

The Emergence of an Organizational Field: The Case of Open Source Software

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Executive Summary

Institutional theory offers a very powerful lens to understand and explain societal phenomena. In the context of innovation and technology, this perspective provides insights that complement the understandings derived from a focus on just technology or economics. Adopting this standpoint, this paper examines the emergence of the organizational field of open source software as a response to the norms of propriety software that were unacceptable to many passionate software researchers and programmers.

The context of software product development has some unique characteristics that separates it from other industries. First, software products are information goods. In general, information goods have very high fixed costs of development and low marginal costs of reproduction which often leads to market inefficiencies. Second, IP protection has the potential to exaggerate the problem of market inefficiencies. Third, software is an input and also an output of the production function and IP protection has the potential to make the cost of software products prohibitively high. Fourth, the Internet has created the potential for the larger society to participate in the production process. These features of the software industry influence the dynamics among software professionals and organizations creating a distinctive context which can be better understood through the lens of institutional theory.

According to institution theory, organizations seek to obtain legitimacy, which goes beyond technological or economic performance, by conforming to institutional requirements in a context. There are three forms of legitimacy. Pragmatic legitimacy, based on regulative requirements, is acquired by complying with the legal and regulative rules in the organizational field. Moral legitimacy, based on normative requirements, is obtained by ensuring that the activities of an organization promote societal good or welfare. Finally, cognitive legitimacy is derived from the extent to which the activities of an organization mesh with the taken-for-granted norms in the larger context. While institutions are normally sustained for long, they do experience change. Institutional change is driven by institutional entrepreneurs who create, maintain, and disrupt the practices that are considered legitimate, and challenge the boundaries that demarcate one field from another.

The findings of this study capture the intricate dynamics and interactions among institutional requirements, software professionals and organizations that led to the norms of the institution of propriety software being challenged. It suggests that the process of institutional change can lead to the creation of a new alternate organizational field leaving the original field largely untouched. This paper contributes to the understanding of the software industry and suggests implications for other industries that produce information goods.

KEY WORDS

Open Source Software

**Institutional
Entrepreneurship**

IP Protection

Copyleft vs Copyright

**Organizational Field
Boundaries**

The broad institutional framework under which proprietary software operates has well-developed regulatory, normative, and cognitive systems that are 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 the source code of software products, to becoming an alternative approach to software development that is non-proprietary in nature, developed through a peer network, supported by the Internet, and with little or no monetary benefits for the software developers or reviewers who contribute to the efforts. This paper traces the evolution of open source software and uses the institutional theory perspective to examine the emergence of this alternate organizational field as a response to the norms of the institution of propriety software that were unacceptable to many passionate software researchers and programmers. This field operates within an institutional framework that has significantly different regulatory, normative, and cognitive elements than those in the field of proprietary software.

Most early studies that adopted the institutional theory perspective had focused on the structure and behaviour of organizations (Scott, 2001), explaining the stabilizing and constraining role of institutions on organizations (DiMaggio & Powell, 1983). Later studies expanded the scope to study how institutions changed over time. This literature mainly addressed questions related to the sources and drivers of institutional change, the mechanisms by which individuals and organizations responded to changes, and the actual processes of change (Dacin, Goodstein, & Scott, 2002; Greenwood, Suddaby, & Hinings, 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 actually do (Lawrence & Suddaby, 2006) and the intricate interplay between the old and new institutions as they influence actors and organizations that are affected by the changes. One possible reason for this lack of research may be the large time period over which institutions emerge and

evolve, rendering very few contemporary examples of new institution formation available for study. The open source movement, however, with a relatively well-documented history provided us with an opportunity to examine the evolution of an alternate organizational field.

This paper explores the circumstances that led to institutional entrepreneurship for the field of open source software, the nature of institutional work undertaken in the creation of the alternate organizational field, 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, it is argued that the process of institutional change need not necessarily be limited to altering or disrupting existing institutions, but could instead lead to the creation of a new alternate organizational field leaving the original field largely untouched. Such an alternate organizational field is likely to share boundaries and practices with the original one allowing agents to evolve their responses as the two fields interact and adjust to one another's practices. This paper contributes to the understanding of the software industry. This has implications for other industries that produce information goods. 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 behaviour to cope with the conflicting pressures from two institutions with conflicting norms.

