

MR. BENKLER GOES TO WASHINGTON: THE PEER-TO-PATENT PROJECT AS A CASE STUDY ON THE LIMITS OF CROWDSOURCING

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ABSTRACT

After reading this, you are probably going to look up Peer-to-Patent on Wikipedia. Crowdsourcing has become very prevalent today; from Uber to Linux, the possibilities seem endless. Professor Benkler’s seminal paper had previously argued that crowdsourcing can tackle *any* project so long as the project can be divided into finely-sized modules with low integration costs. This paper analyzes crowdsourcing’s limits while challenging that traditional framework via the case study of the U.S. Patent and Trademark Office’s Peer-to-Patent Project (P2PP), which solicits public input during the patent examination process. This paper’s analysis of P2PP’s failures reveals that adequate volunteer interest, balance of volunteer contributions, institutional affiliations, and most importantly, robust infrastructure are all relevant and limiting factors for crowdsourcing. To date, this paper is the only independent – and critical – evaluation of P2PP, which has continued to be a darling of the USPTO despite its limited successes and many jarring failures.

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I. INTRODUCTION

Although the Constitution tasks intellectual property (IP) laws “to promote the progress of science and useful arts,”² existing regimes are often bemoaned for doing the opposite. Critics frequently cite three problems with the current IP laws. First, by propertizing knowledge, it becomes inefficiently exploited during the monopoly period because only one party can innovate in that space.³ Second, IP thickets create double-blocking scenarios in which multiple parties can mutually block each other from practicing their IP.⁴ In such “anti-commons” problems, too many

² U.S. CONST. art. I, § 8, cl. 8.

³ See Rochelle Cooper Dreyfuss, *Does IP Need IP? Accommodating Intellectual Production Outside the Intellectual Property Paradigm*, 31 CARDOZO L. REV. 1437, 1441–42 (2010) (“Since knowledge is cumulative, exclusive rights have always had the paradoxical effect of slowing progress in the name of promoting it. [As IP] rights have moved upstream to cover fundamental building blocks of [knowledge, they] . . . dominate such a broad swath of inventive opportunities that it is not clear whether the right holders have the cognitive capacity to fully mine their claims.”).

⁴ Robert P. Merges, *A Brief Note on Blocking Patents and Reverse Equivalents: Biotechnology as an Example*, 73 J. PAT. & TRADEMARK OFF. SOC'Y 878, 878–79 (1991) (“Two patents are said to block each other when one

rights holders have veto power to impede the action of any and all of the other rights holders.⁵ Third, when the IP within a space is too fragmented, potential innovators need burdensome IP-clearing to obtain the freedom to operate. This drastically chills innovation due to increased transaction costs.⁶ These issues have led scholars to examine alternatives to IP regimes. Direct sponsorship, public or private grants, prizes, and contests have all been studied as alternatives to incentivize innovation.⁷ In recent years, scholars have also studied a variety of intellectual production phenomena in contexts without any formal IP laws.

Looking at communities like magicians,⁸ French chefs,⁹ comedians,¹⁰ or fashion designers,¹¹ scholars have noted that

patentee has a broad patent on an invention and another has a narrower patent on some improved feature of that invention. In such a situation, . . . the holder of the dominant patent cannot practice the particular improved feature claimed . . . without a license.”).

⁵ See generally MICHAEL HELLER, *THE GRIDLOCK ECONOMY: HOW TOO MUCH OWNERSHIP WRECKS MARKETS, STOPS INNOVATION, AND COSTS LIVES* 4–6 (2010) (discussing the tragedies of the “anti-commons” and effects).

⁶ Ian Ayres & Gideon Parchomovsky, *Tradable Patent Rights: A New Approach to Innovation*, 60 *STAN. L. REV.* 863, 864–65 (2007) (“the need to secure licenses from multiple patentees, each possessing a veto power over the production of new innovation . . . dramatically increases bargaining costs[,] . . . creates a potential for hold-ups[,] and . . . mak[es] it more expensive for users to gain access to the relevant product or technology”).

⁷ See generally PETER S. MENELL & SUZANNE SCOTCHMER, *INTELLECTUAL PROPERTY LAW*, in 2 *HANDBOOK OF LAW AND ECONOMICS*, 1531–32 (A. Mitchell Polinsky & Steven Shavell eds., 2007) (discussing different types of initiatives to incentivize innovation).

⁸ JACOB LOSHIN, *SECRETS REVEALED: PROTECTING MAGICIANS’ INTELLECTUAL PROPERTY WITHOUT LAW*, in *LAW AND MAGIC: A COLLECTION OF ESSAYS* 123, 135 (Christine A. Corcos ed., 2010) (“The lack of protection from intellectual property law, however, has not stopped magicians from innovating and thriving.”).

⁹ Emmanuelle Fauchart & Eric von Hippel, *Norms-Based Intellectual Property Systems: The Case of French Chefs*, 19 *ORG. SCI.* 187, 187 (2008) (“[Accomplished] chefs consider recipes they develop to be a very valuable form of IP. At the same time, recipes are not a form of innovation that is effectively covered by law-based IP systems.”).

¹⁰ Dotan Oliar & Christopher Sprigman, *There’s No Free Laugh (Anymore): The Emergence of Intell. Prop. Norms and the Transformation of Stand-up Comedy*, 94 *VA. L. REV.* 1787, 1789 (2008) (“Comedians are not amused when their jokes are stolen . . . [y]et, we could not find even a single copyright infringement lawsuit between rival comedians.”).

¹¹ Kal Raustiala & Christopher Sprigman, *The Piracy Paradox: Innovation and Intellectual Property in Fashion Design*, 92 *VA. L. REV.* 1687, 1689 (2006) (“[T]he existence of a global industry that produces a huge variety of creative goods . . . does so without strong IP protection. Copying is rampant, as the standard account would predict. Competition, innovation, and investment, however, remain vibrant. That industry is fashion.”).

intellectual production indeed takes place even absent formal IP laws. Magic tricks, recipes, jokes, and fashion designs are generally not patented, copyrighted, or trademarked, and yet, social norms within those communities provide guidelines against appropriating others' intellectual productions.¹² Along with norms, the love for the activity,¹³ its community and culture,¹⁴ and some compensation for the activity's service or presentation¹⁵ all provide what seem to be sufficient incentives for these thriving intellectual productions.

However, norms-based IP production has its limits. Most of these intellectual productions are low-stakes; the world is probably happier with jokes or magic tricks, but the world really needs machines and medicine. Furthermore, this paradigm relies on the existence of a community, which inherently limits the size and scalability of its principles. Enforcing community norms works only if there is a notion of a community "member," which does not fit well with anonymous, large-scale market transactions.

A second thread of the IP without IP literature studies the commons production paradigm, more well-known as crowdsourcing, which attempts to ameliorate some of these concerns. Yochai Benkler pioneered and crystallized the study of crowdsourcing systems. He argues using high-stakes examples like Linux that small amounts of effort from a multitude of volunteers can be combined to form an intellectual production of

¹² Fauchart & Hippel, *supra* note 9, at 188 ("[W]e find that an IP system based on implicit social norms and offering functionality quite similar to law-based systems does operate among accomplished French chefs."); Loshin, *supra* note 8, at 136 ("As magicians spend more time in the magic community, they come to internalize a handful of common norms that govern how secrets, techniques, and presentations are to be treated."); Oliar & Sprigman, *supra* note 10, at 1790 ("in stand-up comedy, social norms substitute for intellectual property law"); Raustiala & Sprigman, *supra* note 11, at 1733 ("[A] regime of low IP protection, by permitting extensive and free copying, enables emerging trends to develop and diffuse rapidly, and, as a result of the positionality of fashion, to die rapidly. Induced obsolescence and anchoring are thus intertwined in a process of quick design turnover.").

¹³ See, e.g., Oliar & Sprigman, *supra* note 10, at 1816 ("[P]sychological rewards operate as a substantial, perhaps major, incentive to create for most comedians. One such reward is of course the audience's laughter.").

¹⁴ See, e.g., Loshin, *supra* note 8, at 136 ("One must impress magic's top practitioners and earn their trust and respect.").

¹⁵ See, e.g., Fauchart & Hippel, *supra* note 9, at 194 ("Usually, a chef does not disclose everything when publishing a recipe in a cookbook. The published version may exclude important 'tricks' (elements of technique)[.]").

immense scale and power. Benkler boldly argues that “[p]eer production is limited not by the total cost or complexity of a project, but by its modularity, granularity, and the cost of integration.”¹⁶ Under this model, if any project is separable into small enough tasks that can be completed without excruciating efforts and their subsequent integrating is cheap, crowdsourcing without any compensation or formal IP laws can be used for that project. Furthermore, according to Benkler, these crowdsourcing productions have two key advantages over traditional productions. First, because volunteers accept tasks that they are especially interested in and qualified for, there is an information gain in this self-nomination process. The best talent finds the suitable project, an inverse of the traditional marketplace.¹⁷ Second, because volunteers come from varied backgrounds and utilize wide-ranging resources, there is an allocative gain in accessing a broader set of agents and resources than the confines of a traditional corporation.¹⁸

Utilizing internet communications, there has indeed been a tremendous growth in such crowdsourcing projects in recent years. From online shopping reviews¹⁹ to encyclopedias²⁰ to cataloging craters on Mars,²¹ many crowdsourcing projects with Benklerian features have been quite successful. However, many of these projects have also been dramatically modified from Benkler’s vision. For example, Wikipedia has extensive rules and a high degree of moderation.²² It is very interesting to study the examples that do not perfectly fit Benkler’s paradigm in order to illuminate the limits and assumptions of the bold claim that crowdsourcing can accommodate all forms of intellectual production without formal IP laws. For its appropriateness and poetic irony, this paper analyzes as a case study the attempt by the United States Patent and Trademark Office (USPTO) to marshal crowdsourcing.

¹⁶ Yochai Benkler, *Coase’s Penguin, or, Linux and the Nature of the Firm*, 112 *YALE L.J.* 369, 435 (2002).

¹⁷ *Id.* at 414–15.

