reason for this might be that it is actually very difficult to anonymise authors; based on information in the articles themselves, reviewers could find out the identity of the authors in about a quarter to a third
of the analysed cases. Double-blind peer review by now is getting more and more popular, but there are concerns that making anonymity compulsory will make it even more difficult to find willing reviewers (Mulligan, 2005).

Another suggestion was to increase the transparency of the whole peer review process, either by revealing the identity of the reviewers or by presenting the whole review discussion in real time on the web. This system would transform peer review “from a black box into an open scientific discourse”, a procedure that in some cases led to an open discourse that can be sometimes “a lot more interesting than the study itself” (Smith, 2006, p. 181).

Suggested improvements to the system often start with the reviewers. It is often suggested that reviewers be rewarded for doing the job (either with money or with scientific credits). It has also been suggested that reviewers receive standardised training material (Smith, 2006). There is a large degree of variability between review reports based on wide array of referees at different stages in their scientific and reviewing careers. It has been suggested that mentoring of young researchers and the establishment of a transparent framework for the whole peer review system would help to improve the general quality or peer review (Mulligan, 2005).

2.2 Research on the attitudes towards peer review and alternative methods

The following section introduces different empirical studies designed to capture the attitudes and opinions of researchers towards the traditional peer review system and possible alternatives.

The Publishing Research Consortium published their Peer review survey in 2015, providing an overview of opinions and attitudes (Ware, 2016) and compared answers to former surveys conducted in 2007 (Ware and Monkman, 2008). Both reports sent out questionnaires to researchers randomly selected from the Scopus author database. They mainly analysed the quantitative results, which were enriched with qualitative statements for illumination. Their main findings showed that peer review is a key factor in the control of scientific communication and has broad support, largely unchanged from 2007 to 2015. According to these studies, researchers still value the benefits of peer review to a great extent. Traditional pre-publication peer review (both single and double-blind) is still preferred (Ware, 2016). These results differ from the survey 2007, which showed that double-blind peer review is more trusted than single-blind peer review (Ware and Monkman, 2008).

Open peer review, on the other hand, was clearly less trusted than anonymous review methods even though support for this approach seemed to grow over time. But according to Ware (2016) support drops when the method includes publishing signed reviews alongside accepted articles – though publishing reviewers’ names alongside the articles does not lead to a similar drop. The
study also shows that attitudes towards alternative review methods vary across research areas, with Computer Science/Mathematics/IT being most prone to accept open peer review (Ware, 2016).

A similar approach to measuring opinions of peer review was applied in a large-scale international study by Mulligan, Hall & Raphael (2013). They asked researchers to rate some general statements about peer review. Based on this rating, they measured the attitude of researchers towards peer review. Their method was to randomly select researchers worldwide and all across scientific disciplines and asked them to fill an online survey.

Their results showed that most of the reviewers who took part in the survey not only highly valued the peer review process but also believed that the system was foundational for scientific communication. For the respondents, double-blind peer review was considered the most effective method by far. These findings agree with the results obtained in the survey of Ware (2016). The study also showed that a vast number of researchers think that technological advances are improving peer review. The majority of researchers think that peer review should be able to prevent fraud, but at the same time only a minority believe that it currently does so.

Another evaluation of alternative peer review systems was conducted by Kovanis et al. (2017). They did not include researcher opinions in their study, instead applying an entirely theoretical approach. They used an agent-based model of scientific publication and peer review systems, calibrated with empirical data. Agent-based models are a class of computational model used to simulate actions and interactions of independent entities. The agent-based model was separated into independent parameterised sub-models that were structurally changed to allow modelling of the alternative peer review systems. This method allowed for a comparison of the efficiency of the conventional peer review system with five alternative systems.

The five alternative models they selected for analysis were two models of immediate publication with and without online reviews (crowdsourcing), one system with one round of reviews and allowed revision (re-review opt-out) and two review-sharing systems when rejected manuscripts are resubmitted with their past reviews. In the portable method, this resubmission can be done to any other journal whereas, what they call cascade method, allows such resubmissions only to journals of the same publisher with lower impact factor.

Based on the results of their study, the authors recommend prioritising a system of review sharing. In their opinion, it is the most efficient way of creating a sustainable peer review system that improves scientific publishing. They found that only the cascade system was more efficient than the conventional system (closely followed by the portable system).

BioMed Central created a new journal, BMC Pharmacology and Toxicology by merging two journals with different peer review strategies (single-blind peer review and non-blind peer review). The new journal employed a full open peer
review policy. The reviewers were known to both the authors and the readers. After two years they surveyed the editorial board members, asking them eight questions about their experiences and preferences towards peer review systems (included in the survey were open, double-blind and single-blind peer review). Half the responses they received were from researchers in medicine and half from non-medical fields (biology, chemistry, pharmaceutical science). The results showed that the majority preferred double-blind review to open peer review (non-blind) because they argued that this is the “most objective system and thus minimises bias” (Moylan et al., 2014, p.2). Divisions turned out to be most substantial between career stages. Early career board members preferred double-blind, while senior members favoured single-blind or double-blind methods. The authors conclude, however, that the journal continued with the fully transparent open peer review policy because of the value not just in knowing who reviewers are, but in general public transparency. This approach is designed to reduce possible competing interests (Moylan et al., 2014).

Ross-Hellauer, Deppe and Schmidt (2017) conducted a survey on the attitudes and experiences of editors, authors and reviewers towards open peer review. They wanted to examine the current levels of awareness of various forms of open peer review, which methods participants actually prefer, the differences in attitudes among scientific disciplines and the current level of experiences among all stakeholders.

The method they applied was an openly accessible online questionnaire focused on three different key areas: attitudes to open peer review, experience levels with open peer review and definitions of open peer review. Most of the respondents had experience with open peer review and had taken part in an open peer review process. The results showed that in general, the majority of respondents were positive towards open peer review as mainstream scholarly practice. However, different traits of open peer review received different grades of support. Open interaction, open reports and final-version commenting were highly supported, whereas revealing reviewer identities to authors was judged negatively by more than half the respondents. They argue that views on open peer review among researchers are largely positive but also diverse. They see open peer review as an “evolving phenomenon” (Ross-Hellauer, Deppe and Schmidt, 2017, p. 25) and explicitly encourage further studies.
3 Theory

3.1 Introduction to the theoretical part

Peer review is at the core of scientific publishing. Many empirical studies have been conducted on peer review in science. However, only a few studies, mainly in the early phase of peer review research, managed to connect their findings with theory (Bornmann, 2008). According to Gläser and Laudel (2005, p. 187), there is “a stark discrepancy between the number of empirical peer review studies and the theoretical approach of the process.” In this current study, a theory-guided approach will be used to interpret the findings. Two different theoretical directions in the sociology of science will be applied: the Mertonian sociology of science, and social constructivism.

According to Bornmann (2008), both theoretical approaches provide a valuable basis for an in-depth examination of findings obtained from studies on scientific peer review. What makes these theoretical approaches especially interesting is that they represent two different, sometimes conflicting approaches to research and peer review: the Mertonian norms provide a more traditional viewpoint than the social constructivist approach. How these theories can be applied to opinions about peer review in our modern society is of potential interest.

3.2. The two sociological directions

3.2.1 Mertonian sociology of science

The view of Robert K. Merton on the sociology of science that he developed in the book *The Sociology of Science* (1973) shaped the early theoretically-guided research approach to peer review. Generally, Merton assumes that society can be defined by leading institutions, and science is one of them. Each institution serves a function and when working well, they ensure the well-being and success of society (Sismondo, 2009).

According to Merton (1973), the ideal way of conducting science should be characterised by certain norms and values. He introduced the ethos of ideal modern science as comprised of four sets of institutional imperatives. The first norm is communalism (communism), meaning that scientific knowledge should be made public. Second is disinterestedness, that scientists do not seek any kind of personal gain. The third imperative is universalism, meaning that knowledge must be judged independent of its source, and the fourth norm he names its organised scepticism, demanding that knowledge must be closely examined. These moral norms are related to the attitude and behaviour of scientists as a community and within research practice (Zuckermann, 1988).

Merton (1973) argues that science can only claim to be the societal organization that is solely responsible for the production and accumulation of
knowledge if a system of quality control is in place. According to Bornmann (2008), two of Merton’s norms are of leading importance for analysing the peer review process: universalism and organised scepticism. Tennant et al. (2017) partly agree with this view but add that the norm of disinterestedness is valuable for the interpretation of empirical findings regarding peer review.

As mentioned already, universalism specifies that scientific work must be evaluated independent of the personal and social standing of the scientists involved. This is important to ensure objective and unbiased scientific findings that do not weight irrelevant characteristics such as nationality, race, religion or professional affiliations (Anderson et al., 2010). Tennant et al. (2017) argue that disinterestedness can also be connected to reducing systematic bias in peer review, since the pursuit of personal gain can influence findings. Organised scepticism, on the other hand, refers to scrutiny of findings, demanding that evaluation be based on empirical and logical criteria. This norm is applicable to both producers and consumers of research findings. Producers are compelled to present their findings in a way that is sufficiently transparent to assess the value of results. Consumers, on the other hand, must examine the work critically, according to established criteria and standards (Anderson et al., 2010). That guarantees that all knowledge that gets added to the knowledge pool has been carefully tested and deemed reliable by experts. And in line with the Mertonian norms, the most suitable experts are successful scientists working in the same field as the author of the work under submission. When these experts approve the work, it flows into the larger knowledge pool within the respective research field (Bornmann et al., 2008).

To summarise, the most important scientific characteristics according to Merton’s view on the sociology of science are oriented around a behavioural ideal. It is founded on the notion that scientists do not work to promote their own career but focus solely on producing new knowledge by following an objective research process. This research can only be assessed by experts. Followers of this school are convinced that as long as researchers are willing to follow these norms, a review process free of bias is possible.

3.2.2 Social constructivism

From the point of view of social constructivists, human interactions and relations consist of thoughts and ideas. Reality is a social construct. There are no natural laws of society. Knowledge is constructed relationally, as an internal process and within a broader environment (Jackson and Sorensen, 2006).

Social constructivists reject Merton’s (1973) ethos of science. There are four main arguments that form the basis for social constructivism defined by Bornmann (2008) of relevance to peer review. Bornmann (2008) lists them as:

*Scientific behaviour does not follow the norms described by Merton (1973).* This assumption is based on study results showing that scientists do not conduct their work in accord with a set of norms. (Knorr-Cetina, 1981, 1991). In the eye of social constructivists, the process of knowledge-building and progress in science is not the result of behaviour guided by norms. Merton’s
norm of universalism, for example, is rebutted by some study results showing that the peer review process is influenced by non-scientific criteria like gender. It also became apparent that scientists are mostly not willing to comply with institutionally-determined principles and regulations (Bornmann, 2008).

Second, constructivists assume that the privilege of participating in scientific discourse is not owned by scientists. They assume that outsiders (non-scientists) can also participate in scientific discourse if they are familiar with contents, theories and technical terminologies, and that non-professionals can also evaluate scientific findings (Bornmann, 2008).

The third assumption is that scientific knowledge is created socially and locally and does not reflect natural reality. One of the central assumptions of social constructivism is that scientific knowledge is constructed in a research process based on certain given conditions. Therefore, it is influenced by the cultural and social context in which it is created, the personal interest of scientists, relationships and bias (Knorr-Cetina, 1981). Reviewers are influenced by their backgrounds, biographies, social networks, personal interpretations and local conditions, all of which influence their judgement (Gläser and Laudel, 2006).

Fourth, constructivists assume that scientific work is a joint effort between scientists who have submitted work for review and reviewers. They claim that it is not just the author but also reviewers and editors who are responsible for the content of a manuscript, making it socially co-constructed (Knorr-Cetina, 1981).

In conclusion, it can be said that in the view of social constructivists, scientific work is socially constructed. It is actually not possible for any piece of work to be free from social and personal influence, hence the peer review process can never be totally objective and neutral. Social constructivists focus on the collective research and publication process. According to this interpretation, a scientific publication is not just the work of one scientist but a collaboration between the researcher, his/her colleagues, the editor and the reviewer. Science is not possessed exclusively by people working in the field: instead, everybody with a basic understanding of a subject has the right to participate in the discussion.
4 Method

This chapter describes both the method of data collection and data analysis. Furthermore, the ethical considerations of the study will be discussed at the end of the chapter. The focus of the study is to capture opinions freely expressed in the course of online discussion without the influence of an interviewer or a reviewer. The material used for this study is obtained from two different online forums for scientists and people connected to or interested in science. Discussions are open and any opinion can be expressed, making the data suitable for answering the research questions raised in this study.

4.1 Method of choice

The method applied in this study is qualitative content analysis. It is a method used to analyse text data with a focus on the meaning of the words used in each text (Hsieh and Shannon, 2005). Hsieh and Shannon (2005, p. 1278) define qualitative content analysis as “a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes and patterns”. This approach will be employed in this study, with the goal of providing knowledge and the understanding of the target phenomenon (Downe-Wamboldt, 1992).

Content analysis provides several advantages. It is unobtrusive and context sensitive. Further, it is designed for the examination of communication, rather than communicating directly with individuals (Krippendorf, 1980). It was initially developed to analyse the underlying meaning of messages (Zhang and Wildemuth, 2017) and is thus most suitable for the analysis of opinions. It is a method that is “mainly inductive, grounding the examination of topics and themes, as well as the inferences drawn from them, in the data” (Zhang and Wildemuth, 2017, p. 319).