SOFTWARE AS INFORMATION GOOD

The context of software product development has some unique characteristics that separate it from other industries. 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. This often leads to inefficiencies in the markets. For example, there are likely inefficiencies of consumption when software products are priced higher than their marginal cost of reproduction in order to allow the original producer to recover development costs. This may also encourage piracy of software. On the other hand, when products are priced at the marginal cost of reproduction, there are few incen-

tives for the development of new software. While similar issues plague other industries too, the scale of difference between costs associated with developing the original product relative to the marginal cost of subsequent reproduction creates instability in the software product market. The response by law-makers to counter this threat was the legislation that provided for expanded protections for propriety software and harsh penalties for those who violated the norms (Boyle, 2008), thus creating 'digital fences'.

Second, patents, copyright, and intellectual property (IP) laws that were introduced to ensure that producers of propriety software products were able to recover the development costs, affects consumption of software. 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 marginal costs often lead to inefficient markets as it is likely to lead to loss of consumer surplus. In other words, IP has the potential to exaggerate the problem described earlier.

The third unique feature of the software industry is that software is an input and also an output of the production function. Hence, when a product is priced at higher than marginal cost of reproduction, it leads to a decrease in consumption. In addition, the higher price of products is likely to increase production cost for subsequent cycles of products, and this has the potential to further reduce consumption. This argument can be extended to indicate that the underlying economics of information, the stringent IP protection to facilitate the recovery of development costs, and the structure of the software development process, collectively has the potential to make the cost of software products so prohibitively high that it could hurt the industry, and then the society at large. As discussed later, the need to protect the industry, and society, from those who might hurt it by an excessive focus on recovering production cost or earning monopolistic profits was the inspiration for many of the professionals who worked for the open source software movement.

The fourth distinctive feature is the role of the Internet on production of software (Benkler, 2006). Along with the declining costs associated with computation, communication, and storage, the Internet has enabled a networked and computer mediated communications environment in which a large number of individuals are able to collabo-

rate and share information at negligible costs. As a result, the economics of software production has undergone a significant change. Benkler (2006) argued that the Internet has created the potential for the larger society to participate in production process leading to the possibility of social production of software. In such an arrangement, the software product is produced by geographically distributed individuals who collaborate over the Internet to produce products that are non-proprietary in nature, which are reviewed by peers who are part of the same network, without any monetary incentive for the producer or the reviewer (Benkler, 2006). The goal of protecting the industry and society from what they believed are unfair and unsustainable practices is sufficient to provide the moral force to sustain the alternate production efforts.

Past researchers had suggested that the emergence of open source software was an attractive alternative mode of organizing the software industry (Gehring, 2006). Subsequently, researchers had analysed open source software through the lens of neo-institutional economics, such as transaction cost economics (Bergquist & Ljungberg, 2001; Demil & Lecocq, 2006) and property rights theory (Boyle, 2009; Evans & Layne-Farrar, 2004). Here the open source software phenomenon is studied through the lens of institutional theory to explore the role of institutional entrepreneurs in the emergence of the alternate organizational field.

INSTITUTIONAL CHANGE AND INSTITUTIONAL WORK

The idea of an organizational field is at the heart of institutional theory (Greenwood et al., 2002). It refers to a set of organizations that interact with, and are influenced by each other in the process of production of goods and services. They collectively participate in the process of creating a shared meaning in their context to define the boundaries of the organizational field, the criteria of membership, and the appropriate ways of behaviour among internal members and members of other fields, and beyond. Within a mature organizational field, there is normally an institution with well-established norms that are widely known and accepted, providing a sense of stability in the patterns of interactions and behaviour (Greenwood et al., 2002; Zietsma & Lawrence, 2010).

Institutions refer to enduring social patterns that govern the interactions and behaviour in an organizational field.