¹⁸ *Id.* at 415.

¹⁹ *See id.* at 391 (referring to Amazon through discussion in footnote 45).

²⁰ *See id.* at 387 (referring to the participants of Wikipedia and through the common project, the people that come together and participate have adopted to make it an “encyclopedia”).

²¹ *Id.* at 384.

²² *See, e.g., Wikipedia: Moderators/Proposal*, <http://en.wikipedia.org/wiki/Wikipedia:Moderators/Proposal> (last updated Apr. 2, 2015) (discussing moderator access and control policies).

The USPTO has been often criticized for inefficiency, inconsistency, and high costs. Some studies estimate that up to 55% of granted patents aren't meritorious.²³ Despite what appears to be porous examinations, there still is a backlog of 1 million patent applications per year.²⁴ In the middle of this logistical nightmare, a PTO Examiner allocates on average only 20 hours to examine a patent.²⁵ Using this estimate and the published employee and application data,²⁶ each PTO Examiner annually produces 1,140 hours of effective output, which is a 57% efficiency assuming a 40-hour work week. These USPTO shortfalls are frequently cited in the IP without IP literature: alternative IP regime discussions always make relative cost-effectiveness comparisons to the formal IP regime. Therefore, it is extremely interesting that the USPTO has itself experimented with crowdsourcing production. It is also noteworthy that as the IP without IP literature moves toward studying high-stakes productions to broaden its applicability,²⁷ this case study of crowdsourcing intellectual production within the formal IP regime is at the apex of meta importance.

The Peer-to-Patent Project (P2PP) is a pilot USPTO program which incorporates public input into the patent examination system. The program aims to make prior art searches more

²³ The Ctr. for Patent Innovations at N.Y. L. Sch., *Peer to Patent First Anniversary Report*, 3 (June 2008), <http://www.peertopatent.org/wp-content/uploads/sites/2/2013/11/P2Panniversaryreport.pdf> [hereinafter *Year One Report*].

²⁴ The Ctr. for Patent Innovations at N.Y. L. Sch., *Peer to Patent Second Anniversary Report*, 4 (June 2009), http://www.peertopatent.org/wp-content/uploads/sites/2/2013/11/CPI_P2P_YearTwo_lo.pdf [hereinafter *Year Two Report*].

²⁵ *Id.*

²⁶ James Loisel et al., *Evaluation of the Peer to Patent Pilot Program* 18–19, <https://www.wpi.edu/Pubs/E-project/Available/E-project-122109-150816/unrestricted/usptofinalreport.pdf> (last visited Feb. 22, 2015) (sponsored by the United States Patent and Trademark Office).

²⁷ Laura J. Murray, *Cultural Labor in a Small City: Motivations, Rewards, and Social Dynamics*, in *PUTTING INTELLECTUAL PROPERTY IN ITS PLACE: RIGHTS DISCOURSES, CREATIVE LABOR, AND THE EVERYDAY* 152–54 (2014) (“The findings [relating to Kingston’s artistic community] suggest that we do not have to turn to artistic practice that lies ‘outside’ copyright—cuisine, comedy, fashion, indigenous traditional knowledge—in order to decenter copyright’s utilitarian justifications. Nor do we have to study places and times where copyright is weak or ill-defined, as interesting as those contexts are. We can look at ‘high copyright’ practices such as visual art in spaces well within copyright’s largest sphere of influence, and still find that copyright is more ‘moth-like’ than determinative.”).

efficient. Members of the public may volunteer to review a patent application and submit what they consider relevant prior art; such a reviewer can also annotate, comment on, and rate other reviewers' submissions.²⁸ After a 4-month public review period, the ten highest-rated prior art references are forwarded onto the PTO Examiner. The program hopes that these contributions can better resolve novelty and nonobvious concerns.²⁹ Patent applicants elect to participate in this program in exchange for higher application priority. Initially, patent applications in the field of computer architecture, software, information security, business methods, and e-commerce were eligible for P2PP.³⁰ The USPTO selected these subject areas because it felt that Examiners were especially likely to miss prior art from these fields, which are commonly found in published articles, software codes, and conference presentations.³¹ P2PP began in 2007 and lasted for two years. Its organizers deemed this first rendition of the program very successful. In 2010, the USPTO agreed to renew and expand the program into other subject areas for one additional year.³² The 2007–2009 program phase provides extensive data reporting and will be the basis of discussion for this paper; organizers are currently still evaluating the 2010–2011 rendition.

Overall, P2PP generally has crowdsourcing's analytical levers. First, searching for prior art is a distinctive step within the patent examination process, which makes the public's contributions a separable module; interpreting, analyzing, and ultimately determining patentability based on the submitted prior art are still PTO responsibilities. Second, the volunteer reviewers can comment on, rate, or search for prior art, which

²⁸ The Ctr. for Patent Innovations at N.Y. L. Sch., *Peer to Patent First Pilot Final Results*, 10 (June 2012), <http://www.peertopatent.org/wp-content/uploads/sites/2/2013/11/First-Pilot-Final-Results.pdf> [hereinafter *Final Report*].

²⁹ Year One Report, *supra* note 23, at 3–5.

³⁰ Christopher Wong & Jason Kreps, *Collaborative approach: Peer-to-Patent and the Open Source movement*, 1 INT'L FREE OPEN SOURCE SOFTWARE L. REV. 15, 17 (2009) [hereinafter *Collaborative Approach*] (Wong was the project manager of P2PP and Kreps was the lead analysis of P2PP during their tenure at NYU.).

³¹ Year One Report, *supra* note 23, at 4.

³² *Peer Review Pilot FY2011*, U.S. PAT. AND TRADEMARK OFF., http://www.uspto.gov/patents/init_events/peerpriorartpilotindex.jsp (last visited Nov. 23, 2014) (“The scope of the previous pilot program—which was limited to computer technologies and business methods applications—has been expanded to also include applications in biotechnology, bioinformatics, telecommunications, and speech recognition[.]”).

makes the P2PP tasks relatively granular in terms of required effort. Third, P2PP contributions are facilitated electronically by the NYU Law School, who forwards and integrates the public contributions into the USPTO examination process, at no cost to the volunteer reviewers.

In this paper, I will analyze some of P2PP's useful features, but I will also argue that it is overall an absurd failure. For instance, only 6 volunteers accounted for nearly one-third of the total prior art submissions received during P2PP's entire two-year project course!³³ Jarring failures like these make P2PP undeserving of public funding and the darling treatment it receives from the USPTO. Through this assessment, I will discuss more generally whether a crowdsourcing production may indeed be broadly used for *any* project. I will also discuss crowdsourcing's limits and factors for success. This paper's exploration is important for both practical and theoretical reasons. Practically, my conclusion is quite novel because all P2PP evaluations thus far have been rosy. The underlying data, as I point out throughout the paper, does not justify such a picture. Furthermore, to my knowledge, there has not been a P2PP evaluation performed independently from the USPTO, NYU, or individuals involved with P2PP.³⁴ This paper is thus the first and only non-affiliated, independent program evaluation to date. Theoretically, this inquiry is important because it examines the limits of crowdsourcing and highlights areas that were previously unaddressed in the literature. This inquiry complements the Benklerian framework with additional and generalizable factors to consider when analyzing crowdsourcing.

In Part II, I discuss P2PP's many benefits. Specifically, P2PP had relatively expert reviewers, which fits with information gains from self-nomination. These P2PP reviewers also had access to a broader range of prior art than PTO Examiners, which fits with allocation gains from crowdsourcing. Moreover, different reviewers were able to contribute different amounts of time and to different types of productions as results of modular and granular inputs. Furthermore, the P2PP software allowed

³³ See *infra* Part III (c) and accompanying notes (discussing the lack of infrastructure); see also *Final Report*, *supra* note 28, at 30 (listing the "prior artists awards" that were "[l]isted by the amount of contributed prior art used by the examiner").

³⁴ See *generally* notes 23, 24, 26, 28, 30, and 32 (for the six reports that have evaluated P2PP thus far and their affiliations with organizers of P2PP).

reviewers to annotate, tag, and rate other contributions, which facilitated integration. Finally, P2PP received very strong institutional sponsorships, which helped its credibility. Therefore, given these results, implementing P2PP had many benefits.

In Part III, I discuss P2PP's many stunning shortfalls, especially those that were not mappable to the prior crowdsourcing literature. For example, P2PP did not generate enough interest for volunteers. Even within the slight contributions, a small minority of volunteers provided the overwhelming bulk of the input, with the contributions heavily biased towards those that required less effort. Such imbalances threaten the very definition of *crowdsourcing*. Furthermore, volunteer motivations and contributions seem to have been influenced by institutional affiliations and P2PP's lack of infrastructure.

In addition to these shortfalls, P2PP also faced many expected problems with crowdsourcing. For example, many volunteer reviewers did not have a good understanding of patents, which is an expected problem with self-nomination. As a facilitator, the USPTO also struggled to excite interest in the program. Furthermore, P2PP set many lofty but unmet goals that were not sufficiently modular. Therefore, given all of these shortfalls, P2PP is definitely a failure in its current form.

In Part IV, I summarize this paper's two analytical layers by differentiating between the theoretical mapping of P2PP onto the crowdsourcing framework and the pragmatic evaluation of P2PP as a program. I then extrapolate from P2PP's shortfalls to delineate the scenarios, projects, and their essential characteristics that crowdsourcing can and cannot accommodate. These new contours direct future research on the necessary and sufficient factors that make crowdsourcing projects tenable.

II. P2PP'S BENEFITS

The P2PP organizers considered the program a success.³⁵ The volunteer self-nomination process provided reviewer expertise, resulting in information gains. These volunteers also used

³⁵ See, e.g., Final Report, *supra* note 28, at 11 (“[T]hese figures provide an illustration of the current success of the project in stimulating the self-selection of participants, retaining these participants, and developing an overall ‘human database’ of interested citizen-experts.”).

resources that PTO Examiners usually do not, resulting in allocation gains. Furthermore, the reviewers performed a variety of tasks, making contributions that are relatively granular and easy to integrate into the PTO examination process. Finally, P2PP had strong and credible industry support. In this Part, I discuss each of these benefits that showcase the program's limited success and some of the theoretical advantages of crowdsourcing.

