

*How Firms Leverage Crowds and Communities for Open Innovation*¹

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Abstract: *There are many similarities in how firms pursuing an open innovation strategy can utilize crowds and communities as sources of external innovations. At the same time, the differences between these two network forms of collaboration have previously been blurred or overlooked. In this chapter, we integrate research on crowds and communities, identifying a third form — a crowd-community hybrid — that combines attributes of both. We compare examples of each of these three network forms, such as open source software communities, gated contests, crowdsourcing tournaments, user-generated content and crowd science. We then summarize the intrinsic, extrinsic and structural factors that enable individual and organizational participation in these collaborations. Finally, we contrast how these collaborative forms differ regarding their degree of innovativeness and relevance to firm goals. From this, we identify opportunities for future research on these topics.*

Keywords: *crowds, crowdsourcing, communities, open innovation, user innovation, open source software*

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INTRODUCTION

Historically, firms have had two ways to obtain new technological innovations. One was to develop them internally, an approach that led to the dominant vertically integrated firms of the 20th century (Chandler, 1977; Freeman & Soete, 1997). The other has been to source innovations through cooperation with other firms, through outsourcing, alliances, contracting and markets for technology, as part of a process that more recently has been dubbed “open innovation” (Teece 1986, 1992; Arora et al., 2001; Chesbrough 2003).

Open innovation reflects firms using “purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation” (Chesbrough, 2006: 1). Most often, researchers (and managers) have focused on the inbound flows that firms commercialize to supplement or replace internal R&D (West & Bogers, 2014). Although open innovation typically involves monetary or other economic incentives for cooperation, firms can also access flows based on non-economic motivations (West & Gallagher, 2006; Dahlander & Gann, 2010; Piller & West, 2014).

In the last two decades, there has been increasing interest in how firms work with external communities — those outside the boundary of any firm (O’Mahony & Lakhani, 2011). In some cases, the community provides a common infrastructure that is prerequisite to each firm’s products (Rosenkopf & Tushman, 1994). In other case, firms practicing open innovation leverage communities as an important source of external innovations, such as those that produce open source software (Dahlander & Magnusson, 2008; West & Lakhani, 2008). Research and popular interest have focused on new forms of virtual community made possible through the Internet (Rheingold, 2000). However, face-to-face interaction remains crucial for voluntary communities formed around users of physical goods such as sporting goods or 3D printers (Franke & Shah, 2003; West & Greul, 2016).

More recently, open innovation has turned towards externally sourcing ideas by tapping into the so-called “wisdom of crowds” (Surowiecki, 2005). Various forms of external innovation sourcing strategies — including tournaments, collaboration, open calls and an open search for partners — have been lumped under the title of “crowdsourcing” (Afuah & Tucci, 2012; Boudreau & Lakhani, 2013; Diener & Piller, 2013). Crowdsourcing is an important new area in both applying and extending the principles of open innovation (Tucci et al, 2016).

There are important overlaps between these two forms of external collaboration: some crowdsourcing has been conducted within existing communities, while other crowdsourcing efforts have created new communities. Both forms of collaboration typically fit within the “coupled” mode of open innovation, in that they involve both inbound and outbound knowledge flows between the firm and its external collaborators (Piller & West, 2014).

There are many phenomena that can be classified under both categories, even if others are clearly distinct from one or the other. For example, many crowd-sourced activities (such as tournaments) clearly fit the definition of a crowd but not a community. These cases involve a firm working with a network of potential contributors, but without peer-to-peer interactions that would foster a sense of belonging or identity and thus community (e.g. Jeppesen and Lakhani, 2010). Conversely, many communities — such as trade associations and consortia involving firms — lack any of the attributes of a crowd in that they are working cooperatively towards a shared goal. Some forms combine both, such communities engaged in social production (Benkler, 2006). This is illustrated in Figure 1, which classifies phenomena on two dimensions — degree of crowd and degree of community — illustrating those network collaborations that are crowds, communities, both or neither.

Insert Figure 1 about here

In this chapter, we are interested in communities and crowds external to the firm, and collaborations that either directly or indirectly impact commercial activity. While communities and crowds have been utilized by firms within firm boundaries, consistent with our focus on open innovation, this chapter examines only three types of external collaborations: communities, crowds — or hybrids that combine elements of both.

As a potential source of innovations for firms, these collaborations have important similarities. All are external networks of multiple actors that can share knowledge and other information to produce an innovation or other output that can support a firm's open innovation strategy (Piller & West, 2014; West, 2014). At the same time, not all communities or crowds are organized in a way that benefits firms (West & O'Mahony, 2008). Some are organized for the benefit of individual members and have interests that are indifferent (or even antithetical) to companies (Muñiz and Schau, 2005; O'Mahony & Lakhani, 2011), the utility of others may depend upon the stage of the technological lifecycle (Seidel et al., 2016). Similarly, while innovation researchers have driven much of the research on these external collaborations, communities or crowds often produce results that do not fit a standard definition of technological innovation — including brand communities (Muñiz and O'Guinn, 2001) and crowds that produce complementary assets to support an innovation (Jeppesen and Frederiksen, 2006).

This chapter seeks to contrast recent research on these three forms of network collaborations — communities, crowds, and hybrids — and examine the degree to which each form of collaboration produces technological innovation that benefits firms. It begins by reviewing definitions of each, considering where they overlap and where they do not. It then considers variation in firm involvement — with communities, crowds and hybrid crowds — and the role these groups play in producing innovation. Finally, it concludes with a discussion of implications and future research.

COMMUNITIES, CROWDS AND COLLABORATION

Here we consider two specific forms of collaboration outside firm boundaries — the community and the crowd — and how the members of these efforts collaborate with each other and potentially with one or more firms. Both have elements of network organization (Howe, 2006b; West, 2014), but both also have characteristics beyond the network form identified by Powell (1990). Because there is often considerable overlap between these forms — and often the boundaries are fuzzy — researchers have tended to ignore the distinctions between these constructs.

Because community and crowd attributes may be measured by degrees, this can create overlap and confusion over terms. At the same time, communities can learn from the behavior and practices of crowds, and vice versa. As Figure 1 illustrates, many network forms — such as open source software, user generated content, and cooperative contests — include characteristics of both communities and crowds.

In this section, we summarize and synthesize definitions of communities and crowds as used in prior research. From this, we identify a new hybrid case that combines elements of both communities and crowds.

Insert Table 1 about here

Communities

Definition. The community form is a distinct approach for organizing human interaction (O'Mahony & Lakhani, 2011). We draw two distinctions between our definition of "virtual community" and other uses of "community" in the social sciences (O'Mahony & Lakhani, 2011; Brint, 2001; Putnam, 1995). First, here we consider "virtual communities" that include both purely online communities as well as those communities that combine online and physical interaction. The past two decades have brought the rise of geographically dispersed virtual communities, enabled by online electronic technologies (Rheingold, 2000). We define virtual communities as voluntary associations of individuals or organizations united by a common goal regardless of geographic proximity (West and Lakhani, 2008; O'Mahony and Lakhani, 2011). While many scholars (e.g. Rheingold, 2000; Brint, 2001) limit the term "virtual communities" to those that are exclusively online, economically significant work of such virtual communities often depends on episodic face-to-face meetings that build social ties and enable rapid resolution of complex challenges (Rosenkopf et al., 2001; Crowston et al., 2007; Leiponen, 2008, Waguespack & Fleming, 2009). Even the community that made online collaboration possible, the Internet Engineering Task Force, has been organized around regular face-to-face meetings for more than 25 years (Fleming and Waguespack, 2007).

Second, we are interested in virtual communities (henceforth labeled "communities") that are external to the firm, even if (e.g. Henkel, 2006; Dahlander & Wallin, 2006) they may include employees of the focal firm. This is consistent with a decision process that "takes place independently from the employment structure that guides the workplace" (O'Mahony, 2007: 144). In contrast, much of the research on communities of practice focuses on leveraging community ties between employees of a common employer who share a common identity through shared vocation (Brown and Duguid, 1991; Wenger, 2000; Bechky, 2006; O'Mahony & Lakhani, 2011).

