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# Communities of making: Exploring parallels between fandom and open source

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## Abstract

Studies of social media frequently focus on the most popular platforms (Facebook, Twitter, Instagram, etc.) and fail to consider more unconventional platforms and communities that nevertheless fit the criteria of social media. A comparison of fan communities emphasizing different content structures (Archive of Our Own, DeviantArt, and Fanfiction.net) to open source community platform GitHub can provide insight into the practices of communities of making, regardless of even substantial differences in purposes and affordances, while expanding the traditional definition of social media. Study of both fan and open source communities revealed commonalities across platforms, such as non-market practices with deep market ties; gift economies that run on status; and a lack of inclusivity. We argue that the dynamics of inclusion and exclusion, labor, and value on social media platforms can be illuminated by putting these platforms and their communities into conversation.

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## Introduction

In some ways, it's difficult to think of two Internet-based practices that are more different than open source software (OSS; software where the underlying source code is open to be read, modified, and redistributed) and fan works (creative production such as fan fiction and fan art that reworks and extends commercial media properties).

OSS is disproportionately done by men; Vasilescu, Posnett, *et al.* (2015), using a metric that may in fact overcount women, found that the GitHub platform is populated by 91 percent men and nine percent women. By contrast, fan work is dominated by women; in one recent survey of the fandom community, 80 percent of participants identified as female, followed by non-binary and transgender individuals, and, finally, a tiny minority of cisgender men (Fiesler and Dym, 2020).

Related to these stark demographic divergences, OSS is often criticized as exclusionary, while fandom

prides itself on inclusion. There are also important differences between these two areas of endeavor in their objects of making and their respective value models. That is, OSS is an increasingly important part of the economy, while fan works are generally understood as noncommercial.

However, some research has begun identifying commonalities between them, particularly around the fan fiction site Archive of Our Own (AO3), which is itself an OSS project. On one level, Fiesler, *et al.* (2016) argue that the two types of communities have similar values. On another, Fiesler, *et al.* (2017) argue that AO3 provides a model for how to get more women involved in OSS.

The seemingly incommensurable difference between these two modes of online making, as well as their potential compatibility, offers a rich space for comparative analysis that this article explores in more depth.

We argue that putting fan communities like Archive of Our Own, DeviantArt, and Fanfiction.net into conversation with OSS communities such as GitHub provides insight beyond their common condition as forms of participatory culture to reveal not only shared strengths, but shared weaknesses. That is, attending to research on fan works improves our understanding of GitHub and attending to research on GitHub improves our understanding of fandom.

Placing these communities alongside one another also invites attention to the fact that their sites are, in essence, social media platforms. While content-driven communities are frequently left out of definitions and discussions of social networks, they include many of the same affordances, and considering them within the scope of social media offers new ways to understand social media platforms and their role in sustaining both community and the production of content.

Our analysis emphasizes that, despite their differences, both fan works and OSS similarly foreground skills development through critique, collaboration, and editing. Fan and OSS platforms share additional similarities; first, these platforms are similarly structured as content spaces with community aspects. Second, they are nominally nonmarket practices but nevertheless deeply hooked into the market.

Third, at the level of everyday practice, these two kinds of platforms are usefully understood as gift economies, operating based on user status. Finally, both frame themselves as open to all, but aren't. In such ways, these two sets of community interactions are not all that dissimilar, and both have key commonalities with other social media platforms.

Putting these platforms and their communities into conversation raises fundamental questions of inclusion and exclusion, labor, and value. Furthermore, the important limitations and challenges facing communities of making can be better understood by comparing these apparently disparate sites with one another and the broader social media ecosystem.

In the face of persistent technoutopianism that holds up broad-based access to Internet participation as the solution to a wide variety of social ills, we contend that a closer interrogation of sites where people post, respond to what other people post, and form connections with each other sheds light on the broader possibilities and limitations of participatory culture.



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### **A community of their own: Community-building usage norms and affordances**

Although GitHub and fan platforms both seem to be simply places where individuals can post their content, they have affordances and usage norms that facilitate community similarly to other social media. Thus, considering OSS and fan platforms from the perspective of social platforms more generally can expand our understanding of social media.

GitHub is a platform built on top of the version control tool Git that incorporates social networking features and a visual interface for tracking the history of and conversation about OSS projects to facilitate development. Similar to other social platforms, GitHub provides profiles that display user activity to others. Any code contributions a user has submitted are associated with their profile.

