

Institutional foundations of open innovation and field dynamics in the software industry: from antagonism to contested cooperation between firms and Open Source community

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The problem of collaborative innovation between companies and Open Source communities

Open source software (OSS) development is a specific form of open and distributed innovation in the software industry (Chesbrough 2006; Chesbrough, Vanhaverbeke and West 2006; Krogh and von Hippel 2003, Baldwin and von Hippel 2011). As an alternative model for knowledge exchange in highly distributed innovation processes, OSS opens up a field for knowledge production that is both beyond the organizational boundaries of firms and outside of the restrictions imposed by the market (Benkler 2006; von Hippel 2006). OSS as a form of community based innovation and production follows a very specific institutional logic that frames cooperation and knowledge transfer within the Open Source community and serves as an overarching mobilization structure for developers (Raymond 1999; Benkler 2002; Weber 2004; Gläser 2007; Ferraro and O’Mahony 2012). Community based innovation and production is different from the market-oriented and hierarchical institutional logics followed by firms, as commercially motivated actors (Henkel 2008; Thornton et al. 2012).

Despite intense resistance in the early phase, Open Source software development (OSS) today is a widespread innovation model that is increasingly used by market-oriented actors in the software industry (Dahlander and Magnusson 2005; West and Lakhani 2008). But although firms are now important actors in the OSS world, this does not mean that their participation in and relationship to Open Source communities is a straightforward matter. In fact, communities can benefit *and* threaten firms (O’Mahony and Lakhani 2011). On the one hand, Open Source communities offer new opportunities for firms, in particular for strategic establishment of standards and engendering network effects in early innovation phases or monopolized market sectors (Garud et al. 2002). Instead of concentrating on internal R&D processes, firms take part in or collaborate with community-driven or community-managed software development (Lakhani, Lifshitz- Assaf and Tushman 2013; Chesbrough and Appleyard 2007; O’Mahony 2007). Furthermore, communities can contribute to

organizational processes: communities help organizations emerge and grow (O'Mahony and Lakhani 2011: 11). On the other hand, the production of freely available knowledge and the development of non-proprietary software can also pose serious threats to firms' interests and business models when Open Source software becomes a competitor to established firms' products or services (O'Mahony and Lakhani 2011: 22). Hence, the contested and often contradictory nature of the relationship between firms and communities is an important topic in current research (Wittke and Hanekop 2011: 11).

Recent contributions have specifically focused on the ways companies attempt to frame and coordinate collaborative production and innovation processes (Alexy and Reitzig 2013; Fitzgerald 2006; Bonaccorsi, Giannangeli and Rossi 2006, West and Mahony 2005) and to attract "voluntary contributions from a large number of external actors" (Wittke and Hanekop 2011: 19). Further research has highlighted the role of boundary organizations in establishing cooperation between commercial organizations and communities (O'Mahony and Bechky 2008). But despite the research conducted so far, the relationship between firms and communities is still a complex and underresearched topic. One important complicating factor is the diversity of forms of communities, and the functions they serve with regard to formal organizations and firms. We agree with O'Mahony and Lakhani (2011) who suggest that further research should not strive to find a common definition of community forms and its impact on firms and other formal organizations, but rather "pursue a process approach that recognizes the fruitful intersections where communities affect core organizing processes" (2011:36), in order to understand "what explains the emergence of communities within organizations and fields of endeavor" and "what [...] traditional organizations [are] not doing or not capable of accomplishing that communities provide instead" (O'Mahony and Lakhani 2011: 35 f.). Instead of solely focusing on the interactions between communities and firms on the micro level, we propose a broader approach that encompasses the complex interrelations between companies and communities. We will argue that extended the analysis to include the meso-level of the field dynamics of which companies and communities are a part advances our understanding of the arising forms of collaboration between companies and communities. The argument presented in the following is twofold: On the one hand, we will highlight the role a community can play in the institutional reconfiguring of a field. Our thesis is that Open Source communities in the software industry play an important role not only in the development of innovative new products, but also in the transformation of organizational and institutional fields. They provide the organizational form for distributed innovation and production. In a way, Open Source communities can be seen as "institutional entrepreneurs"

(DiMaggio 1988) who get disparate groups to cooperate by creating means that appeal to a large number of actors, propagating new frames that convince other actors to cooperate (Fligstein 2001: 106). In this manner, communities can transform the field-wide ‘rules of the game,’ altering the strategic positions of corporate actors and leading to collaboration between corporate and community actors.

On the other hand, we will argue that the corporate actors’ strategies towards collaboration with the community are shaped by their position in the field, and serve their interests inherent in the competition between incumbents and challengers in the field.

