The Emergence of an Organizational Field:

The Case of Open Source Software

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Abstract

The institutional theory perspective has been used to study organizations and organizational fields. In this paper, we use the perspective to examine the emergence of the organizational field of open source software as an alternate to the field of propriety software. We highlight the role of institutional entrepreneurs in initiating a wide variety of institutional work to redefine the norms in a field and change field boundaries that demarcate a new field from an old one. Based on the analysis of a narrative account of the open source software movement, we provide propositions that capture the dynamics between individuals and organizations in the emerging field and the old one that is challenged. The findings have implications for other industries dealing with information goods.

Keywords: Institutional Theory, Information Economics, Open Source Software

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The institutional framework under which proprietary software operates is well developed with its regulative, normative and cognitive systems being widely shared in the organizational field. However, there also exists an alternate organizational field that produces and distributes open source software. What started as a movement promoted by the 'hacker' ethos of the 1960s is now widely accepted, not just by individuals, but also by commercial firms and governments. The open source movement has evolved from its original objective of free sharing of source code to becoming an alternative approach to software development that is non-proprietary, developed through peer network, supported by the Internet, and with little or no monetary benefits for the contributors. In this paper, we trace the evolution of open source software and use institutional theory to examine the emergence of this field as a response to the norms of the institution of propriety software that were unacceptable to many passionate software researchers and programmers.

Most early studies adopting institutional theory have focused on the structure and behavior of organizations (Scott, 2001), and attempted to explain the stabilizing and constraining role of institutions on organizations (DiMaggio & Powell, 1983). Later studies expanded the scope to study how institutions change over time addressing questions related to the sources and drivers of institutional change, the mechanisms by which individuals and organizations respond to this change, and the process of change (Dacin et al., 2002; Greenwood et al., 2002). In recent times, studies have focused on the emergence of alternate organizational fields and the role of institutional entrepreneurs in influencing the formation of institutional systems in these fields (Zietsma & Lawrence, 2010). However, not much research has focused on what institutional

entrepreneurs exactly do (Lawrence & Suddaby, 2006) and the intricate interplay between old and new institutions as they influence actors and organizations that are affected by the changes. The open source movement, with a well-documented history, provided us with an opportunity to examine the evolution of an alternate organizational field.

In this paper, we study the open source software phenomena through the lens of institutional theory to explore the circumstances that led to institutional entrepreneurship, the nature of institutional work undertaken, and the interaction among the individuals and organizations of the alternate field with those of the original one. Based on the evidence from this study, we argue that the process of institutional change need not necessarily be limited to altering or disrupting existing institutions, but could lead to the creation of an alternate organizational field. Such an alternate organizational field is likely to share boundaries and practices with the original field allowing agents to evolve their responses as the two fields interact and adjust to each other's practices. This paper contributes to the understanding of the software industry and the development of the alternate field of open source software. It also contributes to the institutional theory literature by highlighting the salient issues associated with the emergence of alternate organizational fields and institutions in the information goods industry relative to the traditional context in which the theory has been developed and applied. Further, it contributes to the understanding of how members adjust their behavior to cope with the conflicting pressures from two institutions.

Software as Information Good

The context of software product development has some unique characteristics that separates it from other industries. These characteristics have facilitated the emergence of an alternate field, and hence an understanding of these antecedents is essential. First, software products are

information goods, which are subject to the laws of information economics (Varian & Shapiro, 1999). In general, information goods have very high fixed costs of development or production and low marginal costs of reproduction. Patents, copyright and intellectual property (IP) laws were introduced to ensure that producers of propriety software products are able to recover the development costs, and constitute the second characteristic that has impacted the market dynamics of software products. IP protection allows producers of software products to price their products at above marginal cost in order to recover the high fixed cost incurred in their creation. But goods that are priced at higher than their marginal costs often led to an inefficient market that potentially results in a loss in consumer surplus. It also increases the incentives for software piracy, necessitating laws that further expand protections for propriety software and harsh penalties for those who violated these norms (Boyle, 2008) thus creating "digital fences".

Another unique feature of software is that software is both an input and an output of the production function. When a product is priced at higher than its marginal cost of reproduction, it leads to a decrease in the number of consumers who can afford, or are willing to pay for the product. In addition, the higher price of products leads to an increased production cost for subsequent cycles of production, causing further reduction in the market for such products. This dual impact leads to a reduction in consumption as well as in production.