Developers on GitHub can also “follow” other developers or “watch” repositories, which hold the code for developing projects, to receive updates about activity. Like other social network activity feeds, as watchers engage with a project it is promoted in their social network. These social features are essential to collaborative coding on GitHub (Blincoe, *et al.*, 2016; Casalnuovo, *et al.*, 2015).

While GitHub is the dominant platform for version control and content sharing within the OSS community, fan activity is more widely distributed across sites. Here, we focus on platforms centered on fanworks. We emphasize platforms that are fan-dominated: that is, where the dominant aesthetics, community, and purpose is determined by fans, as opposed to platforms where fans are visible but not driving the community features and utility. This makes these platforms more directly analogous to GitHub, which emerged from OSS and still prioritizes public repositories and coding practices aligned with that community.

In centering fan content, we chose three communities, each notable for their rich fan activity around different modalities of user-generated content:

1. *Fanfiction.net (FFNet)*. Founded in 1998, Fanfiction.net was one of the original multifandom hubs for text fanfiction, as opposed to earlier sites organized around a particular fan object like a TV show or book series. The archive is thus both larger and better defined than smaller, fandom-specific platforms, acting as a center of gravity in fan culture that makes it important to examine.
2. *AO3*. Created in 2008, AO3 reflects a non-profit, archive-focused model for building a fanfiction community that has been designed and built by fans for fans. The site is open source and, while smaller than Fanfiction.net, it is faster-growing (De Kosnik, 2016), reflecting a highly active community of users and fandoms. Moreover, it is run and developed primarily by women and has been described specifically as feminist HCI (Fiesler, *et al.*, 2016). This combination of total fan control and the fact that AO3 uniquely sits at the intersection of fan works and OSS makes it particularly interesting to analyze.
3. *DeviantArt*. While AO3 and Fanfiction.net are primarily text-driven, DeviantArt (founded in 2000) is notable as a space for visual art, and so provides another dimension to our analysis. The site is of particular interest for its networks of affinity based on both subject and style of artwork. The site is not fan-exclusive, but has a substantial fanart community (Seymour, 2018), which has shaped the platform significantly enough to meet our criteria laid out above.

Although these platforms are far from a comprehensive census of online fan spaces and omit social-centered hubs such as Tumblr (and precursors such as LiveJournal), their affordances and usage norms as community-enabling content spaces (rather than primarily conversational spaces) make them particularly interesting for comparison to GitHub.

At a fundamental level, these platforms facilitate community-building in much the same way that more traditional social media do. On platforms like Twitter and Facebook, hashtags are used to facilitate community creation and communication among users (Mulyadi and Fitriana, 2018). Similarly, while GitHub, DeviantArt, and fanfiction repositories can all be sites for solitary creation, uploading and tagging work invites engagement.

First, tags allow creators to put their work in front of communities with shared interests. In fan fiction, tags indicate features such as the source text, characters, and genres. Similarly, DeviantArt uses various categories to form communities; each work posted to DeviantArt must be categorized, typically by production technique. Tags thus enable users, referred to by the demonym “deviants,” to form communities

around similar production techniques (Salah and Salah, 2013).

GitHub differs somewhat from fan production in that production typically takes place in collaborative teams rather than the single-creator model common in fan work. However, GitHub is similar to both fanfiction sites and DeviantArt in that communities are formed according to common interests, such as the type of project (machine learning, databases), or the language (JavaScript, Objective-C).

Beyond tagging, other affordances also facilitate community. Traditional social media enables the articulation of friendship links (boyd and Ellison, 2007), as well as parasocial engagement with celebrities or other influential public figures through one-way following (Shariffadeen and Manaf, 2017); the platforms used by communities of making facilitate comparable actions.

GitHub allows engagement through features like forking (creating copies of repositories), watching (subscribing to a specific project's events), and following (subscribing to a particular developer's activities), which facilitate social connections and provide opportunities to learn about other developers' previous contributions and skills (Bissyandé, *et al.*, 2013; Casalnuov, *et al.*, 2015; Dabbish, *et al.*, 2012; M.J. Lee, *et al.*, 2013).

Similarly, users on AO3 and FFNet can subscribe to or follow the works of a particular author and be updated when new stories are posted, and AO3 allows subscribing for updates of a particular work as well.

Third, these communities, like others on the Internet (van der Nagel, 2017), are driven by consistent (often pseudonymous) identities. On GitHub, a user's past code contributions are associated with their profile. FFNet provides author profiles, comments, and discussion forums, which all enable users to learn about and form ties with one another.