Institutional theory views institutions as comprising of regulative, normative, and cognitive elements (Scott, 2001) which are formed as products of purposive actions (Jepperson, 1991), whether the outcomes were intended or not. 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 (Oliver, 1991) through isomorphic processes, namely, coercive, mimetic, and normative (DiMaggio & Powell, 1983). However, more recent studies have examined the changes in institutions.

The concept of legitimacy is central to the idea of institutions as well as the notion of institutional change. Suchman (1995) defined legitimacy as "generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions" (Suchman, 1995, p. 574). He identified three forms of legitimacy which loosely correspond to the three types of elements or systems in an institution. Pragmatic legitimacy, based largely on conformance to regulative elements in the field, refers to approval from other entities in the field that is provided based on the extent to which the activities of the focal organization meet the self-interest of other organizations in the field. Organizations make efforts to obtain the approval or support of the entities with which they have exchanges by complying with the 'rules of the game'. 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 good or welfare. Moral legitimacy allows actors within organizations or in the organization field 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 larger context, which comprise the cognitive elements of an institution.

While institutions are sustained for long, they do experience change. Greenwood et al. (2002) conceptualized institutional change as a six-stage process. An institution is likely to experience precipitative jolts that destabilize established norms and practices in Stage 1, followed by

the process of de-institutionalization, which disturbs the socially constructed consensus in Stage 2. Stage 3, or the pre-institutionalization stage, involves the introduction of innovations that may replace the old norms and practices, and Stage 4, or theorization stage, is the period in which pragmatic and/or moral legitimacy arguments for the new norms and practices evolve. Following this, in Stage 5, the new norms get diffused among other actors and organizations in the field, and finally in Stage 6, which is the re-institutionalization stage, the new norms and practices obtain cognitive acceptance and become taken for granted.

Institutional change is driven by institutional entrepreneurs who indulge in institutional work. Institutional work refers to efforts by institutional entrepreneurs that create, maintain, and disrupt the practices that are considered legitimate, and challenge the boundaries that demarcate one field from another. It has been defined as the process of creating alternate institutions or the process of changing established institutions through purposive actions (Lawrence & Suddaby, 2006). Recent studies that have focused on institutional work have included Maguire and Hardy (2009), Ziestma and Lawrence (2010), and Lepoutre and Valente (2012). Lawrence and Suddaby (2006) outlined a framework that classified institutional work into three broad categories of activities. The first set of activities impact the regulative elements: (i) advocacy: mobilization of political and regulative support, (ii) defining: construction of rule systems, boundaries and hierarchies of membership, and (iii) vesting: creation of rules that confer property rights. The second set of activities influence the normative elements: (i) constructing identities: defining the relationship between the actor and the field in which the actor operates, (ii) changing normative associations: re-mapping the connections between the new practices to the moral and cultural foundations of these practices, and (iii) constructing normative networks: creating inter-organizational connections through which these practices are sanctioned. The third set of activities focus on the meaning systems and cognitive aspects and include (i) mimicry: associating new practices with already taken-for-granted ones, (ii) theorizing: elaborating abstract categories and new concepts to specify cause and effect, and (iii) educating: providing actors with skills necessary to support the new institution.

As dominant institutions are deinstitutionalized, and new ones emerge, agents or organizations often find themselves responding to more than one institution. While early studies normally assumed that organizations have to respond to one dominant institution, and hence are governed by a single dominant logic, Dunn and Jones (2010) demonstrated that organizations were often influenced by two or more institutions that led to the presence of plural logics. Different actors within the organizations respond differently to the dissimilar institutional forces and attempt to influence the mission of the organization to make it more consistent with logic of the institution they favour. Figure 1 shows the Institutional Theory Framework with different aspects of institutions and their relationships during the process of institutional change.