The Internet played a significant role in the rapid emergence of the alternate field. The Internet facilitated a networked environment in which a large number of individuals were able to collaborate and share information. This resulted in the economics of software production undergoing a significant change-- what was earlier required to be produced in a centralized manner could now be produced through the efforts of decentralized individual actors; and what was distributed to users through mass sales channels could now be distributed individually

through the Internet. In such an arrangement, the software product is produced by decentralized individuals, who collaborate over the Internet to produce software that is non-proprietary in nature, and with no monetary incentive to participate in this production (Benkler, 2006).

In short, the stringent IP protection and the structure of the software development process have the potential to hurt the industry and the society at large. The need to protect the industry and society from those who might hurt it through an excessive focus on earning monopolistic profits was the inspiration behind the institutional entrepreneurs who worked towards the organizational field of open source software. The Internet has greatly facilitated the process.

Institutional Change and Institutional Work

The idea of an organizational field is at the heart of institutional theory (Greenwood et al., 2002) and refers to a set of organizations that are influenced by each other during the process of producing goods and services. They collectively participate in the process of creating shared meaning; define the boundaries of the organizational field; the criteria of membership; and the appropriate ways of behavior among internal members, members of other fields, and beyond. Institutional theory views institutions as comprising of regulative, normative and cognitive elements (Scott, 2001). Institutional elements consist of formal rules and informal constraints (North, 1990) that provide stability and meaning to life within the field through associated activities and resources (Scott, 2001) and are transmitted, maintained and reproduced across generations (Zucker, 1977). Early work using institutional arguments, largely focused on the constraining influence of institutions on organizations within its field (Oliver, 1991). However, more recent studies have examined the changes in institutions including both outsider driven deinstitutionalization (Maguire & Hardy, 2009) as well as insider driven deinstitutionalization (Zietsma & Lawrence, 2010).

The concept of legitimacy is central to the idea of institutions and to the notion of institutional change. Suchman (1995) identified three forms of legitimacy loosely corresponding to the three types of elements in an institution. Pragmatic legitimacy refers to approval from other entities in the field that is provided when the focal organization meets the self-interest of others in the field. A certain level of pragmatic legitimacy allows an organization to proceed smoothly with its normal functioning. Moral legitimacy, based largely on adherence to normative elements, refers to the evaluations by members within the field whether the activities of an organization promote societal welfare. It has less to do with the self-interest of the agents or their organizations but more to do with the altruistic nature of the activity. Moral legitimacy allows actors to pursue their activity with a sense of purpose and meaning. Finally, cognitive legitimacy refers to the extent to which the activities of an organization mesh with the taken for granted norms and belief systems in the institution. Institutional entrepreneurs pursue changes to increase pragmatic legitimacy, but they are often driven by the need to improve the moral legitimacy of their activity, which also requires changes to the basis of cognitive legitimacy in a field.

Greenwood et al. (2002) conceptualized institutional change as a six stage process. An institution is likely to experience jolts that destabilize established norms and practices in Stage 1, followed by the process of de-institutionalization in Stage 2 which disturbs the socially constructed consensus in the field. Stage 3, or the pre-institutionalization stage, involves the introduction of innovations in the field that may replace the old norms and practices. Stage 4, or theorization stage, is the period in which institutional entrepreneurs justify and provide pragmatic and/or moral legitimacy arguments for the new norms and practices. Following this, in Stage 5, the new norms get diffused among other actors in the field. Finally in Stage 6, which is the re-

institutionalization stage, the new norms and practices obtain cognitive acceptance and becomes taken for granted in the field.

Institutional work refers to the work of actors that create, maintain and disrupt the practices in an institution. It has been defined as the process of creating alternate institutions or changing established institutions through purposive actions (Lawrence & Suddaby, 2006). Recent studies on institutional work have included Maguire and Hardy (2009) who studied the field of DDT, Ziestma and Lawrence (2010) who examined changes in the institution around 'clear-cutting' in British Columbia, and Lepoutre and Valente (2012) who examined the institutional work in emergence of alternate field in the Belgian horticulture industry. Dunn and Jones (2010) demonstrated that organizations are often influenced by two or more institutions that lead to the presence of plural logics.

Methods

The history of the open source movement is well documented (see Aksulu & Wade, 2010, who reviewed 618 papers on open source software). There also exists a rich set of papers in the academic literature. We relied on these publically available documents to develop a narrative of the evolution of open source software from the early 1960s to the early 2000s.

