

Getting Clear About Communities in Open Innovation¹

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An important development in the past decade of innovation studies has been the recognition of the role of communities outside of the boundaries of firms in creating, shaping and disseminating technological and social innovations. While the dominant role of users in creating functionally novel innovations was established 20 years ago by von Hippel (1988), the advent of open source software communities has highlighted the important role of communities in the innovation process. The relative success of the open source movement, and its novel collaboration, problem solving and intellectual property practices, have also focused the attention of innovation scholars on the "community" phenomenon and its implications for innovation theory and practice.

Concurrent with the rise in studies of community in the innovation process, there has been a parallel and distinct body of literature focused on "open innovation" (Chesbrough 2003). This literature has tended to focus on interfirm cooperation and the development of an ecosystems of firms, sharing technologies and trading intellectual property, within a given industry or sector (cf. West, Vanhaverbeke and Chesbrough, 2006). Interestingly, non-firm actors, i.e.

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communities, are rarely to be found in the recent writings on open innovation. However, community-based innovation by its nature takes place outside the boundaries of the firm, which thus fits Chesbrough's (2003) definition of open innovation. Thus communities and their role in the innovation process both fit within and offer an opportunity to extend the firm-centric concept of open innovation developed by Chesbrough and his colleagues (Chesbrough, 2003; Chesbrough et al, 2006; Gassman 2006).²

The papers in this special issue are an attempt to explicitly link the role of communities in open innovation. But what is a community? If we are considering a community as a level of analysis then we need a precise definition of "community." In scholarly research, the definition of community may be explicit, implicit or phenomenological, as illustrated by the papers of this special issue. The definition may be explicitly stated in terms of prior research, as West & O'Mahony (*this issue*) do in citing technical communities, Kaiser and Muller-Seitz (*this issue*) do with communities of practice or Di Maria and Finotto (*this issue*) do for user communities. In other cases, communities are implicitly defined by citation of prior research, as when Langlois and Garzarelli (*this issue*) cite Allen (1983). Still other papers use the

² In our respective work on open source software over the past eight years, we have encountered many cases where both scholars and industry participants questioned whether all open source software development qualifies as "innovation" rather than low-cost reimplementation of existing technologies. There are enough examples of new technologies being pioneered in open source (such as the Apache webserver) — plus all the well-documented user innovation work of Eric von Hippel and his followers — that here we focus on communities without regard to which ones are truly "innovative."

term to refer to the phenomenon they are studying — as do den Besten and Dalle (*this issue*) — which helps others studying the same phenomenon but unduly limits the applicability of their work to other phenomena.

These papers and others suggest a welter of overlapping literatures and terms: innovation communities, knowledge producing communities, online communities, scientific communities, technical communities, user communities, virtual communities, or communities of practice. That doesn't even include the disparate uses of "community" in sociology, where Brint (2001) recounts that some 100 different definitions have been used.

Here we do not attempt to impose a single definition of "community" applicable to all innovation studies. Instead, we encourage researchers to explicitly articulate the theoretical and phenomenological boundaries of their use of the term, both to build upon earlier scholarship and to enable subsequent scholars to build on them.

To advance such precision and enable researchers to better fit their community innovation research to the broader community of innovation researchers, we contrast some of the major similarities and differences across the prior definitions, noting ambiguities and unresolved issues in such definitions. We also consider questions of how such communities are constituted and operate. From that, we suggest opportunities for future research on community innovation.

Better Defining the Community Construct in Open Innovation

While there are many types of communities, we are only interested in those involved in creating innovation outside the boundaries of the firm. We thus bound our scope in two ways. First, by building upon

the definition of Gläser (2001), we consider a community to be a voluntary association of actors, typically lacking in *a priori* common organizational affiliation (i.e. not working for the same firm) but united by a shared instrumental goal — in this case, creating, adapting, adopting or disseminating innovations.