METHODS

The open source software movement evolved over several decades over many stages. The history of the open source software movement is well documented covering the diverse aspects of open source software (see Aksulu & Wade, 2010). This study relied on these publicly available documents to develop a narrative of the evolution of open source software field 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). Past studies on institutional work have adopted such an approach for the purpose of describing and developing the empirical context (see Zietsma & Lawrence, 2010). The approach of this paper was to first develop a narrative on the evolution of the open source software move-

ment through a review of the available literature on the phenomenon. Next, the narrative using the framework developed by Lawrence and Suddaby (2006) was reviewed to identify the institutional work in the evolution of the field. The conditions leading to the emergence of the alternate field were then identified and the boundaries of the open source software field analysed in relation to the existing field of proprietary software. As a final step, the interactions among agents and organizations in the fields were examined.

CONTEXTUAL BACKGROUND OF THE STUDY

Lerner and Schankerman's (2010) classification of the open source software movement was loosely adopted into three eras to illustrate the evolution of the field. Table 1 provides a broad chronology of significant events in the open source software movement.

The First Era

The collaboration among research laboratories located at universities such as the University of California (UC), Berkeley and the Massachusetts Institute of Technology (MIT), Boston, along with corporate research laboratories had an important role in the development of early versions of operating systems, software 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

Figure 1: Institutional Framework

Institutional Elements	Regulative	Normative	Cognitive
Isomorphic Processes	Coercive	Normative	Cognitive
Bases of Legitimacy	Pragmatic	Moral	Cognitive
Institutional Work	Advocacy Defining Vesting	Constructing Identities Changing Normative Associations Constructing Normative Networks	Mimicry Theorizing Educating

Increasing emphasis across the six stages of institutional change

Table 1: Chronology of Significant Events in the Open Source Software Movement

Year	Event
Early years	<ul style="list-style-type: none"> • Collaboration among university and corporate research laboratories • Network of informal sharing • Operating Systems were usually community developed and shared
1969	<ul style="list-style-type: none"> • Request for Comments (RFC) developed by ARPANET for developing protocols
Early 1970s	<ul style="list-style-type: none"> • Development of OSs such as UNIX by UC Berkeley and MIT researchers • Network Working Group (NWG) and Request For Comments (RFC) used as a means of collaboration • Creation of TCP/IP protocol at ARPANET
Late 1970s	<ul style="list-style-type: none"> • AT&T decided to impose IPR on UNIX and asked users to pay license fees • Branching out of BSD • A free version developed by CSRG at UC, Berkeley was offered. It still required AT&T license for the core UNIX kernel
Early 1980s	<ul style="list-style-type: none"> • Richard Stallman, a programmer at the AI Laboratory in MIT launched GNU • Eventually, formed the Free Software foundation (FSF)
Late 1980s	<ul style="list-style-type: none"> • Free Software Foundation (FSF) released GNU Emacs • Operating system freely redistributable under the terms of BSD license • CSRG striped the TCP/IP code out of UNIX and released it as Networking Release 1 • Keith Bostic, a member of the CSRG, proposed development of a complete BSD version free of code developed by Bell Laboratories. Solicited developers, offering no compensation except listing credits • Wide-scale adoption of GNU and BSD, often by commercial vendors. Multiple version, constant change, unstable versions, etc. led to resistance in adoption • Richard Stallman adopted 'Copyleft' licenses as a means to ensure code from the GNU cannot be incorporated by proprietary packages
Early 1990s	<ul style="list-style-type: none"> • Variations of Copyleft licenses • GPL, BSD, etc. • Release of Linux kernel version 0.02 by Linus Torvalds • Launch of collaboration tools such as SourceForge • Commercial support to Linux from firms such as Suse, RedHat, etc. • Development of Linux through distributed mass collaborated peer production
Late 1990s	<ul style="list-style-type: none"> • Proliferation of several popular OS products • Apache, MySQL, and PHP launched • Browser wars : Microsoft vs Netscape • Publication of "The Cathedral and the Bazaar" by Eric Raymond- Open Source Initiative (OSI) launched • Creation of open.sourceforge.org and SourceForge.net
Early 2000s	<ul style="list-style-type: none"> • Several collaboration platforms launched • IBM adopted Apache/donated IP to the Open Source Community • HP released Spectre-Object-Linker as open source

prospered. Network Working Group (NWG) and Request for Comments (RFC) were used by various actors as a means of collaboration. The role of RFC in the development of TCP/IP protocol at Advanced Research Project Agency Network (Abbate, 1999) is an example of such collaborations. In addition, program languages such as BASIC were distributed along with the source code. Thus, by default, much of what is today referred to as an open source development environment already existed in the networks of university-based and firm-based research laboratories in the 1960s and early 1970s. However, this

network of collaboration was informal in nature, imposed no property rights, and was without explicit regulative control.