A narrative strategy is often used as the primary analysis tool for studies involving multiple phases (Langley, 1999). Our approach was to first develop a narrative on the evolution of open source through a review of the published literature. Next we reviewed the narrative using the framework developed by Lawrence and Suddaby (2006) for the purpose of identifying the institutional work in the evolution of the field. We then identified the conditions leading to the emergence of the alternate field and analyzed the boundaries of the open source field in relation

to the existing field of proprietary software. As a final step, we examined the interactions between the fields. We then developed propositions to present our findings.

Contextual Background of the Study

We loosely adopted Lerner and Schankerman's (2010) classification of the open source software movement into three eras to illustrate the evolution of the field.

The First Era. The collaboration among research laboratories located at universities and corporate research laboratories had an important role in the development of early versions of operating systems, programming languages, and the Internet. Researchers enjoyed a great deal of autonomy in pursuing their goals and it was commonplace for them to share software code and programs among themselves (Lerner & Schankerman, 2010). UNIX, as an operating system, played the dual role of being the object of creation as well as the intermediary through which this network of informal sharing of information prospered. Network Working Group (NWG) and Request for Comments (RFC) were used by various actors as a means of collaboration. Thus, by default, much of what is today referred to as open source norms and practices already existed in the networks of university-based and firm-based research laboratories in the 1960s and early 1970s. This network of collaboration was informal in nature, imposed no property rights, and was without explicit regulative control.

During the late 1970s, however, AT&T chose to enforce intellectual property rights (IPR) on the UNIX operating system requiring users to bear the license costs for its usage. This attempt to impose the norms of proprietary software was a set-back to the network of collaborators as they no longer had free access to the UNIX system, the primary medium of their collaboration.

The Second Era. This era is characterized by the action of a few key actors to resist the imposition of property rights as initiated by AT&T. Richard Stallman, a programmer at the

Artificial Intelligence (AI) Laboratory in Massachusetts Institute of Technology (MIT), had a key impact in the early days. Stallman first encountered the problems manifested by proprietary software when he was unable to modify a problematic printer driver provided by Xerox (Stallman, 2001). Stallman quit the laboratory when its operating system was replaced by proprietary software and created a free operating system named as GNU, a recursive acronym for "GNU's Not Unix". This effort eventually led to the formation of the Free Software Foundation (FSF) in 1985. The FSF was set-up as a tax-exempt charity to raise funds for promoting the freedom to change and share software (Stallman, 2001). A year later FSF released GNU Emacs: an editing software that was made freely available over anonymous FTP and by tape for a charge.

While GNU was taking shape at MIT, there was another movement being initiated at the University of California (UC), Berkeley. The university had a strong collaboration with Bell Laboratories for developing UNIX. In 1977, the development of UNIX branched out with one version being Bell Laboratories' UNIX and the other one being the Berkeley Software Distribution (BSD) (McKusick, 1999). BSD was a free version, shared among research communities in universities across the world, but still required the purchase of a source license from AT&T for using the kernel that was still proprietary to AT&T. Soon after, UNIX became commercialized and Bell Laboratories was no longer directly responsible for the development of UNIX.

The CSRG (Computer Science Research Group) at UC, Berkeley continued development on UNIX. However, the prohibitive license fees of the AT&T UNIX impeded vendors wanting to develop standalone TCP/IP applications. This led CSRG to strip the TCP/IP code out of UNIX and release it as Network Release 1, freely downloadable as well as distributed for a charge by

tape (McKusick, 1999). The success of Network Release-1 encouraged Keith Bostic, a member of the CSRG, to propose the development and release of a complete BSD version which was free of code developed by Bell Laboratories. This was a voluminous work needing the replacement of hundreds of programs and files. The approach taken by Bostic was to solicit developers to contribute to the development of BSD. He offered no compensation except for listing credits in the source code as an acknowledgement for the effort. Most of the files were written in less than two years setting the precedent for mass contribution by a community. Soon, several other communities worked on variants of BSD such as the 386BSD, FreeBSD and NetBSD, further strengthening the movement for free and open source software.

By late 1980s, both BSD and GNU were in advanced stages of development attracting wide scale usage within the 'hacker' community. Concerned that code from the GNU could be incorporated in proprietary packages, Stallman decided to adopt a "Copyleft" license to ensure the protection of the GNU software. By "Copylefting" a program, one first copyrights the program and in addition provides the licensee the right to use, modify and distribute the program under the condition that the licensee also grants similar rights to the modifications made by him/her (Mustonen, 2003). The particular variant of license used by Stallman was called GNU General Public License (GPL). He released the first version of the GNU GPL license in 1989 and subsequently a modification in 1991 (Bretthauer, 2002). The BSD software, in the meantime, was being licensed through the BSD license. A significant difference between the GNU GPL and the BSD license was that while the GNU GPL protected the code from being incorporated by proprietary packages, the BSD license imposed no such restriction. The idea behind the BSD license was that free usage should be allowed by everyone including commercial software providers who developed propriety software.