The communities studied in open innovation share attributes of both organizations and networks (West, 2014), but they are distinct from both forms (Demil and Lecocq, 2006; O'Mahony and Ferraro, 2007; von Hippel, 2007; West and Lakhani, 2008). In particular, communities (like other voluntary associations) typically demonstrate repeated interactions, common identity and shared purpose among their members (cf. Galacziwicz, 1985; Brint, 2001; Wellman et al., 2002b). Towards this end, von Hippel (2007: 294) writes:

User innovation networks also may, but need not, incorporate the qualities of user "communities" for participants, where these are defined as "...networks of interpersonal ties that provide sociability, support, information, a sense of belonging, and social identity." (Wellman [et al.], 2002[a]: 4).

This shared identity is often associated with achieving one or more shared goals, such as producing a shared artifact or collection of artifacts.

These characteristics – particularly the impact of repeated interaction between members of a virtual community who are connected by identity but separated by geography – necessitate some form of governance. Governance provides an agreed-upon process by which communities can maintain their independence while effectively managing members' participation and contributions and facilitating predictable interactions with external parties (de Laat, 2007). Appropriately, governance has been a topic of broad academic interest for community researchers. Markus (2007: 154) notes that the literature "exhibits a wide range of views about

what constitutes governance,” and O’Mahony (2007) concluded that differences – in organizational form, objectives, and sponsors – will lead to different modes of governance.

Two broad community attributes are likely to affect the governance choices: the degree to which a community is more open or closed, and whether or not the community is sponsored by a firm or other organization. Communities that are open but not sponsored are more likely to adopt governance that promotes four of O’Mahony’s (2008) five principles of community governance: pluralism, representation, decentralized decision-making, and autonomous participation. Closed and sponsored communities face a potentially challenging balancing act – the need to adopt governance that protects the organizers’ or the sponsors’ interests, while at the same time attracting external contributions (West & O’Mahony, 2008).

Elsewhere in this volume, Levina and Fayard (2017) conclude that few boundary spanners succeed in managing their multiple commitments to different groups: explicitly designed and articulated governance may help boundary-spanners understand and manage their conflicting roles within the community. Similarly, Curto-Millet and his colleagues (2017) found that codified governance practices can also clarify the roles of stakeholder groups in communities.

Our definition of community thus describes networks with repeated interaction among community members, a shared identity or purpose, and whose actions are guided by a governance process that perpetuates the community’s existence. In practice, there are varying degrees of community such that some networks demonstrate some (but not all) of these attributes. While a community without shared identity would not meet von Hippel’s definition, realistically communities have degrees of identification or other attributes, just as West & O’Mahony (2008) found they had degrees of openness.

Types of Communities and Members. A number of different forms of community have been identified in the literature (Table 2).

Insert Table 2 about here

As discussed below, many modern communities have a high degree of firm involvement (cf. West & O’Mahony, 2008). In some cases, the members of the community are firms themselves: examples of such communities include industrial collaborations organized by and for the benefit of firms such as trade associations (Rosenkopf and Tushman, 1998) and standardization consortia (Keil, 2002) that seek to overcome collective action obstacles to achieve shared purposes. Firms within these communities agree to abide by shared goals and policies in order to influence cooperative agreements (such as technological standards) to align them with the firm’s interests (Crowston et al., 2007; Fleming and Waguespack, 2007; Isaak, 2007; Leiponen, 2008). Involvement in these types of communities may be critical to both the firm’s ability to innovate and their longstanding ability to favorably shape their environment.

In other cases, such as when communities support a software ecosystem, a network of firms seek to advance their own interests by producing complementary goods (West, 2014). In the case of open source communities, the members may be either individuals or firms represented by their employees (West & Lakhani, 2008).

Communities can also connect firms with customers. A prominent example is the firm-sponsored brand community organized by firms to influence consumer perceptions of a product or group of products (Füller et al., 2008). Brand communities provide firms with an opportunity to interact with supportive customers who share an affinity for the company’s brand or product. At other times, individual enthusiasts may organize their own brand communities, independent

of any firm sponsorship or involvement. One example is the brand community that promoted the Apple Newton, even after the firm's abandonment of the product line (Muniz and Schau, 2005).

Crowds

Definition. To develop a definition of a crowd first requires a definition of crowdsourcing. Crowdsourcing builds upon two postulates from the social sciences — that a large group of individuals have better information than any one individual (Surowiecki, 2005) and that many people performing small tasks can collectively perform a large task (Benkler, 2006). The process usually includes a contributor (the crowd), a sponsoring² organization (or other actor) soliciting these contributions and some form of sourcing process.

There are many definitions of crowdsourcing.³ For example, Brabham (2013: 3) defines crowdsourcing in terms of an organization that solicits a crowd of volunteers to perform a task for “the mutual benefit” of both sides.⁴ Perhaps the most comprehensive definition is provided by Estellés-Arolas and González (2012: 197):

Crowdsourcing is a type of participative online activity in which an individual, an institution, a non-profit organization, or company proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task. The undertaking of the task, of variable complexity and modularity, and in which the crowd should participate bringing their work, money, knowledge and/or experience, always entails mutual benefit. The user will receive the satisfaction of a given type of need, be it economic, social recognition, self-esteem, or the development of individual skills, while the crowdsourcer will obtain and utilize to their advantage what the user has brought to the venture, whose form will depend on the type of activity undertaken.

However, describing the process of crowdsourcing begs the question: what is a “crowd”? Researchers have identified common attributes:

- *Large Network.* Consistent with Surowiecki (2005), Howe (2006b) refers to an “undefined (and generally large) network of people.”
- *Unknown Potential Contributors.* Poetz & Schreier (2012: 246) refer to “a potentially large and unknown population.”
- *Self-Selected Actual Contributors.* Like many others, Afuah & Tucci (2012) emphasize that within a large pool of potential contributors, individuals “self-select” to volunteer to provide information or otherwise solve the problem.
- *Open vs. Closed Crowd.* Viscusi & Tucci (2017) argue that there are really two different types of crowds: an “open crowd” that is permeable to new members, and a “closed crowd” with well-defined boundaries that limit the crowd to existing participants and exclude potential participants.

² While prior research has not adopted consistent terminology for naming the firm, by analogy to research on open source software communities (Shah, 2006; West, O'Mahony, 2008) we adopt the term “sponsor” to refer to the organization that benefits from a crowdsourcing effort.

³ See Estellés-Arolas and González (2012) for excerpts and an integration of 47 previous definitions.

⁴ Some research on crowdsourcing has blurred the distinction between crowds and communities, as when Brabham (2013: 117) defines a “crowd” as an “online community” used for crowdsourcing.

The common thread across these definitions — one that we adopt in this chapter — is that a crowdsourcing crowd leverages the “wisdom of crowds” and incorporates two or more⁵ of the following attributes:

- self-selected participants
- that explicitly or implicitly compete
- to produce a measurable deliverable (such as an answer to a question or an information good)
- as organized by and benefiting a sponsoring organization.

The rapid growth in practice and research on crowdsourcing is tied to new forms of collaboration enabled by the Internet — which today is by far the most common way of organizing crowdsourcing. However, contests to produce innovation, knowledge or other antecedents to innovation⁶ — solicited via an open call — date back to at least the 17th century, and include many famed examples such as measuring longitude or detecting radio waves (Scotchmer, 2004; Afuah & Tucci, 2012).

Types of Crowds and Crowdsourcing Efforts. Within crowdsourcing processes and institutional forms, there are different variants (Table 3).