Likewise, AO3 facilitates the development of relationships between fans by providing a profile, which lists user information and the works a fan has posted, as well as a system for commenting and replying to comments. Similarly, deviants can view activity on users' accounts to determine which communities best support their interests.

In addition to their design, usage norms on the platforms also facilitate connection. More traditional social media allows for the formation of relationships around content streams or brands, which in turn gain visibility as they grow in community investment, and such behavior is also prevalent on the making-focused platforms featured here.

On GitHub, established social relationships influence developers' choice of projects to which to contribute. Generally, developers prefer to collaborate with users with whom they have previously worked (Blincoe, *et al.*, 2016; Casalnuovo, *et al.*, 2015). Stronger social relationships between developers also increase the rate of productivity on a project, likely due to the perception of a project as more likely to succeed with contributions from other developers with known skills (Casalnuovo, *et al.*, 2015).

While the norms differ somewhat, fan communities also have norms around how to engage with the contributions of others, not unlike the etiquette of resharing or retweeting (rather than reposting and therefore taking credit for) content on traditional social media platforms. Hellekson (2009) argued that fan communities operate around the sharing of gifts in the form of fan works, which are often reciprocated with feedback or reactions, which we will discuss in more depth later in the article.

The social norms of fandom position feedback as an obligatory response to the creative works offered by other fans, which is why the "lurker" who reads but doesn't write can be seen as a freeloader (Jenkins, *et al.*, 2013), not unlike the user of an OSS project who submits bug reports but never offers constructive suggestions for improving the code.

In fandom, reciprocation is a fuzzy exchange, as authors are understood to deserve feedback from the community, but not every single member. One important norm is that fans should provide positive or at

least constructive feedback, or even express gratitude when fanworks are in short supply (Švelch, 2013).

<b>Table 1: Community features and usage norms.</b>			
<b>Feature</b>	<b>GitHub</b>	<b>Fandom platforms</b>	<b>Social media platforms</b>
Profile	Profiles displaying user activity	Profiles displaying user information and the works a fan has posted	Profiles typically displaying user information and a feed of activity or posts
Following	Follow other developers and watch repositories; activity feeds that promote engaged projects in the social network	Subscribe to or follow the works of a particular author and be updated when new ones are posted	Patterns ranging from following to “friending,” encompassing both symmetrical (reciprocal) and asymmetrical connections
Tagging	Indicating programming language or project type invites engagement	Tagging with fandom or work type invites engagement	Frequently used to organize content or conversations (such as hashtags on Twitter and Instagram)

As [Table 1](#) shows, both GitHub and fan production platforms function similarly — to each other and to mainstream social media. They enable community through affordances like profiles, following features, and tagging, as well as the usage norms that encourage deploying these features to form community.

### **(Non)market production: Blurring noncommercial and formal labor**

The objects produced by fan and OSS communities diverge in economic significance, which is perhaps the biggest reason these communities are not commonly put into conversation. However, a closer look demonstrates that the lens of fandom can reveal much about the workings of GitHub.

On one hand, OSS is, rightly, often thought of as deeply involved with the tech industry. On the other hand, fan works are often (but not always) noncommercial, not least because, given that they build from intellectual property owned by others (TV shows, films, etc.), noncommerciality makes them more likely to be fair use and therefore safer under copyright law [1]. However, both types of digital production communities have strong nonmarket traditions that mask their actual relationship with the market.

To some extent, OSS appears tightly linked to the market: it plays a sustaining role in many technological projects and architectures, making it more likely that code is contributed as part of employment. In fact, Hars and Ou (2001) found that 16 percent of their respondents were financially compensated for their programming, and that they contributed 38 percent of total working hours on the GitHub platform, having a disproportionate impact. A 2018 survey of Global Fortune 2000 companies discovered that 72 percent use OSS internally and 55 percent use OSS commercially (Olin, 2018).

The value of OSS to businesses is also evident from a US\$350 million donation to GitHub in 2015 from several venture capital companies to aid the platform in developing relationships with large businesses (Helft, 2015). GitHub was therefore deeply hooked into the technology industry even before its 2018 purchase by Microsoft.

Fan communities, by contrast, tend to be (sometimes vehemently) noncommercial. Fans often explicitly distance their production from market exchange, whether by rejecting it in favor of popular cultural capital (Fiske, 1992) or to try to avoid legal censure (Hellekson, 2009; Scott, 2011). In particular, De Kosnik (2012) noted that fans' negative perception of official media producers discourages them from joining in market participation.