A. Information gains: Self-nominated reviewers were very qualified

One marquee advantage of crowdsourcing is its information gains over traditional production approaches. Because “human intellectual effort is highly variable and individuated[,] . . . allow[ing] individuals to self-identify for tasks[,] will [allow them to] be better at gathering and utilizing information about who should be doing what.”³⁶ P2PP seems to have attracted appropriate and qualified volunteers, fulfilling this information gain. Over 50% of P2PP reviewers are from the software industry. These reviewers also have industry experience.³⁷ In fact, 73% of the reviewers utilized their relevant work experience in their P2PP tasks.³⁸ Moreover, over 50% of P2PP reviewers hold at least a bachelor's degree.³⁹ Therefore, P2PP had extremely qualified participants.

Furthermore, these highly-qualified reviewers assembled because of self-identified common interest. Among the P2PP reviewers, the vast majority participated for noneconomic reasons: 39% participated for professional development, 21% participated to improve the patent process, and 12% participated for personal reasons.⁴⁰ Moreover, 78% of P2PP reviewers stated that they would like to review another application.⁴¹ Specifically, many reviewers are from the open-source software community who participated because they wanted to ensure that open-source code does not appear in any patents.⁴² These reviewers are

³⁶ Benkler, *supra* note 16, at 414.

³⁷ See Final Report, *supra* note 28, at 22 (with the most prevalent at 45% citing their industry background as “computer software”).

³⁸ Year Two Report, *supra* note 24, at 20.

³⁹ Loisel et al., *supra* note 26, at 49 (discussing the number of advanced degree and qualities that reviewers have that was noted in the survey).

⁴⁰ Final Report, *supra* note 28, at 22.

⁴¹ Year Two Report, *supra* note 24, at 20.

⁴² See generally Collaborative Approach, *supra* note 30, at 17 (stating that

especially comfortable with and interested in crowdsourcing productions. Thus, P2PP indeed summoned participants with self-identified common interests.

Various institutions also self-identified common interests with P2PP. The software industry welcomed P2PP because it wanted to prescreen troublesome patents before they were relied upon.⁴³ Because of this, industry titans like IBM, Microsoft, HP, and RedHat financially sponsored P2PP, with IBM and Microsoft each contributing \$2 million per year.⁴⁴ Additionally, as beneficiaries, more than 70% of PTO Examiners surveyed stated that they wanted P2PP as a regular part of USPTO practice.⁴⁵ Therefore, P2PP seems to have brought together motivated, qualified, and well-received volunteers and institutional sponsors. For a discussion on the implications of institutional participation, see Section E *infra*. Thus, these P2PP features fulfill crowdsourcing's theoretical advantage of self-nomination without entry barriers or formal hierarchies, which assembles better human intellectual capacities due to its information gains.

B. Allocation gains: P2PP had access to a broad range of resources

Another marquee advantage of crowdsourcing is its allocation gains over traditional firm approaches. “[M]arket- . . . based production processes rely on . . . *bounded* sets of agents and resources in the pursuit of *specified* projects. . . . [Crowdsourcing] relies on making an *unbounded* set of resources available to an *unbounded* set of agents, who can apply themselves toward an *unbounded* set of projects.”⁴⁶ Because crowdsourcing can have any volunteer use any resource to take on any project of her choosing, problems can be solved via more permutations. P2PP has captured this allocation gain through its reviewer contributions.

participation in Peer-to-Patent can help quell the concerns of the open-source software community).

⁴³ See generally Year One Report, *supra* note 23, at 5 (stating that high profile software companies have submitted applications to the program, and that the deliberation process weeds out the weak patents, only sending the ten strongest to the patent examiner).

⁴⁴ *Id.* at 4; see also Peer-to-Patent Funding, CB INSIGHTS, <https://www.cbinsights.com/c-3f62d610adac92bbf2996bb4d8ff7657> (last visited Feb. 12, 2016).

⁴⁵ Final Report, *supra* note 28, at 29.

⁴⁶ Benkler, *supra* note 16, at 415.

P2PP reviewers accessed a broader “set” of resources. In 20% of the cases, PTO Examiners conceded that reviewers found prior art that the Examiners themselves would not have found.⁴⁷ A likely explanation is that the reviewers were using a different set of resources than the USPTO. For instance, during USPTO Examiner searches, only 10% of the results are non-patent prior art,⁴⁸ whereas in P2PP reviewer searches, 53% of the results are non-patent prior art.⁴⁹ Thus, P2PP is better at finding a different type of prior art than the USPTO. This difference may also be due to the dissimilar search methods utilized. The USPTO conducts the vast majority of its prior art searches using the EAST database, which collects patents and applications.⁵⁰ Conversely, P2PP reviewers conduct the vast majority of their searches using Google.⁵¹ For a discussion on the implications of using non-specialist search engines like Google, see Part III(C) *infra*. Overall, the general USPTO consensus is that P2PP-generated prior art is higher quality than the presently available applicant-submitted prior art.⁵² Therefore, excellent P2PP reviewer contributions fulfill the prediction that crowdsourcing can utilize a broader range of assets.

With respect to the “set” of agents, qualities that the P2PP reviewers themselves possess are equally important reasons for their success in finding prior art. 13% of reviewers indicated that upon reading an application, they immediately knew the relevant prior art.⁵³ Fifty-two percent of reviewers indicated that they knew the relevant prior art but had to search to locate the specific references and seventeen percent of reviewers indicated that they at least knew of the relevant prior art.⁵⁴ Only 17% of reviewers had to search for prior art without any prior knowledge.⁵⁵ Having such knowledgeable reviewers thus makes the prior art search extremely efficient. Indeed, a surveyed PTO Examiner admits that “[i]t’s not . . . that it was inaccessible . . . [but i]t would have taken me much longer to find such art.”⁵⁶

⁴⁷ Final Report, *supra* note 28, at 29.

⁴⁸ Year One Report, *supra* note 23, at 14.

⁴⁹ Final Report, *supra* note 28, at 26.

⁵⁰ Loiselle et al., *supra* note 26, at 37.

⁵¹ *Id.* at 47.

⁵² Year One Report, *supra* note 23, at 24.

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ Loiselle et al., *supra* note 26, at 36.

Moreover, reviewers from the open source community have unique access (and incentives) to flag prior art from open source materials.⁵⁷ For software patents, access to such materials is crucial because PTO Examiners are especially likely to miss prior art in published articles, software code, and conference presentations.⁵⁸ Therefore, excellent reviewers fulfill the prediction that crowdsourcing can utilize a broader range of agents, which is a part of the theoretical advantage of allocative gains in the “sets” of a crowdsourcing project that traditional production does not enjoy.

C. Modular & Granular: P2PP reviewers had a variety of small tasks

Crowdsourcing volunteers will be more motivated in projects if each of the tasks is granular. Each individual volunteer does not have to contribute beyond their own comfort level; hence, “[h]eterogeneous granularity will allow people with different levels of motivation to collaborate by making smaller- or larger-grained contributions, consistent with their levels of motivation.”⁵⁹ P2PP reflects this heterogeneous granularity. Within the already-modularized task of prior art searches, there are different sub-tasks that require different amounts of time.⁶⁰ For example, the average amount of time a reviewer spent on all P2PP tasks is two hours, but a reviewer spent on average only one hour for reviewing an application, discussing an application, or rating an application.⁶¹ Thus, by granulizing prior art searches into smaller sub-tasks, P2PP is structured to reflect crowdsourcing’s heterogeneous motivations.

D. Integration: P2PP is well-facilitated with the USPTO

Another factor crucial for crowdsourcing is the cost of integration. To facilitate volunteer contributions, “[i]ntegration includes two distinct components [of] . . . providing quality

⁵⁷ See Collaborative Approach, *supra* note 30, at 17–18, 23 (discussing access to materials and open source projects, which is a useful tool to get in front of the examiner).

⁵⁸ See Year One Report, *supra* note 23, at 4 (discussing limited access to non-patent literature).

⁵⁹ Benkler, *supra* note 16, at 379.

⁶⁰ See Year One Report, *supra* note 23, at 9 (discussing the Peer-to-Patent 5-Step Methodology).

⁶¹ Final Report, *supra* note 28, at 25.

control . . . to defend the project against incompetent or malicious contributions, and . . . a mechanism for combining the contributed modules into a whole.”⁶² For P2PP, both quality control and effective combination depend on communicating reviewer contributions to the USPTO.

For quality control, P2PP reviewers may rate other submitted prior art so that only the 10 highest-rated ones are submitted to the PTO. This theoretically prevents low-quality prior art from reaching the PTO. In fact, reviewers on average rated the quality of other prior art submissions at 6.6 out of 10.⁶³ For effective combination of individual contributions, P2PP streamlines communications to the USPTO. For example, P2PP reviewers may use their own “tags” to describe patents, which correspond with PTO classification codes, so that reviewers and PTO Examiners can both have an accessible yet interchangeable vocabulary.⁶⁴ Furthermore, P2PP reviewers may supply search terms for PTO Examiners,⁶⁵ which help contextualize the submitted prior art as well as allow confirmatory parallel searches. Therefore, P2PP facilitates many of crowdsourcing’s theoretical mechanisms for integration between reviewer contributions and the PTO examination process.

E. Credibility: P2PP has institutional backing and is prominently credible

Another key ingredient for crowdsourcing success is credibility. At its inception, it was uncertain for P2PP how credible the program would be from the standpoint of encouraging public participation and for the PTO to seriously consider the public input.

As it turned out, P2PP has been very credible. First, the program is extremely well-funded. Its sponsors include IMB, the MacArthur Foundation, GE, HP, and Microsoft.⁶⁶ Furthermore, the program enjoys good governance. P2PP is headed by the

⁶² Benkler, *supra* note 16, at 436.

⁶³ Year Two Report, *supra* note 24, at 20.