Insert Table 3 about here

Crowdsourcing Contests. These efforts enable explicit (or implicit) competition between self-selected, self-identified contributors. The earliest definitions emphasized the open call, and thus some limit “crowdsourcing” to that particular form. Perhaps the earliest attempt to define the term — by the journalist who coined it— says that “crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call” (Howe, 2006b).

While the explicit competition means a clearly defined winner, in other cases the competition is implicit. Some idea contests allow for multiple winners, and so while there is a limit to the number of ideas that will be selected— as with Threadless t-shirt designs (Brabham, 2008) — the contest may be more of a competition for attention than for designation as the single winner.

Although the idea of such contests dates back centuries, today’s use of information technology can help increase the number of participants and reduce the time needed for completion (Savage, 2012). In such contests, the firm establishes guidelines and invites outside others to participate. Compared to other methods, contests tend to focus on complex problems that may best be solved by novel or creative approaches (Boudreau & Lakhani, 2013). In the end, the winners are often those whose expertise is most distant to the nature of the problem (Jeppesen & Lakhani, 2010).

Labor Markets. In these cases, the competition is before the work is performed rather than afterward: the firm puts out an open call for labor, selects one (or more) individual(s) based on

⁵ We recognize that this is more expansive than some previous definitions, but believe it is an accurate summary of the crowdsourcing research to date. As with communities, it seems more realistic to define crowds in terms of degrees than to strictly bifurcate between crowd and non-crowd.

⁶ While information, knowledge, and antecedents to innovation are distinct from technological innovations (West & Bogers, 2014), and not all information goods count as information, for this definition we do not draw distinctions between these different possible outputs of the crowdsourcing process.

skills and/or price, and then that individual performs the task for pay. Examples include Amazon Mechanical Turk, Freelancer.com and Turkit (Howe, 2006a; Doan et al, 2011).

Gated Contests. Some crowdsourcing contests are not open to all contenders, but instead the sponsor pre-selects specific external participants to participate in the contest in a selective open call. Typically this is done when the sponsor wants to improve the quality of the submissions, e.g. when it lacks the time needed to evaluate all possible submissions or it must expend its own resources to collaborate with each potential contributor (Diener & Piller, 2013; Piller & West, 2014). This corresponds to Shah’s (2006) earlier definition of “gated” open source communities with participants selected by the sponsor — or the closed crowd of Viscusi & Tucci (2017) with participants selected by the sponsor or crowd.

Grand Challenge Contests are crowds organized to solve a sizable problem, often scientific in nature, whose solution would spur further technological progress. Examples include the 1714 longitude prize offered by an act of the English Parliament, the 1927 prize for transatlantic flight claimed by Charles Lindbergh, and the X Prize, a \$10 million prize offered in 1996 for private space flight (Scotchmer, 2004). Since then, the X-Prize Foundation has sponsored a series of prizes, as have government agencies that conduct R&D such as DARPA and NASA. These contests tend to offer large prizes (millions of dollars in today’s terms) that attract large teams to make a multi-year effort: for example, the original X Prize took eight years to award. These contests may be winner-take-all or reward multiple (or cooperative) contributions, but generally tend to be offered in hopes of attracting private investment to solve problems that have broader economic or societal benefits (Lampel et al, 2012; Murray et al, 2012). In the case of winner-take-all, the losing contributors may receive no direct benefit from their efforts, but hope to benefit after the contest ends from learning or publicity gained during the contest.

Personal Problem Solving. Some crowds engaged in producing decentralized solutions to their own problems. As such, this is often outside the classic definition of crowdsourcing. However, if these solutions are later shared or otherwise disseminated with others, collectively the crowd produces a range of solutions that might parallel those generated in response to a central call. User innovation and user toolkits provide examples of such processes (von Hippel, 2005; Poetz & Prügel 2010), as do firm-sponsored communities to organize individual complement providers (Jeppesen & Frederiksen, 2006).

Other forms of crowds — such as *Cooperative Crowdsourcing* and *Social Production* — often possess attributes of communities and thus are more accurately classified as crowd-community hybrids, as discussed below.

Other phenomena do not fit the above definition of crowdsourcing, but leverage crowd contributions in other ways. For example, there has been some managerial interest in how firms can crowdsource from internal contributors — harnessing the knowledge of employees (Andriole 2010; Byrén 2013) — but there has been little empirical research on it to date. The process of crowdfunding (cf. Mollick, 2014) leverages the money of external crowds but not their wisdom.

Hybrid Crowds: When Crowds are like Communities

Definition. Regardless of their origins, some crowds share the characteristics of communities, as the two forms are often complementary. Existing communities can provide the participants in a crowd-based problem solving (e.g. DARPA, Local Motors), while, over time, crowd participants may form ties that allow them to form communities. For example, some crowds and crowdsourcing efforts include repeated peer-to-peer interactions (Afuah & Tucci, 2012; Boudreau and Lakhani, 2013). Put another way, firms can manage the contributions of crowds either through communities or contests (Lakhani, 2016).

Here we define a “hybrid crowd” as a network form that combines attributes of both crowds and communities. Typically, “hybrid crowds” include a network of contributors who have some form of shared purpose or governance, and produce a deliverable for a sponsoring organization.

Types of Crowd-Community Hybrids. Prior research has identified numerous examples that might be classified as overlapping both communities and crowds. Below, we provide examples that include attributes of each form (Table 4).

Insert Table 4 about here

Cooperative Contests are an example of crowds that often have attributes of communities. This form of crowdsourcing allows for collaboration between members of the crowd to produce a solution (Howe, 2006b; Afuah & Tucci, 2012; Franzoni & Sauermann, 2014). Typically organized by a sponsor, these include elements of both crowd-based competition (the “contest”) and community-based collaboration. These are crowdsourcing contests augmented with ongoing community collaboration used to design and promote products. The Threadless t-shirt design community is the best known example, but Local Motors — an automotive crowdsourcing site — provides another example (Brabham, 2008; Langner & Seidel, 2014). In such cooperative contests, the organization(s) creates community of passionate contributors to participate in both design competitions and play a role in more mundane (but important) contributions to the firm and its goals. The maintenance of such a community clearly requires a strong shared identity — and presumably a shared purpose for limiting the crowd membership — and thus most are likely to correspond to the definition of a community rather than typical open-call contests (cf. Jeppesen & Lakhani, 2010). Community members can also cooperate in contests, when firms crowdsource to the community the task of filtering and prioritizing individual contributions (Jensen et al, 2014).

Social Production. Crowdsourcing shares many attributes of the social production of Benkler (2006) in which a group of individuals cooperate to produce a shared good. Some researchers define crowdsourcing as including the self-organized social production of information goods — notably Wikipedia (Doan et al, 2011) — but because of a lack of sponsor, some would not consider it as such (Estellés-Arolas and González, 2012). Such social production by an independent self-organizing group shares many of the attributes common to all definitions of crowdsourcing, but lacks a sponsoring beneficiary firm (or organization). Despite this distinction, we believe that such production should be classified as crowdsourcing for both factual and theoretical reasons⁷ — just as open source software communities may be firm sponsored or autonomous (West & O’Mahony, 2008). We identify three examples of such social production.

Open-Source Software Communities are well-researched examples of crowds working with an existing community. These groups demonstrate — and in fact often depend on — the shared identity and purpose of communities (Weber, 2004; Feller et al, 2008) in addition to the practice

⁷ From a factual standpoint, the work of Wikipedia is done under the supervision and control of nonprofit organization — the Wikimedia Foundation (Ciffolilli, 2003) — and thus fits the original definition. However, from studies of independent open source communities (e.g. West & O’Mahony, 2008), the existence of such foundations is not directly related to the governance or openness of such communities, suggesting that the existence of a foundation as a crowdsourcing sponsor is not a theoretically meaningful distinction for classifying crowds.