4.2 Data

In qualitative content analysis, the data collection is based on collections of purposely selected text (Zhang and Wildemuth, 2017) and the data analysed is selected based on certain criteria (specified in section 4.2.2). The benefit of applying content analysis to Web-based content is that it provides a rich opportunity to study user opinions. People speak freely as individuals (no multiple choice answers, no leading questions), which eliminates problems that could occur in online surveys or interviews (Kim and Kuljis, 2010).

As mentioned already, two different forums for scientific discussions were mined for data. To counter possible high homogeneity in the data, I decided to choose two sources with slightly different user characteristics. ResearchGate is a platform that connects research scientists with each other. Reddit, on the
other hand, is largely a forum for “public engagement with research” (Tennant et al., 2017, p. 22), not confined to people working in or with research and science.

I collected comments from discussions written by scientists or individuals interested in science. I am using comments in which participants express their opinion of different aspects of peer review and peer review methods. The free discussion is important, since a main goal of this study is the analysis of uninfluenced opinions. This approach sets this study apart from other studies that collected data about attitudes towards peer review through interviews or surveys.

4.2.1 Data collection

Both forums used are specifically focused on science (ResearchGate) or have sections focused on science (Reddit). ResearchGate is a social-network site designed for academics. As a “scholarly version of Facebook or LinkedIn”, the site allows the user to create a profile, share publications and keep track of on-site views and downloads. It also provides a discussion forum where members can ask questions and discuss freely (Van Noorden, 2014, p. 126). The discussions included in the analysis were selected based on the topic of the discussion thread. The discussions had to be focused on different methods of peer review.

Reddit (reddit.com) is an open-source and community-based platform. Users can submit comments and content, which are organised into lists that are called subreddits. Registered users are allowed to up- or down-vote any posting based on relevance and quality. Everyone can comment on all shared content. Inappropriate postings or comments are deleted by moderators (mods), who control for quality within subreddits (Tennant et al., 2017). To assess data in Reddit, the search term “peer review” was applied in the science subreddit (r/science). r/science is the subreddit for science which is highly moderated by “at least 600 professional researchers” (Tennant et al., 2017, p. 22) and with more than 15 million signed members (Tennant et al., 2017). The results of the search were sorted by relevance, all obtained search results were read and each comment fitting the criteria was selected for analysis.

In both cases, the threads obtained after applying the search terms were read and harvested for data suiting the criteria discussed in the following section.

Overview over the data obtained in this study

The data from both forums has certain similarities. In general, in both forums threads and comments showed great variation in length and the number of discussion participants. In Reddit, some of the threads were started by specialists in the field but explicitly invited a more general discussion (called AMA, Ask Me Anything; Tennant et al., 2017). This kind of thread could results in a long discussion composed of 50 comments or more (though not all comments were useful for analysis). In total, included in the analysis are 33
threads, 153 comments and extracted from those comments were 169 cases (which corresponds to 169 separate opinions on different peer review methods; 100 cases from ResearchGate and 69 cases from Reddit).

4.2.2 Data selection

Data selection was based on the following criteria:

1. the overall impression of the richness of the discussion in the thread; the main point for selecting a comment was that the opinion(s) about one or several peer review methods were clearly expressed in the comment

2. online discussions were preferred if they touched on several peer review alternatives in different comments and different methods within a thread

4.3 Analysis

This section explains how the data were analysed to answer the research questions. Further, it gives a brief overview of the data collected.

To answer the research questions, the data were analysed in different ways:

A) To get information on which methods were discussed in the data and in what proportions, statistics based on the assigned categories were calculated using Microsoft Excel. The same technique was applied to obtain information about the preferences for alternative methods across the different categories of research.

B) To collect information about the expressed pros and cons of various peer review, a qualitative approach was applied. The process of the data analysis was conducted according to Zhang and Wildemuth (2017) with necessary modifications.

Step 1: Data preparation

The two forums were searched using the following terms: peer review (Reddit/science); peer review opinion (ResearchGate). Two different search terms were applied because the search term peer review gave too many hits in ResearchGate. It was time-wise and work-wise not possible to go through all these results to manually filter out the threads discussing opinions about peer review methods. In Reddit, on the other hand, the search term peer review opinion did not result in any hits, as it was too specific. The more general search term peer review resulted in a moderate number of threads.

The search results were not ordered. All discussions/comments were read and selected according to the above mentioned criteria.
Each comment was copied and saved as a separate case in a word file and numbered consecutively. In accordance with ethical guidelines, all information that could lead to identification of the author of a comment has been either coded or entirely removed (for further discussion on ethical concern on data used for research purposes that is obtained from the internet please see section 5.4 on ethics).

Personal information (in this case research area) of the people writing comments was collected as often as possible. In ResearchGate, personal information was collected on the authors of comments from their ResearchGate profiles. In Reddit, most of the posters do not use real names and they also usually do not reveal their identity on their profile. In that case, personal information was obtained from the text content or, if possible, from users’ profiles. In several cases, there was no or very little personal information available.

Step 2: Definition of the Unit of Analysis
The data used for analysis is text-based and the basic unit of text that was copied for analysis was a comment. Each comment was implemented in a discussion and was characterised by having one author (Fig. 1).

The core unit in the analysis is named a case, referring to one single peer review method mentioned in a comment. That means that one comment written by one author can compress several cases, depending on how many methods one author was discussing in a comment.

Both comments and cases were marked separately throughout the analysis applying consecutive numbers (example: C1, case1: comment number one containing case number 1). Sometimes one comment expresses opinions about several peer review methods (Fig. 1; example: C63, case 70 and case 71; comment number 63 contains case number 70 and case number 71).

Step 3: Development of the coding manual and the coding schedule
The coding of the data is a crucial step in content analysis (Bryman, 2016). Following Bryman (2016), data coding was based on a coding schedule and a coding manual. The coding schedule is the form in which all the coded data were entered. The coding manual includes the coding instructions and all the possible categories for every dimension applied in the text coding. It should comprise the following points: all dimensions, all categories listed in the adequate dimension and the actual codes (the numbers used to identify a category). Further, the coding manual provides guidance on any considerations that need to be accounted for when doing the coding.

I. Coding dimensions:
Following the research questions, the analysis was based on five variables. In the analysis, these variables are labelled as coding dimensions. Each of these coding dimensions represents one column in the coding scheme:

1. Method. The dimension method describes the peer review method to which the author of a comment refers.
2. **Pros alternative method.** This dimension comprises the arguments the author referenced in favour of the method under discussion.

3. **Cons alternative method.** This dimension comprises the arguments against the method discussed in the comment.

4. **Reasons for wanting or not wanting the discussed alternative method.** This dimension lists all the reasons the author provided in his/her comment for supporting or not supporting the method under discussion.

5. **Research area.** This dimension lists the research area (professional field) of the author.

II. Categories:
Each dimension is divided into as many categories as necessary. The categories for the variables method and research area had been defined prior to analysis. The categories for pros, cons and reasons evolved out of the texts during analysis. The list of categories applied in the analysis is in Appendix 1 (App.1).

4.4 Coding the data
As mentioned before, each comment of a thread discussing opinions on peer review methods was read. When a comment was selected for analysis (based on the criteria in point 4.2.2), it was copied into a word document (consecutive numbers were added). After copying, the personal data of the author was anonymised and the text was analysed for the above-mentioned dimensions. If a certain dimension was found, it was marked in the text, and the corresponding number to identify the category was noted down in the coding schedule (Fig.1).

![Fig.1. Coding example.](image)

This is a screenshot of a comment that was copied in a word file and numbered consecutively (in this example comment nr. 63 - C63). The line below the line for identifying the comment indicates to which discussion this comment belongs. After this follows the research area the commentator is connected to. The identified categories were marked in yellow and coded according to the methods described in section 4.4. The comment comprises two cases (two methods) - case 70 and case 71. The identified pros, cons and reasons were assigned to the relevant method.
4.4.1 Coding decisions
The identity markers of comment authors were removed from the data, as described before. There has been no further analysis conducted on the authors included in the data, as during the data collection there was no dominant author. On average, each thread had five comments (the highest number of comments in one thread was 16) and always included several authors, except for in the five threads with just one comment, which were still selected due to an interesting argument the thread contained.

In some cases, the coding of the data was not straightforward when it came to deciding on a certain category. Pros, cons and reasons were assigned to categories and, subsequently, those categories were aggregated depending on the method. Those aggregate categories were then synthesised in a text (see the results section). One challenge was the coding of the method when it was related to open peer review. As discussed in the introduction, (chapter 1.3.2), open peer review is an umbrella term for several different methodological approaches concerning anonymity, open publishing and participation in the reviewing process (Ross-Hellauer, 2017). In the data analysed in this study, people used the term open peer review (or open review) to describe all of those different approaches. I assigned these comments to a certain method category based on the context of the comment.

Another coding decision had to be made in the category research area. In case the assigning of the right category was not straightforward, the overall working area of a poster (= author of a posted comment) was taken into account. One example for straightforward assignment would be a person who works in evolutionary biology was assigned to the category natural science. A difficult case would be a person working in biochemistry or pharmaceutical research. If the research/working area was clearly in the medical field, this poster was assigned to the category medicine and not natural science or technology. The same procedure was conducted for the categories humanities/social science. The 6th category implemented in the analysis is scientific publishing. While this area is not a research area per se, it seemed to be a valuable field of expertise, given that there were people from this field writing constructive comments.

4.5 Research ethics
The data used in this study were obtained from two platforms on the internet that provide space for open discussions: Reddit and ResearchGate. The data obtained were comments taken from online discussions containing opinions on peer review methods. Comments were copied, saved and subsequently analysed. In addition to the comments, this thesis collected information about the author’s professional working area (research area). In some comments, authors refer to other authors by using their names or signing their name to comments. Those names were all substituted with XXX by me (specific
substitutions are also marked in the text). Several direct citations used in Reddit and ResearchGate texts were entered in the google search engine to ensure that it was not possible to obtain personal information about the author in this way. No positive results were obtained. The main ethical issue arising in this study is whether the data can be used without the informed consent of discussion participants.

Using the internet as the medium for collecting online published data entails certain ethical issues connected to the online environments in which communication takes place (Bryman, 2016, p. 139). People might take part in online communications and acknowledge that they are public, but they still might think that “the specific context in which it appears implies restrictions on how that information is — or ought to be — used by other parties” (Markham and Buchanan, 2012).

The question of whether electronic communications published on Reddit or ResearchGate are public or private can be debated. According to Livingstone (2005), online data can be used for research purposes when it fulfils certain criteria. The information under question should be publicly available and publicly archived, there should be no password required to access the information and the material itself should not be of a sensitive nature. Finally, there should be no stated site policy prohibiting the use of the material. If these criteria do not apply, informed consent must be obtained. All data obtained from Reddit and ResearchGate fulfils these criteria, as both forums allow everyone to access the data used in this study without needing to register.

All together the author is confident that the data used in this study does not violate ethical standards in any way and can be used for the current study without obtaining informed consent.
5 Results

The results presented in this chapter are based on an analysis of the discussions on ResearchGate and Reddit. The chapter is divided into two sections. The first section (5.1) focuses on the methods discussed in the data. It presents which methods were discussed and in what proportions. Then, the arguments for and against certain methods are presented in detail. The second section (5.2) of the chapter presents the detected connections between research fields and peer review methods.

5.1 Methods discussed

As already mentioned in this paper, each peer review method discussed in the comments was coded using the nine categories of the dimension method. These nine categories were: pre-peer review commenting, pre-publication peer review (closed), post-publication peer review, post-publication commenting, collaborative peer review, portable peer review, recommendation services, decoupled post-publication (annotation services) and potential future models (described in section 1.4 of this paper).

The following presentation of the results will first give an overview over the general proportions of the methods discussed in all comments. The opinions found concerning each method will then be presented in detail. In all categories, several different methods, variations or combinations of methods were discussed. Each of these will be presented separately. The categories not mentioned in the comments will not be discussed any further.

Within the threads analysed in this study, collaborative peer review, portable peer review, recommendation services and decoupled post-publication (annotation services) are not mentioned at all. The most discussed category was closed pre-publication peer review (45.6%) followed by post-publication peer review (18.9%) and suggested potential future models (12.4%). Pre-peer review commenting methods were discussed in 5.3% of the cases, and post-publication commenting was raised in 11% of the cases. 3% of the references in the discussions dealt with suggestions for improving the traditional peer review system that could not be assigned to any of the above-mentioned categories (Fig. 2). The subsequent presentation order follows the order of discussion in section 1.4. This order is based on method features. The first part discusses methods concerning pre-peer review and pre-publication, and the second part contains post-publication methods. These two sections are followed by a summary of discussions about alternative methods and suggestions for improvement of peer review.
5.1.1 Pre peer review commenting

Pre-peer review commenting was the least discussed model found in the data. The name pre-peer review commenting seems confusing, leading to the question of how something preceding peer review could be considered to be an alternative peer review method.