This changed during the late 1970s, when AT&T enforced intellectual property (IP) rights 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 setback 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

The beginning of the second era was characterized by the action of a few key actors to resist the imposition of property rights as initiated by AT&T. Richard Stallman had a key impact in the early days. Stallman worked as a programmer at the Artificial Intelligence (AI) Laboratory in MIT on a locally developed operating system called 'Incompatible Timesharing System'. He first encountered the problems manifested by proprietary software when he was unable to modify a problematic printer driver provided by Xerox (Stallman, 2001). When the laboratory's operating system was replaced by proprietary software, Stallman decided to quit the laboratory to create a free operating system named as GNU, a recursive acronym for 'GNU's Not Unix'. Eventually, this led to the formation of the Free Software Foundation (FSF) in 1985. FSF was established as a tax-exempt charity to raise funds for promoting the freedom to change and share software (Stallman, 2001). A year later, FSF released the GNU Emacs, an editing software that was made freely available over anonymous FTP and by tape for a charge. The software was adopted widely but raised questions on what was free about the software when in fact it had to be purchased for a price.

Simultaneously, there was another movement being initiated at the UC, Berkeley. The university had a strong collaboration with Bell Laboratories for developing UNIX. In 1977, there was a split in the collaboration. The development of UNIX branched out into two versions: Bell Laboratories' UNIX and Berkeley Software Distribution (BSD) (McKusick, 1999). BSD was a free version, shared among research communities in universities across the world, but required the purchase of a source license from AT&T as the kernel used 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 Computer Science Research Group (CSRG) 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) and was soon adopted by hundreds of organizations. The success of Network Release-1 encouraged Keith Bostic, a member of the CSRG, to propose the develop-

ment and release of a complete BSD version which was free of code developed by Bell Laboratories. 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 licensees the right to use, modify, and distribute the program on the condition that the licensees also grants similar rights to the modifications made by them (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 (Brethauer, 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: Linus Torvalds, an undergraduate student at the University of Finland. 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 operat-

ing system (Brethauer, 2002). The Linux version attracted a large community of developers who borrowed heavily from the GNU and BSD versions (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 (Raymond, 2001) 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.

The Third Era

The third period can be argued to have commenced with the publication of the seminal essay titled "The Cathedral and the Bazaar" (Raymond, 1999). In his essay, Raymond provided his view on the development model of open source software and lessons learnt from it. Raymond described the Linux development as the '*Bazaar*' style of software development with his famous quote "*Given enough eyeballs, all bugs are shallow*" (Raymond, 1999, p.41). Facing a threat from Microsoft's Internet Explorer (IE) and triggered by Raymond's article, 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, 'OpenSource' 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 (Brethauer, 2002). The formation of OSI provided legitimacy to the open source software movement in multitude of ways. OSI laid clear rules on what constituted the field, who were its members, what were the rules that governed the membership, and how was the formal accreditation process with standards and certification created. In addition, OSI established various types of licenses that provided different levels of liberties including the provision of mixing proprietary and open source code (DiBona, Ockman, & Stone, 1999). Lerner and Tirole (2005) argued that the different types of licenses had 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, was more likely to appeal to the community as potential contributors sought benefits from signaling incentives. Commercial firms launching open source projects, however, were 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 that their contribution was 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. SourceForge became popular within the community and had 30,000+ projects registered within two years of launch with the number spiraling up to more than 150,000 projects by 2007 (Maguire, 2007) and was influential in initiating several successful open source projects. The impact of SourceForge was significant not merely in terms of providing a platform for open source projects to collaborate; it also acted as a platform for potential users to scout for new open source products and became a measure of the popularity of the product based on the number of downloads. Given the number of projects launched in SourceForge, it very soon became the central repository from where researchers studying

the open source phenomenon could obtain data for their empirical analysis.