To substantiate our argument, we will analyze the transformation of the field of workgroup server operating systems that has arisen around Microsoft’s network environment, a set of services and protocols used to share files, printers and other services between clients and servers in local networks. We will present first empirical results from an ongoing research project (started in 2013) on collaborative innovation conducted at the Sociological Research Institute (SOFI) at the Georg-August-University in Göttingen in collaboration with the University of Oldenburg. The paper draws on interviews with developers and managers of the Samba community and cooperating companies conducted in the course of this project. Additional information was gathered in interviews with industry experts and online enquiries in publicly available documents on the Samba community (homepage, mailing lists). Additionally, participatory observation of the main developers’ conference in 2014 enabled us to gather important information about the interplay between the various actors involved in the Samba community. The field of workgroup server operating systems is an excellent subject for our endeavor because it has gone through significant changes during the last twenty years, leading to changed relations between corporate and community actors from antagonism and market dominance to contested cooperation.

The paper is structured as follows: the **first part** of the paper outlines the theoretical approach used to describe and analyze the dynamics of the field of study by referring to Fligstein & McAdams’s (2012) theory of strategic action fields. In the **second part** we will introduce and sketch the recent changes in the field of study. The **third part** of the paper will analyze the establishment of the Samba community, in which some Open Source protagonists succeeded in motivating a volatile group of independent and disparate actors to develop Open Source software to bridge Windows and Unix/Linux networks, enabling servers and clients from both worlds to interoperate. We focus on the practices and institutional logic of a distributed and open innovation process in this field. Finally, the **fourth part** of the paper is about the roles

and strategies of firms in collaboration with the community and about the question of how firms strive to leverage external knowledge for their own value-creating innovation processes. The paper closes with a short summary and reflections on the implications of the study for further research.

The aim of the paper is not to provide a comprehensive analysis of possible strategies of firms, but to discuss the ways in which the field dynamics on the meso-level interact with the innovation strategies of firms.

Theoretical background: strategic action fields

In order to describe the changes in the field of server-client network software we refer to theoretical approaches which address the structuring and institutionalization of social fields (u.a. Fligstein and McAdam 2012; Hargrave and Ven 2006). In the intersecting of social movement research, organization-sociological approaches, and neo-institutionalist approaches, a common basis has formed which, in spite of differences, affords a common perspective (Fligstein and McAdam 2012: 4). In their theory of strategic action fields, Fligstein and McAdam try to synthesize the common elements of these different approaches and bring them into a single framework. We employ these terms in our paper as well, to the extent possible, while at certain junctures we also point out approaches which complement and extend that of Fligstein and McAdam.

Thus we define a strategic action field (referred to in the following simply as “field”) as a social space in which at least two actors relate to one another in their behavior:

“If two or more organizations or groups are attempting to attain ends that are sufficiently similar that they are compelled to take one another’s actions into account in their behavior, then we can say that we are observing an attempt at field formation.” (Fligstein and McAdam 2012: 167)

According to this definition, action fields are constituted through mutual reference of actors to one another who are competing for certain purposes, or have similar objectives, in a given field. The advantage of this approach is that it allows us to conceptualize fields as dynamic social orders on the analytical meso-level (Fligstein and McAdam 2012: 9), making them well suited for describing changes between and within social fields. This approach focuses on the question of how social fields are structured by the actors; in other words, how the “rules of the game” – the institutional foundations of the field – are created and adapted through collective efforts of the actors (see also Hargrave and Ven 2006). Particular attention is paid

to the structure of social fields. According to Fligstein and McAdam (2012), strategic action fields are determined primarily through conflict between incumbents and challengers, with incumbents being “those actors who wield disproportionate influence within a field and whose interests and views tend to be heavily reflected in the dominant organization of the strategic action field” (Fligstein and McAdam 2012: 13), while “[c]hallengers [...] occupy less privileged niches within the field and ordinarily wield little influence over its operation” (Fligstein and McAdam 2012: 13). Although Fligstein and McAdam formulate this concept in a way apparently focused largely on political conflict in fields, we can use the same terms to conceptualize the conflicts we address in this paper, in the areas of technology standards and institutional meanings. Hargrave and Ven (2006) explicitly comprehend the creation of technology standards (referring to the example of SUN Microsystems’s attempts to establish Java as a standard) as a form of creation and adaptation of the institutional foundations of the field. It is in this sense that we shall describe the conflict between Microsoft and a coalition of challengers in the area of network-based services in intranets: a coalition of challengers from the Samba community environment is challenging Microsoft, the incumbent in this field. In the resulting battle for the institutional foundation of the emerging field, both sides try to use the community, each in their own way and for their own purposes. As we shall show, the different ways in which each side attempts to use the community are shaped by each side’s position in the field.