The month of October, 1991 marked the entry of another significant actor into the open source software movement: an undergraduate student at the University of Finland named Linus Torvalds. Torvalds, who used to work on an operating system called Minix at his university, developed and released Linux kernel version 0.02 and posted a message announcing the release of a Minix look-alike operating system that was in an early stage of development and available absolutely free for anybody. What was significant about this announcement was that it dared to replace the core kernel that other operating systems such as BSD and GNU were unable to achieve and challenged the 'hacker' community to develop a world class operating system (Bretthauer, 2002). The Linux version attracted a large community of developers who borrowed heavily from GNU and the BSD version (McKusick, 1999) and soon Linux evolved as a superior operating system competing with the more popular commercial operating systems. The development of Linux was markedly different from those of BSD and GNU. Unlike the latter that was developed in a fairly tightly controlled environment and by a closely knit group of people, the former was marked by its open style of development and huge number of programmers contributed over the Internet. Linux achieved its superior quality, not because of rigid standards and gate keeping, but by frequently releasing incremental versions and letting hundreds of developers provide continuous feedback. Raymond describes the Linux development as the "Bazaar" style of software development with his famous quote "Given enough eyeballs, all bugs are shallow" (Raymond, 1999: 41).

The Third Era. Facing threat from Microsoft's Internet Explorer (IE), Netscape Navigator announced the release of the source code of Navigator web browser as free software (Lerner & Schankerman, 2010). The motive behind open sourcing the browser was to counter the monopolistic attempt of Microsoft which was distributing its version of IE bundled with the

Windows Operating System. This was the first instance of a commercial firm seeking the aid of the open source software movement to counter the advantages of another large commercial firm.

Till the late 1990s, the phrase 'open source' was not in circulation and software distributed by the community was mostly referred to as free software. In order to discard the ambiguity carried by the term free software, leaders of the movement met in February, 1998 and coined the phrase "Open Source". The FSF led by Stallman did not adopt the "Open Source" tag and preferred to continue promoting free software. Nevertheless, "Open Source" was widely communicated and accepted by the community. This group, calling themselves the Open Source Initiative (OSI), provided a formal definition for "Open Source", registered the domain name opensource.org, developed the OSI certification and published a list of licenses meeting this certification (Bretthauer, 2002). The formation of the OSI provided legitimacy to the open source software movement in multitude of ways. By providing a formal 'definition', OSI laid clear rules on what constitutes the field, who its members were, the rules that govern the membership, and the creation of a formal accreditation process. In addition, the OSI established 'vesting' norms by establishing various types of licenses that provide different levels of liberties.

Lerner and Tirole (2005) argues that the different types of licenses have a significant role in promoting open source software adoption and firms strategically chose the type of license based on their usage pattern. For example, their model suggested that open source projects launched by non-profit foundations with permissive licenses, such as the BSD, is more likely to appeal to the community as potential contributors seek benefits from signaling incentives. Commercial firms launching open source projects, however, are likely to adopt restrictive licenses such as the GPL in order to signal their intention of not appropriating property rights for themselves. Mozilla Public License is an example of such a restrictive license adopted by Netscape to ensure that

potential contributors were assured of their contribution not being appropriated for commercial gains (Lerner & Schankerman, 2010)

Another significant event in the history of the open source movement was the launch of SourceForge.net, a web-based source code repository that provided a collaboration platform for the open source software community. Subsequently, several other collaboration platforms   such as Launchpad, GNU Savannah, Novell Forge, GitHub etc. were established. The impact of SourceForge was not merely in terms of providing a platform for open source projects to collaborate, but also as a platform for potential users to scout for new open source products.