— common in crowdsourcing — of soliciting and incorporating contributions by self-selected participants (Afuah & Tucci, 2012). In many (but not all) cases, their work is orchestrated for the benefit of a firm (West & O’Mahony, 2008).

User-Generated Content is a more general example of the open source process. Wikipedia challenged the dominance of established encyclopedias by using attributes of both crowds and communities (Forte et al., 2009). While a crowd of disconnected volunteers can contribute to or edit Wikipedia pages, like other communities this crowd shares a common purpose, and it has a formal self-governance system that resolves disputes by acting as editors and fact-checkers (Nov, 2007; Forte et al, 2009). Most UGC initiatives would qualify as crowdsourcing when a firm makes an open call for contributions. However, when these firms encourage (or the contributors independently engage in) repeated interactions, the resulting sociability between contributors can shape both the outcome of the content as well as their motivation to participate (Ghose et al, 2012).

Crowd Science. In some cases, firms or other sponsors of crowdsourcing end up creating a new community to support their cause. Initiatives in “crowd science,” such as Foldit and Galaxy Zoo, attract individuals to a crowd to solve a common problem, after which a community forms around the common goal and the dissemination of data (Franzoni and Sauermaun, 2014).

MOTIVATING NETWORK COLLABORATORS

There are numerous motives behind firms engaging these three forms of external network collaborators, including the pursuit of new technologies, reducing costs, enhancing reputation, or seeking support for their own technologies (Dahlander and Magnusson, 2005; Henkel, 2006; Jeppesen and Frederiksen, 2006; Isaak, 2007; West and Lakhani, 2008; von Krogh et al, 2012).

Firms face two broad challenges of motivating external community and crowd participants to achieve their own objectives. The first is the necessity of understanding the community or crowd in question – namely its governance system and social norms. One potentially useful perspective is the idea that communities and crowds may represent “loosely coupled” organizational systems (Weick, 1976) which firms must both understand and adapt to if they hope to profit from interaction.

Secondly, firms must understand the nature of *individual* participation in these groups, and how to leverage it. Participation is driven by a combination of co-existing extrinsic and intrinsic motives (e.g., Hars and Ou, 2002; Dahlander and Magnusson, 2005; Lakhani and Wolf, 2005; West and Gallagher, 2006; Markus, 2007). If managers wish to harness the benefits of these external groups, they must both understand the motivations of such individual participants, and the various ways their firm might be able to capitalize on it.

Structural Forms of Participation Architecture

Firms seeking to structure a collaboration network to attract contributions need to create an architecture of participation, which West and O’Mahony (2008: 146) define as a “socio-technical framework that extends participation opportunities to external parties and integrates their contributions.” One key element of this architecture — determining the size of participation effort that is valued by the contributor and the firm — is the degree of divisibility (and thus accessibility) of the externally contributed tasks.

We identify three levels of task divisibility:

Incremental. This would include making a single small contribution that has value to the sponsoring organization. This could include making a suggestion (Dahlander & Piezunka 2014), updating a Wikipedia article (Nov 2007), or making a bug fix to open source software (Crowston & Howison, 2005).

Modular. These collaborations have a modular design with well-defined interfaces (Sanchez & Mahoney, 1996), which allows external contributors to add value in ways not anticipated by the original content designer. The original definition focused on contributing new modules to software system, such as a new project in Apache or Eclipse or a new procedure in the GPL library (Baldwin & Clark, 2006). However, it also includes contributing entire articles to a blog or online newspaper. In many cases, a modular architecture makes incremental contributions easier because it limits the complexity that an external contributor must understand (MacCormack et al, 2006). However, not all modular architectures allow incremental contributions: Google’s failed Knol encyclopedia crowdsourced entire articles, rather than Wikipedia’s policy of allowing the crowd to modify any previously submitted article.

Indivisible. Most pure crowdsourcing contests seek entire completed solutions to a single well-defined problem. These include the familiar innovation tournaments such as those mediated by intermediaries such as InnoCentive and NineSigma (Howe, 2006a), and even some forms of cooperative crowdsourcing. In these contests, most contributions are submitted by individual “solvers” (Boudreau & Lakhani, 2009). On the other hand, the scale of grand challenge contests usually require contributions to be made by groups: for example, 26 teams spent \$100 million over eight years seeking the original \$10 million X-Prize award for manned space flight (Murray et al, 2012).

Who are the participants in these network collaborations? Individuals are a core part of both communities and crowds. Communities often include firms or other organizations (West & Lakhani, 2008). Meanwhile, crowdsourcing efforts — both grand challenges and larger private contests such as the \$1 million Netflix Prize — attract teams of individuals or organizations (Murray et al, 2012; King & Lakhani, 2013).

How Firms Tap into Motivation

We identify four distinct pathways firms use for influence: directly motivating the group, motivating other firms who also participate, motivating individual members, and motivating employees who are also members (Table 5). Each pathway presents firms with distinct challenges for aligning the goals of the firm, the external group and its members.

Insert Table 5 about here

Working Directly with Communities, Crowds and Hybrid Crowds. In many cases, firms identify an external group whose motivations and objectives are aligned with its own, (Leiponen, 2008; Bonaccorsi et al., 2006), and proceed to work directly with that group (e.g., Keil, 2002; West, 2003; Stam, 2009; Snow et al., 2011). In these cases, one of the firm’s greatest challenges here is aligning the goals of the community to their own.

Given that such alignment is not established *a priori*, a firm must decide the degree to which they will accept the community’s goals, or to determine whether – and how – they will take action to influence those objectives. When working with external communities, firms should look to the group’s governance structure. These rules leverage culture, shared norms and intrinsic motivations to align participation. However, when compared to firm governance, communities in particular are more likely to emphasize self-governance and democratic processes (de Laat 2007; Markus, 2007; O’Mahony, 2007; O’Mahony and Ferraro, 2007; Dahlander et al, 2008). Community governance is often designed to encourage individual (not firm) participation by providing recognition and increased responsibilities (O’Mahony and Ferraro, 2007; West and O’Mahony, 2008).

Working with Other Firms. Two or more firms often work collectively to tap into the motivations of community members. One of the best examples is the cooperation that unfolds between companies who share membership in a standardization group or trade association. Here, firms are motivated to work together through these communities to achieve a common objective (Bekkers et al 2002; Keil, 2002; Hallström, 2004). We know that these firms benefit in various ways through their common participation, such as gaining access to alliance partners (Rosenkopf and Metiu, 2001), but these firms must monitor both their relationships to their peers as well as to the community.

Working With Individual Members. Here, firms motivate individual members who are unaffiliated with the firm, rather than the community itself. Studies in this vein examine how firms can either motivate (e.g. Wiertz and de Ruyter 2007; Porter and Donthu 2008, Jeppesen and Frederiksen 2006) or access the contributions of individuals (Spaeth, Stuermer, and von Krogh, 2010). Once again a central challenge is identifying and aligning common interests, but in this setting, a firm must assess the degree to which they can motivate individual members can provide value either by themselves or by influencing the policies of the community in a way that is favorable to the firm. One approach is to work with the leaders of the group who can motivate and coordinate the voluntary contributions of others (Markus, 2007; Dahlander et al, 2008). For communities and hybrid crowds, the motivation issues apply to two different stages of participation: first to join the community, and then to contribute to a given collaboration (Lakhani, 2016).

Working with Employees who are also Members. Firms can also support their own employees' participation in an external group. These individuals can act as boundary spanners to align the interests of the firm and the community (Schweisfurth & Herstatt, 2016). Studies of this topic often focus on how employees approach the goals of the community (Isaak, 2007), alongside those of their own employer (Dokko and Rosenkopf, 2010). Here, firms must confront their employees' dual allegiances, which may force a firm to address agency issues and possibly role conflict (O'Mahony, 2005; Henkel, 2008; Rolandsson et al., 2011).