Fligstein and McAdam (2012) emphasize the actors’ “social skill” as a mechanism of change, defining “social skill” as “the ability to induce cooperation by appealing to and helping to create shared meanings and collective identities”. They consider social skill to be the most important means of actors to attain collective action by “reading people and environments, framing lines of action, and mobilizing people in the service of broader conceptions of the world and of themselves” (Fligstein and McAdam 2012: 17). In this, Fligstein and McAdam follow a social-constructivist perspective in highlighting the attainment of shared (or to be shared) interpretation schemas and meaning. When other actors in the field are persuaded to adopt the views of the socially adept (persuasive) actors, the socially skilled thus institutionalize their view and thus create the foundation for collective action in line with their interests in that field. But although this concept of social skill is aimed primarily at the creation and change of meanings and identities to legitimize one’s own action, it can also be applied to the unequal distribution of power and resources. If resources, or already institutionalized meanings, are highly unequally distributed in the field or primarily serve only one side, the incumbents may use this circumstance as a source of power in the conflict with

the challenger. In this sense, the social skill of the actors is in the ability to use their social skill targetedly and purposefully; thus the emphasis on social skill is not meant to replace the attention to be given to asymmetrical power structures and resource distribution, but rather to complement it (Fligstein 2001: 107). When observing the conflict between Microsoft and the coalition of challengers, it remains to be seen to what extent the actors (or groups of actors) on each side of the conflict can access which resources in the field and use them for their own strategic action in relation to the other actors.

Rise and dynamics of a strategic action field

Given the situation of 20 years ago, the field of client-server software for local networks (intranets) would not have been a good example for the study of open and distributed innovation processes. Back then, Microsoft – the monopolist in PC software – also strove to dominate the market for networks and server systems by integrating its proprietary network software inseparably with its PC operating system.

Microsoft possessed the proprietary knowledge regarding the technological standards and methodologies necessary to operate network services between Windows clients and servers. Innovation in this field was driven in-house at Microsoft. To use Fligstein et. al.'s (2012) terminology, the strategic action field was hierarchically structured with Microsoft having all the resources at its own disposal. But this situation changed dramatically with the rise of the Samba community, which began reverse-engineering the network protocols needed to interoperate with Windows clients and servers. The efforts of this community resulted in the Samba software package that enables Linux clients and servers to interoperate within Windows domains. Other actors, such as SUN Microsystems, for example, also strove to integrate their products and services into Windows network domains. But this task was complicated by the closed and proprietary character of the necessary network protocols, which Microsoft did not reveal to its competitors. Accordingly, a coalition of challengers, including other software companies as well as proponents of the free software movement, formed, whose minimum consensus was the demand for interoperability between different operating systems and applications in local networks. In the end, it was a lawsuit brought by SUN Microsystems that put into motion an investigation by the European Commission, which led to the commission's decision in 2004, declaring Microsoft guilty of abusing its dominant market position in the PC market to illegally shut out its competitors in the field of networked services. As a result, Microsoft was forced to make all of its network protocols and APIs necessary to effectively interoperate within Windows network environments freely available

to its competitors and the community. In its decision, the commission explicitly referred to interoperability as the foundation for competition in the market for workgroup server operating systems¹. Although Microsoft continued fighting the decision until 2012, the company started working on its terms in 2005, consecutively publishing the specifications and documentation of its network protocols. Interestingly, Microsoft ordered one of the prominent actors of the Samba community for this task, as Microsoft itself did not possess the information required for the disclosure of its protocols and APIs. The court's decision marked not only a significant change in the structure of the field but also an important shift in Microsoft's strategy in this field. Forced to disclose the protocols and documents which enabled other companies to develop software able to interoperate with Windows products, Microsoft could no longer rely on its proprietary knowledge and services to dominate the field. Instead, Microsoft chose an offensive strategy to tackle the topic of interoperability by taking a very active role in the distribution of the network protocols, effectively contributing to the Samba community and similar development projects. This change in strategy gave rise to the intense collaboration between Microsoft and the Samba community that we see today, and put the Samba community at the center of open and distributed innovation activities in this field.

How the Open Source community spurs the institutional and organizational transformation of the field

The Open Source project called Samba has a major role in the organizational and institutional change of the field in a number of ways. First, the Samba project is developing open software that bridges Windows and Linux/Unix networks, enabling servers and clients from both worlds to interoperate. The Samba software is a part of every Linux distribution, implementing the same protocol that is implemented in Microsoft workgroup server networks. In fact it has established a common standard for workgroup server networks and has succeeded in blocking the initial Microsoft strategy to gain dominance in this area. Second, the Samba community is an important actor in the coalition of dispersed challengers in the field. It catalyzed the field in bringing together different and even competing actors. In fact, the Samba team plays a vital role in forming and stabilizing the coalition of Microsoft challengers. And third, the Open Source community motivates developers to participate;

¹ <http://curia.europa.eu/juris/document/document.jsf?docid=62940&doclang=en>

² A good example for Microsoft's "old" attitude towards open source software is the "Halloween Document"²,

rules, practices and social relations in the Samba team create a framework that motivate cooperation and encourage a distributed, collaborative development process.