The mid-1990s saw the launch of several other successful open source software products. It is worth mentioning specifically three products: Apache, MySQL and PHP. The combination of Linux, Apache, MySQL and PHP, often referred to as LAMP technologies, soon became a preferred technology stack for developing web-based applications and was widely used for developing web-applications, both commercial as well as non-profit ones. The 1990s saw the involvement of commercial firms such as Suse, RedHat etc., who were developing for-profit business models around open source software. Later, commercial firms got involved for multitude of reasons such as (i) providing employees the opportunity to sharpen their skills by participating in open source development, (ii) reusing code that was developed under permissive licenses, (iii) leveraging technological development in the open source world, and (iv) attempting to simply generate good public relation by contributing to popular programs (Lerner & Schankerman, 2010). In addition, some firms also released proprietary code under open source license for competitive reasons such as IBM providing source code of its Cloudspace program to Apache Software Foundation, and Hewlett-Packard releasing its Spectrum Object-Linker to enable Linux to operate on HP's RISC computer architecture (Lerner & Schankerman, 2010).

Analysis

Having presented the outline of the history of the open source movement as a narrative, we will first examine the elements of the two competing institutions, the explanations for the institutional change and the establishment of the alternate organizational field, and the institutional work undertaken by institutional entrepreneurs in the process of creating the field. We then focus on some unique dynamics in the context, differentiating it from other contexts that have been examined through the institution theory perspective, and then present a series of propositions.

Institutions, Institutional Change and Institutional Work

Two Institutions. It is quite clear from the reaction of the early institutional entrepreneurs such as Stallman that software researchers and developers had a shared understanding of the norms that governed their activity. In the 1960s, the elements of the regulative system were not very apparent, but there existed a normative system in which these actors operated, and a cognitive system that provided a shared meaning and purpose for their activity. The normative system allowed and encouraged laboratories in universities or other government supported organizations to freely interface with laboratories in profit making organizations. Actors within these laboratories had internalized the notion of collaborative research and development as an integral part of the cognitive system. The efforts to create an alternate organization field that resulted in the field of open source software was supported by the fact that it had the cognitive legitimacy from software researchers and programmers who always thought that software was to be produced collaboratively and freely shared. The social goal of trying to address the needs of providing software at lower costs or no costs provided the moral authority for the entrepreneurs and others in the movement to take on the might of the propriety software industry.

Stages of institutionalization. The act by AT&T to impose IP rights on software shook the taken for granted nature of that stability and provided the precipitate jolt (Greenwood et al., 2002) or Stage 1 event that led to early entrepreneurial activity. This act, along with subsequent efforts, to enforce the regulatory system informed by notions of property rights made several actors re-examine the normative and cognitive elements of the institution in the field.   Richard Stallman can be considered as an early institutional entrepreneur responsible for laying the ground work for the open source software movement resulting in the first signs of de-institutionalization that occurred in Stage 2 of institutional change. Kieth Bostic, Linus Torvalds, and Eric Raymond, among many others, were other key institutional entrepreneurs who contributed to the institution work in carving out a separate field of open source software. Key actors experimented with several alternate ways to protect the normative and cognitive elements that existed before property rights got enforced. Distributing GNU and Emacs free, introducing 'Copyleft' licenses and the 'Bazar' model of development were innovations to replace old norms and practices during Stage 3. While the bulk of the software industry complied with the institution of proprietary software, and made changes to their work patterns to adapt normative and cognitive systems that were compatible with the 'new' regulative system, the efforts of a few institutional entrepreneurs to retain the moral and cognitive legitimacy of the earlier period challenging the need to obtain the pragmatic legitimacy from those who supported the propriety software regime culminated in the emergence of the open source software field. Raymond's essay, "The Cathedral and the Bazar" is representative of the attempts at theorization of the legitimacy of the alternate institution in Stage 4. The proliferation of OS products, creation of OSI and the entry of Suse, Redhat, IBM and HP all reflect the diffusion of the open source software institution among other actors in Stage 5. At the end of the period studied, the field of

open source software was in the re-institutionalization stage or Stage 6 as SourceForge.net and other collaboration platforms enforced the normative and cognitive norms of open source software in the field.

In the rest of this section we provide some propositions that present some unique findings related to the field of open source software.

Institution Stability and Information Goods

We observe that during the various stages of the emergence of the field of open source software, the information characteristics of software products allowed institutional entrepreneurs to easily disturb the stability of the established norms of propriety software. The low marginal cost of reproduction allowed some actors to leverage their knowledge to develop new software products without violating any laws. It was much easier for software professionals to access and use knowledge and set up work spaces for contributing to the open source movement relative to any other industry. The alternate development processes were facilitated by the ease with which software could be broken down into sub-components and again reconnected to produce the whole. We also observe that the information network system facilitated the participation of widely dispersed individual programmers and organizations to collaborate in the activities of the field. Together, this allowed institutional entrepreneurs to easily access a large number of motivated professionals and have them contribute to the development of the alternate field. In short, the ease with which the institutional entrepreneurs in the open source software movement were able to unleash disruptive practices with the support of geographically distributed actors contrasts with the difficulties faced in the disruption of organizational fields of 'normal' goods and services as seen in Maguire and Hardy (2009) and Ziestma and Lawrence (2010).