This term actually refers to when e-prints or preprints are published prior to any formal peer review and disseminated in the scientific community for commenting purposes. Before dissemination, manuscripts undergo professional selection to filter out non-scientific content, but this is the only evaluation step prior to publication. This method is actually one of the efforts to “decouple peer review from the publishing process” (Tennant et al., 2017, p. 7). According to Tennant et al. (2017, p.7), this practice represents a “significant shift, as public dissemination was decoupled from a formalised editorial peer review process”. In the discussions analysed in this study, pre-peer review commenting was mentioned under several different labels, like pre-peer review self-publishing, peer review preprint, and open peer review preprint server.

**Arguments supporting the method**

The advantage of preprint methods mentioned in the comments analysed is that they encourage interaction and vivid discussions within the research community, which can lead to interesting and constructive exchanges. Commentators argue that this method makes it easier for the authors to claim priority of findings, speeding the spread of new ideas. Further, several people mentioned that the approach facilitates the development of new contacts and collaboration. Getting a manuscript out before review makes it possible for the author to “receive comments that might improve later versions of the paper” (C95, case 110).

![Percentage of peer review methods discussed in the analysed threads (n = 169).](image)
Arguments opposing the method
In the comments analysed, several authors argue against pre-peer review commenting and claim that the publication of preprints could lead to problems. They argue that the author actually runs the risk of getting scooped, because information published in preprints could be used in related projects without credits. Several people raise concerns that authors might miss out on mistakes they have made in the work, causing the “dissemination of potentially wrong information” (C123, case 138). A further argument against publishing research findings for pre-peer review commenting is that the published information is unfiltered and “too much information ends up burying everything in noise” (C101, case 16).

Main reasons to suggest the method
Mentioned reasons to suggest this method note the facilitation of rapid dissemination. This improves the base of research (“gets new ideas across faster” C5, case 5).

Summary on the opinions
The main issues raised concerning this method are dishonesty in the scientific business, the problems of disseminating research without any previous quality control and the issue of publishing delay due to long review times, which can lead to disadvantages for the author.

5.1.2 Pre-publication peer review (closed)
Closed pre-publication peer review is conducted by invited expert reviewers that are editorially selected according to their expertise in the relevant field (Tennant et al., 2017).

Closed pre-publication peer review was mentioned in nearly half of all cases analysed. The main methods discussed into this category were the traditional single-blind peer review (also mentioned as “traditional blind review” C81, case 91), double-blind peer review and open peer review (also mentioned as “double non-blind” (C43, case 46 or “non-blinded review” C64, case 72). Beside these three methods, further varieties of pre-publication review were discussed, such as stage review (double-blind followed by single-blind review), triple blind peer review and reviewing of all the data alongside the resulting manuscript.

Single-blind review, traditional peer review
Single-blind peer review means that the reviewer is anonymous for the author(s) as well as the audience. But the reviewer gets personal information about the author(s). The method is also called traditional peer review and has been the most common peer review method (Kelly, Sadeghieh and Adeli, 2014). Due to its ubiquity, this approach does actually not fall in the category of alternative peer review methods. But due to its central role in the peer review system, it needs to be addressed. In some comments, traditional peer
review is compared to other methods, generating interesting arguments that were included in the analysis.

*Argument supporting the method*

The pros raised in the discussion included the opinion that reviewers actually make valuable comments that improve the quality of the work. Another advantage that was mentioned several times was that “anonymity allows expression of honest opinions”, even if the authors are “powerful people” (C81, case 92).

*Arguments opposing the method*

The most oft-cited cons mentioned of single-blind reviews noted that, due to anonymity, personal bias of reviewers can get in the way of a good review. Further, commentators argued that the anonymity of reviewers might enhance laziness, as unknown reviewers do not have to answer for a bad review. Others even found the method “unjust” (C18, case 18), as anonymity allows the reviewer to make decisions without taking responsibility for them and even “every kind of abuse towards the authors guaranteeing total impunity to the reviewers” (C53, case 59).

*Main reasons to suggest the method*

In the discussions, there were actually more reasons mentioned to get rid of this traditional method than to keep it. Defenders argued that it is actually “good enough” (C47, case 50) and knowing the author might be advantageous, as it “lowers the risk of making stupid decisions” (C39, case 42).

*Summary on the opinions*

The vast majority of arguments given revolve around the issue of reviewer anonymity and any related abuse of power or possible bias.

*Double-blind review*

In a double-blind review, both the authors’ and the reviewers’ names are hidden. In some research fields, double-blind reviewing is standard, falling with single-blind reviewing under the umbrella of traditional peer review. Within the discussions analysed for this paper, opinions were very divergent. Many people did not consider it a traditional method. Therefore, it is considered as an alternative method in opposition to traditional single-blind peer review.

*Arguments supporting the method*

A lot of people argue that this is a very fair method. It eliminates bias against “big names” if the reviewer does not know the author. The approach is considered “best for academic integrity” (C19, case 19) and allows for the expression of honest opinions and suggestions for improvements, guaranteed quality and enables objectivity.

*Arguments opposing the method*

Critics of the method state several times that it “is totally unjust” (C18, case 18) and that “… reviewers, taking advantage of anonymity” could “get away
with the most preposterous unilateral comments, having obviously missed the point for the submission and focusing on whether the authors give (over)due recognition to the mullahs of the field” (C43, case 46). Several times, people were concerned that a blind reviewer did not need to consider bias. They claimed that the identity of the reviewer was still hidden, allowing the reviewers’ “personal bias” (C133, case 149) to influence his/her judgment. Furthermore, people argue that it is easier for the reviewer to give constructive criticism if he or she knows where the authors are coming from intellectually. When names are known, authors can respond to reviewers’ comments “in a more informed way” (C36, case 38). Another recurring argument was that double-blind reviewing makes it difficult for the reviewer to “discover if the authors provided a new contribution or just restate their previous work with minor modification” (C38, case 41), which would violate the rule of scientific novelty in research and therefore influence the review.

But actually, the main argument raised many times in the discussions was that for experts in the field (a group reviewers are generally considered to be a part of), it is reasonable that the majority of manuscripts contain at least one self-reference. This is especially true in small research fields. Furthermore, authors can “guess who the reviewer was about half the time” (C128, case 143). Many people are uncertain if “double-blind review processes can actually truly be double-blind” (C148, case 164) and doubt that there is “really any serious way to do it in practice” (C128, case 143). Even though this was a recurring argument, some people argued that empirical data prove that reviewer confidence in identifying anonymised authors is not sufficient and therefore cannot negatively influence the advantages of a double-blinded process. But another group argued that a “pseudo double-blind process doesn’t reduce bias”; instead “it manipulates bias” (C148, case 164), introducing more unhelpful noise in the reviewing process. This argument was countered by the suggestion that journals increase the number of reviewers involved in the process to make the number “sufficient to deal with it” (C149, case 165).

**Main reasons to suggest the method**

In general, discussants favouring this model argue that not knowing the author is fairer and more unbiased, as “applicant characteristics can effect review outcomes”, which can, for example, lead to “different success rates in different racial groups” (C11, case 11).

**Summary of the opinions**

In both single- and double-blind peer review, the arguments and reasons against the method are similar, in that they support anonymising the reviewer. Another big issue is again bias in the process, which can be hidden if the reviewer can figure out who the authors of a study actually are, even though they are supposed to be anonymised.

**Triple blind peer review**

In this method, neither the author nor the reviewer know the other’s identity, and the editors also do not know the author’s identity during the review process.
**Main reasons to recommend the method**
The main reason mentioned in favour of this method is that “editors are incredibly biased towards known authors, while ignor[ing] new authors” (C142, case 158), since journals need citations to raise their impact factor and big names are more likely to be cited.

There are no arguments against this method, since the topic was not discussed further. The comment was still included in the analysis because the author suggested and discussed a new alternative method.

**Summary of the opinions**
The main goal of introducing this method is lowering the risk of bias.

**A staged process: double-blind followed by single-blind review**
This method includes two rounds of peer review. The first round is double-blind (reviewer(s) and author(s) remain anonymous) and the second round is single-blind (just reviewers are anonymized). The reason for suggesting this method was that “a second referee confined to investigation on 'conflicting interests' and such (possibly raised by first referee?)” (C145, case 161). This two stage process should prevent bias in the reviewing process. The judgement of the reviewer acting in the double-blind reviewing process should be re-checked through a single-blind review to identify weaknesses (like bias).

**Arguments opposing the method**
The argument against this method was that it actually “defeats the purpose of the double-blind stage” (C145, case 161).

**Summary of the opinions**
The main issue for replacing traditional peer review with this method is to lower the risk of reviewer bias in the peer review process.

**Open review, unblinded peer review**
The name open review in this case refers to the openness of reviewer and author names but not the reviews themselves. Participation in the peer review process is still confined to invited reviewers, and reviews are not made public.

**Arguments supporting the method**
Proponents of revealing both the names of authors and reviewers argue that this is much fairer and improves reliability by creating a more serious and “responsible reviewing process” (C41, case 44). One of the most frequently raised pro arguments was that getting feedback from a known reviewer makes it possible for the author to clarify questions, to get more information and it “can be helpful” (C6, case 6). People argue that judging the work of others using your real name prevents careless or unjust reviewing and leads to fewer mistakes in the review. Several people mention that doing a review openly does not force the reviewer to like the paper, but decisions must be well-argued and “one would think twice before outing a negative review, but also before outing a positive one! And exactly that is the goal” (C90, case 104). One common claim in favour of openness is that open review can “reduce potential
bias” (C147, case 163). The thrust is that reviewers are more conscious of potential bias when their identity is open.

**Arguments opposing the method**
Arguments against openness in the reviewing process include the belief that knowing the reviewer’s name could in case of a negative judgement lead to institutional, collaborative or even financial conflicts. To prevent this, people argue that reviews will be overly and more frequently positive because people “didn't want to be harsh to their colleagues” (C150, case 166) or feared that the person they criticised might review their own papers in the future. Another comment mentioned the disadvantage of some people contacting the reviewers directly instead of corresponding with the editor, producing a lot of “noise in the system” (C64, case 72).

Commentors noted that one problem with this method was that, in many cases, researchers do not want to review a paper if their name will be revealed. This makes it not only difficult to find good reviewers, but also results in “losing a large fraction of the potential reviewer pool” (C102, case 117).

**Main reasons to suggest the method**
Positive reasons people give for implementing this method include knowing that the reviewers can be very helpful for the author and that this approach “makes the reviewer responsible and not able to hide in anonymity” (C35, case 37). In general, discussants argued that it makes peer reviewers “responsible for your reviews and comments, and live up to this responsibility” (C43, case 46). Another reason in favour is the argument that people should know who their reviewer is, was to give them the right “to reject any reviewer that may have any bias a possible bias towards her/his research” (C53, case 59).

**Summary on the opinions**
The emphasis in discussions of this method is on the social responsibility towards the work due to openness of identities and the restriction of possible bias.

**Reviewing of all aspects of the study, including the data, research and tools**
The argument for this method is that this would actually “change the way of making reliable science” (C69, case 77).

The reasoning against this method, on the other hand, is that it is extremely time-consuming for the reviewer, and that making all work accessible, is something which “works only among honest and correct people” (C75, case 84).

**Summary of the opinions**
The main argument for this method focuses on securing reliability and trust in science.
5.1.3 Post-publication peer review

The category post-publication peer review is comprised of all types of peer review that employ a formal (optionally invited) evaluation of the article after publication. All reviewers are experts in their respective research field – main difference with the post-publication commenting method. This category comprises methods like open peer review, in the sense of openly publishing both the manuscript and the review, real time refereeing and post publication peer review. It was the second most discussed category among all the threads included in this work.

Arguments supporting the method

One regularly mentioned reason in support of these methods was that, if the reviewer names are open, this is actually the most transparent method of doing peer review. Information about who is doing the review, how well it was reviewed, the issues raised in the review and the author’s response are included. Further, anyone can access the full scientific information, meaning that being able to access the paper and the review makes it possible to access all the comments and reasoning of both authors and reviewers. The advantage here is that scientists and reviewers can learn from published reviews. The general understanding of the paper would be enhanced with the inclusion of peer comments. The readers get the benefit of access to criticism, which helps to “train young scientists on how to do better peer review” (C109, case 124).

Another positive reason mentioned in the discussions is that open review provides the opportunity to “review the reviewing process” (C23, case 23). This is considered an improvement and helps to prevent fraud. This method is considered an “honest” (C130, case 146) process because suggestions and opinions are open. In fact, discussants stress the fact that by having all reviews openly accessible “I can easily decide for myself whether the review process is serious” (C139, case 155).

Several people raise the issue that these open methods in fact also are positive for the reviewers, since it gives them credit, and “the reviewers work is taken seriously” (C80, case 90). Additionally, reviews are citable.

Arguments opposing the method

One of the main negative arguments raised in several comments was that quality is not sustainable (“many papers, especially by those early in their career, are less than perfect, but the job of a reviewer is to suffuse improvements BEFORE the paper is published” C36, case 39). People fear that researchers could “download here papers thinking the information on them is correct” (C32, case 32). For several, it is a drawback that some papers are less polished or should not be published at all. Having a system without rejection is “creating a mess” (C110, case 125), and some voiced the opinion that the amount of information would become unmanageable. It is a disadvantage if people can misuse a review method to maximise their article counts and “dump” (C118, case 133) anything. One person argues that submitting a paper for open review “did not result in any additional feed back [sic!] to our paper” (C86, case 99). Another point was that the publishing of reviews in
conjunction with the paper “puts a burden on the reader to wade through a paper and all the reviews” (C110, case 125). Another argument against open peer review is that “it would only work if all scientist [sic!] would actually strive for the betterment and advance of humanity, instead of working for who gets the most citations and the highest impact, including backstabbing and trying to get one up on others” (C48, case 52). An additional argument against open reviewing raised by a researcher highlighted the system’s potential for tremendous financial loss.