In this section, we analyze the institutional foundations of a distributed and open innovation process in which socially skilled actors build up an Open Source community (the Samba team), motivating developers from various contexts and firms to cooperate by making strategic use of the community's structures and institutions. As a consequence, they alter the field and establish a new institutional configuration.

The Samba team was initiated by actors who have not only excellent technical skills and reputations as developers, but also the ability to inspire enthusiasm for the project in others, and to move others to join in the collaboration. The initiator and main developer was a well-known Open Source developer before he started Samba, and the co-founder was an activist in the Open Source and Free Software movements, closely connected within the "startup scene" and the culture of Silicon Valley (today, he works for Google). Both are skilled, acknowledged and very closely acquainted with actors and situations in the field (Fligstein 2001:112 ff).

Within the constellation with Microsoft as incumbent on one side and a number of weak challengers on the other, the challengers have pursued a strategy that, referring to Hargrave and de Ven (2006), can be characterized as "collective action model of institutional change". The "collective action model of institutional change suggests that the social construction of the rules ... will be determined through a contested process in which actors mobilize their resources and other actors in an attempt to outcompete alternative framings" (Hargrave and de Ven (2006:882). We argue that the logic and structure of the OSS community - adapted and adopted from the Open Source movement - is a suitable form for the collective action that can establish an alternative framing, create new meanings and rules, as well as motivate, induce and organize cooperation among diverse actors and firms in the field.

The institutional logic of the community: Shared goals, rules and practices for cooperation

The purpose of the Samba community is the development of a Linux-based software to facilitate the communication between Windows and Linux clients in local networks. Linux clients are supposed to communicate as peers and offer services as if they were Windows computers, enabling servers and clients from the 'not-windows' world to interoperate. The challenge, and a strongly binding motivation within the Samba community, was the fact that before being forced to by the EU (see above), Microsoft was not willing (and to some extent not able) to systematically reveal and document on the protocol level how Windows computers in the workgroup network communicate with one another. The Samba team not

only reverse-engineered Windows network protocols, but also made the results public and integrated them into the Linux ecosystem. As a result, Microsoft's propriety SMB protocol became an open standard for networked computers and services, in particular file and print services. In its initial phase, this could be considered as a surprising – while unintended - form of open innovation in which the innovating firm still resisted.

The strong *shared goal* of unveiling proprietary knowledge, impeding the dominance of Microsoft and developing free and open software for server networks was critical for building the Samba community. Moreover, the institutional logic and culture of Open Source encourages and induces cooperation among diverse individual actors and frames the highly distributed and collective process of software development. An essential prerequisite for this strategy is to prevent private appropriation of the software by protecting it under the Open Source GPL license (now GPL Version 3), which is an explicit reversal of the fundamental principle of market-oriented exchange of knowledge ("copyleft" instead of copyright).

To achieve this strategic goal, it was important to integrate a variety of actors as well as competing firms in the cooperation, without allowing any of the firms to have decisive influence over the development. This was possible because the Samba team is open to diverse contributors from a wide range of firms in the field. According to O'Mahony (2007), this kind of *pluralism* is one of the main principles of community managed governance; it ensures that actors with multiple, even competing interests and views can participate and that no firm is able to dominate or determine the governance of the project. At the same time, it is important to mobilize the resources, in particular work hours, of competent developers to produce attractive and reliable software. Here again, the production model of community-managed Open Source projects does not require networking between firms with differing interests or changing corporate strategies.

Crucial rules and practices for collaboration among the developers in the Open Source community include the freedom to use and contribute to the software, the independence of individual actors, and self-definition of contributions, as well as the plurality of interests and meritocratic, decentralized decision-making within the OSS project (Weber 2004, O'Mahony and West 2008). Being embedded in such an institutional setting, the development of software is neither determined by individual firms and their strategies, nor by the (changing) personal priorities of developers.

Individual membership, independence and individual representation of developers in the community

Another central and fundamental principle of OSS development is that each developer decides for herself or himself whether and what to contribute. Basically, anyone can make a contribution, in the sense of using the shared development platform to offer suggestions concerning development processes or improvements in the software. When a suggestion comes from a team member, it is reviewed by another team member before it is integrated in the next version of the software. If the contributor is not yet a member of the team, he or she can ask a team member to put forward the suggested code. To become a member of the team, the prospective member provides contributions to introduce himself personally and to demonstrate his or her skills. Once being a member, one has access to all resources, in particular to the development platform (git) and the source code. Furthermore, all contributions are permanently accessible so that the originator of each line of code can be easily identified. Each member is expected to take part in the debates and decision-making processes involved in the product development, in particular regarding those parts of the program which he or she is working on and the code which he or she has written. In this way, the individual representation and membership structure of developers in Samba ensures that rights can be allocated to contributing members and that those members are represented in community-wide decisions. It also determines the degree to which members have a voice in discussions and decision-making processes within the community.