Proposition 1: *Institutional stability in an organizational field of information goods will be more easily disturbed than in an organizational field of 'normal' goods.*

Institutional Entrepreneurship in the Software Industry

We notice that the origins of an institutional field may be in practices that are not formally organized or motivated, till they are threatened by the enforcement of the elements of the original institution. The enforcement of IPR norms on the collaborative efforts of researchers in university and corporate laboratories had a disruptive impact which triggered the transformation of regular software professions into institutional entrepreneurs. AT&T's decision to enforce the IPR norms provided the precipitating jolt that initiated the process of de-institutionalization (Greenwood et al., 2002) of the propriety software institution. This resulted in the marginalized actors taking on roles of institutional entrepreneurs to create a new open source software field as a replacement to the original field of proprietary products. Stallman's effort to launch GNU and offer free access to the product for use as well as change is one such example. A key challenge, however, was the enormous amount of effort required for developing such large and complex programs. The response from the institutional actors, such as Keith Bostic and Linus Torvalds, was to mobilize large scale collaborative efforts of distributed programmers by appealing to their intrinsic motivation and sense of morality. The resulting community came to be recognized by its 'hacker' identity that includes solving software problems, freely sharing the code, and sharing a group identity derived from a sense of obligation to the community (Lakhani & Wolf, 2005).

Proposition 2: *A precipitating institutional jolt can transform regular professionals into motivated institutional entrepreneurs who are very keen to establish new logics with different bases for legitimacies in an organizational field.*

Boundaries of an Organization Field in the Software Industry

A primary driver of social production was the need to develop information, knowledge and culture that can be made available for mass consumption and without the intentions of appropriating rents by its producers. However, these free information goods are vulnerable to being used by other actors for proprietary production, and once reproduced as a private good they are secured under property rights leading to the very producers of these inputs being shut out from their own creations. Thus, the risk of such an appropriation by individuals and firms for private use also makes it less attractive to contribute in the first place (Benkler, 2006), leading to the dual impact of drying-up of information input as well as a reduction in individual motivation to contribute. A solution to this problem was offered by Stallman when he invented the GNU General Public License, also referred to as "Copyleft". Copyleft licenses use copyright law, not to protect software from being privatized, but as a means of keeping it free. Copyleft licenses forces modifications and combinations to be redistributed under the same license terms as the original work (deLaat, 2005). The concept of Copyleft license soon became widely accepted with various shades of licenses ranging from restrictive form such as GNU GPL to permissive licenses such as BSD license. The creation of Copyleft licenses can be seen as a significant institutional practice work that led to further demarcation of the boundary between the two institutions: one governed by intellectual property, patents and copyrights that enable firms to appropriate value; and the other governed by Copyleft license that enforce free sharing!

Propositions 3: *Institutional stability in an organization field of information goods is more likely to be disturbed as motivated insiders find it easy to establish boundaries for an alternate organizational field that is not subject to the norms of the old dominant field.*

Social Production in the Software Industry

The open source movement required the support of a large number of programmers to contest the strong roots established by proprietary software. This was made possible through the

mobilization of large scale cooperative effort among a diverse and disparate set of individuals and organizations enabled by the Internet. Linus Torvalds exploited these factors to establish the bazaar style of development that was characterized by a large mass of diverse programmers collaborating through the Internet, developing incremental versions of the software that was being simultaneously peer reviewed by the community, and resulting in superior quality software. The bazaar style of development soon became an institutionalized practice significantly demarking the open source community from those of proprietary software.

As argued earlier, the bazaar style of organization was possible given the nature of software being information good. However, a large scale development of such information goods was possible only because there was a mass collaboration among a diverse set of individuals who channelized their individual efforts towards a common goal and produce a good through self-organized teams that operate outside the boundaries of a firm. The technical and organizational architecture of Internet was what made this possible. Shirkey (2008) attributes this to the intrinsically sociable nature of humans who tend to self-assemble into groups and engage in group efforts, and the role of Internet enabled technology that has radically altered the magnitude of such unsupervised group effort. Apart from enabling essential practices such as the decentralized form of peer collaboration, the role of the internet can also be seen to be fundamental in enabling various other practice and boundary work such as its role in promoting open standards, as a tool for communicating the open source philosophy, or as a medium that enables wide scale adoption of open source products.