⁶⁴ Year One Report, *supra* note 23, at 8.

⁶⁵ Loiselle et al., *supra* note 26, at 73.

⁶⁶ See Year One Report, *supra* note 23; see also Peer-to-Patent Funding, *supra* note 44 and its associated text.

former general counsel of RedHat,⁶⁷ its Board is composed of numerous distinguished IP scholars, and its work is managed by student clinics from 4 reputable law schools.⁶⁸ In fact, these institutional reputations have created a seeding effect: during P2PP's first year, 60% of the applications came from sponsors,⁶⁹ but by the second year, only 44% of the applications were from sponsors,⁷⁰ which reduced even further to 38% by the program's close.⁷¹

Such levels of institutional and financial support are not commonly associated with crowdsourcing. Thus, a deeper question may be what exactly constitutes a crowdsourcing project?⁷² P2PP could be so thoroughly supported by institutions that it veers into the realm of an "organization" that possesses many firm traits; thus, it could be argued that P2PP is a hybrid between a firm and a crowdsourcing production because of this extensive institutional affiliation. However, I would argue that P2PP is still a crowdsourcing production because it lacks centralized capstone infrastructure. I discuss this issue in detail in Part III(C), *infra*, where I describe one of P2PP's main weaknesses as its lack of high quality search tools that volunteers can use to find prior art. Thus, even with strong institutional support for peripheral infrastructure components (such as website maintenance, USPTO facilitation, staff monitoring, etc.), the lack of the most crucial tool needed for finding prior art still presents a stark contrast to organizations such as firms, which presumably provide such capstone infrastructure.⁷³

No doubt in part due to P2PP's credibility, the program's patent applications have fared comparably well. 48% of P2PP

⁶⁷ Year One Report, *supra* note 23, at 5.

⁶⁸ *Year Two Report*, *supra* note 24, at 8–9. (Mark Lemley, Gideon Parchomovsky, Dennis Crouch, and Arti Rai serve on the P2PP Board, and student clinics from NYU, Berkeley, UNC, and Albany Law school staff the project's day-to-day activities.)

⁶⁹ Year One Report, *supra* note 23, at 12 (assuming RedHat is a sponsor the percentage would be correct at 60%, but if RedHat is not a sponsor, the percentage drops to 57.5%).

⁷⁰ Year Two Report, *supra* note 24, at 14.

⁷¹ Final Report, *supra* note 28, at 18.

⁷² See *infra* Part III.A (I ask this same question in terms of the number of participants needed to constitute a crowdsourced production).

⁷³ See *infra* Part III.C. (discussing such provisions lacking in P2P. For example, companies or universities can and often do provide employees with access-limited subscriptions and databases in order to facilitate research.)

applications were allowed and 20% of P2PP applications were abandoned.⁷⁴ Among general USPTO applications, 36.1% are allowed and 14.5% are abandoned.⁷⁵ Therefore, P2PP seems to have established credibility in both its process and results. And if imitation is the greatest form of flattery, the fact that the UK, Japan, Australia, and Canada are all implementing similar programs⁷⁶ speaks to P2PP's influence.

III. P2PP'S SHORTCOMINGS

Despite these positive features, P2PP is not tenable in its current form. P2PP did not have nearly enough patent applications or volunteer reviewers, which made the project very expensive for its modest contributions. Even within these limited contributions, there is significant discrepancy in the amount and type of meaningful volunteer input. Most importantly, P2PP lacks high-quality infrastructure to facilitate crowdsourcing efforts. In addition, P2PP had problems with volunteer self-nomination, USPTO facilitation, and too-lofty goals. In this Part, I discuss each of these shortcomings and their relevance to the feasibility of crowdsourcing projects generally. Examining the relevant underlying data throughout this discussion, I would argue that P2PP was certainly a failure.

A. P2PP did not have enough volunteers and prior art submissions

One key assumption many crowdsourcing projects make is that there are enough volunteers interested in participating. For example, for the Mars Crater catalog, Benkler simply notes that the project "can be reorganized to be performed by tens of thousands of volunteers in increments."⁷⁷ However, some projects do not interest tens of thousands of volunteers.

P2PP may be such a project; over two years, P2PP attracted 686 active volunteer reviewers,⁷⁸ who combined to submit 602 pieces of prior art.⁷⁹ This amounts to 2.66 pieces of submitted

⁷⁴ Final Report, *supra* note 28, at 28.

⁷⁵ Michael Carley et al., *What is the Probability of Receiving a U.S. Patent?*, 17 YALE J.L. & TECH. 203, 207 (2015).

⁷⁶ Year Two Report, *supra* note 24, at 28.

⁷⁷ Benkler, *supra* note 16, at 384.

⁷⁸ Final Report, *supra* note 28, at 24.

⁷⁹ *Id.* at 26.

prior art per application,⁸⁰ far short of the initial expectation to “limit” submissions to the *top ten* pieces of prior art to forward onto PTO Examiners. Even the proposed scale-down to accepting only the top 4 pieces of prior art⁸¹ would still be too many. This shortage in volunteer contributions is likely a major reason for P2PP’s limited impact: only 38 out of the 187 applications in the program have had PTO office action that included P2PP prior art.⁸² Moreover, these modest contributions make the peer rating quality control mechanism useless, since every submitted prior art reference is likely to pass the “top-ten” (or even the proposed “top-four”) cutoff. This lack of meaningful peer quality control is likely the reason PTO Examiners were not completely satisfied with the P2PP contributions, as discussed in Part III(F) *infra*. Therefore, P2PP and crowdsourcing in general should not assume that there will be sufficient volunteer interest and input.

P2PP’s shortage of volunteer interest is especially puzzling when analyzed from the motivation perspective. According to Benkler, human motivation can be broken down into hedonic, monetary, and social-psychological desires. The majority of P2PP reviewers cited non-monetary reasons like professional development or personal beliefs for participating in P2PP.⁸³ P2PP also publicly announced “Prior Artist Awards” for the most prolific contributors⁸⁴ and encouraged reviewers to personally invite fellow experts to volunteer as well.⁸⁵ Thus, P2PP contributors seem to have non-monetary and hedonic motivations impelled by social recognition and pressure. Under these conditions, Benkler would argue that “if the hedonic and social-psychological rewards are greater than zero, . . . [a]gents will [take action] if someone . . . incur[s] the cost of providing the opportunities for action.”⁸⁶ Yet, despite the appropriate motivating factors, some crowdsourcing productions like P2PP still do not attract enough volunteers.

The broader labor literature has extensively studied this volunteer shortage issue. Organizations that depend on volunteers frequently cite volunteer shortage as their primary

⁸⁰ *Id.*

⁸¹ See Loiselle et al., *supra* note 26, at 78 (discussing the proposed change of accepting 4 pieces of artwork compared to 10).

⁸² Final Report, *supra* note 28, at 28; Year Two Report, *supra* note 24, at 14.

⁸³ See *id.* at 22 (showing non-monetary reasons for participation in P2P).

⁸⁴ *Id.* at 30.

⁸⁵ Loiselle et al., *supra* note 26, at 53.

⁸⁶ Benkler, *supra* note 16, at 430.

labor concern.⁸⁷ For example, state and local government projects almost always need more volunteers.⁸⁸ Unfortunately, the willingness to volunteer has generally declined in recent decades,⁸⁹ with some scholars arguing that the appearance of excessive volunteer reliance is itself disaffecting volunteers.⁹⁰ Thus, the general labor literature calls into question the assumptions about volunteer interest.

More specifically, labor research shows that volunteer interest varies from project to project. Hager and Brudney discovered from empirical studies that volunteer recruitment is most difficult for projects that seek young volunteers, have high staff-to-volunteer ratios, and require intense volunteer input.⁹¹ Furthermore, Margaret Harris found that volunteers are very likely to quit when an organization does not meet their expectations or when volunteer input is frequently overridden by non-volunteers.⁹² Unfortunately, P2PP fits many of these characterizations. Searching for prior art in P2PP application fields requires deep technological familiarity, which is more likely associated with younger volunteers. Furthermore, a full prior art search requires intense effort, as discussed in Section B, *infra*. Moreover, multiple layers of PTO staff review and have ultimate discretion over P2PP contributions. All these factors make P2PP volunteer recruitment difficult according to Hager, Brudney, and Harris. Finally, as discussed in Section B, *infra*, actual P2PP volunteer behavior matches Margaret Harris's predictions, as most potential volunteers quit readily when they discover that P2PP did not fit their expectations after visiting the P2PP website.⁹³ Thus, difficulties in recruiting and retaining

⁸⁷ Jeffrey L. Brudney, *The Availability of Volunteers: Implications for Local Governments*, 21 ADMIN. & SOC'Y 413, 418 (1990).

⁸⁸ *Id.* at 418–19.

⁸⁹ *Id.* at 416.

⁹⁰ Avril M.C. Maddrell, 'You just can't get the staff these days': *The challenges and opportunities of working with volunteers in the charity shop – An Oxford case study*, 5 INT'L J. OF NONPROFIT & VOLUNTARY SECTOR MKTG 125, 126 (2000).

⁹¹ Mark A. Hager & Jeffrey L. Brudney, *Problems Recruiting Volunteers: Nature versus Nurture*, 22 NONPROFIT MGMT. & LEADERSHIP 137, 140 (2011); see also Jan E. Mutchler, Jeffrey A. Burr & Francis G. Caro, *From Paid Worker to Volunteer: Leaving the Paid Workforce and Volunteering in Later Life*, 81 SOC. FORCES 1267, 1267 (2003) (examining the association between paid work status and formal and informal volunteer activity).

⁹² Margaret Harris, *Doing It Their Way: Organizational Challenges for Voluntary Associations*, 27 NONPROFIT & VOLUNTARY SECTOR Q. 144, 151 (1998).

⁹³ See *infra* Part III.B (For example, most potential P2PP contributors visit the website and never perform any other tasks for P2PP, which presumably fits

volunteers are not the same for all projects. Different factors contribute to and affect volunteer interest. Therefore, not only should a crowdsourcing project not assume that there will be sufficient volunteer interest, but specific projects also need to consider the aforementioned volunteerism-affecting factors to ensure sufficient labor.