The independence and representation of all developers in the community is also a main criteria of community-managed projects for O'Mahony (2007: 144). It is based on the fact that each developer can make his or her own decisions on whether and what to contribute, and which tasks to take on. There is no institution or position in the community that can assign tasks. Even the founders and project leaders, although they do have a stronger voice in decision-making processes, do not have the option of assigning tasks to individuals, nor of sanctioning contributors when tasks are not completed. The motivation of the developers is decisive for a cooperative atmosphere and stimulating social relationships, because in addition to the attraction of challenging one's skills and intellect, social relationships (e.g. liking or disliking for a given co-developer) and the mutual stimulation and support are important factors for the willingness to take an active part in collaborative and highly distributed software development.

Contributions are also limited by the availability of resources and of the developers' time. These limiting factors dictate how intensively each developer can actually participate. This is

where firms do come into play – specifically, the firms that employ Samba developers. Generally, a given team member's cooperation in Samba does not depend on whether or not the development of Samba is the object of his or her paid position in a company; if it is, however, that team member can devote time to working on Samba during work hours. Thus firms can influence the development of the OSS project indirectly, by way of the time allowed to OSS developers and their assignments at the company (see below). Indeed, a large majority of Samba developers are employed in companies that are in some way involved in or affected by the commercial use of the Samba software, in that they offer support services or develop enterprise software solutions which use Samba software to communicate with Linux machines.

So, a large portion of Samba development takes place within the context of a paid position. Firms that employ and pay members of the Samba team for working on the Samba project are financing Samba's development. To this extent, Samba certainly falls into the category of company-sponsored projects (West and O'Mahony 2008). Thus the question of which development steps can be implemented depends to some extent on the actual economic interests and strategies of the Samba members' employers (see also below).

While this type of sponsorship does give certain firms influence over the activities of the developers and over software development in the community-managed project, the constitutive and institutional independence within the structure of an Open Source community is still an essential difference compared to the hierarchical governance in a firm.

Our empirical findings show that developers are free to define their work on Samba in alignment with their interests and orientations. First of all, some of the main developers working on Samba began this work during their studies, or even as part of their doctoral programs; it started as part of their acquisition of professional qualifications and shaped their professional development; in a word, their choice of employer came after their start with Samba, not before. This can also be seen in the career biographies of certain other Samba developers, who came to Samba by way of their professional employment and then stayed with Samba; when their employer lost interest in Samba or changed strategies, they changed employers. The most prominent of such cases is the Samba co-founder who left his job at Novell following the EU lawsuit, when Novell came to an agreement with Microsoft without taking the interests of the OSS community into account. Another example is a developer who quit her job after her employer cancelled his cooperation project with Samba. Samba developers often seek an employer who will enable them to work on Samba. The priority and continuity of their career lies in their work in the Samba team. This is facilitated by the fact

that these developers have a good position on the job market - thanks to their work in the Samba community - which gives them a measure of independence. Some of the Samba developers have changed employers without interrupting their work on the Samba project. Others have an employer for whom the membership of an employee in the Samba team is decisive for the success of the employer's business model; this also gives the developer in question a degree of independence. In all interviews with Samba developers, however, it was clear that some of the intensive developing work, in particular the more innovative part, spilled over into their private time. Hence, motivation and the agenda of developers are crucial in either case. To maintain effectiveness of such individual commitment over the long term, the project must be embedded in a social relationship and community-based institutional logic. This is ensured on the one hand through the anchor of individual participation (as opposed to the participation of firms, as is usually the case in firm networks) and individual authorship. On the other hand, it is maintained through the process of decision-making in the Samba team, where both formal roles and informal authority and influence lie with the developers.

Decentralized, meritocratic decision-making

Decision-making in the Samba team is transparent, open to members and meritocratic. Because the team is comparatively small and stable, decision making is less formalized. Every member is expected to take part, in particular to comment on or discuss further development of the those parts of the software he or she has been working on. From authorship follows a form of responsibility of the developer that also attests to his or her authority with regard to the code in decision-making processes. The author of a certain piece of code generally has to be consulted before changes are made. It is a general rule that new code will not be included if a member argues against it, given that his/her arguments are clear and objective. Arguments are discussed until a decision is arrived at by consensus.