Proposition 4: *Institutional entrepreneurship in an alternate organizational field of information goods can be more easily established because (a) the Internet facilitates social production and (b) the Internet provides support to institutional work that challenges the prevailing institutionalized norms and practices.*

Competition among Institutional Entrepreneurs

Earlier studies on the emergence of alternate organizational fields have reported the institutional work of institutional entrepreneurs in opposing a dominant institution and creating the foundation of an alternate institution. There are also instances in which institutional actors with differing motivations cooperate in maintaining an organizational field having competing institutional logics existing over a period of time (Reay & Hinings, 2009). In the case of open source software we notice the interactions of institutional entrepreneurs who shared a common belief in opposing the dominant institution but had differences over the elements of the alternate institution. Even as their efforts to oppose a dominant institution united these institutional entrepreneurs, their own differences over the 'new' institution allowed conflicts to co-exist with collaboration as they saw their efforts fructify.

The difference in opinions and philosophies between the proponents of open source and free software is an example that illustrates this point. While both open source and free software had the same beginning, the Free Software Foundation refused to be part of the Open Source Initiative. Explaining why open source and free software are not the same, Stallman describes the difference as: "Open source is a development methodology; free software is a social movement" (Stallman, 2009:31). As Stallman elaborated, the philosophy of open source software is purely based on pragmatic legitimacy as the open source software development allows the community to collaboratively work to make it powerful and reliable (Stallman, 2009). Thus, open source software could provide for licenses that allow vendors to distribute executables corresponding to free source but inhibiting users from actually undertaking changes. On the other hand, the philosophy of free software is that "Software can only be said to serve its users if it respects their freedom" (Stallman, 2009:33) which displays a greater emphasis on moral legitimacy. However,

institutional entrepreneurs from both streams of thought and motivation have cooperated at different stages to share their rejection of the institution governing propriety software.

Proposition 5: *Institutional entrepreneurs with different motivations may cooperate with each other to conduct institutional work to create an alternate organizational field because of shared opposition of a dominant institution.*

Permeable Organizational Field Boundaries

We notice that during the transition, actors from both the dominant institutional field and the alternate field attempt to redraw the boundaries of the fields that were confusing to the agents within the two fields as well as those outside. The browser wars of the 1990s can be considered as an example to illustrate the attempts of proprietary vendors attempting to draw practices from the newly formed open source movement. During this time, Microsoft had effectively exploited the network externalities of information goods by bundling complimentary software along with their core Windows offering (Wang et al., 2005). By bundling essential desktop software along with Windows, Microsoft was able to monopolize and crowd out other software from the user desktop systems. Netscape Navigator, which used to have nearly 80% of the web browser market share during the early 1990s, was a victim of such monopolistic actions and quit the browser business in 1998. Netscape was succeeded by Mozilla who revived the browser, renamed it as Firefox and released it under open source through the Mozilla Public License. Mozilla's revival of the browser is a case of an organizational actor jumping across the boundary. By adopting a very restrictive license Mozilla further signaled to the developer community its intention of not appropriating community contributions for commercial gains (Lerner & Schankerman, 2010).

Another case of an organization leveraging on practices from across the boundary is that of IBM's adoption of Apache web browser. IBM and Microsoft were engaged in the battle for gaining control in the web server market. The dominant web server, however, was an open

source product called Apache with a market share of close to 50% (Koenig, 2004). IBM's response to the competition was to drop its own web-server and instead adopt Apache, which resulted in Apache's market share increasing to 70% and thus preventing any chance of monopolization by Microsoft (Koenig, 2004). IBM and several other vendors were also able to derive commercial benefits through network effects of open source by actively supporting open source products on their platform, or releasing base versions of proprietary software products under open source license. While organizations such as IBM and HP were motivated to actively support open source products to derive benefits through sales of complimentary products, other commercial organizations such as Suse and RedHat developed commercial business models by providing services on open source products.

Additionally, it was not just the organizational actors who found an opportunity in transcending the borders. Individual programmers, employed by commercial software firms, found a motivation to contribute to open source as a signaling mechanism to potential employers (Lerner & Tirole, 2002). Several commercial software firms actively encouraged their employees to spend their time in contributing to open source (Lerner & Schankerman, 2010) with the intent of ensuring that their resource talents were current and to explore the possibility of mining innovations from the open source repository (West & Gallagher, 2006).