Secondly, in this review we focus on innovations that are explicitly brought to market or widespread use by commercial actors. While some community innovations have a purely non-profit motivation and thus do not overlap the definition of open innovation (West and Gallagher, 2006), many of the principles of community innovation described below would apply to non-profit actors as well.

Communities of What?

A fundamental question about communities is what is the level of analysis for the community's constituent members. In sociology communities are assumed to comprise a group of individuals. In innovation studies, we certainly have examples of communities containing only self-governing groups of individuals, as with open source software (Lerner and Triole 2002, O'Mahony 2003).

More often, for economically valuable innovations, firms are involved either directly or indirectly. As von Hippel (2005: 96) explicitly says, "Innovation communities can have users and/or manufacturers as members and contributors." Firm participation can occur through direct sponsorship of staff and their efforts in communities. For example, Lakhani and Wolf (2005) have shown that 40% of contributors to open source software projects are "paid" to participate. Outside of open source, in communities developing important technical standards, the direct interactions involve individuals, but the

individual actors are formally or informally representing their corporate parents, as can be seen from the subsequent corporate actions (e.g., Rosenkopf et al 2001, Fleming and Waguenspak, 2007).

However, does the “community” concept also encompass groups of (only) firms interacting with each other? Lynn et al (1996) refer to an “innovation community,” while von Burg and Kenney (2003: 354) defines its community as “a cluster of autonomously acting firms agreeing to be bound by the constraints of a standard.” Such cooperating firms might be aligned through formal institutions — as with the Eclipse community that West & Gallagher (2006) liken to an industrial R&D consortium — or they might be coordinated through market mechanisms across a value network (Vanhaverbeke, 2006). But are these, in fact, “communities,” or instead better described as a value chain, value network, ecosystem or industry segment?

Powell (1990) was among the first to notice that a network of organizations is explicitly a distinct interorganizational form from markets and hierarchies. Networks play a central role in organizing the open innovation activities of multiple cooperating firms (see Vanhaverbeke 2006 for a review). Certainly there are overlaps in the definition between networks and communities, such as Powell’s (1990) emphasis on reputation, norms of reciprocity and mutually beneficial interactions. Given these overlaps, are communities of firms synonymous with interorganizational networks? Are they a proper superset (or subset)? Do the two constructs have differing domains or theoretical predictions?

Firms and Communities

An area of increasing interest is how firms choose to interact with communities, with research that links a firm’s strategy to

the organization and motivation of the community. Such firms may occupy a privileged position in the community — usually communities of their own creation — or may instead interact with existing communities.

In some cases, firms are merely one of the constituent members in a community that contains multiple types of actors. A well-known example of such a heterogeneous mix of actors is the Linux kernel community, with individuals, firms and two (recently combined to one) non-profit foundations.

More commonly, firms play a central role in creating and organizing innovation communities. Often, a single firm holds privileged role in which it seeks to guide or control the community towards achieving firm-level objectives. Such control of open source communities has attracted increasing managerial and theoretical interest: Välimäki (2003) was the first to look at the impact of firm control (of IP terms) upon an external community, while West & O’Mahony (*this issue*) establish more broadly the mechanisms by which firms both control and seek participation from open source communities. Such sponsored open source communities are becoming more common as the successful model of MySQL (and its acquisition for \$1 billion in early 2008) becomes widely know and emulated.

Such firm sponsored communities are not limited in open source software. Firms sponsor communities to develop modifications to other information goods, such as music synthesizers or video games (Jeppesen, and Frederiksen, 2006; West and Gallagher, 2006). Di Maria and Finotto (*this issue*) show how these principles can be applied to fashion and motorcycle equipment.