Transparent decision-making is enabled by the openness and transparency of the code and each contribution. The same is true for discussions, which are open and transparent for each member on the mailing list. The basis for decision-making is the central mailing list in which all discussions, suggestions, contributions, reviews (and requests for reviews) take place. Most decisions are made in mutual agreement, and those whose work or area of interest is affected usually take part in decision-making. Objections backed by well-founded arguments lead to discussions in which consensus or compromise is sought. Decisions are not hierarchically pushed through. However, decisions that are of general interest or exceptionally controversial can lead to intense discussion. When the issue is important, the decision-making process can

be very long. This does not necessarily block the software development, since all are independent of the communal decision and continue to write code. But it does block the decision on the next new version. For example, it took more than five years to come to an agreement preceding the launch of Samba's fourth version. The lengthy process also resulted in two separate development paths, with developers writing alternative pieces of code independently of one another for years. Merging the two versions was a complex and work-intensive process. One of the problems the team faced due to this period of divergent development was that decisions had to be made as to whose code would be kept and whose would be discarded. In the end, external pressure from customers and users basically forced a solution. Finally, social competence of some team members enabled an agreement that made it possible to launch the next, integrated version of the software.

Decision-making in the Samba team is meritocratic. Anyone who has written a piece of code is asked to review changes to that code. Those who have contributed a lot have a stake in decision making, too. Furthermore, core developers are given more attention and more easily receive approval in debates.

At the same time, there are no formalized voting procedures, which means sometimes a decision can be made simply because no further objections were raised. So it may happen that decisions are made by the core developers although no explicit prior agreement could be reached; for example, because the opposing person or persons thought it better to bypass a conflict at that particular point.

Decisions affecting substantive suggestions for coding, however, are more rigidly formulated and structured. Suggested code undergoes a formal review, and any proposed addition or other modification must be examined and approved by at least one other team member. Reviews are usually requested from developers working in the same area. In most cases, informal decision making takes place beforehand, in that developers talk with the one who wrote the code for which the change has been suggested. This is also a meritocratic practice in which respect for the work of others is expressed, and it is a useful cooperation practice to preserve and encourage the motivation of contributors.

We do not wish to gloss over the fact that this community-based decision-making has its disadvantages and weaknesses – for example, it is almost impossible to set out a realistic road map. Furthermore, the implementation of a road map depends not only on the motivation of the developers but also on the amount of time and resources available to them, which means it is also subject to the strategies of the firms that employ them. Looking at the field in the past 20 years, one can comprehend the Samba team as a collective, institutional entrepreneur that

is capable of mobilizing developers and firms in a strategic, collective action changing the economic and institutional order in the field.

Varying firms' strategies for collaboration with the community

So, with regard to the actual state of the field, we have a great mixture of collaborations between commercial and community actors, rendering this field a good case for studying the strategic interactions between firms and communities. As has been argued in the sections above, the Samba community has played a crucial role in facilitating open and distributed innovation activities between the community and commercial actors. But the behavior of companies towards the community is driven by very different strategies and business models. As will be argued in the following, in order to understand the companies' different approaches towards the community, it is necessary to reflect on the companies position and the resources available in the field. The struggle between incumbent and challengers also shapes the companies' strategies towards the community and the role the community plays in their business models.

In order to substantiate our argument, in the following we will highlight two distinct strategies pursued by three commercial actors in this field and indicate how they are rooted in their position in the field.

From contestation to support: Microsoft's interoperability strategy

One of the major partners and supporters of the Samba community today -- though not being part of it, because there is no direct support by staff and no direct contributions to the Samba software code -- is Microsoft. Since the EU commission's decision in 2004, Microsoft has fundamentally changed their relationship with the Samba community. Where previously Microsoft had striven to counteract² many of the community's attempts to develop an open source implementation of the Windows network environment, they changed their behavior towards supporting the community after the EU decision. Since then, Microsoft has been actively promoting and supporting the implementation of their protocols in a wide array of activities, in close collaboration with many different actors (for an overview on Microsoft's efforts to implement interoperability, see Lange 2009). In this paper we focus on activities that are closely linked to the Samba community, but it is important to note that the new interoperability-strategy applies not only to the open source community but also to a wide

² A good example for Microsoft's "old" attitude towards open source software is the "Halloween Document"², see <http://www.catb.org/~esr/halloween/>, last accessed July 1, 2014

range of other commercial actors (for example SUN Microsystems before it was acquired by Oracle; Lange 2009) who desired to implement Microsoft network protocols in their products. The most visible effect of Microsoft's change of strategy is its presence at the Samba development conferences called Samba XP, where the community convenes on a yearly basis to discuss the strategy and plans for further developments and developers report on the results and prospects of their recent work. Since 2008 Microsoft has been a regular participant in this conference and even sponsored the conference in 2014. In this context, the participants representing Microsoft are approachable for all developers with regard to technical details and methodologies used by Microsoft. They take an active role in the technical debates to successfully implement new features of Microsoft's network protocols. The basis for this cooperation is the documentation and specification of the network protocols that Microsoft was forced to compile and share by the 2004 commission's 2004 decision. Though delayed, the documentation is now available to the community due to a special agreement between Microsoft and the Protocol Freedom Information Foundation (PFIF), a non-profit organization created by the Software Freedom Law Center in 2007. Accordingly, these documents form the basis for the ongoing cooperation between the community and Microsoft. According to the developers interviewed, Microsoft is very supportive in interpreting and implementing the network protocols. Important channels for their effort are the presentations and discussions at the developer meetings organized by the Samba community, the mailing lists and contact persons Microsoft has assigned to answer questions (via email) concerning interoperability with Microsoft protocols and the regular "Plugfests" Microsoft organizes in their corporate headquarter in Redmond. For these "Plugfests", Microsoft invites all those in any way interested in implementing Microsoft standards in their projects or products for a few days to Redmond for an intense workshop, where Microsoft staff is available to help implement Microsoft technologies. According to community members these interactions at the "Plugfests" have become an important source of knowledge for the community and have made the implementation of the network protocol's new features (like the Active Directory functionality) considerably faster and easier.