Thus, we notice that the practice work arising as part of the institutional change was instrumental in defining the boundaries of the alternate institutions. During this process, we also observe that the boundaries between the old and the alternate fields are drawn and redrawn, as agents operating within these distinct institutions adjusted and adopted to practices across the boundary.

Proposition 6: *Old and alternate organizational fields with different regulative, normative and cognitive elements can co-exist with porous boundaries that may be drawn and redrawn such*

that agencies may occasionally adopt the institutionalized logics of the field to which they do not normally belong.

Discussions and Implications

We undertook the study of the institutionalization of open source software, explored the process of institutional change leading to the emergence of an alternate organizational field, and elaborated on the characteristics of software that triggered the institutional change, the role of the Internet in drawing the boundaries and defining the practices of the alternate field, and the interactions between these two organizational fields around their boundaries. We summarize our findings and its possible implications to institutional theory.

Institutional actors driving institutional change are often seen as insider actors who translate exogenous shocks, institutional innovators operating in the periphery, new entrants or those bridging boundaries (Zietsma & Lawrence, 2010). In our case, we notice that the marginalized actors who initiated the creation of the new open source movement were well accomplished programmers who were insiders having contributed significantly to the traditional software industry. These actors were motivated not as a result of any exogenous shocks but due to the underlying complexities of information economics on which the original institution was based. Further, we notice that the process of ongoing institution work could impact a dormant logic that can then act as a trigger for institutional change. Lok (2010) had elaborated on the role of non-entrepreneurial actors in the institutionalization process as they participate in everyday identity work. Our study extends this work by elaborating how such regular professionals turn into institutional entrepreneurs as they engage in new identity work and establish new logics in the organizational field. We also notice that the motivated institutional entrepreneurs were able to establish boundaries of the alternate field by exploiting the properties of information goods.

Further, the role of Internet is visible through impact on the social production of information goods and as a vehicle to pursue institutional work. Maguire and Hardy (2009) examined outsider-driven de-institutionalization and Ziestsma and Lawrence (2010) suggested that international customers and advocacy groups can play a role in problematizing institutional boundaries. However, the open source movement presents a unique case where by its very nature there is collaboration across the world. The role of the Internet is evident in facilitating the creation of meaning in an alternate organizational field.

Our study also highlights the dynamics amongst institutional entrepreneurs as they are unified in their efforts to bring about the institutional change while deferring in their motivations for the change. Another salient characteristic of this institutional change is the establishment of an alternate field in parallel to the existing organizational field. Unlike other institutional studies, the open source movement saw the emergence of an alternate field with the original field retaining its form. The boundary of these two institutions were demarked by the differing practices followed by them: free sharing vs. appropriating software; distributing source code vs. executables; copyleft vs. copyright; software being developed by a community vs. software developed within the boundaries of a firm; bazaar style vs. engineered and controlled. The existence of these two institutions, both operating in the same market but with diametrically opposite norms and philosophies, offer the possibilities of interplay of practices undertaken by the organizations operating across the boundaries. We find that as open source progressed towards greater institutionalization; the boundaries became blurred with both sides attempting to redraw the boundaries.

Conclusions

In this paper, we have attempted to construct the history of the open source software movement and in doing so, describe the set of events leading to an institutional change and the subsequent set of activities that led to the formation of an alternate organizational field. We attempted to identify the role of agency, the institutional work undertaken by these agents and the process of legitimization of the regulative, normative and cultural/cognitive pillars of the institution. We also delved into the creation and institutionalization of practices in the alternate institution and the drawing of boundaries of these institutions.

Open source software has fundamentally changed the cost structure of the software industry (Gehring, 2006), defined new commercial business models (Krishnamurthy, 2003), developed new innovation paradigms (West & Gallagher, 2006) and transformed the software product and services space (Fitzgerald, 2006). The success of open source is bound to lead to several challenges, such as litigations by commercial vendors who are threatened by the open source movement, attempts to protect their digital fences, the potential infringement of open source software that may be patented by commercial firms, or the potential impact due to the inadequate documentation in open source projects (Lerner & Schankerman, 2010). These ongoing challenges and their subsequent resolutions will potentially impact and alter the organizational field of open source software. Studying the ongoing institutional change in the field will be an interesting area of future research.

Given the vastness of the subject, we acknowledge the paper's inadequacy in covering the breadth of the topic. The history of open source software is rich with contributions of various actors over multiple dimensions. A comprehensive analysis of these events could provide additional insights and potentially have additional contributions to theory.

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