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, there were instances of commercial firms releasing proprietary code under open source license: 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

After outlining the history of the open source movement as a narrative, this paper first examined 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 of open source software. It then focused on some unique dynamics in the context, which differentiated it from other contexts that were examined with the institution theory perspective. A series of propositions capture the findings.

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 research-

ers 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. This probably provided the moral legitimacy to the free collaboration that took place. Given this context, the actors within these laboratories had internalized the notion of collaborative research and development as an integral part of the cognitive system. There was a sense of stability in the patterns of interactions and behaviour of the actors in this field. 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. It was also backed by the moral legitimacy that was obtained from trying to address societal needs at lower costs or no costs. The social goal provided the moral authority for the entrepreneurs and others in the movement to take on the might of the propriety software industry. While there was no attempt to overturn the regulative elements, there were efforts to develop ways to work around them.

Stages of Institutionalization

The act by AT&T to impose IP rights on software shook the taken-for-granted nature of that stability based on the established norms and provided the precipitative 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. Stallman was an early institutional entrepreneur responsible for laying the groundwork for the open source software movement resulting in the first signs of de-institutionalization that occurred in Stage 2 of institutional change. Bostic, Torvalds, and 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 had emerged before the property

rights were enforced. Distributing free copies of GNU and Emacs, introducing the concept of 'Copyleft', and later the 'Bazar' model of development were innovations aimed at replacing old norms and practices during Stage 3. 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. However, the efforts of a few institutional entrepreneurs to retain the moral and cognitive legitimacy of the earlier period while 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 Bazaar" 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 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.

Institutional Work

The narrative displayed a range of activities that were undertaken as institutional work to promote the emergence of the alternate organization field. These can be categorized along the lines suggested by Lawrence and Suddaby (2006). The setting-up of FSF and its campaign for an alternate regime for software development was one of the first acts of 'advocacy'. Other acts of 'advocacy' include Bostic's attempt to build a new version of BSD and his public campaign to solicit developers to work on the project without compensation, the act of CSRG in open sharing of the source code, and Torvalds' postings in his newsgroup explaining the benefits and advantages of open source software. While these acts did not attempt to establish a new regulative regime, they did create awareness of the means by which the regulative regime that was central to propriety software could be avoided or bypassed.

There were several attempts to define the rules, norms, and boundaries for the open source software field. Clarifications on the concept of 'free as in freedom' (Williams, 2002) provided by FSF was one of the first acts of defining

the rules of engagement. Bostic's attempts to get programmers to contribute to the development of BSD without compensation for a larger purpose was another attempt at defining some form of rules for professional members to contribute to the open source software development. The actions of OSI in registering a domain and developing norms for licensing also helped define the rules and norms. Linux was also instrumental in defining the rules for open source software development and how members were to participate. These rules were not formally binding rules but normative ones that governed the community of developers as illustrated in Raymond's (1999) essay. More recently, platforms such as SourceForge contributed to the institutional work of defining by providing a platform for members to collaborate and administer membership rules.

Since property rights are at the heart of the open source software movement, the role of vesting in creating new norms for property rights is very critical. The release of the GNU GPL license was a form of the institutional work of vesting. Stallman's strategy of 'Copyleft' was an explicit effort to define the ownership of IP as quite the opposite of those prevailing in the propriety software field. The launch and widespread acceptance of Linux entrenched the 'non-ownership' of software code. The entry of several vendors in the field who did not seek ownership of code but made revenues by providing services on open source products was another layer of vesting. Later, Netscape's act of releasing Navigator for free to fight the coercive power of a commercial giant was also an act of vesting. Over time all these acts contributed to a shared understanding of property rights in the open source software field.