Moreover, fans tend to perceive the production of fanworks as at odds with consumerism and therefore resist considering their works as increasing the market value of media products (De Kosnik, 2012). Hellekson (2009) described fandom as operating independently of profit, creating a division between the labor of fan communities and more traditionally capitalistic (and masculinist) activities. Russo (2010) has similarly explained fans' aversion to equivalating the value of their creative work with standards typically attributed to the capitalist marketplace.

However, OSS also has a history of resistance to marketization. Hansson's (2013) widely circulated post on "The perils of mixing open source and money" warned that more traditional methods of monetary exchange detract from the internal motivation of open source coders and the sense of community among collaborators.

Raymond (1998a) described a sharp division between "free software" — which maintains that software should not be paid for and which he identifies as anti-commercial — and "open source" — which avoids confrontation about commercialism. The free software side is most comparable to fandom's rejection of commercialism. Thus, both OSS and fandom are at times uneasy with the implications of monetary rewards for their work.

Despite this discomfort, both fan and OSS production are forms of labor, and specifically what Terranova (2000) called free labor. Bringing OSS and fandom into conversation presents a reparative opportunity for addressing exploitative labor practices within both spaces. The supposed amateurs in both OSS and fandom, like those in other fields (Brabham, 2012; Duffy, 2015), often have formal training and employment, meaning that the content produced for free is of similar quality to content from formal, paid channels.

In fact, Crell (2018) noted the similarity of OSS labor to spec work (work done first and only possibly paid after the fact), particularly in the lack of certainty that an OSS contribution will actually be accepted; in both cases, value is produced at the expense of labor that may not be extrinsically rewarded or even acknowledged.

Many studies on GitHub focus on identifying what makes projects successful (Bissyandé, *et al.*, 2013), how new developers enter the platform (Casalnuovo, *et al.*, 2015; Marlow, *et al.*, 2013), and questions of popularity (Blincoe, *et al.*, 2016; M.J. Lee, *et al.*, 2013), but few navigate questions about the value of that work. This is particularly troubling given the tendency of OSS to approach "free" labor in a way that can be marginalizing and unreasonable.

That is, it matters that open source software relies heavily on autodidacticism and volunteer labor, both of which require time free from other obligations, making participation less possible for people with more familial responsibility (disproportionately women; see Driscoll and Gregg, 2011) — those doing what Hochschild (1990) has called the second shift — and those in precarious work relationships (disproportionately people of color), who often already need to work two or more paid shifts.

This is one place that the comparison to fandom is especially fruitful; research in fan studies has argued for more than a decade that fan activity can actually be better understood through the lens of labor (De Kosnik, 2013, 2012, 2009; Stanfill, 2019; Stanfill and Condis, 2014), despite the fact that it is pleasurable and freely chosen. This is an essential insight for OSS as well. A labor framework thus provides important perspective, particularly given the fundamentally marginalizing impact of these labor practices.

Although fan labor is not typically motivated by an expectation of financial compensation, it nevertheless extracts value from human action (Stanfill, 2019). Moreover, the formal media industries have access to this content with no obligation to use it (Helens-Hart, 2014). Thus, while fans may produce fan fiction, fan art, etc. for individual reasons (enjoyment, desire for recognition from others, altruism), their work can, as with other digital production (Andrejevic, 2008; Postigo, 2016; Terranova, 2000), nevertheless traverse circuits of capital.

Overall, one way that fan works resemble social coding is that both are ostensibly non-market practices that nevertheless feed back into (and are exploited by) the market. Fans often drive media innovation (Bechmann and Lomborg, 2013; Fast, *et al.*, 2016; Potts, *et al.*, 2008), and similarly OSS can be used to drive software innovation without the cost of research and development.