Helping government and other not-for-profit organizations. Originally conceived as a strategy for profit-maximizing firms, the principles of open innovation can also be applied to benefit government (public) agencies as well as not-for-profit organizations. The process of identifying and sorting innovations from external crowds and communities parallels that of firms, with two major differences. First, the success of the sponsoring organization — whether national government, local government, academic or other nonprofit — is measured by achieving its mission rather than profit goals. Second, participants tend to be motivated by intrinsic support for that mission (or nonmonetary extrinsic rewards such as recognition) rather than by monetary rewards (Hilgers & Ihl, 2010; Chesbrough & Minin, 2014; Franzoni & Sauermann, 2014; Cordella et al, 2017).

Intrinsic Motivations Driving Participation in Communities and Crowds

Intrinsic motives are present in both communities (Lakhani & Wolf, 2005) as well as crowds (Boudreau & Lakhani, 2013). Research on user innovation has emphasized the importance of “scratching an itch,” where the community member works to address his or her individual need (Baldwin et al., 2006; Franke et al, 2006; West and Lakhani, 2008). Also common to both is motivation related to improving one's career prospects by gaining skills or visibility (Hars and Ou, 2002; Lakhani and von Hippel, 2003; von Krogh et al., 2003; Lakhani and Wolf, 2005; West & Gallagher, 2006).

Communities provide a form of social interaction that itself can be a form of motivation.

Personal identification with the community and its goals can be a powerful motivator (Hertel et al. 2003; Lakhani and Wolf, 2005; von Hippel, 2007). For example, since the Stallman (1985) manifesto, the perceived that software should be “free” has attracted many (von Krogh et al., 2003; Shah, 2006; Stewart and Gosain, 2006; Nov, 2007). However, motivation can differ depending on the degree of involvement, as Budhathoki and Haythornthwaite (2012) found among OpenStreetMap contributors: those who contributed the most were motivated more by their affiliation to the community and learning, while less frequent contributors were motivated more by the idea that mapping data should be free.

Compared with communities, crowds exhibit fewer (if any) interactions between members. Crowdsourcing efforts are also more likely to ask for a one-time effort, while community engagement is ongoing. Thus intrinsic motives to participate in crowds are more likely to be driven by a desire to make an individual contribution (i.e. provide user-generated content or participate in the contest) than it is to develop social ties with other like-minded individuals.

Extrinsic Motivations Driving Participation in Communities and Crowds

Because participation in these external groups is typically voluntary and often uncompensated, it makes sense that most of the research on motivations has focused on those that are intrinsic. That said, there are extrinsic motivations provided by communities and crowds. The most unambiguous is monetary payment, whether for those who are paid by their employer to work in a community (Hertel et al., 2003; Fleming and Waguespack, 2007) or for user entrepreneurs forming their own companies (Hienerth, 2006). Similarly, for crowd participants, the motive to win a prize can be compelling. Others extrinsic motivations include career signaling, the desire to access other contributions, and the related expectation of reciprocity (e.g. Franke and Shah, 2003; Lakhani and von Hippel, 2003; O’Mahony, 2003). At the same time, individual (particularly extrinsic) motivations must be weighed against the cost of participation.

DEGREES OF COLLABORATIVE INNOVATIVENESS

As noted earlier, the efforts of most crowds and some communities directly benefit firms (Howe, 2006b; West & O’Mahony, 2008). At the same time, the goals of a few crowds (and many communities) are indifferent — or even hostile — to those of firms (Lih, 2009; O’Mahony & Lakhani, 2011). Thus, these network forms vary considerably in the degree to which they benefit firms and their open innovation strategies.

At the same time, there is wide variation in the role that communities and crowds play in providing innovations to others. At times, the nature of the innovative challenge itself may influence the process by which organizations choose to engage communities, crowds, or hybrid crowds. As suggested by Viscusi & Tucci (2017), the characteristics of different types of crowds and communities lend themselves to helping solve different types of innovative challenges.

Here, we define innovation broadly, as either new products or services or changes to process (Dahlander and Gann, 2010). At one end of a spectrum (see Table 3), communities and crowds do provide innovations, whether to firms, their members, or society at large. In the middle are communities and crowds that do not play a direct role in providing innovation, but facilitate its diffusion, adoption and use by complementing innovation. At the other end of the spectrum are those communities or crowds whose roles are clearly unrelated to innovation, but may provide other benefits (such as symbolic meaning) to their members.

Thus, we can classify various examples of these network forms across these two dimensions: the degree to which they benefit firms, and the degree to which they create technological innovations (Figure 2). Consistent with our focus, here we examine those cases when these

networks contribute to the benefit of a firm or other organization, and consider the differing degrees of innovativeness in those contributions.

Insert Figure 2 about here

Direct Contributions to Open Innovation

Both communities (West & Lakhani, 2008) and crowds (Boudreau & Lakhani, 2013) can potentially contribute to a firm's open innovation strategies. Such contributions may take the form of innovations, or other antecedents or components of such innovation such as inventions, technical or market knowledge; after sourcing such innovations, firms face the subsequent challenge of integrating and bringing them to market (West & Bogers, 2014).

Communities. Many communities play an important role in creating technological innovations. This may be by directly providing those innovations, or by directly providing knowledge that enables innovation by firms or other parties.

Communities provide access to several forms of knowledge, extending technological innovation beyond the limits of their own resources (e.g. Lee and Cole, 2003). Community knowledge may come from lead users (Jeppesen and Frederiksen, 2006, Hienerth, 2006), from other firms in the community (Wade, 1995), or from the community itself (Henkel, 2006). At best, newly acquired community knowledge can form the basis of collective development (Snow et al., 2011) that enables firms to overcome technological problems. It can increase also increase the demand (and thus the supply) of innovative complementary products and services produced by community members (Henkel, 2006: 955).

Hybrid Crowds. Outside groups that combine attributes of communities and crowds can also provide direct contributions to firm innovations. As mentioned previously, open source software can be seen as both a community (of programmers and active contributors) and a crowd (of users and infrequent contributors). These hybrid crowds can directly contribute to both radical and incremental innovation depending on how the firm interacts with the community (Sims and Seidel, 2016).

Customer groups and lead users can also take the form of either communities or crowds. Consumer groups have contributed a significant number of innovation opportunities across various industries (Terwiesch and Ulrich, 2009), and lead users are able to develop innovations that build on the work of pre-existing designs and products (Hienerth, 2006).

New technologies are firms to source innovations from crowd-community hybrids in novel ways. One example is the collaborative contest, where contributors who may not know each other (an attribute more common is a community), work together in hopes of solving a common problem. For example, the computer game FoldIT uses non-experts to assist in examining and rearranging proteins, often surpassing the abilities of dedicated computers (Savage, 2012).

Crowds. Many firms are now using contests to source innovations directly from the crowd. While the ideas generated may not be as feasible as those developed internally, they are often more novel (Poetz & Schreier 2012, Jeppesen & Lakhani, 2010; Franke et al, 2014). That said, an increase in contributors does not equal more (or even better) ideas; increased productivity is not always associated with the growth of the crowd (Boudreau and Jeppesen, 2014), and repeat contributors to the crowd may propose incremental changes to ideas already implemented (Bayus, 2013).

Indirect Contributions to Open Innovation

In many cases, firms do not use communities as a source of direct innovations, but to complement internal development efforts, by reducing costs or gaining new insights (Bonaccorsi et al., 2006; Samuelson, 2006; West and Gallagher, 2006; Piva et al., 2012). This is consistent with the decades-old finding that technical inventions require many complementary assets — such as marketing, distribution, support, or add-on products — to realize their full value (Teece, 1986).

Communities. Indirect contributions to firm innovation often come from communities who can provide unique insights on the limitations of alternatives (von Hippel, 2001; Jeppesen and Frederiksen, 2006; Mahr and Lievens, 2012; Shah and Tripsas, 2007; Baldwin and von Hippel, 2011).