**Main reasons to suggest the method**

One reason that is often put forward to argue for and suggest open peer review is that actually traditional peer review practice is outdated in terms of what can technically be done and science is in need of new methods. In the eyes of the people discussing it makes sense that a fully open and transparent peer review should improve the scholarly process and “many people value the open peer review history” (C134, case 150). They are in favour of the open process because “a good review – may it be positive or negative - is more than a consent of a reputable person but a substantial part of a dialogue” (C93, case 107). Another reason is that even with the traditional peer review methods it is difficult to be sure that bad science is not slipping through but “open peer review encourages us not to let our guard down” (C139, case 155). Furthermore the system needs much less resources when it comes to reviewers as the cascade of submission/rejection from the highest journal possible down is obsolete.

**Summary on the opinions**

The main issues raised in the discussions on this methods were openness, transparency, quality issues and resource issues.

### 5.1.4 Post-publication commenting

Post-publication commenting methods are conducted by informal discussions on published research. They can be performed on any platform and anyone can participate. They are furthermore independent of any possibly already previously conducted formal peer review. The discussions about post-publication commenting methods involved immediate peer review conducted by online discussion forums, users, the general public and crowd commenting in general.

**Arguments supporting the method**

The arguments in favour of this peer review approach highlight that, due to the possibility of having many different people that comment on the work, “the evaluation might even be more informed than it would have been from whichever willing peer reviewers a journal was able to contact” (C51, case 57). It is considered to be “very effective” (C51, case 57), as authors get feedback from users, and the public can judge if the research aim is relevant for society. People in favour argue that this is a very feasible method if a large percentage of the scientific community agrees to participate, making the system very
successful in “identifying shortcomings, fundamental problems and questionable research practice” (C99, case 114). Those methods can encourage online discussions and lead to interesting exchanges of views. The approach is in general considered “fair” and “a win-win situation” (C72, case 81). One person claims that the model prevents researchers from doing science just to “keep their peers happy” (C55, case 61).

Arguments opposing the method
Critics argue that a journal applying such methods could be seen as a sink for otherwise refused papers. A number of objections noted the large amount of time needed to successfully conduct a review and people would “rather have 3-4 reviewers look at a paper thoroughly than 10+ people gloss over it” (C106, case 121). Another common argument against the crowd review method is that many users, for example students, do not have the “perspective for evaluating a certain research work” and “can’t be objective in their observations” (C56, case 62).

Main reasons to suggest the method
The strongest argument for this approach is that small review panels might lack general understanding of research methods and topics and therefore these methods must have a place in the scientific publishing process. In an open review process, more academics get the chance to write a review, preventing the danger of an editor picking a less than suitable peer. This also increases the chance of finding mistakes. Another strong reason for supporting this method is that it helps to prevent peer review burn-out and “reduces the peer-review burden” (C135, case 151).

One debated argument for all open post-publication peer review methods is that they make available research that would otherwise not be seen; research that can be “poor in some respects but nevertheless valuable in other aspects” (C51, case 57).

Summary of the opinions
The main issues raised in discussions about post-publication commenting are review quality maintenance, reward of reviewers and human resources in the peer review process (peer-review burden).

5.1.5 Potential future models
The different potential peer review models suggested in the discussions were Reddit-like rating systems, Wikipedia-style systems, grassroots design and changing the focus of the review from reviewing manuscripts to either reviewing the work of researchers as a whole or focusing on the experimental design and the research plan.
Reddit/Credit system

A Reddit-style system is a community-driven open ratings system where texts or links to publications can be up- or down-voted. Users can comment and these comments can also be up- or down-voted, moving the most valuable ones upwards (Tennant et al., 2017).

Arguments supporting the method

Noted advantages of such a system were the potential for improvement of reviews if the reviewers were to be rewarded. This could be done by rating the reviews and giving credits to the reviewers via an open platform. An advantage of this approach would be the production of both good papers and good reviews; a way to “filter out some of the detritus” (C140, case 156). Furthermore, such a method might allow crowd-sourcing, which is regarded as “wonderful for checking validity of an article” and a “powerful force for doing peer review” (C151, case 167).

Arguments opposing the method

Within the discussions, this method was also highly criticised. People argued that, in general, non-academics do not possess the background to evaluate scientific quality and, therefore, the “general public should not have any say in how good or relevant a paper is”. There is a fear that “the outcome is not always predictable” and that “it would kill fundamental research” (C57, case 63). One person argues that people with little knowledge in a field could be threatened by an idea and vote against it “without having to adequately explain why” (C104, case 119). That would lead to a shift: “peer review would change from a more-or-less direct conversation between the author and the reviewers (chosen for their expertise on the subject) with an editor as a moderator into something more like the ugliest highlights from the Prime Minister’s questions from Parliament” (C104, case 119). According to the forum discussions, a peer reviewer should have both “ethical and educational qualifications” (C105, case 120) to help to ensure standards maintenance. Another argument against this method is that popular ideas would be more visible while not so exciting ideas that still might contribute a lot to a field might be rated down and disappear. This would be a problem because “popular ideas aren’t always the right ones” (C107, case 122). A recurrent fear is that this method is simply a “terrible idea” (C104, case 119). Another argument raised by a publisher is that it is currently a struggle “getting academics to participate online at all” (C138, case 154). Other critics say that methods like this are problematic due to potential collusion and fraud. “Career crunched or ambitious scientists would routinely be attempting to fudge votes in order to further their career” (C137, case 153) or “the nature of an open board of commenters through voluntary participation is easily poisoned by a minority of zealots working diligently to torpedo anything that threatens their pet theories” (C104, case 119).

Main reasons to suggest the method

One main reason to advocate for this kind of method was ability to work against journals as “comment ghost towns” (C136, case 152).
Summary of the opinions
The main issues raised in the discussions about the Reddit-style system focus on quality, rewards for reviewers and the communication and exchange in the community.

Wikipedia style model
The wiki-style model is supposed to improve publication by direct editing (version control mechanisms; Tennant et al., 2017). It is mentioned only in one comment, where the author only suggests the approach as an answer to a suggested Reddit model for peer review: “Why Reddit? A Wikipedia-style system would be perfect” (C108, case 123).

Grassroots scientific publishing
This is a method suggested by only one person in one comment (C131, case 147). Grassroots scientific publishing is based on the scientific community curating the articles in their own field, including doing the peer review. The main reason for applying this method is that scientific publishing would be in the hand of the scientific community. They could decide over the peer review process and “would no longer need publishers”.

Reviewing the research design or the researcher
People in favour of this suggestion argue that such an approach would increase the reproducibility of experiments as all steps of research would be revealed and this would subsequently improve the reliability of the whole peer review process.

Main reasons to suggest the method
The main support for this method is that because the outcome of an experiment is not foreseeable, false results might be published. Several people would be in favour of this approach, but opponents argue that this would actually make journals more boring to read, since they would include negative results (which might not have the same relevance in all research fields).

The reason for suggesting a review of researchers and their work as a whole rather than via just one paper was that some people tend to split up results into smaller pieces to be able to publish as many publications as possible. In the end, the new paper contains “a tiny fraction more than previous publications” (C76, case 86), indicating that there are already too many papers published.

Summary of the opinions
The main issues raised are quality matters and academic honour.
5.1.6 Further suggestions to improve the system

Apart from new methods, the replication of studies and the reward of reviewers were discussed in the threads.

*Main reasons to suggest the method*

The reason to suggest replication of research is that there “is a growing concern” in different research fields that there is “an inability to reproduce results” (C7, case 7).

The suggestion to reward reviewers in order to improve the quality of reviews is a widely discussed issue. People argue that “we must interest the reviewer by money or other recitative measures” (C27, case 27), and several people agree that this would push researchers to review. One person actually suggested that the authors should pay the reviewers. This would considerably diminish “the motivation to flood the journals with manuscripts that may be pass” [may pass the peer review process and get published] and “force the authors to write better papers” (C25, case 25). This would not just increase the seriousness of reviews and reduce the workload for the reviewers but also improve the quality of the submitted drafts.

5.2 Research field analysis

As both Reddit and ResearchGate are open forums, researchers from different scientific fields participated in the discussions. As mentioned before, in Reddit it was in most cases not possible to get information on the research field of commentors. Analysis of the research fields to which commentators could be assigned gave the following results:

Out of the total number of 169 cases, 18.3% (n = 31) of all cases could not be assigned to any research field because this information on the person posting was not accessible.

![Figure 3. Distribution of research fields across all cases analysed (N = 138; not assigned cases not included in the chart).](image-url)
Excluding the cases that did not include any information, the rest subdivided as follows (100% = only cases that could be assigned): 31.2% Natural Sciences (n = 43); 27.5% Engineering/Technology/Computer Science/Mathematics (n = 38); 15.2% Medicine (n = 21); 14.5% Social Sciences (n = 20); 7.2% Humanities (n = 10); 4.3% Scientific Publishing working with science but not as a scientist (n = 6) (Fig. 3).

In the following section, all peer review methods included in the analysis are analysed according to the research areas with which the authors of comments are associated. As mentioned before, this information was not accessible for all cases. To give a good overview of the data obtained, all methods were included in the analysis. The only category not analysed according to research fields of commentators was the comments on how to improve the peer review system. People raising this issue came solely from the areas of natural sciences and technology and the number of records was too low to draw any conclusions on these numbers (total number of records: 5).

Pre-peer review commenting

The total number of cases of pre-peer review commenting was 9. When looking at the percentage of people from specific research fields commenting on this method, cases from the natural sciences turned out to be three times as many as from any other field. But in general, the number of cases that include this method are low.

The percentage of cases from a certain research area weighting in on pre-peer review commenting in relation to all cases assigned to this research area in the whole study provides a different picture. The area of scientific publishing represents the highest percentage (16.7%), followed by the humanities (10%). However, due to the low number of cases from these fields, the number of cases behind these proportions is only one from each field. Generally, pre-peer review commenting is mostly discussed among people coming from the natural sciences, but the overall appearance of this method in discussions is rather low.

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<tr>
<th>Research Area</th>
<th>Number of cases</th>
<th>% in relation to all</th>
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<tbody>
<tr>
<td>Humanities</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Social Science</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Natural Science</td>
<td>3</td>
<td>7</td>
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<tr>
<td>Technology</td>
<td>1</td>
<td>2.6</td>
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<tr>
<td>Medicin</td>
<td>1</td>
<td>4.8</td>
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<tr>
<td>Scientific Publishing</td>
<td>1</td>
<td>16.7</td>
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</table>

The table depicts the number of cases that included opinions on pre-peer review commenting in relation to research area. The first row shows the number of cases mentioning pre-peer review commenting. The second row shows the percentage of cases in each research area mentioning pre-peer review methods in relation to all cases of a certain research area included in the whole study.

Table 1. Pre-peer review commenting.
Pre-publication (closed)

The total number of cases dealing with this category was 77. Looking at the proportions of research fields in relation to the total number within each research field in the whole study, two research fields stand out: the majority of comments from people from the humanities and the social sciences are on these methods (70% and 75%). Natural sciences and technology are far behind with rather equal levels (39.5% and 44.7%) but still clearly ahead of the rest.

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<td>Humanities</td>
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<td>Social Science</td>
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<td>Scientific Publishing</td>
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<td>16.7</td>
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<td>Nr. of cases without info</td>
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<td>Total nr. of cases</td>
<td>77</td>
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Table 2. Pre-publication (closed). The table represents the percentage of cases with opinions on closed pre-publication peer review methods broken down by research area. The first row shows the number of cases mentioning pre-publication peer review. The second row shows the percentage of cases in each research area mentioning pre-publication peer review methods in relation to all cases of a certain research area included in the whole study.

Post-publication peer review

The total number of cases including comments on post-publication peer review was 38. This method is obviously of significant interest for researchers in medicine (52.4%), followed by technology (28.9%). People from scientific publishing seem to be strongly represented in discussions about post-publication peer review. But even though 3 out of 6 people in total from this field contributed to discussions of post-publication peer review, the low total number does not allow further conclusions to be drawn. The interest among people from the social sciences and the humanities for this method seems very low.

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<td>Total nr. of cases</td>
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Table 3. Post-publication peer review. The table represents the number of cases commenting on post-publication peer review methods in relation so research area. The first row shows the number of cases mentioning post-publication peer review. The second row shows the percentage of cases in each research area mentioning post-publication peer review methods in relation to all cases of a certain research area included in the whole study.
Post-publication commenting

The total number of cases assigned to this category was 20. In terms of representation within this group, natural science and scientific publishing are nearly equal (16.3% and 16.6%). But again, it must be emphasised that this high number is due to the low total number of cases assigned to scientific publishing. Natural science and scientific publishing are followed by technology and medicine (13.2% and 14.3%). Humanities and social science are least represented in discussions about these methods (both 10%), but all together it can be said that the distribution across all research fields is quite even.