One way P2PP can motivate greater participation is through better rewards. Currently, a patent applicant electing to participate in P2PP is rewarded only with moving to the head of the PTO Examiner queue, which does not seem to entice enough applicants. Thus, proposed alternative rewards include removing all filing fees for those electing P2PP, imposing a PTO default of P2PP participation and requiring an opt-out, or guaranteeing a PTO response time for P2PP applicants.⁹⁴ The USPTO could also solicit for P2PP reviewers from its database of past inventors in the field.⁹⁵ And finally, P2PP can simply pay reviewers to submit, rate, and annotate prior art, which some surveyed reviewers had indicated that they would have preferred.⁹⁶ Considering the extensive costs of running the P2PP website, and keeping these additional proposals in mind, one possibility is that they could be funded via advertising revenues from the P2PP website, which is currently ad-free.⁹⁷ While it could be argued that financial rewards and penalties may crowd out altruistic motivations, so that these proposals might be counterproductive and lead reviewers to give even less of their time,⁹⁸ given the already low levels of meaningful participation, risking the presently altruistically-motivated few seems worthwhile for greater overall interest. By using these alternative rewards, perhaps P2PP can dramatically increase meaningful participation.

the Harris hypothesis that upon learning that an organization differs from their expectations, volunteers quit very easily.).

⁹⁴ Loiselle et al., *supra* note 26, at 60–61.

⁹⁵ *Id.* at 79.

⁹⁶ *Id.* at 53.

⁹⁷ *Id.* at 68.

⁹⁸ See generally Emad H. Atiq, Note, *Why Motives Matter: Reframing the Crowding Out Effect of Legal Incentives*, 123 YALE L.J. 1070, 1081 (2014) (“an inability to advance an impression of oneself as motivated by ‘higher values,’ like truth and morality, diminishes the importance of having the relevant motivations. As a result of their inability, when incentivized, to reliably signal their intrinsic motives to others, agents exhibit what Bruno Frey calls ‘altruistic anger,’ which involves a relinquishing of altruistic and other intrinsic motives altogether.”).

B. Stunning imbalance among volunteers: not enough reviewers perform difficult tasks

Crowdsourcing generates allocation gains because decentralizing production best allocates individual talents. That is, “[t]he variability in talent and other idiosyncratic characteristics of individuals suggests that any given resource will be” most efficiently utilized by that individual.⁹⁹ However, what the literature does not specifically address is how volunteers, given this individualistic freedom, allocate their preferences among the “heterogeneity in the size of” the project tasks.¹⁰⁰ Within a large project, some tasks are shorter, more entertaining, or require less focus; how volunteers distribute their efforts among this variance greatly impacts the overall project efficacy.

P2PP volunteers displayed a high degree of contribution imbalance. As a percentage of total P2PP reviewer activities, 30% was on discussing prior art, 25% was on submitting prior art, 10% was on rating prior art, and 2.5% was on annotating prior art.¹⁰¹ Not surprisingly, the less time-consuming tasks had more contributors: discussing prior art took reviewers an average of three hours, while rating other prior art submissions took reviewers an average of five hours.¹⁰² However, this distribution did not match what the USPTO needed. From a survey of PTO Examiners, 63% found the prior art submissions helpful, 38% found the general discussion of prior art helpful, and 29% found the prior art annotations helpful.¹⁰³ Thus, the most abundant reviewer contribution – the discussion of prior art – was not the most desired or helpful work product, while there was very little prior art annotation, which was in fact a work product many PTO Examiners highly desired, especially for longer prior art submissions.¹⁰⁴ Therefore, the heterogeneity of tasks within a crowdsourcing project can create a mismatch between volunteer efforts (skewed by ease or interest) and the ultimate project needs.

In a related argument, crowdsourcing allocation gains are best captured when they utilize the “completely unbounded

⁹⁹ Benkler, *supra* note 16, at 415.

¹⁰⁰ *Id.* at 436.

¹⁰¹ Loiselle et al., *supra* note 26, at 44.

¹⁰² Year One Report, *supra* note 23, at 24.

¹⁰³ Loiselle et al., *supra* note 26, at 37–38.

¹⁰⁴ *Id.* at 41, 44.

availability of all agents.”¹⁰⁵ According to this argument, more volunteers meant a larger resource set. However, underlying variances in volunteer contributions can severely mask such a set’s effective size.

P2PP volunteers displayed exactly this type of high variance in commitment. Over the two-year period, the P2PP website had 107,105 visitors, but only 2,800 registered as reviewers.¹⁰⁶ Within these reviewers, only 686 actively contributed anything to P2PP.¹⁰⁷ Surprisingly, during the first year of the program, a core group of eight reviewers accounted for most of P2PP’s activity.¹⁰⁸ Upon further breakdown, the reviewer contributions were even more shockingly unbalanced. Over P2PP’s two-year period, one reviewer submitted 100+ prior art references, two other reviewers submitted 20+ prior art references, and three other reviewers submitted 10+ prior art references; these six individuals accounted for 218 out of the 602 total prior art references submitted during P2PP’s entire course!¹⁰⁹ Thus, the true number of P2PP volunteers is nowhere close to the number of stated participants.

Such disproportional participation is extreme even according to the many theories that posit that group participation will always be imbalanced.¹¹⁰ The classic 80/20 Pareto rule hypothesizes that within any large group, a subgroup of 20% is expected to dominate 80% of the larger group’s goals, endeavors, and interests.¹¹¹ However, in P2PP’s case, the participation disproportionality is much more skewed than 80–20. The more modern 1% rule of internet participation hypothesizes that “if you get a group of 100 people online[,] then one will create content, 10 will ‘interact’ with it (commenting or offering improvements) and the other 89 will just view it.”¹¹² Even by this

¹⁰⁵ Benkler, *supra* note 16, at 416.

¹⁰⁶ Final Report, *supra* note 28, at 24.

¹⁰⁷ *Id.*

¹⁰⁸ Year One Report, *supra* note 23, at 13.

¹⁰⁹ Final Report, *supra* note 28, at 31.

¹¹⁰ M.E.J. Newman, *Power laws, Pareto distributions and Zipf’s law*, 46 CONTEMP. PHYSICS 323, 334 (2005).

¹¹¹ *Id.*

¹¹² Charles Arthur, *What is the 1% rule?*, THE GUARDIAN (July 19, 2006), <http://www.theguardian.com/technology/2006/jul/20/guardianweeklytechnologysction2>.

standard, 6 out of 100,000 P2PP visitors generating over a third of the prior art submissions is still several orders of magnitude off from the 1% hypothesis.

This disproportionality raises serious concerns about whether P2PP can even be called a “crowd”-sourced project since so few participants meaningfully contribute. Thus, to truly obtain allocative gains in a crowdsourcing production, one needs to look beyond the mere size of the “set” and examine the underlying contributions in order to gauge the true amount of talent a project has. This P2PP shortcoming challenges the fundamental notion of a crowdsourcing production: with so few true participants, there is no bona fide “crowd” that is contributing to a project, which may mean all the aforementioned crowdsourcing benefits disappear as well. Hence, questions like how many volunteers need to be involved and how well-distributed do volunteer contributions have to be will help demarcate the contours of crowdsourcing’s allocation gains. It is therefore crucial to examine both the size and the depth of volunteer contributions to fully evaluate a crowdsourcing project.

One way P2PP can impel deeper engagement is through a website redesign that attracts and retains more visitors. According to those surveyed, the current P2PP website is neither stylish enough nor particularly user-friendly.¹¹³ In fact, 50% of P2PP web traffic visits the landing page and leaves without clicking anything else on the website.¹¹⁴ Even among those who explore the website more, 42% of users viewed one or two items and never visited the website again.¹¹⁵ In electronic transactions, maintaining a compelling website is crucial; a widely accepted theory of e-commerce posits that “[w]eb elements influence [w]eb shoppers’ purchase intentions by influencing their salient beliefs related to e-commerce, which in turn change their attitudes . . . in their purchase intentions.”¹¹⁶ Thus, P2PP needs an attractive website to recruit and retain a larger volunteer base, which would alleviate P2PP’s shortage of volunteers, as discussed in Section A, *supra*. A convincingly presented website will also

¹¹³ Loïselle et al., *supra* note 26, at 129–30.

¹¹⁴ Collaborative Approach, *supra* note 30, at 23.

¹¹⁵ Year One Report, *supra* note 23, at 23.

¹¹⁶ Jaeki Song & Fatemeh “Mariam” Zahedi, *A Theoretical Approach to Web Design in E-Commerce: A Belief Reinforcement Model*, 51 MGMT. SCI. 1219, 1219 (2005).

cause visitors to explore beyond the landing page, and hopefully engage them in the substance of the project. Moreover, a web presence with clarity in project expectations and well-annotated infrastructures may lead those who are already engaged in the facile tasks (e.g. commenting on prior art submissions) to undertake more challenging ones (e.g. actually searching for prior art). This outcome is especially likely if the current volunteers are hesitant to take on in-depth P2PP tasks due to the lack of specific and clear directions for the more complex tasks. Therefore, a website overhaul will hopefully induce more P2PP volunteers and more meaningful volunteer contributions.

C. Lack of Infrastructure: allocative gains are not fully realized due to a lack of search tools

One central argument about motivating volunteers in crowdsourcing is that there will be a point at which a task required of volunteers is sufficiently granular that monetary loss from performing that task becomes trivial. However, this argument uncritically assumes that crowdsourcing projects will have sufficient infrastructure so that the granularity-cost threshold can be reached. In Benkler's examples, NASA provided software for crater searchers, Linux has a standard platform, and Amazon reviews are built into Amazon's website. However, such standardized infrastructure does not exist in all crowdsourcing productions.