Some communities also create frameworks and processes that enable firms to better access user ideas, as the research on toolkits has illustrated (von Hippel and Katz, 2002; Piller and Walcher, 2006).

Communities also support innovation by providing infrastructure or resources that help these firms commercialize their own innovations. Examples include standard-setting organizations and trade associations. By developing a common set of standards, firms can create innovations internally with confidence they will be compatible with others (e.g. Rosenkopf et al., 2001; Keil, 2002).

Similarly, firms bringing a new technology to market require validation to provide legitimacy (Garud et al., 2002). Communities can provide such legitimation. These may be external groups such as trade associations, or communities created by the firms themselves to legitimate a new product category (Snow et al., 2011).

Finally, communities can help diffuse and disseminate firm innovations (Dahlander and Magnusson, 2005) by providing support (Lakhani and von Hippel, 2003; Henkel, 2008) complementary goods (Jeppesen and Frederiksen, 2006).

Hybrid Crowds. Crowd-community hybrids also play a role in indirectly contributing to firm innovation. In many cases, these contributions are complementary goods and capabilities (as defined by Teece, 1986) that support such innovation. For example, Propellerhead Software crowdsourced to an external community the provision of customized sounds that made its Reason software more valuable (Jeppesen & Frederiksen, 2006), and Dell crowdsourced product design ideas to their IdeaStorm community to improve or create new product ideas (Di Gangi and Wasko, 2009; Bayus, 2013).

Open source software is again perhaps the most prominent example. Using open source software allows a firm to rely on the support of an entire community of volunteer contributors for assistance. The low-cost and traditionally high-quality software saves firms from having to devote resources (capital or human) to maintaining the software, allowing them to spend more time developing their own innovations (e.g. Bonaccorsi et al, 2006).

User-generated content also provides a platform on which firms can build their own innovations. For example, those contributing to OpenStreetMap provided firms with a high-quality and low-cost mapping solution (Budhathoki & Haythornthwaite, 2013). Similarly, firms can now augment their own internal efforts by working with cooperative crowds to analyze “big data” in ways that have provided insight beyond what the firm was able to develop on their own (Martinez & Walton, 2014).

Crowds. Firms could conceivably crowdsource support or other user-generated content to support their innovation efforts. The degree to which crowds contribute indirectly to innovation

is influenced by various crowd characteristics. The typology introduced by Viscusi & Tucci (2017) suggests that the use of “closed crowds” — as with those managed by an innovation intermediary such as Innocentive — forces a company to conceptualize and even modularize its innovation challenges, making it more appropriate for outsourcing problem-solving. In contrast, the contributions to firm innovation from “open crowds” (which similar to our concept of hybrid crowds) can be more difficult to specify *a priori* due to their flexibility and fluidity of membership.

Contributions Beyond Innovations

Communities

Some communities simply do not contribute to firm innovation, but may still create value for firms and their members by providing symbolic meaning (Dahlander et al., 2008). Sponsored brand communities are a common example. They allow firms to reinforce their brands, promote products and solicit feedback from enthusiastic customers and lead users (e.g. Porter and Donthu, 2008, Marchi, Giachetti, and de Gennaro, 2011, Jeppesen and Frederiksen, 2006, Füller et al., 2008). For firms, the end result is often higher customer loyalty, engagement or identification of with the firm’s products (e.g. Harrison and Waluszewski, 2008); Algesheimer, Dholakia, and Hermann, 2005). They can also leverage the collective insight of the community to access tacit knowledge and insights held by the community (Schau et al., 2009).

Other communities are independent of any particular firm interests, as when patients with similar medical conditions share information and provide mutual support (Jayanti and Singh, 2010; Laing et al., 2011). In rare cases, customers create their own brand communities without firm involvement, as when owners of the handheld Newton tablet organized after Apple had canceled the product line (Muñiz and Schau, 2005).

Hybrid Crowds

At times, hybrid crowds contribute to firms in ways beyond innovations. For example, the research on open source contributions shows that many of these contributions are motivated by reputational and intrinsic (as opposed to monetary) incentives (Shah 2006). For firms who employ developers who are “boundary spanners” with an open source community, these communities can act means for firms to promote themselves to gain market traction in the form of referrals. In a similar way, firms that solicit user-generated content (e.g. Threadless or Local Motors) can use those same users to promote their brand.

Crowds

Crowd-based tournaments and contests may provide benefits beyond the actual innovations sourced. This might include connecting to a larger pool of enthusiasts, winning publicity and goodwill that comes with sponsoring such challenges.

Beyond their use in innovation contests, crowds are also used to source content or other contributions unrelated to any innovation, such as providing content supporting a firm’s daily operations. For example, online retailers such as Amazon.com rely on individual users to provide product ratings to help other users (Shen & Rees Ulmer, 2015), while Yelp depends upon detailed customer reviews of popular destinations. Uber uses rankings by both ridesharing passengers to monitor customer satisfaction. In these examples, the voluntary feedback from individual contributors provides a critical complement to the firm’s core product or service.

DISCUSSION

Since Rheingold (1993), researchers have learned a great deal about the nature of communities, their governance, and the activities of their constituent members. Researchers have

studied a variety of different communities and community-firm interactions, while firms have identified communities as an important source of external innovations for firms practicing open innovation. More recently, researchers have identified crowds as a potential source of external innovations, as well as hybrid forms of communities and crowds that combine elements of each.

Contribution

This paper has three main contributions.

First, by reviewing prior research on crowds and communities, the paper identifies and contrasts three network forms of external collaborations that firms can potentially join. A community is a network of individuals or organizations that have repeated interaction and shared goals or identity; a crowd is a network of individuals that utilizes the wisdom of crowds with some (if not all) of the previously-identified attributes. The paper also introduces the community/crowd hybrid construct and discusses the characteristics, activities and use of these hybrid crowds.

Secondly, it offers two dimensions of classifying all three types of networked external collaborations. The first is the degree of firm involvement — whether the network is controlled by a single firm, shared control by multiple firms, or independent of any firm control. The second is the degree of innovation produced by the network: whether creating (or directly contributing to) an innovation strategy, producing complementary products needed to support an innovation strategy or providing other benefits such as marketing and support.

Finally, it considers how firms leverage these external collaborations to support their open innovation strategies, and how these strategies are similar and different based on these three attributes – the form of collaboration, the degree of community innovativeness and the degree of firm involvement. In particular, because motivation is essential assuring a supply of external innovations (West & Gallagher, 2006), it focuses on what motivates the participants in these collaborations and what firms can do to increase that motivation.

Future Research

Here we suggest future research opportunities related to the three forms of external collaborations. We also suggest research ideas for the two dimensions of firm involvement and network innovativeness, with particular focus on how this would help firms leverage collaborations to support open innovation.

Communities. Our review identifies some gaps in the literature. At the level of phenomenon, we know a lot about how firms work with brand and open source communities. But what are the limits of these insights of how motivation, cooperation and integration work in other settings? For example, which of the open source governance mechanisms translate to other types of communities (cf. Raasch et al., 2009)? Similarly, are the benefits of brand engagement the same in pure brand communities as in those used to provide support, product ideas or even complementary goods? And while an increasing body of work has examined how firms run innovation contests, we know less about the role of community in influencing the interactions between solvers — or how communities run by intermediaries are different from those run directly by the firm itself.

Although open innovation researchers have conceptualized communities and crowds as two distinct forms of collaboration, this chapter has sought to demonstrate how they play similar roles in a firm's external sourcing strategies. Some research (West, 2014; Viscusi & Tucci, 2017) has focused on the structural similarity of communities and crowds as network forms of organization, but both differ from Powell's (1990) network form and from each other.

Hybrid Crowds. While the community/crowd hybrids share many of the attributes of their

two elemental antecedents, future research could examine how these hybrid crowds are different from these antecedents.