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<tr>
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<th>Number of cases</th>
<th>% in relation to all</th>
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<tbody>
<tr>
<td>Humanities</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Social Science</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Natural Science</td>
<td>2</td>
<td>16.3</td>
</tr>
<tr>
<td>Technology</td>
<td>5</td>
<td>13.2</td>
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<tr>
<td>Medicin</td>
<td>3</td>
<td>14.3</td>
</tr>
<tr>
<td>Scientific Publishing</td>
<td>1</td>
<td>16.7</td>
</tr>
<tr>
<td>Nr. of cases without info</td>
<td>1</td>
<td></td>
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<tr>
<td>Total nr. of cases</td>
<td>20</td>
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Table 4. Post-publication commenting. The table represents the number of cases commenting on post-publication commenting methods in relation to research area. The first row shows the number of cases mentioning post-publication commenting. The second row shows the percentage of cases in each research area mentioning post-publication commenting methods in relation to all cases of a certain research area included in the whole study.

Potential future models

The total number of cases regarding potential future models was 21. This topic seems to be of some interest to people in the publishing business (although again it must be emphasised that there are just a few cases assigned to this field) and to researchers in the natural sciences. Humanities and social science scholars do not participate at all in these discussions. Potential future models seem not to be of high interest to them.

<table>
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<tr>
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<th>Number of cases</th>
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<tr>
<td>Natural Science</td>
<td>7</td>
<td>16.3</td>
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<tr>
<td>Technology</td>
<td>2</td>
<td>5.3</td>
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<td>Medicin</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td>Scientific Publishing</td>
<td>2</td>
<td>33.3</td>
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<td>Nr. of cases without info</td>
<td>9</td>
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<tr>
<td>Total nr. of cases</td>
<td>21</td>
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Table 5. Potential future models. The table represents the number of cases commenting on potential future models in the peer review system in relation to research area. The first row shows the number of cases mentioning potential future models. The second row shows the percentage of cases in each research area mentioning potential future peer review models in relation to all cases of a certain research area included in the whole study.

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Summary of findings

The first part of the presented data clearly shows that not all peer review methods are equally discussed among people in science. The most discussed methods are the more traditional approaches. Very new and innovative ideas were mentioned very rarely or not at all.

The reasons why people suggest certain methods can be grouped into a few major topic areas. Extrapolating from this analysis, these areas are bias, fairness and anonymity followed by quality of reviews and publications. The next big issue was communication and exchange between reviewers and authors but also potential readers of the publication. Another recurrent point was the peer review burden and connected to this the human resource issue. One point that was not a method of its own but was connected to several methods discussed was rewarding the reviewers in order to secure better quality in the reviewing work. All of these issues were discussed in connection to the numerous arguments in favour of or against the method in question.

The distribution of research fields represented in the collected data is not even. There are clear differences when comparing methods. Discussions about closed pre-publication methods showed proportionally strong participation by members of the social sciences and humanities, whereas post-publication peer review methods were dominated by medicine. But the problem of drawing solid conclusions from these data is limited by one aspect of the study. Due to the fact that the data used were already there and not organised to ensure equal distribution of participants (or research fields), the collected data are very uneven, making comparison difficult.
6 Discussion

In the following chapter the research questions will be discussed based on the key empirical findings of this study. The results will be analysed in relation to findings from other empirical studies and relevant literature.

The discussion will be separated into two different sections. The first will focus on discussing results that can help to answer research questions one and two (the order of the methods is by frequency of mentions the analysed discussions):

Q1. What are the main proposed alternatives to traditional peer review suggested by researchers?

Q2. Are there discernible differences in preferences for alternative peer review methods between different research fields?

The second section will focus on research questions three, four and five:

Q3. Which pros and cons for alternative methods are raised in the discussions?

Q4. What are the main reasons why researchers suggest alternative peer review methods?

Q5. Can the arguments be understood as expressions of different theoretical views on science?

6.1 Preferences towards different methods of peer review

6.1.1 Pre-publication peer review (closed)

The analysis of discussions on Reddit and ResearchGate all showed the predominance of one method. Closed, before publication peer review was most discussed, appearing in almost double the number of analysed threads as all other detected methods together. The main issue with this form of peer review is the degree of bi-directional anonymity during the peer review process (Ware, 2008). For many years, peer review meant single-blind review. The author submits a manuscript to a journal and if it gets through the editorial check the editor selects a (for the author anonymous) reviewer that judges the work.

But in the past few years, journals have started to change this form of peer review to integrate new ways of pre- or post-publication reviewing with open identities (Rodgers, 2017). Researchers have of course opinions about these methods and the enthusiasm towards new methods is not always high. Studies showed that the openness towards progressive methods is low and the greatest
trust is still set in blinded methods – traditional single-blind review and double-blind review. Open peer review (non-blind) is less popular and trusted (Mulligan, Hall and Raphael, 2013; Moylan et al., 2014; Ware and Monkman, 2016; Rosse-Hellauer, Deppe and Schmidt, 2017). Several studies show that double-blind peer review is along with single-blind peer review the most favoured method but single-blind peer review is losing popularity (Ware, 2008; Moylan et al., 2014) whereas this also seems to be changing by time and there is indication in some studies that single-blind peer review is increasing in popularity again (Ware and Monkman, 2016). One reason might be that it seems to be the preferred method for scientists in the later stages of their career (Moylan et al., 2014) whereas double-blind peer review is preferred from younger scientists (Rosse-Hellauer, Deppe and Schmidt, 2017).

These findings seem to largely be in alignment with the discussions analysed in this study. The current study shows clearly that pre-publication peer review, comprising mainly single-blind, double-blind and non-blinded open peer review, is by far the most discussed peer review system (almost 50% of the whole data set). The fact that these methods dominate discussions can, of course, be due to the fact that this is the most traditional and most used peer review system, and therefore also the best known one. Within the analysed discussions, different variations of blinded peer review, apart from single-blind, double-blind or non-blind, were mentioned. One of those is triple-blind peer review, where the identity of the author(s) is blinded for both the reviewers and the editors. Another variation was a combination of double- and single-blind peer review. Triple-blind review is not currently used much (Tennant et al., 2017), which could also be the reason why it is discussed very little in the threads analysed in this study. Review not just of a manuscript but of the data and the tools used for conducting the research was also discussed briefly, but there is no evidence in the collected data that this method is used in any journals.

Several studies mention disciplinary differences in attitudes towards different peer review methods (Ware, 2016; Mulligan, Hall and Raphael, 2013; Ross-Hellauer, Deppe and Schmidt, 2017). When it comes to closed pre-publication peer review, Ware (2016) cites material science and chemical engineering as mostly generally trusting traditional single-blind peer review. The data from the current study points to two research areas interested in this method: 70% of all comments from researchers in the humanities and 75% of all comments from researchers in the social sciences were about these methods. Researchers from the disciplines of technology (44.7%) and natural sciences (39.5%) also discussed this approach. These findings are not in accordance with the survey by Ware (2016), but it is tricky to compare results because, as mentioned before, the applied methods are not the same.
6.1.2 Post-publication peer review and post publication peer review commenting

The second most discussed form of peer review was post-publication peer review. This approach is characterised by a formal reviewer judgement subsequent to publication. Reviewers are experts who volunteer for the journal, and their report is published alongside the manuscript (with or without revealing the reviewer’s identity). This form of peer review is always open review, which refers to the practice of publishing the reviews. The third most discussed peer review method was post-publication commenting. It is a method technically close to post-publication peer review, since the review process happens after publication and is open to everyone. Reviews are thus not conducted by chosen experts but rather consist of informal discussions independent of other formal peer review processes (Tennant et al., 2017). The number of discussions of this kind of review aligns with findings from other studies. In Ware’s (2016) peer review survey, open peer review was ranked far behind the more traditional, blind review methods in popularity, but acceptance of open methods has increased in the last few years.

"Open” can refer to the degree of anonymity within the reviewing process. This variety is reflected in the array of pre-publication peer review methods (see above). On the other hand, open peer review can refer to publishing review reports (with or without naming the reviewer) alongside the published article or opening the process up to the public (Ross-Hellauer, 2017). These interpretations of open review have been applied in this study when assigning comments about open peer review either to the category pre- or post-publication. It became clear from the discussion content which type of open peer review was under discussion.

The popularity of these different forms of open review is not evenly distributed within the scientific community – a pattern evident in this and other studies. Ware (2016, p.3) cites that a high number of researchers favour open peer review, but this support drops by nearly 50% “if it includes publishing signed reviews alongside the paper“. That also reflects the findings of the current study; open peer review (including the publication of reviewer names and reports) was discussed less often than open peer review, merely involving the publication of reviewer names or the fact that the reviewers name is revealed to the author but not necessarily to the public. Another open peer review approach, called post publication commenting, also appeared, though it was less visible than open peer review conducted by reviewers. This system is often applied in combination with the open review of expert reviews or conducted on platforms where anyone can contribute (Tennant et al., 2017).

The survey of researcher attitudes toward open peer review by Ross-Hellauer, Deppe and Schmidt (2017) showed that, across research areas, a majority favoured open peer review as common scholarly practice; there was strong support for open access to publications, review reports and research data. The strongest support came from the social sciences. The research areas that were most against the method included biology, life sciences, physics and
In the current study, the research area most proportionally involved in discussions about post publication peer review was medicine. Scientific publishing was well-represented but, considering the low number of participants included in this group (n = 6), this result is not very meaningful. Ranked third was technology; almost 30% of comments from this field were related to this method. Open peer review commenting was different. The number of cases in general was lower, and the comments came most frequently from the natural sciences, followed by medicine and technology (all were grouped around 15% +/- 2%). But what it clear is that people in both the humanities and the social sciences seem to be less interested in the open publishing methods. This fact agrees with the findings of Ford (2016) in his investigation of open peer review in LIS journals. Due to differing approaches to the categorization of respondents and commentators, it is difficult to compare results. But all studies clearly prove that discussions about open peer review methods are lively and distributed over all research areas.

6.1.3 Future peer review models and additional suggestions for general improvement of the peer review system

More common than post-publication commenting were discussions of future peer review models. The development of these models is connected to the rise of Web 2.0 and the expansion of social media platforms and “an overall shift towards a more open system of scholarly communication” (Tennant et al., 2017, p.21). The most discussed model in this study is the Reddit-style system, based on up- and down-votes and open commenting on articles. The Reddit system of judging online contributions is applied at the discussion platform reddit.com, which is said to be “the world’s largest 2-way dialogue between scientists and the public” (Owens, 2014). But the reason why the Reddit-style model is discussed discernibly more often than any other alternative model might not be based in the possibilities of improved peer review, but rather that reddit.com was one of the two forums from which data were gathered for this study. Discussions about the Reddit-style system were found only on reddit.com and not on ResearchGate, the second forum included in the study.

Other alternative systems discussed were mentioned only briefly. Among these were the wikipedia-style model. Both the Reddit- and the Wikipedia-style model represent new developments of peer review methods based on communication platforms. But the actual purpose of these platforms is to attract followers, not to ensure an ethical approach and reliability – the primary goals of peer review (Tennant et al., 2017). The negligible interest in these methods could indicate that most academics are not ready for a total make-over of the traditional system. This disinterest is confirmed in both the current study and several other studies showing a measurable preference for traditional forms of peer review (Deakin, 2016; Ware, 2016; Moylan et al., 2014; Ware and Monkan, 2008).

This study also identified threads identifying a desire to improve the current peer review system without proposing an alternative method. The two suggested improvements were replications of studies and rewarding of
reviewers. The former is not really an issue so far but the latter one already is. Even though it was not deeply discussed as a stand-alone point among the comments analysed in this study, the option of rewarding reviewers was judged to be positive within several discussions of other methods. This finding fits with other research community arguments about the need for recognising reviewers with monetary or academic compensation (Ware, 2016).

Alternative peer review models were not heavily discussed, and in almost half of the cases, there was no information on the research field of the discussant. A majority of these threads came from individuals in the natural sciences (3.3%, n = 7). This number is not very high, at just 16.3% of the total number of cases assigned to natural sciences. But it is still higher than for other research fields. However, the available data is not very conclusive, and there are no other studies available on this issue.

6.1.4 Pre-peer review commenting

The practice of sending preprint manuscripts to colleagues for pre-submission corrections has long been a common procedure in physics or mathematics (among other research fields). This approach is reflected in a preprint archive called arXiv (arXiv.org), where pre-peer review manuscripts can be freely accessed worldwide. Even though the adoption of pre-print services in research fields other than natural sciences is slower, several platforms have been developed for the dissemination of preprints from other scientific fields (Tennant et al., 2017). There are some arguments that preprint services will become the favoured venue for publishing and, in the end, replace peer-reviewed journals (Kaiser, 2017).