In P2PP, a common volunteer complaint is that the project does not provide a research database for performing prior art searches. When P2PP reviewers came upon prior art like journal articles with pay walls, many were unwilling to pursue such references using out-of-pocket expenses.¹¹⁷ Not surprisingly, by far the most common prior art search tool used by volunteers was Google.¹¹⁸ This lack of search infrastructure raises serious concerns about P2PP contributions' level of sophistication. Therefore, regardless of task granularity, crowdsourcing productions need quality infrastructure to enable volunteers to contribute at low cost but with high sophistication.

Infrastructure availability is an issue frequently discussed in the crowdsourcing literature. A meta-survey of all crowdsourcing literature from 2010 to 2015 showed that 12 out of 50 articles

¹¹⁷ Loisel et al., *supra* note 26, at 52.

¹¹⁸ *Id.* at 47.

specifically addressed the infrastructure issue.¹¹⁹ This literature notes that project managers' decision to use crowdsourcing (instead of other traditional methods) often turns on how costly an internally-constructed and sustainable infrastructure would be.¹²⁰ These managers believe that one of the biggest advantages for using crowdsourcing is reduced costs. Hence, not having to provide extensive infrastructure reduces that cost further; conversely, building such an infrastructure internally would be one of the biggest expenses for a crowdsourcing project. The literature also highlights the five consensus ideals for crowdsourcing infrastructure: accessible, high quality, high speed of communication, reliable, and suits the needs of the community.¹²¹ However, implementing any type of infrastructure, let alone ideal ones, has been very challenging.

Perhaps out of necessity, early solutions to provide infrastructure for crowdsourcing productions were rather creative. One solution is to peer produce the infrastructure itself. Many early (and some modern) cloud computing techniques use background computer resources from across the web to process pieces of larger tasks.¹²² In such a system, not only are individual volunteers contributing to the larger task, but they are also providing their own computational resources that are a part of the infrastructure. Many peer-to-peer sharing networks possess essential traits of such an arrangement. Another solution is to hop onto and/or temporarily convert existing infrastructures that normally serve another purpose. For example, in studying citizen-driven earthquake disaster response plans in Chile, researchers noted that public libraries are often marshaled as central communications and information infrastructures.¹²³ The rationale behind this is that public libraries usually already have

¹¹⁹ Nguyen Hoang Thuan et al., *Factors Influencing the Decision to Crowdsourcing: A Systematic Literature Review*, INFO. SYS. FRONTIERS, June 2015, at 12–13.

¹²⁰ *Id.* at 14.

¹²¹ Cindy Puah, Ahmad Zaki Abu Bakar & Chu Wei Ching, *Strategies for Community Based Crowdsourcing*, 2011 RES. & INNOVATION IN INFO. SYS. 1, 3.

¹²² See KYLE CHARD & SIMON CATON, *Social Clouds: Crowdsourcing Cloud Infrastructure*, in CROWDSOURCING: CLOUD-BASED SOFTWARE DEVELOPMENT 191, 209–10 (Wei Li et al. eds., 2015) (stating that users across the social network can contribute different resources to contribute to overall infrastructure).

¹²³ A. Celedon, *Disaster response in Chile: The critical role of libraries and telecenters*, U. OF WASH. INFO. SCH., 2 (Feb. 2012), https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/19638/TASCHA_Chile_Disaster_Brief_20120224.pdf?sequence=1.

good telecommunications networks and a large information repository, both of which become highly useful during crises. Thus, homologous infrastructures can sometimes be converted to serve as crowdsourcing infrastructures. A third solution is to integrate crowdsourcing efforts into traditional infrastructure. A simple but illustrative example is data processing, in which crowd-sourced input may be assembled into traditional platforms like a Word or Excel file.¹²⁴ The rationale and benefit of integrating into traditional infrastructures is that data transfer and communication across many participants will utilize well-known techniques, which introduces consistency to the user input.¹²⁵ However, none of these solutions addresses the fundamental issue: how does a crowdsourcing production generate infrastructure when what exists is insufficient?

As crowdsourcing techniques become more mainstream among businesses, the operations literature has begun to offer applicable insights to the infrastructure question. In recent years, many businesses have begun micro-outsourcing, where one specific facet of the enterprise utilizes the crowd. For example, while most of Amazon's operations can be categorized as traditional enterprises, public relations for Amazon's products is micro-outsourced to the crowd via customer reviews; Amazon could have chosen to promote its products via traditional advertising. As e-commerce matures, there has been a steady growth in micro-outsourcing, with many vendors now providing a ready pool of volunteer or nominally paid¹²⁶ users to take on small micro-outsourcing tasks such as surveys, preference analysis, or data entry for large traditional enterprise clients.¹²⁷ Unsurprisingly, the key to success for micro-outsourcing is providing appropriate platforms for the input.¹²⁸ The essential

¹²⁴ Omar Alonso, *Perspectives on Infrastructure for Crowdsourcing*, MICROSOFT CORP., 7, 9 (Feb. 2011), http://www2.cs.siu.edu/~dche2/files/csdm2011_alonso.pdf (workshop on Crowdsourcing for Search and Data Mining, Hong Kong).

¹²⁵ *Id.* at 9.

¹²⁶ Vili Lehdonvirta, *From millions of tasks to thousands of jobs: Bringing digital work to developing countries*, PRIVATE SECTOR DEVELOPMENT (Jan. 31, 2012), <http://blogs.worldbank.org/psd/print/from-millions-of-tasks-to-thousands-of-jobs-bringing-digital-work-to-developing-countries> (with gift cards or other similar token gestures).

¹²⁷ Baozhou Lu et al., *Examining the antecedent factors of online micro-sourcing*, 17 INFO. SYS. FRONTIERS 601, 602–03 (2015).

¹²⁸ Valerie Chanal & Marie-Laurence Caron-Fasan, *The difficulties involved in developing business models open to innovation communities: The case of a*

role these platforms serve has been analogized to providing brokerage. Specifically, the ideal micro-outsourcing infrastructure acts like a broker who orchestrates transactions and eliminates search costs.¹²⁹ The theoretical argument is that to fully realize the benefits of the crowd, the infrastructure must broker effort equity: some volunteers should not be expending Herculean efforts while other more resource-privileged volunteers are easily obtaining the exact same result. A good infrastructure orchestrates appropriate resource access to achieve this effort equity in order to keep all peers well-motivated. To be clear, the argument is neither that the all various volunteer tasks have to be the same size nor that all volunteers are expected to perform at the same efficiency. Rather, effort equity simply prevents the scenario where the same task performed by volunteers of the same expertise requires from each volunteer drastically different effort levels merely due to partially-accessible resources; such inequity disheartens and de-motivates the crowd.¹³⁰ From this perspective, good infrastructure provides the crowd greater parity in resource access, which indirectly translates into greater expertise for the entire crowd as more volunteers gain more access to information. In turn, this infrastructure-brokered increase in total expertise enables more volunteers to take on more “difficult” tasks.

This infrastructure brokerage analysis yields similarly hopeful conclusions for P2PP. As discussed in Part II(B), 13% of P2PP reviewers were so highly trained that they knew the relevant prior art references without any additional research. However, many more P2PP reviewers had the ability to achieve the same level of expertise but for a lack of search infrastructure. For instance, 69% of P2PP reviewers had some prior knowledge about the relevant prior art, but had to search for the specific references.¹³¹ Good infrastructure that orchestrates these searches and reduces the search costs brings up the expertise level for the entire reviewer population, which makes the crowdsourcing production more efficient overall. After analyzing its pilot years, P2PP has recently decided to provide volunteer

crowdsourcing platform, 13 M@N@GEMENT 318, 322–23 (2010).

¹²⁹ Joseph Feller et al., “Orchestrating” Sustainable Crowdsourcing: A characterisation of Solver Brokerages, 21 J. OF STRATEGIC INFO. SYS. 216, 228 (2012).

¹³⁰ *Id.*

¹³¹ Year One Report, *supra* note 23, at 24.

reviewers with free access to IP.com, which offers relevant non-patent literature, international patent databases, and patent management tools.¹³² While IP.com will need further in-depth evaluation, it certainly provides accessibility (because it is free) and a high speed of communication (because it is entirely electronic); it also seems tailored to the needs of the community (because it focuses on IP literature and databases). These characteristics fulfill three of the five ideals of crowdsourcing infrastructure.¹³³ Future volunteer feedback will assess IP.com's quality and reliability. Therefore, from P2PP's experience and a general analysis of crowdsourcing, one vital tool of success is the need for infrastructure, which enables volunteers to equitably contribute with sophistication.

D. Fear of participation: volunteer motivation affected by institutional-affiliations

It has been argued that individuals will always volunteer for a task if it is granular enough, so that the monetary loss from performing the task is outweighed by the performance's hedonic and social gains.¹³⁴ However, this analysis overlooks the influences from larger institutions that the individual volunteers may be affiliated with and their background effects on volunteer motivations.

For example, one commonly cited concern about participating in P2PP is the hypothetical that if company A's employee reviews or comments on rival company B's patent, company A may potentially be liable for knowing infringement (and treble damages) in subsequent patent infringement suits.¹³⁵ This is a very valid concern because despite the sharing nature of open production systems, the content originator still faces the same liabilities for IP infringement as any other individual outside of the open production; she simply happens to share or provide

¹³² The Ctr, for Patent Innovations at N.Y. L. Sch., *Sponsors*, PEER TO PATENT, <http://www.peertopatent.org/sponsors> (last visited Mar. 2, 2016).

¹³³ Maja Bott & Gregor Young, *The Role of Crowdsourcing for Better Governance in International Development*, 27 PRAXIS: THE FLETCHER J. OF HUMAN SEC.47, 50, (2012), <http://fletcher.tufts.edu/Praxis/Archives/~media/Fletcher/Microsites/praxis/xxviii/4BottYoungCrowdsourcing.pdf>.

¹³⁴ Benkler, *supra* note 16, at 429.

¹³⁵ Loiselle et al., *supra* note 26, at 67.

access to her infringement.¹³⁶ Another commonly cited concern about participating in P2PP is that there may be structural biases in P2PP patent reviews since large companies can afford to hire dedicated “volunteers” to selectively and aggressively scrutinize applications from smaller competitors.¹³⁷ Worryingly, nearly one-third of all first-year P2PP reviewers were affiliated with IBM, which co-sponsors P2PP.¹³⁸ While there’s no factual basis for these concerns yet (due to the program’s small size and short duration), such examples illustrate looking beyond the confines of an individual for motivational influences.