<b>Table 2: Labor features.</b>			
<b>Features</b>	<b>GitHub</b>	<b>Fandom platforms</b>	<b>Social media platforms</b>
Content creation	Form of free labor	Form of free labor	Form of free labor
Training/experience	Participants often have formal training and employment in the field	Participants often, but do not necessarily, have formal training and employment in the field	Participants typically have little to no training
Content sharing/circulation	Often like spec work (work done first and only possibly paid after the fact)	Formal media industries have access to this content with no obligation to use it	Can build on/extend more formal media narratives, doing free work for established media developers
Economic value	Ostensibly non-market practice but feeds back into (and is exploited by) the market	Ostensibly non-market practice but feeds back into (and is exploited by) the market	Ostensibly non-market practice, but can promote commercial products and existing media narratives, as well as become self-sustaining through ad revenue or promotional deals

Ultimately, these kinds of devaluation enable exploiting labor, using fan-produced content and open-source code to increase profits without sharing the gains with those who created the content. The compounding of forms of free labor, by trained professionals, that can be extracted without benefit and used to power the market, becomes much clearer when the two kinds of creative work are put side by side, as seen in [Table 2](#).

Examining OSS in general and GitHub in particular through the lens of work on fandom as labor helps us see how this devaluation of labor is both widespread and unevenly distributed, contributing to deeply rooted exclusionary tendencies in the platform and OSS more broadly. This examination also reminds us of the need for greater scrutiny of labor practices and the devaluation of “user” labor on all social media platforms, where user-generated content frequently forms the bulk of the value with little or no compensation.

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## Status update: Meritocracy to gift economy

Framing our examination of labor through the lens of whose labor is valued offers another significant point of comparison between these platforms. Platform features and usage norms encourage the valuation of certain users over others within the community and even beyond.

Like many technocultures, OSS likes to think of itself as a meritocracy where anyone — even those, like women, who are traditionally marginalized in tech — will succeed by skill alone. Raymond (1998a) argued OSS operates as a meritocracy, arguing that “good” code is easily recognizable by experienced programmers.

This implies the value of quality code is self-explanatory, but in fact that isn’t the case; instead, social norms about what constitutes valuable contributions are simply not transparent. Research has shown that user popularity and frequency of contributions sometimes matters more in OSS than their quality — the merit in this alleged meritocracy is less significant than social status.

Status appears, first, in the role of reputation in both of these communities. OSS is a community where, without more traditional measures like exchange value, a programmer’s value is determined by reputation within the community (Raymond, 1998a). On GitHub, a user’s number of followers is seen as an indicator of their status on the platform (Dabbish, *et al.*, 2012). This status or reputation also produces other effects, as one study found that programmers with followers are more likely to have their code contributions accepted (Tsay, *et al.*, 2014).

In fact, popularity has its own gravitational pull. Individual popularity on GitHub is seen as an indicator of competence, and sometimes code quality nearly drops out of consideration altogether, as the programmer’s popularity becomes a more important factor (Blincoe, *et al.*, 2016).

Despite the belief in meritocracy, the merit of a user’s code may not determine their status after all. Project popularity also matters. Higher numbers of watchers and forks indicate that many developers are interested in the project, which Dabbish, *et al.* (2012) argued may then attract additional developers.

Deviants rely on similar information when determining who to follow and emulate. Users can view deviants’ pages, which display watchers, page views, and number of works; deviants with the highest numbers are considered the most successful (Salah, *et al.*, 2012). At the level of works rather than users, AO3 allows readers to give “kudos” to stories they enjoy. Quantities of kudos are sometimes used by fans as a proxy for quality, which is evidenced by the fact that the platform’s feature set allows sorting by kudos to find the most preferred contributions.

Second, we see status in affordances and practices around following. Developers on GitHub can “follow” other developers or “watch” repositories to receive updates about activity. Like other social network activity feeds, as watchers engage with a project it is promoted in their social network.

Similarly, deviants can “watch” other deviants, receiving notifications when new artwork is added (Buter, *et al.*, 2011), and AO3 users may subscribe to receive updates about “individual users, individual works, and series” (Archive of Our Own, n.d.). In such ways, existing respect for a user’s contributions can perpetuate status when used as a way to find good quality content.

Various reputation and status measures are thus fundamental both in the affordances of these platforms and at the level of practices. While terminologies for marking status vary, all of these sites are demonstrably status-driven. Moreover, as we discussed in the previous section, these contributors are, like with other user-generated content, generally unpaid.



This combination of a status system with both a) an external distinction from the market and b) internal concerns like those discussed above about OSS not becoming transactional and not betraying the nonmarket traditions of fandom, suggest that both fan works and OSS can usefully be understood as gift economies.

Participants in gift economies use gift-giving — not market exchange — to circulate goods and services. Giving in a gift economy is hierarchical: in gift economies, as in the Indigenous North American practice of potlatch, giving more produces status.