However, a focus on successful firm-interactions in these studies would understate the likelihood of firms and communities being able to find a common interest. Firms may be held at arm's length from communities if a self-governing group of individuals wish to insulate themselves from corporate influence (O'Mahony 2003). Firms that attempt to create an innovation community may fail due to lack of adopter interest, or may neglect communities if the innovation returns prove disappointing (Dahlander and Magnusson, 2005). Conversely, firms may ignore the needs of the community, creating a demand for users to create their own companies to commercialize technology. Such user innovator startups can be found in water sports (Hienerth et al 2006), university-developed open source software (West & O'Mahony, *this issue*) and juvenile products (Shah and Tripsas 2007).

Research on firms sponsoring communities may also overstate the intentionality of firm interactions with communities. What is the relative frequency (or economic importance) of such intentional action, versus a more passive, peripheral or responsive approach? As von Hippel (1988) reminds us, firm use of community innovations can also be serendipitous — an emergent rather than planned strategy.

Intra-Community Interactions

Fundamentally it is important to be clear about what interactions constitute the basis for group of individuals and/or firms to be in a community. Is a community more than just a grouping of individuals (or other actors)? Is there a community if there's no sense of community (cf. Corlett 1989)? In particular, what role do interactions between members play in defining communities in the open innovation process?

The communities of practice literature stipulates that knowledge transfer between community members is the key prerequisite to organizational learning, particularly for communities subsumed within an organization. The only reason we remark on the community of practice exemplified by Brown and Duguid's (1991) copier technicians is that their interactions allow them to share, refine, pool and disseminate best practice for their work responsibilities. Similarly, Knorr-Cetina (1999) has shown that collective problem solving and joint artifact creation form the basis of connection and community amongst the individuals and institutions engaged in high energy physics research.

Among studies related to open innovation, the intra-community linkages in some studies are more explicit than others. User innovation researchers have studied the peer-to-peer assistance in open source software (Lakhani and von Hippel, 2003) and sporting goods (Franke & Shah, 2003). For these cases, the community support facilitates adoption and use of the innovation, although only in the latter case does that adoption create revenues for a firm (such as buying a sailplane or a snowboard). Meanwhile, identification and interaction within a user community means that innovations fuels imitation and extension by other user innovators (von Hippel, 2001).

Intra-community interactions also offer the prospect of defining the boundaries of a given innovation community. The boundaries may not be sharply defined, as the differences between core and periphery may be more dramatic than the differences between peripheral members and nonmembers. However appealing such core-periphery distinctions are, they may be highly dependent on both definitional and methodological choices made by researchers as to what constitutes community

membership. From a sample of 116 SourceForge projects, Crowston et al (2006) found different definitions of core membership by using formal responsibilities, code contributions and network interactions.

This still begs the question of user innovation *by* the community that is not *within* the community. That is to say, what if there is no intra-community interaction, i.e. users disclose their innovations to firms but not to each other — as with the scientific instruments innovations of von Hippel (1988)? Does such free revealing by a population of users — without interactions between those users — constitute community innovation? Less dramatically, if a community is held together by the firm as the only bridge between disparate members, then is the community an innovation community or merely a customer base?

Even when direct interactions exist, they are often just part of the picture. For example, research on open source communities has focused on the direct interactions between community members, such as through e-mail interactions. However, the primary outcome (or even antecedent) of successful open source communities is not such interaction, but the joint or cumulative production of a shared information good, i.e. the open source software. At the same time, other parts of the same open source community (such as user-to-user assistance) may be organized around such direct interactions, suggesting an opportunity for network analysis of the innovation flows between these two activities.

Future Research

The disparate definitions and measures provide important opportunities for studying the role of communities in innovation. Here

we offer some suggestions as to some of these opportunities.

Defining the Community Construct

The study of community innovation would first require defining what a community is — either through a more extensive review of prior literature or through empirical study. While we have attempted to survey the use of communities in innovation research, we've made only passing references to the considerable sociological research on communities of individuals. Meanwhile, analyzing communities with individual and organizational members requires not only spanning levels of analysis, but also (as Stein 1997 shows) may require spanning theories with conflicting fundamental assumptions.