The crowdsourcing literature envisions its projects as anonymous, individualized hierarchies, so that with cheaper communications, the “economy will tend to disperse engineers, scientists and technicians into smaller units than ever before.”¹³⁹ However, with no entry barriers, the crowdsourcing projects may also become battlegrounds for larger organizations. The potentially implicated institutional relationships that volunteers bring need to be analyzed, and perhaps insulated, when designing a crowdsourcing production, so as to, for example, not create unexpected liabilities or chill participation.

Institutional interaction with crowdsourcing does not always stem from anticompetitive motives. For example, in the mobile phone industry, large firms have regularly organized consortiums to help develop open-access source code platforms, with the hopes to “induce collective development,” share costs, and avoid sole internal R&D.¹⁴⁰ One explanation for this willingness is that platform development poses avoidable and wasteful duplication costs if multiple firms research it independently.¹⁴¹ These institutional interventions have given rise to what are called

¹³⁶ *Id.* at 64–65.

¹³⁷ *Id.* at 66.

¹³⁸ Year One Report, *supra* note 23, at 17.

¹³⁹ ROBERT P. MERGES, *From Medieval Guilds to Open Source Software: Informal Norms, Appropriability Institutions, and Innovation*, in CONFERENCE ON THE LEGAL HIST. OF INTELL. PROP. 1, 21 (2004) https://www.law.berkeley.edu/files/From_Medieval_Guilds_to_Open_Source_Software.pdf.

¹⁴⁰ Jonathan M. Barnett, *The Host’s Dilemma: Strategic Forfeiture in Platform Markets for Informational Goods*, 124 HARV. L. REV. 1861, 1919 (2011), http://cdn.harvardlawreview.org/wp-content/uploads/pdfs/vol124_barnett.pdf.

¹⁴¹ Sebastian v. Engelhardt & Stephen M. Maurer, *The New (Commercial) Open Source: Does It Really Improve Social Welfare?* 24 (Aug. 2012), <https://gspp.berkeley.edu/assets/uploads/research/pdf/SSRN-id1542180.pdf>. (on file with Univ. of Cal., Berkeley Goldman Sch. of Pub. Policy, Working Paper No. GSPP10-001, 2010).

quality cartels,¹⁴² in which the open-source product becomes the industry standard that all the major players also actively contribute to and improve upon. However, such a platform of cheap code-sharing also suppresses higher-quality competition which does not enjoy this cross-subsidy.¹⁴³ In these cartels, “[c]ompanies do share, but write far less shared code than they ought to . . . [because] no company can offer better shared software than its rivals.”¹⁴⁴ Thus, as this example demonstrates, institutional affiliations can often add very complex dynamics to crowdsourcing motivations.

Institutional affiliation with crowdsourcing can also come in different forms, which creates very different motivation and liability structures. Institutions can sponsor, profit from, or directly participate in a crowdsourcing production; obviously, these roles may overlap. Many institutions have a long history of backing crowdsourcing projects,¹⁴⁵ which offers the institutions benefits like prestige or savings. Additionally, many institutions seek to profit from crowdsourcing productions that become widely-used by offering services and products “complementary to the open source program . . . but are not supplied efficiently by the open source community.”¹⁴⁶ However, institutions that directly participate in a crowdsourcing project, where an institution or its staff becomes one of the volunteers who contributes at the same level as an unaffiliated volunteer, create problems from a competitive standpoint. In an oft-cited example, because open-source software is “open” to all, “[f]irms may temporarily encourage their programmers to participate in open-source projects to learn about the strengths and weaknesses of . . . [an open source project, after which these] [f]or-profit firms may compete directly with open-source providers in the same

¹⁴² *Id.* at 21.

¹⁴³ *Id.*

¹⁴⁴ Stephen M. Maurer, *The Penguin and the Cartel: Rethinking Antitrust and Innovation Policy for the Age of Commercial Open Source*, UTAH L. REV., Feb. 2012, at 269, <http://scholarship.law.berkeley.edu/facpubs/2112>.

¹⁴⁵ See generally Josh Lerner & Jean Tirole, *The Simple Economics of Open Source* 4–9 (Nat'l Bureau of Econ. Research, Working Paper No. 7600, 2000), <http://www.nber.org/papers/w7600.pdf> (providing a historical background for the usage of crowdsourced input on various projects by institutional and corporate entities).

¹⁴⁶ Josh Lerner & Jean Tirole, *The Economics of Technology Sharing: Open Source and Beyond* 12 (Nat'l Bureau of Econ. Research, Working Paper No. 10956, 2004), <http://www.nber.org/papers/w10956.pdf>.

market.”¹⁴⁷ This privatization-of-the-commons concern is especially acute for P2PP because the “open” information is by definition patently novel. Thus, the fear of a potential competitor or its many affiliates examining a valuable patent application may powerfully disincentivize participation. Therefore, the volunteers’ institutional affiliations need to be carefully analyzed in a crowdsourcing project in order to appropriately screen motivations and potential liabilities.

E. P2PP shortfalls that traditional crowdsourcing literature would have anticipated

In addition to the many P2PP shortfalls that provide insights on the limits of crowdsourcing generally, P2PP also suffers from many drawbacks that the traditional crowdsourcing literature would have anticipated. In particular, P2PP had problems with USPTO facilitation, volunteer self-nomination, and non-modular goals.

To facilitate crowdsourcing, dynamic intermediaries need to play an accreditation role. This ensures that participants are comfortable in contributing because of the intermediary’s credibility.¹⁴⁸ P2PP simply did not generate enough volunteer interest despite a reputable intermediary and a ready infrastructure. The USPTO invited over 30,000 inventors to participate in P2PP and received only 100 responses.¹⁴⁹ Thus, P2PP floundered possibly due to the USPTO’s inability as an engaging facilitator.

There are also limits to information gains from a crowdsourcing production, since “self-identification is not always perfect, . . . [because there may be] substantial errors or misstatements by individuals about their capacities.”¹⁵⁰ This caution should be carefully heeded for P2PP volunteers. For instance, 51 out of 52 P2PP reviewers surveyed claimed that they had some patent experience.¹⁵¹ Yet, one of the top PTO Examiner complaints is that the submitted prior art do not address specific claims, but is rather not-so-usefully directed at the entire

¹⁴⁷ Josh Lerner et al., *The Dynamics of Open-Source Contributors*, 96 AM. ECON. REV. 114, 115 (2006), <http://economics.mit.edu/files/3023>.

¹⁴⁸ Benkler, *supra* note 16, at 387.

¹⁴⁹ Loisel et al., *supra* note 26, at 57.

¹⁵⁰ Benkler, *supra* note 16, at 415.

¹⁵¹ Loisel et al., *supra* note 26, at 49.

application's general subject matter.¹⁵² Moreover, 21% of P2PP reviewers surveyed indicated that they were primarily motivated to improve patents or to reform the patent system.¹⁵³ However noble, such alarming ideological motivations go beyond the project's intended scope of seeking expert advice on prior art.¹⁵⁴ Thus, P2PP may potentially suffer from self-nomination problems as well.

Finally, one of the central assumptions for viable crowdsourcing is that the project needs modular goals.¹⁵⁵ Indeed, many P2PP programmatic goals are rather modest, including the main goal of using publicly generated prior art to narrow patent claims.¹⁵⁶ Such a goal would be directly tied to the modular task of soliciting prior art from the public. However, many more P2PP programmatic goals are much loftier. These goals include improving the quality of patents, reducing patent litigation, increasing innovator certainty, and increasing public participation in government decision making.¹⁵⁷ These goals may be logical and indirect effects of accepting public prior art submissions, but other patent system components need to be publicly accessible and similarly modularized before these broader goals can be accomplished. For example, permitting the public to contribute expert opinions in infringement determinations via public non-infringement opinion letters (analogous to the ones currently prepared by attorneys) would more directly pertain to reducing patent litigation than the current P2PP regime. However, each "open"-ing of the patent office or infringement determination process may face strong political opposition or bureaucratic inertia, which potentially precludes many valuable uses for crowdsourcing. Therefore, because many P2PP goals are neither modular nor directly related to prior art searches, they would not befit one of the core qualifications for crowdsourcing.

¹⁵² *Id.* at 51.

¹⁵³ Final Report, *supra* note 28, at 22.

¹⁵⁴ See Loisel et al., *supra* note 26, at 57 (analyzing NYLS interviews).

¹⁵⁵ Benkler, *supra* note 16, at 435.

¹⁵⁶ See Final Report, *supra* note 28, at 3 (discussing relative posts, where evidence from the statistical analysis in the discussion section proved to be most useful).

¹⁵⁷ Year One Report, *supra* note 23, at 3–4.

F. Context-specific P2PP shortfalls

There are many successful crowdsourcing productions today. From Wikipedia to Project Gutenberg, each of these projects processes large amounts of information, which create an ample demand for volunteers. That was not the case for P2PP. When the program began, the USPTO allocated enough resources to handle 400 P2PP applications *each year*. In reality, over the course of two years, only a total of 187 applications were submitted; even including applications that the program rejected, only a total of 302 applied.¹⁵⁸ Moreover, throughout the program, applications from P2PP corporate sponsors constituted 42–70% of this small total.¹⁵⁹ Even the P2PP team concedes that there were too few applications to the program.¹⁶⁰ Thus, one key P2PP-specific shortfall is that the project did not generate sufficient amounts of submitted information to process, which in turn created too little demand for volunteer manpower. In a vicious cycle, this lower demand may have disincentivized volunteer participation due to a perceived lack of need. Benkler's titular example of Linux had abundant information for volunteers to process in part because it was a product deemed superior to its competitors; P2PP does not enjoy a similar reputation. Therefore, one way for P2PP to perhaps incite a sufficient amount of interest and applications is to become a reputable alternative to USPTO Examiners.