Though forum discussion of this method was limited, some research fields were far more likely than others to discuss this issue. Among all threads addressing pre-peer review commenting (nr. of total cases = 9), the majority were from the natural sciences (n = 3). This pattern might be because this method has primarily been used by natural sciences journals. Individuals from the humanities, social sciences, technology and medicine contributed much less (each field n = 1). Hellauer, Deppe and Schmidt (2017) found that agreement on the question of whether manuscripts should be made available via a preprint server prior to any other form of peer review was equally distributed among all research disciplines. The majority of researchers in favour came from the social sciences, mathematics, law and computer science. The majority in opposition came from the disciplines of agriculture/food science, health science and chemistry. But the authors stress that the majority of respondents were against making manuscripts openly available. These findings are not in concert with the results of the current study but, as already mentioned, the limited data prevents this thesis from drawing strong conclusions. Mulligan, Hall and Raphael (2013) found a predisposition towards pre-print publications in astronomy and physics, which fits with their survey finding that participants from those research fields generally value peer review less.
6.1.5 Collaborative peer review, portable peer review, recommendation services and decoupled post-publication (annotation services)

As mentioned in the results section, these four alternative methods of peer review were not addressed in any discussion. Though they are applied on different platforms or by different publishers (Tennant et al., 2017) and research indicates that these methods can improve the current peer review system (Kovanis et al., 2017), appreciation and awareness in the research community appear to be very low.

In conclusion, traditional peer review methods were the most discussed. In accordance with other studies that found that double-blind review was the most trusted method (more or less equal to single-blind review), this was the most discussed methods in this study, together with non-blinded open review. Post-publication peer review was the second most discussed method but with a significantly lower frequency. All other methods deviating from the traditional editor-reviewer-author system were mentioned infrequently or not at all in the discussions.

It was difficult to detect a discernible difference between research areas when it came to opinions about peer review methods. The method applied in this study made it difficult to gather enough data to be able to draw solid conclusions. One rather clear finding was that the social sciences and humanities seem especially interested in more traditional methods of closed pre-publication peer review; open peer review publishing models were most discussed among people from medicine, while natural scientists and people connected to technology were more interested in alternative approaches. Regardless, it is rather difficult to directly compare the findings of this study with findings from other studies of researcher attitudes. All other studies are based on survey data, resulting in a much higher number of participants while also facilitating different statistical analyses and data interpretations.

6.2 Opinions and arguments about peer review methods

Opinions and arguments about peer review methods can be parsed into a few main categories. These categories will be discussed in the following section, using relevant peer review literature and theoretical perspectives.

6.2.1 Bias, Fairness and Anonymity

Bias is one of the most-discussed drawbacks of the peer review process. In this study this was one of the main reasons why people were in favour of or against a certain method. Reviews can frequently be biased, meaning that they are influenced by non-scientific issues like “personal attributes of the authors, applicants or the reviewer themselves” (Bornmann 2011, p. 203). If the judgment of the reviewer is influenced by such factors, the fairness of the peer
review process is not guaranteed (Bornmann, 2011). Possible reviewer bias is a well-recognised problem, often connected to the reputations of authors and reviewers and varying theoretical views (Lee et al., 2012). Bias is often connected to peer review, giving “rise to doubt as to whether there can be objective review without local and social influences” (Bornmann, 2008, p. 31).

The findings of the current study clearly show that concerns about bias in peer review influence opinions about different methods of peer review both positively, because certain methods protect against reviewer bias, and negatively, because the method allows bias in reviews. Bias is thus one of the main reasons for opposing blind review (both single and double). Several commentators believed that hiding a reviewer’s identity allows for personal bias to affect the process. But in the case of double-blind review, people also argue that anonymising the author is fairer than introducing “applicant characteristics” (C11, case 11) into the review process. That findings go along with results described in Ware (2016), who notes that reviewer bias is often understood in connection with single-blind peer review. Tomkins, Zhang and Heavlin (2017) also find that single-blind reviewing grants significant advantages to famous authors or authors from prestigious institutions, in comparison with double-blind reviewing. However, critical discussions about double-blind peer review (in this study as well as in other analyses) also note that it is often possible for the reviewer to guess who the author is (Nature, 2008). The ability to guess reinforces the possibility of reviewer bias.

One blind method designed to prevent bias was triple blind peer review, requiring the anonymization of author names for both reviews and editors. Arguments in favour of this method are based on the belief that “editors are incredibly biased towards known authors, while ignore new authors“ (C142, case 158). This bias is rooted in the need for high citation rates that ensure a high impact factor, a rate that often climbs with the publication of known authors. A high impact factor determines the attractiveness of a journal – not just for librarians who decide which journals to purchase, but for authors deciding where to submit an article as well (Garfield, 2006). In general, taking editorial bias into account is not that common when it comes to discussions about bias in the peer review process, though studies demonstrate that editors affect the research landscape, and editorial strategies can help to prevent bias (Nature, 2008; D’Andrea and O’Dwyer, 2017).

In the current study, prevention of bias was one of the leading reasons behind support for open peer review (both non-blinded and open publishing). These results are supported by Ross-Hellauer, Deppe and Schmidt (2017), who found that open peer review is considered the best method for prevention of bias. As one person states, an open identity “makes the reviewer responsible and not able to hide in anonymity“ (C35, case 37); a large number of commentators in this study agree. People also argue that when the authors know who the reviewer is, they can reject the reviewer on suspicion of bias.

But the issue of editorial bias is also raised in discussions about open peer review. Some argued that open peer review prevents bias in editorial decisions.
Openness prevents editors from picking the wrong or unsuitable reviewers and, as found by Ross-Hellauer, Deppe and Schmidt (2017), this approach also mitigates the unilateral power of editors.

An additional put forth for supporting open peer review and publishing review reports is that this approach provides the chance to “review the reviewing process” (C23, case 23). This is supposed to result in more honesty, helping to prevent bias and fraud and give the reader the opportunity to judge whether the review process proceeded correctly.

The issue of honesty in research was raised several times in the discussion. Especially with methods of pre peer review publishing, discussants stressed the possibility of getting scooped. This finding fits with Ross-Hellauer, Deppe and Schmidt (2017), who noted an emphasis on publication pre-prints increasing the danger of getting scooped.

This study demonstrates that bias is often connected to different grades of anonymity applied within the peer review process. The belief that anonymity could facilitate bias was a main argument against single-blind peer review. Less or no anonymity was considered fairer, preventing abuse of power. But as Tennant et al. (2017) state and as can be seen from the highly diverse and often contradictory opinions analysed in this study, there is no consensus about how to apply anonymity within the peer review. The authors argue that “it would degrade the ability of science to move forward” (Tennant et al., 2017, p. 18) without the ability to deal with exceptions, especially because it is not easy to empirically prove that articles produced within an anonymous or open identity system are better (Tennant et al., 2017; Lee et al., 2012). Opinions about anonymity are very diverse. Ware (2016) found that people are more willing to review work if their identity is not revealed. Authors, on the other hand, prefer to know who their reviewers are. A study by Enserink (2017) showed that only one in eight authors prefers blinded reviewers when submitting a manuscript for review.

Both the issue of bias and the issue of fairness can be connected to Merton’s norm of universalism. This norm states that the evaluation of a scientific claim should never depend on the personality of the person making the claim. Judgment must never be influenced by race, nationality, religion, class or personal qualities. This claim is rooted in the fact that scientific laws are always impersonal. They are considered true or false independent of their origin (Sismondo, 2009). When looking at the arguments raised in the discussions, it is clear that universalism and the guarantee of unbiased judgment are collective goals. Universalism is clearly considered the ideal procedure for fair peer review. But the discussions also illustrate how difficult it is to ensure this ideal. Bias is a big issue at all stages of the peer review process. Sismondo (2009) emphasises that many scientific journals try to employ peer review methods that do prevent the reviewer from identifying the authors’ affiliations, but this information is often easy to guess. However, even though universalism seems nearly impossible to implement, it is still supported – in practical terms and as an ideal.
Merton’s norm of disinterestedness is an interesting way of understanding the problem of bias and fairness, since it demands that the scientist totally disconnect his/her own personal interests from research. The scientist is expected to report results fully, regardless of other implications. Application of this norm should actually prevent fraud and other kinds of dishonest behaviour within academe by mitigating personal interests that could interfere with the pure goals of research and knowledge gain (Sismondo, 2009). In the discussions analysed in the current study, it is obvious that dishonesty, getting scooped by other scientists or just the fear of fraud are all issues within the academic community. Though disinterestedness is a shared value, people do not trust that everyone will prioritize the greater good over personal gain. In general, the scientific world is highly competitive, both in terms of reputation and finances. This does not mesh well with ignoring personal gain.

Connected to universalism and disinterestedness is the Mertonian norm of organised scepticism, which demands that new findings be debated and tested. Without organised scepticism, authors could actually aim to trick reviewers for personal gain.

All the discussions about how to avoid bias in peer review fit with the view of social constructivists, who question whether people are following norms. They argue that social pressures influence the behaviour of scientists as authors and reviewers. As humans, according to constructivists, their actions cannot be controlled or standardised (Sismondo, 2009; Knorr-Cetina, 1991). From this perspective, bias can never be totally erased from the process of peer review. According to constructivists, the peer review process will always be influenced by non-scientific criteria, and there is significant doubt that objective peer review is possible at all (Bornmann, 2008). This argument appears in the discussions analysed in this study. People argue about which methods would make it possible to avoid or at least diminish bias in peer review or which methods should be avoided because they allow possible bias. In the end, there is no clear agreement on how to get rid of bias in the peer review process; the majority seem to agree with the social constructivist viewpoint.

6.2.2 Quality of reviews and publications

The results of the current study showed that the issue of publication and review quality was connected to several methods.

Methods involving publishing before peer review were understood to work against quality control. Discussants argued that publishing unreviewed information leads to publishing mistakes and “potentially dissemination of wrong information” (C123, case 138). Even though the published manuscript can be updated after the post-publication review process, a number of commentators feared that the uncorrected manuscript was still available and might be treated as a valid source of information. These findings are supported by Ross-Hellauer, Deppe and Schmidt (2017) documenting arguments that pre-peer review published papers can contain mistakes that could be read by a large number of people before editing. They state that the review process is there to filter out bad quality publications that would otherwise “pollute” the scientific
knowledge pool (Ross-Hellauer, Deppe and Schmidt, 2017, p. 24). This conclusion is similar to the argument raised in the current study, that publishing everything would lead to “a mess”. All together, participants in the study by Ross-Hellauer, Deppe and Schmidt claim that these disadvantages would outweigh the advantages of this approach.

The argument that pre-peer review publishing could lead to dissemination of bad science, lowering the overall quality of scientific publications can be seen as an expression of the Mertonian worry that skepticism may be lacking among the scientific public, who should scrutinise new ideas until they are established (Bornmann, 2008). Only claims that survive critical testing should end up in the pool of scientific knowledge.

This claim fits with the discussions analysed in this study and with the findings of Ross-Hellauer, Deppe and Schmidt (2017). People think that this method cannot guarantee the quality material without a pre-publication peer review quality check. All kinds of academic publishers support this approach, claiming that the coordination of peer review and text enhancement during publication raises the quality of scholarly publishing (Klein et al., 2018). Klein et al. (2018) took up this claim and compared the quality of preprints published on arXiv and bioRxiv with the subsequent published versions of the papers. They found that for articles pre-published at arXiv, there is no significant difference between preprints and published versions published by commercial publishers. The difference across papers in bioRxiv was slightly bigger, but the authors note that this could be due to differences in formatting and copy-editing practices.

The issue of quality is connected to the issue of openness in reviewing and commenting in the examined discussions. In the current study, people often argued that a larger number of reviewers might result in better publications: “the evaluation might even be more informed than it would have been from whichever willing peer reviewers a journal was able to contact” (C51, case 57). The results of Klein et al. (2018) confirm this view about open peer review including open commenting. The survey conducted by Ross-Hellauer, Deppe and Schmidt (2017), on the other hand, does not confirm this. Here, open participation was not very popular because participants doubted that manuscript quality would be improved by unqualified commentators. This study also identifies instances in which discussants argue that a review process privileging non-academics risks harming the overall quality of scientific work. However, this thesis also identifies a group who believes that open commenting would be a good method for teaching people how to write good reviews while identifying shortcomings, problems and malpractice in the review system. This finding confirms Ross-Hellauer, Deppe and Schmidt (2017) results, which showed that open reports would increase review quality.

Apart from the process of peer review and quality assessment, open methods do not entirely contradict Merton’s norms. The norm of communism states that scientific knowledge “is commonly owned”. The inventor of a certain idea can get recognition for it but has no influence on further use. Scientific ideas must
be disseminated for use by other scientists and the public. Science is a social activity, always the result of common efforts (Sismondo, 2009, p.24). This point of view clearly supports comments that emphasise open review and publishing of reviews as a way to get more out of the review process. The occurrence of scientific fraud - mostly because of personal interests - can be seen as a proof of social constructivists’ argument that scientists’ behaviour do not necessarily follow certain norms (Knorr-Cetina, 1991).

6.2.3 Communication and exchange

Tightly connected to the reasoning about the pros and cons of openness in peer review is the issue of communication and enhanced exchange of ideas in the scientific community. This issue appeared regularly in the threads analysed in this study. Interaction was welcomed by the majority of participants in the study by Ross-Hellauer, Deppe and Schmidt (2017); contributors agreed that more interaction between reviewer and author would improve publication quality. Academics also believed that a good review is the result of a dialogue, aligning with results in Mulligan, Hall and Raphael (2011). These arguments connect the issue of dialogue with the issue of quality. Ross-Hellauer, Deppe and Schmidt (2017) also found that the majority of their participants think that open reviews are useful to the reader; open reviews both ensure transparency and can have pedagogical benefits, particularly for young scientists.

Forum participants understood exchange as benefiting the peer review process, a reason for recommending open crowd review methods because they are “very effective“ (C51, case 57). Open communication was believed to facilitate useful feedback from users and allow the public to judge whether the research aims were reached.