Thus, OSS can be thought of as a gift economy, wherein status within an OSS community is the compensation for work submitted (Raymond, 1998b). Early economic analysis of OSS that emphasized the gift economy noted the importance of the “public good” as motivation for participation in OSS (Bitzer, *et al.*, 2007). Such analysis has fallen out of favor since, but the comparison to fandom suggests revisiting those ideas is productive.

In particular, research on fandom as a gift economy reveals some key features of social coding on GitHub by emphasizing the role of non-market incentives. Fans are variously motivated by personal gain (Leaver, 2013; Stork, 2014), the joy of the hobby (Lee, 2011; Scott, 2011), or a strong desire to create (Tushnet, 2009), any of which could also describe GitHub participants.

By participating in ways valued by the community, fans accumulate cultural capital. Tushnet noted that getting “credit” for fan works is partially a financial metaphor — the reward fans get is recognition from others, which has value (Tushnet, 2007). Accordingly, producing a lot of content is perceived as a contribution to the community and provides fans and OSS participants with status.

In fandom, moreover, the person who provides effusive feedback on fan contributions is also seen as a good contributor, while the person who either writes only sporadically or begins a story and does not finish it has less status, much like an empty GitHub profile is not as valued.

<b>Table 3: Gift economy features.</b>			
<b>Actions</b>	<b>GitHub</b>	<b>Fandom platforms</b>	<b>Social media platforms</b>
Attribution of success	User popularity and frequency of contributions sometimes matters more than code quality	Highest number of visitors and comments are considered the most successful	Typically measured through both connections (followers and/or friends) and some version of likes, which in turn usually results in further amplification
Status markers	Number of followers as a signal of status	Kudos are sometimes used by fans as a proxy for quality	Additional status markers (such as Twitter’s verification) often rely upon external status

Taking a gift economy analysis seriously means paying attention to the community’s internal categories of success and markers of status, showing key commonalities between OSS and fan works (see [Table 3](#)). In these ways, research on the gift economy in fandom helps us understand why OSS coders labor apparently for free — the payment is status in relation to community norms. Similarly, if we attend to status and success as drivers of participation that are not easily or directly convertible into economic capital, these sites also provide new insight about social media in general.

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## Open to whom? Failures of inclusivity

The myth of meritocracy and the ideal of community often lead both fan and OSS spaces to be thought of as inclusive spaces where those who contribute valuable work will in turn be valued. Certainly, anyone with access to the Web can create accounts on these sites and contribute content, regardless of experience. Moreover, fandom has a well-attested “anyone can write” ethos (Green and Jenkins, 2006; Yang and Bao, 2012), and community support offers models of mentorship for improvement.

However, status systems inevitably produce inequality, and these spaces also feature in-group/out-group dynamics and exclusion. While anyone can submit their work, this does not guarantee that the community will respond positively or that others will choose to collaborate with them.

GitHub has enabled new styles of leadership and influence based on developers’ popularity, as opposed to traditional models of explicit leadership (Blincoe, *et al.*, 2016). Some developers on GitHub, called “rockstars” by Dabbish, *et al.* (2012), are particularly influential, with thousands of followers.

While rockstars are sometimes perceived as having a special skill set (M.J. Lee, *et al.*, 2013), Blincoe, *et al.* (2016) determined that a rockstar’s popularity is more influential than their project activity. Thus, the more developers who follow a rockstar, the more influence they wield over their followers (Blincoe, *et al.*, 2016).

The language of the “rockstar” on GitHub emphasizes fame, evoking the music industry and suggesting the importance of popularity. The corresponding term in fandom is the Big Name Fan (BNF) — someone widely known, usually for producing lots of content valued by the community. Similarly, deviants with a higher number of followers have more influence on DeviantArt (Buter, *et al.*, 2011; Salah, *et al.*, 2012).

As noted above, using tagging features to make content discoverable indicates an interest in one’s work being seen by others. Posting in public ways therefore also indicates an interest in reputation building (Jenkins, *et al.*, 2013). Within fanfiction communities, users with more experience provide direction and feedback to newer members, guiding the development of future writing (Evans, *et al.*, 2017; Fiesler, *et al.*, 2017).

Likewise, DeviantArt includes a “resource” category where deviants can post content for others to draw on in their own work, including stock images and demonstrations of various tools or techniques (Salah and Salah, 2013). Deviants who contribute to this feature actively choose to influence the subsequent work of others. These are relatively subtle instances, but they show that such status systems inherently produce hierarchy.