What is the strategy behind Microsoft's efforts to actively support the Samba community that, despite all the collaboration, still develops a product that competes with Microsoft products in the market and enables other companies (for example producers of network storage) to substitute Microsoft software? According to representatives of Microsoft, the goal of Microsoft's interoperability strategy is to make sure that Microsoft's network protocol remains the dominant network protocol in the field. In order to make their network protocols

the field standard, it is important that other products can use new features of the protocols' new versions as soon as they become available and as effectively as possible. So, for Microsoft, the community represents an important intermediary that helps Microsoft spread its network protocols within the field. To this end, Microsoft even accepts the possibility of rivaling products as long as these products use and further spread Microsoft standards. In a way, Microsoft's strategy resembles the strategies followed by other companies in other fields; for example SUN Microsystems with regard to their strategy with the JAVA technology (see Garud et al. 2002).

But beyond the setting of standards in the industry, there are also direct benefits for Microsoft resulting from its cooperation with the community. According to Microsoft representatives, cooperation with the community has enabled Microsoft to significantly speed up their innovation cycles, because new features are implemented in wider areas of products at a faster rate, which significantly increases the number of use cases for Microsoft. Moreover, the community has proven very useful in finding as well as correcting bugs in the protocol specifications³, thereby both enhancing the quality of the specifications and helping Microsoft eliminate bugs.

Governance by “rallying calls”: service providers and Linux distributors

It has been highlighted as the most significant characteristic of the Samba community that it is driven by a rather small group of developers who are almost entirely employed by companies with a commercial interest in Samba. Hence, besides Microsoft as the still dominant player in the field, there is a number of other commercially oriented actors in this field. This section focuses on the strategies of two important actors: companies focusing on end user support for Samba implementations and companies that sell and support Linux distributions of which Samba is an important part.

These two types of actors share important aspects in their strategies towards the community. Both kinds of companies share the challenger's position in the field and are part of the coalition that pushed the lawsuit against Microsoft and its proprietary use of its network protocols. But both types of companies also share the attribute of being small compared to Microsoft with regard to financial means and available manpower. Accordingly, for both companies, the efforts of the community to take on and improve the Samba software are vital to their business models. The challenge for both actors is to make the community do what is good for their business without having the means to force the community in the desired

³ Despite the invaluable effort to initially create these documents at all (see above).

direction. The result is what we call *governance by rallying calls*, a governance mechanism that is driven by the *social skill* of the companies' representatives and members of the community. Fligstein and McAdam (2012: 46) broadly define *social skill* "as the ability to induce cooperation by appealing to and helping to create shared meanings and collective identities". They consider social skill to be the most important means of actors to attain collective action by "reading people and environments, framing lines of action, and mobilizing people in the service of broader conceptions of the world and of themselves" (Fligstein and McAdam 2012: 17). The concept of social skill is a useful concept in understanding the behavior of service providers and Linux distributors in the community. Both types of actors try to influence the development's course within the community and try to set the agenda for further development according to their companies' needs. Of course, the companies' needs differ. Service providers have to prioritize the problems of their end users. When certain functionalities are demanded by their clients, service providers may try to push the community to find a solution for their specific problem. In this respect, the Linux distribution vendors are driven by their clients as well, because they try to offer a Linux suite that is comfortable to use and therefore has to be sensitive for the clients needs as well.

But since there is no formal mechanism to force the community into a specific direction, the main mechanism to this end is the open discussion within the community and the attempt to form coalitions with other actors to promote their own cause. In this regard, the companies' relationship with the community resembles a kind of competition between actors with different social skill all rivaling to set the agenda for further development. This debate is not only about technical details but also about the different meanings and identities involved: What are the important topics for the near future? Which is the right way to go? How should the Samba community position itself in the field in the future? Questions like this are frequently debated both at the Samba XP conferences and on the mailing lists. Thus, influencing these debates is crucial for the corporate actors involved. But it would be misleading to see the companies' efforts as purely instrumental. The developers the companies employ in order to participate in the community are not solely acting as representatives of the companies. They are somehow caught in the middle. On the one hand, they are part of the community (often they have spent more time being part of the community than being employed in the company), on the other hand they are part of the companies and are supposed to act in accordance to their goals. Debates about future development are therefore always debates about the identity of the developers and of the community itself as well as their interests.