In addition to this dearth of applications, P2PP also suffered from a lack of volunteers, as discussed in Part III(A), *supra*. This shortage in both supply and demand for P2PP created extreme operational inefficiencies. P2PP's infrastructure had the capacity to process 10,000 applications per year at a cost of \$50,000.¹⁶¹ P2PP's contributions were estimated to have saved the USPTO \$74,000 per year.¹⁶² Thus, it would require 8 times as many applications as P2PP processes now (and a corresponding increase in volunteers) to become cost-neutral.¹⁶³ And these estimates do not include USPTO's program support costs, which were estimated to be \$900,000 per year. Internalizing this

¹⁵⁸ Year Two Report, *supra* note 24, at 27.

¹⁵⁹ Year One Report, *supra* note 23, at 20.

¹⁶⁰ Loisel et al., *supra* note 26, at 66–67.

¹⁶¹ *Id.* at 68.

¹⁶² *See id.* at 68–9 (discussing internal costs and savings).

¹⁶³ *See id.* at 72–3 (discussing the summary of findings relating to patent applications).

additional cost would require 25 times as many applications.¹⁶⁴ Thus, the current mismatch between actual input and maintained capacity makes P2PP very economically inefficient. Although the obvious and sensible solution is to scale down P2PP capacity, actual future plans call for doubling down. The USPTO currently plans to expand the P2PP-eligible subject-matters, which would hopefully increase the number of applications for the program.¹⁶⁵ However, the P2PP team recognizes that the volunteer contributions need to outgrow applications or subject-areas.¹⁶⁶ Otherwise, P2PP contributions will become even more imbalanced as even fewer volunteer contributions are made per application.¹⁶⁷ Perhaps in response to this concern, P2PP plans to reduce prior art submissions to four per application.¹⁶⁸

Another reason P2PP is cost-ineffective is its expensive bureaucracy. P2PP assigns a dedicated manager for each submitted application to facilitate the reviewers' contributions;¹⁶⁹ within the USPTO, there is a corresponding P2PP liaison.¹⁷⁰ Furthermore, a PTO supervisor has to approve all office actions that include P2PP contributions. The surveyed PTO Examiners dislike these unnecessary steps which make the process inefficient.¹⁷¹ While quality control is very important, this much bureaucratic overhead inevitably drives up program costs. In the Introduction, I discussed P2PP's easy integration into the larger USPTO examination process because prior art search is a separable module within patent examination. While there are no theoretical obstacles for P2PP to be structured to have an efficient handoff to the PTO, the presently implemented program needs to drastically reduce bureaucracy in order to realize low integration costs.

One caveat to all of these perceived inefficiencies is the lack of a good "baseline" comparison. Aside from the USPTO's general

¹⁶⁴ See *id.* at 78 (discussing the current cost of the program and internalizing it to the number of increased applications that would be needed).

¹⁶⁵ See U.S. PAT. AND TRADEMARK OFF., *supra* note 32 (discussing the five major modifications to the new pilot program; stating that the number of eligible subject matter has increased threefold).

¹⁶⁶ Loiselle et al, *supra* note 26, at xi.

¹⁶⁷ See discussion *infra* Part III.B (discussing the imbalance among P2PP contributions and the capability to review applications).

¹⁶⁸ See discussion *infra* Part III.A (discussing the proposed scale down of art submissions).

¹⁶⁹ Year Two Report, *supra* note 24, at 22.

¹⁷⁰ Loiselle et al., *supra* note 26, at 56.

¹⁷¹ *Id.* at x.

inefficiencies discussed in Part I,¹⁷² it is unclear how cost-effective alternatives should be. For example, instead of P2PP, the USPTO could contract for private third-party prior art searches (analogous to the FDA's acceptance of third-party contract clinical studies), or the USPTO could pay its examiners to perform prior art searches in addition to their normal duties. Without calculating such hypotheticals' costs and normalizing for their quality, it is difficult to truly ascertain P2PP's inefficiency. Moreover, even if such direct comparisons are available, no calculations can fully account for the indirect social costs of unmeritorious patents that monopolize a market for decades. Therefore, while P2PP in its current form appears to cost more than its estimated benefits, this inefficiency may lack a contextual baseline.

IV. CONCLUSIONS

In this paper, I described and analyzed the USPTO's recent crowdsourcing experiment. It is important to conceptually separate this paper's two layers of interrelated analyses. The first layer evaluates P2PP's success as a program: the data indicate some strengths but many more weaknesses. This analysis is the first independent and negative review of P2PP. For example, absurdities like 6 volunteers contributing 218 out of the 602 total prior art references received during P2PP's entire two-year project course¹⁷³ make P2PP undeserving of public funding and the darling treatment it receives from the USPTO. This pragmatic layer of analysis also points out areas for improvement, such as increasing volunteer interest and participation. The second layer maps P2PP onto the traditional crowdsourcing framework for theoretical analytical levers. Examining P2PP's features and outcomes, I highlighted certain aspects that were not articulated or predicted by the traditional crowdsourcing paradigm. This theoretical layer of analysis extrapolates previously-unstudied factors for crowdsourcing productions that may nevertheless be important to all such projects' success, such as balanced volunteer participation. These two layers are in fact the two purposes behind this paper: to

¹⁷² See *supra* notes 23–26 and surrounding text (criticizing the USPTO for its inefficiency, inconsistency, and high costs).

¹⁷³ See discussion *infra* Part III. C and accompanying notes (examining P2PP infrastructure brokerage analysis); see also *Final Report*, *supra* note 28, 31–32 (Peer To Patent: Application Outcomes).

evaluate P2PP and to use it as a case study for crowdsourcing generally. These two purposes are undoubtedly related, as P2PP's success depends heavily on crowdsourcing efficacy.

Two of the biggest challenges P2PP faced were that it didn't elicit enough interest – either from patent applicants or from public reviewers, and that volunteer contributions were extremely imbalanced – too few people performed the bulk of the work and too few contributions were the type needed. The first problem made program resource allocation unpredictable, which resulted in P2PP being extremely expensive. The second problem challenged the fundamental definition of a “crowd”-sourced production since so few volunteers meaningfully contributed the type of work that was needed. In future work, it would be very interesting to springboard from this case study and analyze other crowdsourcing projects for these two fundamental problems that went unaddressed in the traditional Benklerian framework.

As a starting point for such future work, I propose that in addition to the Benklerian factors of modularity, granularity, and integration costs, a successful crowdsourcing production needs to ensure there are enough volunteers, balance the workload among the volunteers and the types of contributions made, and provide high-quality infrastructure for the project. By analyzing the importance of these additional factors across other crowdsourcing productions, we may begin to understand when crowdsourcing is and is not well-suited for a particular project. With today's low cost communications, crowdsourcing is often hailed as a magic bullet solution;¹⁷⁴ demarcating crowdsourcing's usefulness is therefore timely and topical.

Another important dimension is the role of institutions. For-profit firms and governmental organizations have begun to use crowdsourcing in parts of many projects, as the examples in Parts III(C) and III(D) demonstrate. This affects the nature and definition of crowdsourcing as institutional support or participation begins to erode the line between a crowdsourcing production and a firm production. Furthermore, institutionally-affiliated crowdsourcing productions may be limited in the types of projects they can solve. In P2PP, for example, corporate sponsorship may have discouraged those volunteers with a penchant for the open source movement. As another example, the

¹⁷⁴ See, e.g., JEFF HOWE, CROWDSOURCING: WHY THE POWER OF THE CROWD IS DRIVING THE FUTURE OF BUSINESS (2009) (discussing the effect of crowd sourcing).

types of patents the USPTO was willing to consider for P2PP likely influenced the volunteer pool makeup. With more and more institutional influence, the “crowd” nature of crowdsourcing may begin to disappear as volunteers have less and less governance control in these contexts. Therefore, the institution’s role within crowdsourcing is a very important factor to analyze in future work.

This paper’s mapping of P2PP is not, however, a direct evaluation of the Benklerian paradigm itself. My analysis only highlights P2PP features that do not map perfectly onto the traditional framework. While I argue that these discrepancies make for additional considerations when analyzing crowdsourcing in general, there are certainly many alternative explanations. For example, Benkler explained that to have truly motivated volunteers, a crowdsourced project may need reputational mechanisms among the community¹⁷⁵ and a sense of reciprocity¹⁷⁶: the more volunteers perceive others are contributing, the more they put in themselves. Thus, P2PP’s low levels of participation may very well be due to a lack of a community reputation mechanism. Better facilitated intra-reviewer communications could perhaps better signal reputation and reciprocity. Like I discussed in Part II, the traditional crowdsourcing literature actually explains many positive features of P2PP. This paper only hopes to contribute to that framework additional unexamined factors and assumptions, which will supplement the analytical tools for determining when and where crowdsourcing productions are appropriate.

A broader direction for future work is to examine if it is possible to capture P2PP’s advantages while remedying its drawbacks by borrowing mechanisms from norms-based IP productions. The ideal structure would be to capture both crowdsourcing’s efficiency and norms-induced participation. For example, if the USPTO impressed upon the inventor community strong expectations that past and current inventors should participate in patents’ peer review, P2PP would be much more successful. Such expert peer review is actually reasonably commonplace in academia. Furthermore, as the community of such hypothetical patent peer reviewers grows, norms will develop around the values of annotating and rating others’ prior

¹⁷⁵ Benkler, *supra* note 16, at 395–96 (describing the importance of Slashdot allowing users to build reputation).

¹⁷⁶ *Id.* at 400.

art, as well as the reputational gains of winning a “Prior Artist Award.” Thus, norms-based mechanisms in addition to a crowdsourcing method may generate a much larger and balanced pool of volunteer reviewers. However, one drawback may be that such norms take time to develop. This argument may be expanded even further to hypothesize that when crowdsourcing paradigms encounter obstacles (such as a lack of interest), developing norms (such as requiring participation) may be the more appropriate remedy, rather than falling back onto the default of propertizing the production. This seems especially true when a public good is produced, which ironically, includes government services for the formal IP regime itself, such as a better version of P2PP.