More intensively, ingroup/outgroup dynamics play a key role. One study found that a GitHub contributor who has a visible connection to the person determining the acceptance of the code has an increased chance of acceptance (Tsay, *et al.*, 2014). The role of social ties is also significant to developers searching for projects, as research has shown that people choose to join projects where there are existing social ties (Casalnuovo, *et al.*, 2015; Hahn, *et al.*, 2008).

Similar dynamics appear in fan fiction communities. Hadas identifies a tension in which an older, more established fan fiction group felt that “rather than being an open space, fandom also has rules that must be followed in order to participate properly — in this case, rules of language as well as rules of personal conduct,” and felt invaded by a new group of writers who felt that “not only is the ability to write fan fiction a basic right, but so is the ability to post it — a right that is not preconditioned by anything and should not be subject to any limitation.” [2] Thus, fundamental differences of norms in subgroups create conflict.

In various ways, then, in-group belonging matters a great deal when determining who contributes. Indeed, these spaces are sometimes actively exclusionary. Google employee James Damore's 2017 anti-diversity screed was the subject of widespread attention due to his position (Feinberg, 2017), but similar arguments that white women and people of color are underrepresented in computer coding because they inherently have less capacity for the work are widespread and recurring.

It is important to take that exclusion seriously as a fundamental limitation of OSS. In OSS communities, women's contributions are often devalued. For people who are already insiders to a project, the code contributions of men and women are similarly likely to be accepted when their gender is not apparent to other users. However, when gender is evident, men's code is accepted at a rate 1.2 percent higher than code developed by women (Terrell, *et al.*, 2017), which is measurably different but not dramatically.

However, when a new contribution is proposed by someone who doesn't have an existing social tie, the impact of gender is more significant, with women's code 12 percent less likely to be accepted when their gender is apparent (Terrell, *et al.*, 2017). The study found that women's contributions are more often accepted overall, despite systemically evident rejection of visible women. This suggests that women's code otherwise has the markers of a good contribution or their accounts otherwise show status.

Beyond not accepting women's contributions, OSS can be actively hostile to them. One study found women were routinely subjected to harassment, and discriminatory language was defended by other participants in the community (Nafus, 2012). Further, research participants said men programmers saw women participants as sources of advice on domestic subjects, such as dress and behavior, refusing to discuss technical details of projects (Nafus, 2012).

Moreover, women reported that they experienced difficulty locating mentors, as men treated their women mentees as potential romantic partners (Nafus, 2012). Given the widespread challenges of similar harassment across social media platforms, it is not surprising that GitHub has similar problems of exclusion.

These exclusionary tendencies are both the effect and the cause of OSS's gender makeup. As GitHub does not require users to disclose gender identity, exact demographics are unknown, but they have been estimated. Studies have used a combination of sampling and inferential methods to assign and recognize gender on GitHub; Vasilescu, Posnett, *et al.* (2015) found 91 percent men and nine percent women, which may in fact overcount women due to their method of inferring from names. A significant majority (75.3 percent) of the projects surveyed by Vasilescu, Serebrenik, and Filkov (2015) had no gender diversity, with an overwhelming proportion of these projects being all men.

This is the case despite the fact that studies have shown that diversely gendered teams tend to be larger and more productive (Vasilescu, Posnett, *et al.*, 2015; Vasilescu, Serebrenik, *et al.*, 2015), and that team members generally seem to be aware of the positive impact of working with a diversely gendered team; Vasilescu, Filkov, and Serebrenick (2015) found that 62.5 percent of users positively rated their experience working with a diverse GitHub team.

Fan platforms are more inclusive of women. A 2018 survey of the broader community of fans from which AO3 users are drawn revealed that 80 percent of participants identified as female, followed by non-binary and transgender individuals, and, finally, a minority of cisgender men (Fiesler and Dym, 2020).

This tracks with a more detailed earlier survey that also found 80 percent identified as female, followed by genderqueer (six percent) and male (four percent), with trans\*, transgender, androgynous, agender, neutrois, and other each accounting for two percent or less of respondents (centrumlumina, 2013). Such demographics encourage a different environment than OSS communities.

However, fan spaces have been criticized for lacking inclusion along other axes, such as race, which attention to ingroup/outgroup dynamics such as that paid to GitHub can help illuminate. As Pande (2016) observed, fandom communities, despite their reputation for inclusivity, still incorporate certain hierarchies

related to socioeconomic status, race, and ethnicity.