Other parts of the definition — such as the boundaries of innovation communities — may only be resolved through empirical study. The largest number of empirical studies of community innovation have focused on open source communities, and such communities have influenced both the theory and practice of innovation in other communities. However, even a superficial examination suggests important differences between software communities and those that (like Wikipedia) produce other types of information goods and even physical goods. These communities may have different perspectives on membership, knowledge sharing, intellectual property and commercialization opportunities. These thus may be different in kind rather than degree, implying generalization across phenomenon may be difficult.

As noted earlier, any definition of “community” needs to consider whether the construct applies to associations of firms (as opposed to individuals or mixed groupings). If so, how do “communities” differ from

other constructs — particularly Powell's (1990) definition of a network, with its open-ended interdependence and relational coordination? Are there communities within networks or networks within communities? Does any set of firms with complementary offerings constitute a community, or only those with a specific shared objective (as in the definition of von Burg and Kenney, 2003)?

Interactions With and Within Communities

Communities differ in how they interact, both in terms of differences in types of members and differences in how communities are organized. Several of the papers in this issue have considered communities of individuals that interact with a sponsoring firm, but does this generalize to more complex community forms? The interplay of charitable trusts, non-government organizations, governments, universities and corporations to develop vaccines for sub-Saharan Africa offer but one example.

If we are considering differences in community interactions, are such differences economically or managerially significant to the community innovation process? If so, we would expect to see differences in important outcomes such as innovativeness (whether quantity or originality), speed, community mortality rate, or the ability of firms to commercialize innovations. Such difference might reflect direct effects or interactions between the nature and organization of the community and imply the development of more contingent theories.

Thus far, the interactions of firms and communities has tended to assume an intentional one-way flow from firms to community structure and organization. For example, West & O'Mahony (*this issue*) bifurcate between sponsored and

autonomous communities, but to what degree do sponsored communities show self-governing traits (consistent with O'Mahony 2007). In many sponsored communities (such as MySQL) firms tightly control code including the technical modularity that enables decentralized innovation, but what is the role of communities in enacting, negotiating or interpreting such modularity?

Finally, we've assumed that firms play a positive role in nurturing and developing communities. But what about parasitic actions by firms — that attempt to harvest the benefits of community innovation without contributing any resources to it? Conversely, communities can turn against firms and create significant economic damage and disruption (e.g., Mollick, 2005). Conflict amongst firms and communities is relatively understudied and its study may provide important insights into the community-based open innovation process.

Communities and Open Innovation

Prior research has identified the importance of individuals, firms, networks, industries and nations upon open innovation (West et al, 2006). Although much of the emphasis in open innovation has been on dyadic interactions between firms, clearly communities are also an important source of innovations, innovations that have been utilized by firms as inputs to their own innovation strategies (e.g. von Hippel, 2005).

How should communities be considered in the context of these other levels of analysis? Would an examination of the role of communities in open innovation produce any different predictions than examining the role of individual members of a community? Are there important industry or national differences in the suitability of communities as a source of innovations?

Although the user innovation literature has pioneered the understanding of community innovation, as the name suggests, the emphasis has been on innovations from downstream (the customer) side of the value chain.³ Conversely, both research and the practice of open innovation has emphasized the supply of inputs to a firm's innovation funnel. Does this gap reflect a fundamental difference in practice or just a difference in conceptualization? Is it due to differences in the assumed motivation — personal utility (scratching an itch) versus financial gain?

Such questions suggest multiple opportunities to integrate the study of innovation communities with the practice of open innovation. There is a strong managerial trend towards embracing innovation from outside the boundaries of the firm (Raynor and Panetta 2005) and the emergence of hybrid innovation models that integrate firm and communities (Lakhani and Panetta 2007). The challenge for scholars will be to build theories and derive empirical evidence to improve both the theory and practice of innovation

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³ As its title suggests, von Hippel (1988) takes the broadest possible view of innovation sources, explicitly including innovation by suppliers. Nearly all of the research that builds on von Hippel has focused strictly on users.

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