The data of this thesis indicates that opinions seem to be widespread. The positive attitude towards open dialogue in the peer review process reflects the social constructivist view that scientific work is a joint effort between the author and the reviewer(s), aligning less with Merton’s belief that only experts from the pertinent field should be allowed to assess the scientific quality of articles within their area. According to social constructivists, discourse about science should not just happen among scientists. Consequently, people who are not specialists in a certain scientific field are free to participate in scientific discussions if they have a sufficient understanding of the subject. It has been shown that when such persons are involved in the peer review process, decisions about the quality of scientific work are very similar to expert-driven decision-making (Bornmann, 2008). The opinions of social constructivists are in strong accordance with proponents of crowd review methods being integrated into the peer review process.

6.2.4 Human resource issues (peer review burden)

In discussions of several methods – especially post publication reviewing and pre-peer review publication – concerns were raised about the need to limit the number of publications in order to ensure quality. People agreed that when there is no pre-publication rejection, the quantity of publications would quickly
become unmanageable. This claim confirms a common opinion in the world of research, where an increasing number of published articles is assumed to be a threat, overburdening the scientific community. To test this assumption, Kovanis et al. (2016) conducted a study providing “an estimated range for the overall quantitative demand and supply in peer review” (Kovanis et al. 2016, p.). They found that review capacity within the scientific community is much higher than current peer review production. The main problem is that a minority of researchers handles the majority of peer reviews, which can lead to a quality reduction and may be the actual origin of the peer review burden (Kovanis et al., 2016).

Interestingly, some considered open peer review an antidote to the peer review burden; open peer review and commenting requires far fewer resources and prevents the cascade of submission/rejections, described by Ross-Hellauer, Deppe and Schmidt (2017, p. 2) as the “waterfall problem”. This finding fits with other opinions reported in the literature, suggesting that open peer review is helping to ease the load from pre-publication peer reviewers (Arns, 2014).

The divergent points of views regarding open communication about scientific work and mostly about judging scientific work mirror the divergent approaches of the Mertonian sociology of science and the social constructivists. Partly, the researchers in the study concur with the Mertonian norm of universalism, asserting that experts in a certain field are the only people able to judge scientific work (Sismondo, 2009). Accordingly, open peer review commenting does not count as proper quality judgement because non-experts neither have the necessary knowledge nor the background to judge science. But the norm of organised scepticism also applies to issues of openness, and open discussions in particular. It states that only experts should act as gatekeepers for new findings (Sismondo, 2009) and newly generated knowledge can only flow into the pool of common knowledge after this official approval (Bornmann, 2008). This norm contradicts this study’s commentators, who state that crowd commenting methods would improve the review process and quality of both publications and reviews. Mertonian norms also deny that open review commenting could be used to ease the peer review burden. The only way to do this according to the norms of Merton would be distributing the work of peer reviewers to more specialists.

6.2.5 Rewards for reviewers

In the discussions about what could improve the peer review process, one argument was recurring. Many people think that if reviewers were rewarded for doing a good job, reviewers and journal editors would take the work more seriously and the quality of the whole reviewing process would improve. This argument is raised frequently in the literature, for example in Tennant et al., (2017, p. 14) who argue that “by incentivising peer review much of its potential burden can be alleviated by widening the potential referee pool concomitant with the growth in review requests” and thereby upgrading the quality of published research. Warne (2016) confirms that reviewers value recognition over monetary rewards and any kind of payment from journals.
According to Ware (2016), these experts agree that the work of writing a review is not yet adequately acknowledged and should become a part of institutional recruiting processes.

This is a frequently-referenced reason for suggesting open peer review methods of all kinds, since openness makes it more possible to reward the reviewers (apparent not just in this study but also in Ross-Hellauer, 2017; Ross-Hellauer, Deppe and Schmidt, 2017). Opening up the review process, especially when the review reports are published, makes monetary reward and citation of reviews possible. One argument in favour of alternative peer review models like the Reddit-style model is that good peer reviews could be upvoted, count as valuable additional input to the scientific knowledge pool and even be recognised with scientific credits as suggested in Warne (2016).

In conclusion, discussions about peer review methods are lively and sometimes even emotional. It seems impossible to conclude why or why not certain methods are better or worse than others. There is not yet evidence that academics and those involved in publishing have come to a consensus. Every method receives support and resistance, and the dialogue is mostly well-reasoned. Ethical issues run like a golden thread through the analysed discussions; ensuring ethical behaviour is a goal, but discussants generally do not believe that this goal can eliminate unethical behaviour in practice.
7 Conclusions and implications for further research

7.1 Conclusions

This work proved that it is impossible to pinpoint “good“ and “bad“ peer review methods. It also clearly showed that, with advancements in technical developments, the possibility of developing new methods is actually unlimited.

One clear conclusion of this study is that the most popular methods are still rather traditional. Closed pre-publication peer review methods in the classical constellation of authors – editors – reviewers still seem to be the most favoured ones. Open peer review methods can, of course, also be considered a “hot topic”. But generalising about this special issue is difficult – even defining the boundaries of what counts as “open peer review” is hard. The most prominent such approaches that appeared in this study’s discussions are non-blinded review, open peer review conducted by expert reviewers including publication of the reviews and open peer review that allows for public commenting. Again, the more traditional approaches involving expert reviewers, either in the sense of non-blind review or including publication of the review, were the most discussed. And even though the more “exotic” methods included in the study are used by some journals and platforms, they are discussed much less or not at all.

One clear limitation of the current study is that it was difficult to track clear connections between discussed methods and the research area of the commentator. The study did reveal obvious differences in discussion foci between research areas about certain methods. Post publication peer review methods – open published reports or involving crowd commenting – were discussed mainly by people from the natural sciences, technology and medicine, whereas the humanities and social sciences were only marginal participants. On the other hand, representatives of the social sciences and humanities were the leading fields in discussions about rather traditional peer review methods. But given uneven data quality, these results must be interpreted with caution and should rather be treated as potential trends than as hard facts.

As already mentioned, there is no clear definition existing for what a good peer review statement actually is. Researchers’ opinions about and personal experiences with different peer review methods are diverse. The analysis of the discussions makes it clear that it is possible to find reasonable pros and cons for each method. These pros and cons can be grouped into a few main areas. Discussions mentioned bias, fairness and anonymity most. Also visible were quality issues concerning both the reviewing process and the resulting publication. The third set of discussion points were communication and exchange between people involved in the reviewing process. Human resource issues also appeared in threads. The last issue was rewarding reviewers – a suggestion that was raised in numerous discussions of how to improve peer
review. Discussions dealing with these issues were interwoven in discussions of every method. And every discussion thread included arguments for and against each method.

This high diversity of opinions also sheds light on the two different schools of social theory of science. The views expressed in the discussions can be understood as expressions of these contradictory opinions about the practice and societal role of science. But these two divergent views on science do not lead to clear recommendations about best peer review practice; solutions to current problems in the peer review system must evolve out of compromises and method combinations. And there might be shortcomings in the peer review process that cannot be eliminated at all. Applying a social constructivist lens to this study’s data demonstrates that the high ethical standards of Merton’s norms are, though they might be considered old-fashioned, still valued among people involved in research. On the other hand, it also became apparent that the constructivists’ view of human nature affecting the world of research is relevant. This thesis can conclude that ethical norms are an ideal and a goal, but human nature makes it impossible to ensure ethical behaviour in science.

7.2 Implications for further research

After discussing the results of the current study, it becomes rather obvious that there are endless possibilities for further studies of not just opinions but also the reasons for applying different methods in the peer review process.

The results of this study indicate that peer review is both a very important and an extremely complicated topic in the world of research. Scanning discussions about different methods of peer review leads to the conclusion that opinions are manifold. Opinions expressed in the online discussions are sometimes factually-based, but sometimes based on personal experiences or general, non-empirical opinions. Obviously, there is more research needed to flesh out these opinions with empirical facts.

The current study contributes an overview of general opinions about peer review methods, including the reasons why people are for or against certain methods. This is a starting point; further research on opinions about peer review would expand our understanding of why certain methods are preferred. More and better data on opinions about peer review would make it possible to improve and argue for these new methods. Further, shortcomings of this study due to methodological limitations demand more research to fill in these gaps. Investigations of peer review methods could emphasize differences in opinions about peer review best practices rooted in gaps between research fields and their varying research methods and traditions.

To fill these gaps is not just important for research but also for people disseminating knowledge based on the findings of research, such as librarians. As mentioned before, they are responsible for advising researchers, not only
when it comes to questions about publishing, but also when it comes to review practices. The results of the current study show that peer review is a complicated field, which is constantly changing. Even if traditional peer review is still preferred, librarians have to be updated on the development, which might actually require that, to be able to critically assess publication quality, librarians must put more energy into keeping a check on the peer review process.

To conclude this with the words of Hirschauer (2004, p.12): “Der Peer Review Forschung fehlt es also generell an einer professionspolitischen „Abkühlung“ im Sinne von Wissenschaftsforschung. Anstelle der normativen Pro und Contra sind zunächst eine Vielzahl empirischer und analytische Fragen zu stellen, mit denen sich eine Reihe fragwürdiger Prämissen überprüfen und ersetzen lässt.”

1 “Therefore, peer review research generally lacks a professional approach in the sense of traditional science studies. Instead of a normative pros and cons approach, a variety of empirical and analytical questions must first be asked, which could result in the questioning and replacement of a number of questionable assumptions.”
8 Summary

This is the summary of this thesis. It gives a brief overview of the study and outlines the main choices and results.

8.1 Introduction

The process of peer review is a cornerstone in securing the quality of research and scientific publishing. But the efficacy of current peer review methods is currently under debate. Since several years – especially with the rise of the internet and the open access movement – numerous alternative methods opposing the classical single-blind review have been proposed and to a great extend also applied and tested.

In this study, I wanted to investigate the opinions of researchers regarding different methods of peer review. The goal was to identify which peer review methods are currently being considered and what factors actually shape opinions. Another point of interest is whether there is a discernible difference between discussion foci among people connected to different research areas. The main research questions investigated in the thesis were:

Q1. What are the main proposed alternatives to traditional peer review suggested by researchers?

Q2. Are there discernible differences in preferences for alternative peer review methods between different research fields?

Q3. Which pros and cons for alternative methods are raised in the discussions?

Q4. What are the main reasons why researchers suggest alternative peer review methods?

Q5. Can the arguments be understood as expressions of different theoretical approaches to evidence?

8.2 Methodology and theory

The main data that this study was based on were collected from two different online forums which provide a platform for scientists and people that are interested in science to discuss topics of interest. Discussions in both forums were filtered for threads focused on peer review. All suitable threads were read and all comments including opinions about peer review methods were analysed.

The method applied was qualitative content analysis. Beside qualitative analysis of opinions about peer review methods, also data about the research
field of the comments authors was collected when available. In total, 169 cases (one case corresponds to one method mentioned in a comment) were analysed (extracted from 153 comments in 33 threads).

The obtained data were interpreted using theoretical frameworks from two different approaches within the sociology of science: Mertonian sociology of science and social constructivism.

### 8.3 Results and conclusions

The most discussed category was closed pre-publication peer review (45.6%) followed by post-publication peer review (18.9%) and suggested potential future models (12.4%). Pre-peer review commenting methods were discussed in 5.3% of the cases, and post-publication commenting appeared in 11% of the comments. 3% of the methods detected in the discussions dealt with suggestions to improve the traditional peer review system; this material cannot be assigned to any of the above-mentioned categories. The analysis of the data illustrates that traditional peer review methods are still the most discussed. Open peer review is hard to define as a singular method, but its different applications provide fodder for many different opinions about peer review more generally. Rather new methods that deviate substantially from the traditional pattern of editor – reviewer – author are only infrequently debated.

The study also showed that it was rather difficult to draw solid conclusions about researcher attitudes within different research fields. What could be seen was that people from the humanities and social sciences were mostly concerned with traditional peer review methods. Open peer review publishing methods on the other hand were popular topics in medicine, and discussions about other alternative methods were dominated by technology and natural science researchers.

What became apparent in the analysis was that discussions of peer review methods are engaging, and each method was both supported and critiqued. The main arguments used to support or oppose particular methods were connected to fairness and bias, anonymity, quality issues (concerning both reviews and publications), human resource issues and general suggestions on how to improve the current peer review system. What also became obvious in the discussions is that, to a large extent, people want the peer review process to ensure ethical norms, such as lack of bias. But discussion participants generally argue, based on personal experience, that there are problems in the peer review system that stem from human nature; bias in reviews might be impossible to eliminate.
Reference list


published scientific journal articles to their pre-print versions.


https://www.nature.com/articles/451605b (27.04.2018)


Appendix

Categories applied in the data coding

App.1: List of the categories applied in the data coding. For elaborate explanation of the categories included in the dimension method (A) see section 1.4 in the main text.

Dimension 1: Method
The categories for coding the discussed methods were defined according to the list of peer review models in Tennant et al. (2017). Discussed methods were noted and assigned to following nine categories:

1. Pre-peer review (commenting)
The peer review consists of an informal commenting and discussion in an open accessible forum; discussions are conducted on a pre-publication manuscript draft

2. Pre-publication (closed)
The peer review is conducted by experts of the field that are invited to review by a journal editor.