In *Predominantly White Fandoms* (Stanfill, 2018), fans are frequently expected to identify first as a fan, subsuming other racial and gender identity markers (Gatson and Reid, 2011; Stanfill, 2018). Thus, while primarily we have used fandom to analyze GitHub, attention to how exclusion works in OSS encourages seeing these fandom exclusions as systemic rather than incidental.

<b>Table 4: Failures of inclusivity.</b>			
<b>Actions</b>	<b>GitHub</b>	<b>Fandom platforms</b>	<b>Social media platforms</b>
Inclusive myth	Myth of meritocracy the ideal of community	“Anyone can write” ethos	“Anyone can post” ethos
Reality on the ground	Ingroup/outgroup dynamics	Ingroup/outgroup dynamics	Ingroup/outgroup dynamics
Structurally unequal outcomes	Women’s contributions are often devalued	More inclusive of women, but criticized for lacking inclusion along other axes, such as race	Women and people of color are present, but face disproportionate harassment and are frequently chased off platforms or discouraged from participating visibly

If we take seriously the way a community’s belief in its own inclusivity can obscure the persistence of exclusion, both OSS and fan communities look different (Table 4). On one hand, fandom provides a model for inclusion of women. On the other, taking the homology of the two seriously demands letting the recognition of OSS’s failures call attention to those of fandom — notably around race.

## Conclusion

Open source communities are not frequently linked to fandom: the demographics of users and the differing valuations of their labor do not invite an easy comparison. However, drawing these communities and platforms into conversation reveals important commonalities shared by “communities of making,” providing not only models for explaining and understanding existing status systems but also insight into supporting and valuing these types of labor.

Further study at this intersection offers potential for developing design strategies and solutions, as well as for recognizing and valuing the fandom elements already present in GitHub and other OSS spaces. Such examination also facilitates recognizing and valuing the types of labor at work in fandom spaces. By considering these two kinds of production together, we can move toward more inclusive spaces that value a variety of kinds of participation.

In June 2020, as we were revising this article for submission, a long-simmering controversy over insufficient attention to racism in content at AO3 erupted into a large-scale debate. At this time, a spate of police murders of Black people had led to widespread protests in the U.S., raising awareness of racism in general and anti-Blackness in particular. Many organizations had released statements about their support of Black people, condemnations of police violence, commitments to change, or other responses (more or less

sincere).

The Organization for Transformative Works (OTW), AO3's parent non-profit, released its usual weekly collection of fandom-related news events — including events relevant to the broader moment such as Star Wars actor John Boyega's impassioned speech at a London Black Lives Matter Rally (Suliman, 2020) and fans of Korean pop music electronically shouting down white supremacists by overwhelming their hashtag (A. Lee, 2020) — but made no particular statement of solidarity on its own behalf.

This prompted backlash from fans of color who saw this as yet another in a long line of instances where the OTW and AO3 had not been responsive to their needs, especially pleas about racist content in the archive. It is here that our work is particularly helpful.

Fandom, because it is predominantly comprised of women, many of them queer and feminist, tends to think of itself as progressive [3]. However, given that this group of women is also disproportionately white, it has not seriously grappled with the role of race in its practice, producing moments like this one. OTW's failure to engage forced an internal community reflection on these gaps in the progressive façade.

Through comparison with the much more widely understood and critiqued failures of inclusion in OSS, the ways implicit beliefs actually reinforce each community's inability to live up to its own stated values come into view. This incident thus underscores that generative capacity of juxtaposition.

OSS and fan work are on one level very different, and on another level very much the same. The fact that they have many of the same structures and community practices — and indeed so many of the same strengths and weaknesses — means they can be leveraged off each other to illuminate bigger social dynamics, as well as potential solutions to problems of exclusion.

Moreover, given that nonmarket practices with deep market ties, gift economies that run on status, and a lack of inclusivity are shared by much of the social media ecosystem at large, we hope that this analysis is provocative for a broader rethinking of what social platforms are good — and bad — for. 

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## Notes

1. That is, under Section 107 of the U.S. Copyright Code, fair use permits the unlicensed use of copyrighted materials for purposes such as criticism, comment, and parody; one of the criteria is the effect on the market for the original work, such that works that are not sold are better positioned to be fair use.
2. Hadas, 2009, para. 5.10, 5.2.
3. For an in-depth discussion of the idea of fandom as progressive, see Stanfill (2020).

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