Constructing identities that allow members to belong to a field is critical. The 'hacker' identity developed in the software field was and remains the main source of the identity. Membership in FSF and other bodies along with the moral legitimacy of fighting large corporate houses to protect the community provided a significant boost to the alternate identity. Membership of OSI and contributions to SourceForge and other similar platforms all helped create an alternate identity. The development of Linux was also a significant step towards the construction of identity of the open source software movement.

Changing normative associations helps institutional entrepreneurs in a field demarcate members from non-mem-

bers. The formation of FSF was the first act in creating that demarcation. The wide-scale adoption of GNU Emacs and the subsequent actions by its adopters in terms of reporting bugs, providing fixes, and offering new enhancements led to the construction of a normative network among these collaborators. While GNU and BSD were influential in setting the normative stance of freely sharing of code, Linux went a step further and established that this collective sharing of knowledge could yield superior quality software in a short period of time. The wide acceptance of Linux and the formation of the Linux community further reshaped the normative associations of the field. The wide adoption of Linux in universities and in commercial firms led to further strengthening of the normative network of the community. Finally, platforms such as SourceForge further aided the construction of the normative network as it allowed not just developers but potential users to participate in the open source community by scouting for new open source products.

The attempts by several open source software developers to adopt a revenue model similar to propriety software in terms of support, was an act of mimicry. Similarly, the involvement of commercial firms in the field of open source was an act of mimicry with open source practices being juxtaposed with the taken-for-granted practices of proprietary software. Raymond's essay, *The Cathedral and the Bazaar* is the most representative example of the attempts at theorization of the legitimacy of the alternate institution for open source software. In addition, all the websites and discussion forums run by members of FSF, CSRG, and OSI contributed to theorization. Finally, SourceForge was also instrumental in theorizing the open source movement on the platform it provided. The other sharing platforms, such as Launchpad, Novell Forge, etc., had done the same.

Institution Stability and Information Goods

It was observed 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 move-

ment relative to other industries. 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 observed that the information network system facilitated the participation of widely dispersed programmers and organizations to collaborate in the activities of the field. Together, this allowed institutional entrepreneurs to more easily access a large number of motivated professionals and have them contribute to the development of the alternate field and institution. 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

It was found that the origins of an institutional field lay in the practices that may not be formally organized or motivated, till they were threatened by the enforcement of the elements of the original institution. The enforcement of IP norms on the collaborative efforts of researchers in university and corporate laboratories had a disruptive impact which triggered the transformation of regular software professionals into institutional entrepreneurs.

AT&T's decision to enforce the IP 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 regular professionals taking on roles of institutional entrepreneurs to create a new open source software field as a replacement to the original field of proprietary software products. Stallman's effort to launch GNU Emacs and offer free access to the product for use as well as change is one such example. However, a key challenge was the enormous amount of effort required for developing such large and complex software programs. The response from the institutional entrepreneurs, such as Bostic and 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 with others, 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 alternate organizational field.

Boundaries of an Organization Field in the Software Industry

The impact of the digital fences created by the enforcement of IP norms was not just limited to restricting the availability of proprietary information for free use. An additional impact was the need for securing property rights of the open source software such that it was free for general use but was protected from being appropriated by commercial vendors for individual gain. A primary driver of social production was the need to develop software that can be made available for mass consumption and without the intentions of appropriating rents by its producers. However, these free information goods were vulnerable to being used by other actors for proprietary production, and once reproduced as a private good they were 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 made 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 colloquially 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 forced 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 was 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 enabled firms to appropriate value, and the other governed by Copyleft license that enforced free sharing!