3. Post-publication
The evaluation is conducted by experts in the field subsequent to publication.

4. Post-publication commenting
An independent, informal discussion of already published research.

5. Collaborative
The revision of a manuscript is conducted by a consortium of referees, editors and external readers. They work with interactive comments and in the end reach a consensus resulting in a single set of revisions.

6. Portable
Referee reports are portable and can be taken to multiple venues.

7. Recommendation services
Reviews are often done through a peer-nominated consortium that does a post-publication evaluation and recommendation of significant articles.

8. Decoupled post-publication (annotation service)
Private or public added notes and comments are directly added to highlighted sections of the publication.

9. Potential future models
reddit, amazon, ...

Dimension 2: Pros for alternative method
Categories derived from the data analysed.

1. providing feedback to the author/clarify questions/more informative and helpful for authors

2. stoking discussions in the research community/more interaction; interesting exchange of views, constructive; better understanding of the paper as commentaries of peers are included

3. catch more mistakes

4. claim priority
5. new ideas getting on faster
6. getting new contacts, foster collaboration
7. discussions among reviewers remove bias (many experts review openly)/
   reduce bias/eliminate bias towards “big names”
8. increase reproducibility
9. improves reliability (serious, responsible peer review process)
10. publication of negative results
11. would reveal review cartels
12. best for academic integrity
13. honest opinions and suggestions for improvement; open; no need for
   anonymity; someone who reads the paper can read the review as well – much
   more honest
14. improve quality (of draft and review); ensure quality
15. review the reviewing process – improve it; "open review of reviews and
   reviewers"
16. increase seriousness of reviews (reduced workloads on reviewers)
17. editors receive better reports (scientists and reviewers learn from published
   reviews)
18. prevents from fraud peer review or waiving through of every paper (like
   claimed by predatory journals)
19. science corrects itself
20. cut down on personality reviews
21. overlay too harsh or negative reviews (in case of conflicts between authors
   and reviewers)
22. fewer evaluative mistakes
23. fairer, fairest
24. reviewer can put work in the context of other works of the reviewer
25. makes research public that would not been seen otherwise (poor in some
   respects but still valuable in others)
26. evaluation more informed than it could be from any reviewer contacted by
   a journal
27. very effective
28. enables objectivity
29. get feedback from the users
30. public can judge if the research aim is relevant for the society
(31 and 32 were cons – transferred to cons after they were already in the data
sheet)
33. provide authors the opportunity to learn by getting more material; reviews
   can be read by other researchers as well to help them improve their own work;
   help young scientists to learn how to write a good review; readers get the
   benefit of the criticism of the reviewer
34. improves reviewing by given credits to reviewers via an open platform;
   perhaps given credits and rating reviews
35. feasible if a large community agrees to participate
36. increases transparency; most transparent method (if reviewers names are
   open) – gives information about who is doing the review, how well it was
   reviewed, the issues raised in the review, he respond of the authors
37. reviewers work is taken seriously
38. anonymity allows expression of honest opinions even of powerful people (reviewer does not know the author)
39. more effective way of peer reviewing using the potentials of the internet
40. ensures that process will be unbiased
41. careless or unjust reviewing not possible
42. no problem with disliking a paper but the argument to defend the decision has to be right
43. allows open access for all
44. gives more than a few peers a chance and prevents the danger of an editor picking a wrong or not the best suitable peer
45. author receives comments that might improve later versions of the paper
46. author claim to be first to observe or report something
47. more people might see the manuscript and it might get more citations
48. the more people comments on a work the better it gets
49. review on research plan would remove bias towards certain (unusual) results
50. successful in identifying shortcomings, fundamental problems, questionable research practice
51. makes reviews citable
52. having more publications and data out there and share it is positive
53. anyone can access the full scientific information
54. would no longer need publishers
55. reviewers made comments that really improved the quality of the work
56. author value a process where reviewers are encouraged to name themselves
57. authors like the possibility to make reviews fully public
58. reduces the peer review burden
59. by having all reviews openly accessible I can decide on my own if the review process was done seriously
60. would allow crowd sourcing
61. filters out detritus and puts forward good papers
62. provides a more fine evaluation stage before final judgement (especially when it comes to conflict of interest, etc.)
63. reduces potential bias
64. empirical data proofs that reviewer confidence in really pinpointing authors when they are blinded is not so sufficient
65. reviewers would be more conscious of potential bias when they know that their identity is open

**Dimension 3: Cons for alternative methods**
Categories identified according to data
1. getting scooped
2. conflicts (institutional, collaborative, financial)
3. mistakes can’t be seen by the author and gets published; publication can potentially disseminate wrong information
4. bad method
5. researchers could download an incorrect because not corrected version
6. not helping to remove bias; reviewers personal bias gets in the way of a good review
7. as expert in the field its guessable who wrote the manuscript (method
difficult to implement as field is small, reviewer can find out who the authors
are also through reference list); and it is guessable at least half of the time who
the reviewer was; majority of papers contains at least one self-reference;
double-blind can’t be truly double-blind
8. when you know where the authors are coming from (intellectually) its easier
to give constructive criticism
9. if reviewers unknown, authors can’t respond to editor in a more informed
way
10. can’t sustain the quality of what appears in print (many papers less than
perfect – should be improved before publication)
11. makes the scientific system impersonal
12. authors and reviewers can’t discuss (could lead to injustice in the reviewer
decision)
13. makes it difficult to judge if work is new contribution to science or just
modified previous work
14. would only work if scientist would work for making science better and not
for impact and citations
15. journal could been seen as sink for otherwise refused papers
16. produces lots of “noise” in the system (phone calls to reviewers,...)
17. revealing identity in scholarly communication turned out to cause problems
18. reviewer wants their own work cited otherwise reject manuscript
19. very time consuming (how to find time to do it systematically?)
20. difficult to work with people in the future if you know they reviewed your
work
21. all the work must be made public – works just with honest and correct
people
22. great amount of papers submitted to be published could not be handled
23. too many people split up their work in as small pieces as possible – makes
post publication peer review impossible to handle
24. did not result in any additional feedback to the paper
25. difficult to find enough reviewers
26. final paper (experiments conducted/results obtained) can deviate quite a lot
from the initial plan due to several reasons
27. time issues – projects would be excepted years before publication would be
ready (field might change and therewith also the view on the project)
28. students can’t be objective in their observations
29. users (like students) don’t have the perspective for evaluating a certain
research work
30. public people in general do not posses the knowledge for an evaluation of
scientific quality work; outcome can be unpredictable and their might be no
users and that would kill fundamental research; general public should not have
any say in how good or relevant a paper is
31. conflict of interest
32. mild reviews because of fear that author will be reviewer next time; mostly
positive reviews because reviewers identity is open; reviewers don’t want to be
too harsh to colleagues
(31 and 32 were by mistake placed in cons... correct in the data sample sheet)
33. the published information is unfiltered and buries everything in the huge amount like noise (for example papers ending up being cited in who knows what)
34. scientist deny to review when their names are revealed (would mean a loss of good scientists that review for the journal)
35. popular ideas would get forward and not so exciting ideas that still might contribute a lot to a field might be rated down and disappear
36. zealots could threaten anything that does not support their pet ideas; new ideas might get torpedoed; finding good reviewers that are not biased is hard
37. people with week knowledge in the field could be threatened by an idea and vote against it without having to explain why
38. not a good fit method for scientific publications; don´t think a method like this would work; would be terrible
39. some papers are not good and should not be published – create a mess; no rejections – who should handle all this info?
40. creates a burden on the reader because he has to read through the paper and the review
41. method used to maximise article counts; everybody can publish (“dump”) everything
42. information could get scooped and used in own related projects without credits
43. preprint versions of papers seems to be waste of time to the reader
44. difficult to make academics participate in online reviewing activities
45. defeats the purpose of double-blind review

**Dimension 4: Reason for wanting alternative methods/not wanting alternative methods**

Categories identified according to data
1. reviewer bias because of competition within the field
2. knowing the reviewers can be helpful
3. inability in reproducing results
4. small review panels might lack general understand of researcher and topic
5. applicant characteristics can effect review outcome (different success rates in different racial groups)
6. publishing of negative results would increase reproducibility of methods
7. method is unjust; reviewers can abuse their position in a number of ways
8. anonymity of reviewers allows abuse (rejection for unthinkable reasons; missing the point of the submission); no need to consider bias when anonymous
9. referees should be more modest (only criticising technical errors, missing references, etc.) not force authors to use a different theoretical framework for the interpretation of their results
10. force authors to write better papers (don´t submit improvable work)
11. motivate/interest reviewers (improves review)
12. reviewer can´t hide behind anonymity, makes him more responsible
13. allows laziness (by knowing the author)
14. hate the method
15. lowers the risk of reviewers making stupid decisions by knowing the author
17. reviewers penalise novel ideas that are not aligned with the mainstream; popular ideas are not always the right once
18. method is good enough
19. should be standard
20. makes more sense
21. difficult to work with people in the future if you know they reviewed your work
22. fair because work is judged not the status of the researcher
23. protects authors from accusations of cronyism
24. fundamental necessity to ensure fair and free science
25. author must have the right to reject a reviewer with possible bias towards him/her
26. is killing free science
27. researchers do science to keep their peers happy
28. public/students/non-scientists can’t be objective in their observations
29. may not have perspective/knowledge to evaluate particular research
30. public/users can’t judge basic research as the outcome is not always predictable – would kill basic research
31. no user/public/consumer contact (ex. when working in a lab)
32. conceal bias
33. avoid bias, be more fair (current system unfair and biased)
34. preferred
35. careful and thorough reviewers do not get acknowledged or rewarded
36. change the way of making reliable science
37. makes it impossible to get account and reward for a good review/time spend for making good reviews
38. idea and procedure excellent
39. people publish papers containing just a tiny amount more (new) information than previously published papers (too many papers published)
40. journals predominantly online
41. publications more openly and quickly accessible
42. knowing who the reviewers are makes it easier for a researcher to evolve his point of view
43. authors can abuse the system (reviewing their own paper,...)
44. need for new methods (the more talking and discussing about it the better)
45. current scientific environment is too competitive for this method
46. negative and positive reviews have to be well reasoned
47. paper rejection or negative reviews through open review can hurt feelings of close colleagues or friends
48. trust that reviewers will provide sound evaluation and that they are similarly opinioned
49. traditional peer review practice is outdated in terms of what can be done
50. a good review is more than a consent of a reputable person but a substantial part of a dialogue
51. journal does not allow publication of before review pre-print (but allows after review pre-print)
52. Science work through discussion
53. journals would become more boring because they would have to publish
also negative ideas
44. bias in review towards unusual results
45. these methods have a place in the scientific publishing process
46. peer reviewer should have both ethical and educational qualification to help
   to insure standard; a reviewer has to know the subject matter well;
47. good review takes a lot of time (rather have 3-4 reviewers that do it
   thoroughly instead of 10 being flimsy)
48. would be perfect
49. creates a mess
50. assumes that everything is worth publishing; bad data needs to be filtered
    out before publishing; information overload is going to have bad effects
51. model needs much lower number of reviewers as the cascade of
    submission/rejection from the highest journal possible down is obsolete (each
    submission round takes at least 2 reviewers)
52. in times of internet non-profit founded research should be freely available
    for everyone; researcher should not agree to parasitic outlets like overpriced
    journals
53. critical method for reviewing articles/findings that could be connected to
    financial tremendous/loss
54. not obvious how free online journals (open review included) could ever get
    the same reputation than for example nature or science
55. method allows rapid dissemination, rapid evaluation – improves the pace
    and quality of research (no prevention of ideas due to long peer review time)
56. impossible concept to implement
57. there is no reason to know who the authors of a paper are or where they
    work (whom I am reviewing)
58. in practice there is no serious way to apply this method correctly (as its
    guessable who the author/reviewer is)
59. when the research field is big it is not guessable who the authors of a
    manuscript are when reviewing
60. method sounds interesting – might be a better way
61. makes sense that fully open and transparent peer review should improve the
    scholarly process; many people value the open peer review history
62. method helps to prevent “peer review burn-out”
63. works against the fact that journals are “commenting ghost towns”
64. career crunched or ambitious scientists would routinely be attempting to
    fudge votes in order to further their career
65. even good journals applying traditional peer review let sub-par articles slip
    through – open peer review encourages us not to let our guard down!
66. problematic due to collusion and fraud
67. editors are biased in favour of big names and against new authors (journals
    needs citations to raise the IF and big names get cited)
68. second reviewer would be confined to investigate conflicting interests and
    such issues (that might have been raised by the first reviewer)
69. reviewer don’t dare to reject papers of highly renowned scientists even if
    they are crappy
70. has to be tried out of respect to objectivity in science
71. pseudo double-blind process does not reduce bias but manipulates it; this
introduces more unhelpful noise in the review process
81. even if double-blind review increases noise in the process increasing the number of reviewers would make it possible to sufficiently deal with it
82. wonderful format for checking validity of scientific articles; powerful force for doing peer review

**Dimension 5: research area**
The dimension research area were divided into six different categories (numbered 1-6). A seventh category (number 0) is the code for data not available.
1. Social Sciences
2. Humanities
3. Natural Sciences
4. Engineering/Technology/Computer Science/mathematic/statistic
5. Medicine
6. Scientific publishing
0. not available