So far, the strategies of service providers and Linux distributors are quite similar. But the picture would be incomplete without mentioning the differences in their strategic approaches towards the community. These differences stem from the difference in resources and their specific relationships with clients' organizations.

Service providers support clients in implementing Samba within their networks. Thus, the service providers' business model is directed at the clients' needs in working with Samba. In practice, this means that service providers are the main contributors in terms of bug fixing and those small improvements of the source code that are developed when fixing their clients' problems. But they lack the resources for research tasks because they can afford only these short phases of development for their clients that are not covered by projects. The situation is slightly different with the Linux distributors: Their clients are also implementing Samba software, but they pay for the entire Linux package (and support). Accordingly, Linux distributors can take alternative measures when they need features the community does not provide, because they can afford making their developers work rather independently on new features that are not yet used by client organizations. But even in this case, the Linux distributors upload their extensions to the Samba source in order to use the community for further maintenance and improvement of the code.

Conclusion: Field dynamics and firm strategies for collaboration with Open Source communities

The focus of this paper was on the analysis of the complex interconnections between institutional changes in the field of workgroup server operating systems and the emerging forms of open and distributed innovation processes between firms and the OSS community.

On the one hand, we have shown that institutional changes have taken place in this field and how interoperability between different operating systems has successfully become institutionalized (in part through judicial decision) changing the "rules of the game" in the field and altering the relationship between Microsoft, as incumbent, and the coalition of challengers. Microsoft no longer has the power to maintain its dominant position through its proprietary network protocols, and the challengers can now refer to the specifications and descriptions of those protocols to develop products that challenge Microsoft's products on the market. As we have shown, this has led to attempts on both sides to integrate the community, as an important actor, into their own strategy. We have focused in particular on how the community as an organizational and institutionally embedded form makes it possible for widely differing actors to collaborate. On the other hand, we have outlined the strategies of

three important actors in the field and attempted to show how the conflict between challengers and incumbent in the field is reflected in the firms' strategies to integrate the community. Microsoft, in spite of the forced revelation of their code, attempts to make its protocols the standard in the field by using its resources, which are still massive when compared to the competitors'. In this strategy, however, the community serves as an intermediary: Microsoft is not introducing the open standard itself, but rather are leaving that to the community that surprisingly advanced to a kind of "standardizing committee" after the court's decision. Moreover, the Samba team implements the latest version of Microsoft workgroup protocols in the Linux world. In return, Microsoft supports the community in the rapid and effective implementation of the protocols.

In spite of their improved position in the field, the former challengers continue to use the community as an external development resource and coordinating authority. But they still do not have direct control over the speed and direction of the development of Samba. We have pinpointed two company strategies for dealing with the limitations on control over the production process: First, development tasks connected to Samba that are vital for the success of the firm's business model are actively taken on in the firm's context. These are customer-driven improvements that come about through the Samba service providers, and the additional functionalities for the Linux distributions that are developed by Linux distributors. Second, they attempt to influence the development process in the community toward their own interests by using the strategy we have designated "governance by rallying calls." Both strategies respect and follow the rules and norms of the community, in particular in their reliance on contributions and attractive suggestions to persuade and motivate.

Our results confirm the fruitfulness of connecting field analysis and case studies. We concur with O'Mahony and Lakhani (2011) that it is necessary to go beyond single-case studies on the interaction between communities and firms on the micro-level, and also see the advantages of a process-oriented procedure. However, we suggest that further research should not only focus on comparisons of different communities and their relationships to firms based on common dimensions in order to determine their influence on organizational processes. Instead, the results of our investigation indicate a crucial role of the meso-level of the field in explaining the interaction between communities and firms. We have argued that taking into consideration the embeddedness of such interactions in the strategic action fields is fruitful in at least two aspects: on the one hand, communities are important drivers of institutional and structural changes in fields, and on the other, the strategic attitudes of firms with respect to communities can be better understood, and variations in dealing with open and dispersed

innovation processes better explained, if their field-specific positions, resources and strategies are given consideration. The structure of the strategic action fields and their alteration is an important influential factor in distributed and open innovation processes between communities and firms. Fields have on the one hand characteristic power to influence strategic action while on the other hand the fields themselves change through new or altered strategies of actors who refer to one another in the field constellation. In this interplay of actions on the micro-level and field structures on the meso-level, changes in institutions contribute decisively to the establishment and (re)stabilization of the new field constellation. Here, too, we can distinguish between two levels in the field: One is the anchoring of interoperability as a (legal) norm in the field, and the other is the rules and practices in the community for cooperation on the micro-level. One of the reasons the new field constellation was able to be established was because these new institutions are not in opposition to one another; on the contrary, they complement and support one another.

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