A crucial (but still nascent) area of research for such hybrid forms is the relative importance and interaction effects (i.e. synergies) between the success factors for each of these component forms. Research on crowdsourcing contests often focuses on attracting contributors with the right knowledge and motivating them to develop and share such knowledge (Jeppesen & Lakhani, 2010; Franke et al, 2014). Meanwhile, research on communities tends to emphasize governance and other aspects of coordinating and organizing these individual contributions (Markus, 2007; West & O'Mahony, 2008; Lakhani et al, 2013). For hybrid forms such as cooperative crowdsourcing or social production (e.g., Franzoni & Sauer mann, 2014; Langner & Seidel, 2014), this raises several questions. Should improving success focus more on the structuring the cooperation or attracting the right crowd? What are the interaction effects between the nature of the crowd and how it is organized?

At the same time, they historically have distinct processes and cultures. For example, communities (as suggest of von Hippel, 2007) tend to be very relational, whereas many forms of firm-sponsored crowdsourcing (such as tournaments) are highly transactional, focused on achieving a specific outcome; this suggests a number of research opportunities as to how (and to what degree) a given network adopts the attributes of either. Similarly, these hybrids differ on a number of easily-identified dimensions (such as listed in Table 4), but do these differences correlate to the processes these crowd-communities use, the nature of their collaborations or the conditions under which they are successful? And for crowd-community hybrids that combine key elements of these transaction and relational extremes — such as winner-take-all tournaments and attempts to build shared identity — how are (or can) these tensions be managed to improve the success of the hybrid network?

We are also interested in path-dependent differences between hybrid crowds of differing origins. Once stable, is a community that adopted crowdsourcing demonstrably different from crowds onto which community-like shared purpose has been grafted? Similarly, since the latter hybrids differ in their degree of shared purpose or identity, is there a threshold (or tipping point) that marks the transition between a crowd and a community/crowd hybrid?

Crowds. Sponsors of crowdsourcing initiatives have the opportunity to graft community-like attributes or mechanisms onto them, such as repeated interaction or internal governance, and in fact sponsors are beginning to do so — including repeated interactions (Brabham, 2008) or shared identity (Levina & Fayard, 2017). What are the real costs and benefits to sponsors of including these mechanisms? What are the moderators of these benefits? These might be internal factors such the nature or size of the crowd, the demographics of the members, or the duration or complexity of the challenge. Or the moderators might be factors external to the crowd, such as attributes of the sponsor (reputation, organizational slack, corporate culture, crowdsourcing experience), the industry (industry concentration, rate of technological change) or attributes of potential or actual participants (expertise, demographics, personality traits, opportunity cost).

At the other extreme, some forms of network collaboration involve a zero-sum allocation of value capture between sponsoring firms and network participants. Both the process and outcomes of this allocation have implications for perception of fairness and the motivation of participants (Afuah & Tucci, 2013; Franke et al, 2013). However, much more research needs to be done on how these processes, outcomes and perceptions impact the results of such collaborations.

We are particularly struck by the emphasis on the hybrid (rather than pure) crowd form for

providing support or other innovation complements, such as user-generated content and other support. Is the pure crowd an unstable form for this requirement? Did the hybrid forms arise via path dependencies? Or have firms found that utilizing hybrid forms is a more effective way of achieving these goals?

Degrees of Firm Involvement. As we have shown, these collaborations differ in their degree of firm involvement. In terms of motivation and governance, we have significant research on how independent communities work with their members (e.g. Franke & Shah, 2003; Lakhani & Wolf, 2005; Markus, 2007; O'Mahony, 2007; O'Mahony & Ferraro, 2007). However, we rarely (e.g. O'Mahony, 2003) see what happens to the governance or individual motivation within such communities when they interact with firms, let alone the internal community dynamics of communities controlled by a single firm. Similarly, we understand the community contributions and role conflicts of sponsored employees, but less about their interpersonal interactions with community members (or fellow employees). We also have only fragmentary research on the interaction effects of multiple motivations, whether complementary (and thus additive) in their effects (Raasch & von Hippel, 2013) or crowding out (Alexy & Leitner, 2011).

Finally, we need to know more about the conditions under which firms are able to benefit from their engagement with these collaborations. Is successful engagement a unique skill, a commodity or merely contingent upon the firm's market or technological position versus its rivals? While we have general measures of the benefits of such engagement, we know less about when (or if) those benefits exceed the cost of engagement.

Degrees of Network Innovativeness. These collaborations also differ in their degree of innovativeness. In terms of output from the external collaboration, some firms manage collaborations that produce complements (such as apps) in a way similar to brand or support communities — as a marketing function to improve the perception of the product rather than its actual content. What are the similarities and differences between these two uses, and with those collaborations that more directly impact the innovativeness of a firm's offerings? For collaborations that combine multiple goals (e.g. complements and brand development), does one set of goals tend to dominant the culture and norms of the collaborators? How is this different between collaborations that feature strong community identification and those that have little or no elements of community identity or shared purpose (such as contests or labor markets)?

While we have sought to classify collaborations assuming they are optimized for a particular type of output (and degree of innovativeness) — and this seems realistic for a transactional crowdsourcing initiative, this may be an oversimplification of communities and hybrid forms of collaboration. For example, the members of a typical open source software community (a crowd-community hybrid) not only produce innovation, but also provide peer-to-peer support and other goods and services complementary to such innovation (e.g. Spaeth et al, 2010). Therefore, it could be useful to think about the way a given network collaborates across a range of value creating tasks or activities — much as Du et al (2014) looked at open innovation success at the level of individual projects — and the degree to which the collaboration, the sponsor or member interactions, and success vary between these differing activities.

Conclusions

With the ongoing creation and diffusion of Internet collaboration technologies by firms and individuals, these three external forms of networked collaborations will become even more important going forward. Researchers on crowdsourcing and communities will continue to benefit by collaborating with each other, and drawing insights from their respective scientific and managerial research.

TABLES AND FIGURES

Table 1: Contrasting communities and crowds

	Communities	Hybrid Crowd	Crowds
<i>Reason for existing</i>	Collaboration	Collaboration	Problem solving
<i>Key attributes</i>	Repeated interaction Shared goal or identity Shared governance	Repeated interaction Shared production goal Common identity or governance	Self-selected participants Competition Produce a deliverable Organized by a sponsor
<i>Typical Participants</i>	Individuals Firms	Individuals	Individuals <i>Ad hoc</i> teams
<i>Motivation</i>	Intrinsic Personal utility Economic gain	Intrinsic or extrinsic	Economic or other incentives
<i>Identity</i>	Shared	A common purpose or goal	Individual
<i>Interaction between actors</i>	Collaborative	Collaborative	Collaborative, competitive or both
<i>Locus of activity</i>	Online Face-to-face Both virtual and physical	Usually online; occasionally face-to-face meetings	Usually online
<i>Output</i>	Knowledge, information or tangible goods	Usually information or information goods	Usually information or information goods
<i>Related phenomena</i>	Communities of practice	Crowd science	Internal crowdsourcing Crowdfunding

Table 2: Contrasting forms of external communities

Category	Participants	Production Process	Output	Control	Prior Research
User and other enthusiast communities	Individuals	Cooperative	Information	Community	Franke & Shah (2003); Hienerth (2006)
Brand communities	Consumers	Cooperative	Information	Firm	Algesheimer et al (2005); Muñiz & Schau (2005); Fuller et al (2008)
Open source communities	Firm employees and other individuals	Cooperative	Software	Firm or community	Dahlander & Magnusson (2008); West & O'Mahony (2008); Garriga et al (2011)
Software ecosystems	Firms or potential†	Competitive	Software	Firm	Iansiti & Levien (2004); West (2014)
Trade associations	Firms	Cooperative	Agreement (<i>collective action</i>)	Firms	Rosenkopf & Tushman (1998); Keil (2002); Dokko & Rosenkopf (2010)