Proposition 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 if it was to contest the strong roots established by proprietary software. This was made possible through the mobilization of large scale cooperative efforts among a diverse and disparate set of individuals and organizations enabled by the Internet. 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, 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 produced a good through self-organized teams that operated outside the boundaries of a firm. The technical and organizational architecture of Internet 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 Internet was fundamental in enabling various other practices and boundary

work such as 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 the Internet (a) facilitates social production and (b) 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 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, the interactions of institutional entrepreneurs, who opposed the dominant institution but had differences over the elements of the alternate institution, were noticed. 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, FSF refused to be a part of OSI. Explaining the difference between open source and free software, Stallman stated: "Open source is a development methodology; free software is a social movement" (Stallman, 2009, p.31). As Stallman elaborated, the philosophy of open source software is purely based on pragmatic legitimacy as it 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, p.33) which displays a greater

emphasis on moral legitimacy. However, it was observed that institutional entrepreneurs from both streams of thought and motivation had cooperated at different stages to share their rejection of the institution governing proprietary 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

It was observed that during the transition, actors from both the dominant institutional fields and the alternate fields attempted 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 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 complementary software along with their core Windows offering (Wang, Wu, & Lin, 2005). Netscape Navigator, which used to have nearly 80 percent of the web browser market share during the early 1990s, was a victim of such monopolistic actions. Through bundling strategies, Microsoft was able to capture the market and increase its market share to 95.4 percent by 2002 (Wang, Wu, & Lin, 2005). Netscape quit the browser business in 1998 and was succeeded by Mozilla. Mozilla revived the browser, renamed it as Firefox, and released it under open source norms through the Mozilla Public License. Mozilla's revival of the Netscape browser was a case of an organizational actor jumping across the boundary. By adopting a very restrictive license, Mozilla further signalled 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 was 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 percent (Koenig, 2004). IBM's response to the competi-

tion was to drop its own web-server and instead adopt Apache, which resulted in Apache's market share increasing to 70 percent 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. Thus, we see that the motivations for commercial firms to develop and support open source products ranges from providing users with assurances against potential hold-up threats and by appropriating profits through services revenue. It can be seen that practices followed by such organizations cut across the two organizational fields.

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 signalling mechanism to potential employers (Lerner & Tirole, 2002). Several commercial software firms were found to actively encourage 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 with the development in the open source world and also to explore the possibility of mining innovations from the open source repository (West & Gallagher, 2006).

It was thus noticed that the practice work arising as part of the institutional change was instrumental in defining the boundaries of the alternate institutions. During this process, it was observed that the boundaries between the old and the alternate fields were 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 agents and organizations may occasionally adopt

the institutionalized logics of the field to which they do not normally belong and even oppose.

DISCUSSIONS AND IMPLICATIONS

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 this study, it was observed 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 merely by any exogenous shocks but due to the underlying complexities of information economics on which the original institution was based. It was further noted that the process of ongoing institution work could impact a dormant logic that could 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 participated in everyday identity work. This study extends that 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. The motivated institutional entrepreneurs were also found to be able to establish boundaries for the alternate organization field by exploiting the properties of information goods.

Further, the Internet was found to have an impact on the social production of information goods, besides providing the vehicle to pursue institutional work for establishing an alternate organizational field. Maguire and Hardy (2009) examined outsider-driven de-institutionalization and Zietsma and Lawrence (2010) suggested that international customers and advocacy groups could play a role in problematizing institutional boundaries. However, the open source movement presented a unique case where by its very nature there was collaboration across the world. The role of the Internet was evident in facilitating the creation of meaning in the alternate organizational field.

This study also highlights the dynamics amongst institutional entrepreneurs as they are unified in their efforts to bring about the institutional change while differing in their motivations for the change. Another salient characteristic of this institutional change was the establishment of an alternate field in parallel to the existing organiza-

tional 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 demarcated by the differing practices followed by them: free sharing vs. appropriating software; distributing source code vs. executables; copyleft vs. copyright; software 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 possibility of interplay of the practices undertaken by the organizations operating across the boundaries. It was found that as open source progressed towards greater institutionalization, the boundaries became blurred with both sides attempting to redraw the boundaries. The open source movement accepted some aspects related to propriety software in order to make open software commercially viable; on the other hand, several proprietary software producers provided base versions as free and open software and developed commercial business models on the basis of open source software.

CONCLUSIONS

This paper attempted to construct the history of the open source software movement and in doing so, described 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. It 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. The paper 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 changes in the field will be an interesting area of future research. ▼

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