† Includes established firms, new firms, unincorporated firms and nascent entrepreneurs

Table 3: Contrasting forms of crowdsourcing

Category	Participants	Production Process	Benefits	Degree of Community	Prior Research
Crowd-sourcing contests	Self-selected individuals	Explicitly or implicitly competitive	Sponsoring firm	Low	Idea competition (Leimeister et al, 2009), Broadcast search (Jeppesen & Lakhani, 2010), Tournament-based crowdsourcing (Afuah & Tucci, 2012), contests (Boudreau & Lakhani, 2013),
Labor markets	Individual bidder selected by firm	Individual	Sponsoring firm	Low	Outsourcing commoditized tasks (Howe, 2006a; Doan et al. 2011)
Gated contests	Individuals selected by firm	Competitive	Sponsoring firm	Low	Selective call (Diener & Piller, 2013), Selective open call (Piller & West, 2014)
Grand challenge contests	Self-selected individuals or organizations	Competitive	Sponsor, winners	Low	Incentivizing major breakthrough innovation through prizes (Murray et al, 2012),
Personal problem solving	Self-selected individuals	Individual	Individual, then ecosystem	Medium	Lead user (Jeppesen & Frederiksen, 2006), Poetz & Prügel 2010), user communities (von Hippel, 2005)

Table 4: Attributes of crowd-community hybrids

Category	Community attributes			Crowd attributes			
	Repeated interaction	Shared Identity/Purpose	Governance	Self-selected participants	Competition	Production	Benefitting a sponsor
Open source software	++++	Both	By Community	√	Implicit	√	+
User generated content	+++	Purpose	By Sponsor	√	Implicit	√	+
Cooperative contests	++	Purpose	By Sponsor	√	Explicit	√	+++
Crowd science		Purpose	By Sponsor	√	Explicit	√	++

Table 5: Motivational issues of firms working with communities and their members

Firm Interaction	Firm Motivational Goals	Prior Research
With overall community	Identifying communities whose goals align to firm objectives	Bonaccorsi et al. (2006), Leiponen (2008)
	Influencing community goals to match the firm's	Dahlander & Magnusson (2008)
Alongside other firms who are community members	Working with other firms to achieve shared community goals	Bekkers et al. (2002)
	How firms leverage intermediaries to motivate a community	Antikainen and Vaataja (2010)
With individual community members	Motivating individual community participants	Jeppesen & Frederiksen (2006), Wiertz & de Ruyter (2007), Porter & Donthu (2008), Langner & Seidel (2012)
	Assuring the quality of their contributions	Spaeth et al. (2010)
With own employees who are also community members	Reinforcing employee-member alignment with community and firm goals	Isaak (2007), Dokko and Rosenkopf (2010)
	Addressing/resolving conflict between employee-member and community goals	O'Mahony (2005), Henkel (2006), Rolandsson et al. (2011)

Figure 1: Community and crowds as phenomena

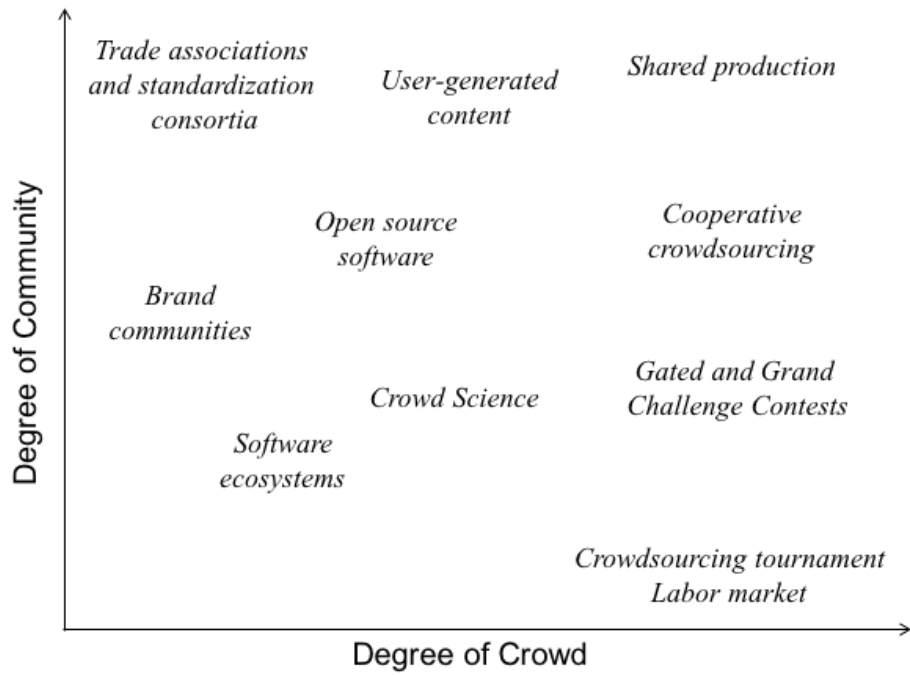
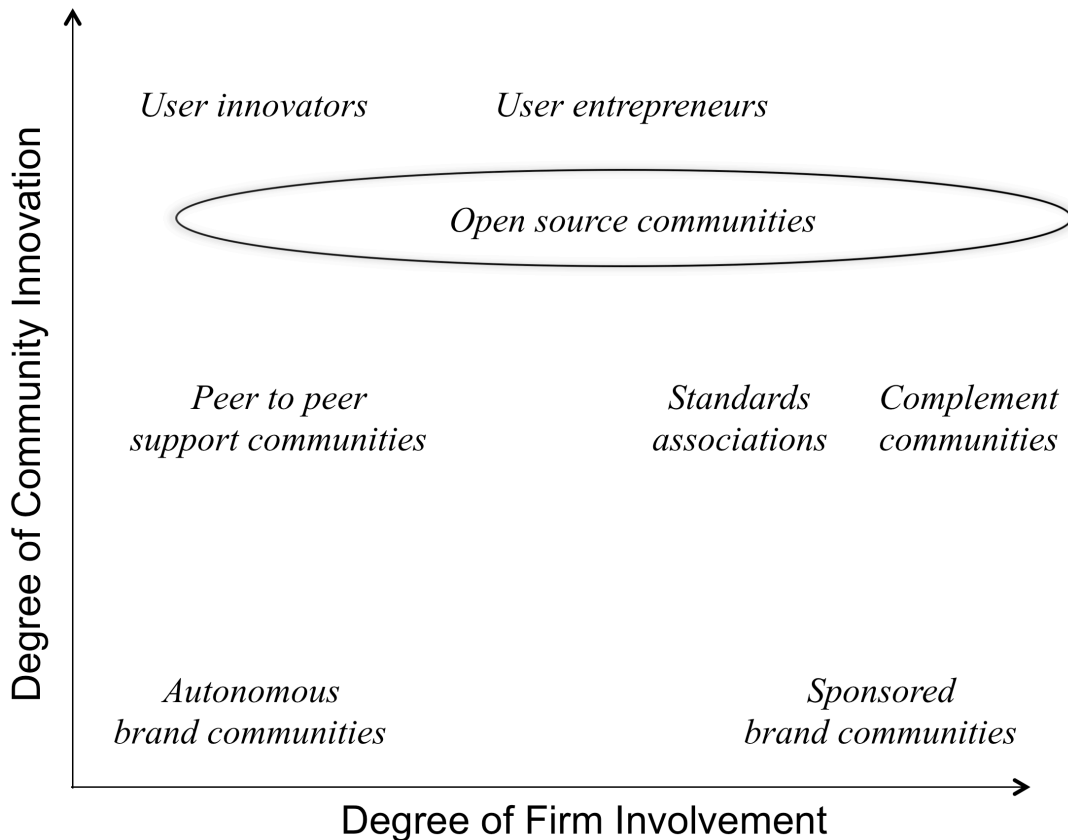


Figure 2: Dimensions of firm-community interaction



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