Open-Source Technologies Realizing Social Networks: A Multiple Descriptive Case-Study

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Abstract. This article aims at describing the role of the open-source software phenomenon within high-tech corporations providing social networks and applications. By taking a multiple case study approach, We address what are the open-source software technological components embedded by leading social networking players, and a rich description on how those players collaborate with the open-source community. Our findings, based on a population of three commercial providers of social networks a suggest that open-source plays an important role on the technological development of their social networking platforms. An open-source technological stack for realizing social networks is proposed and several managerial issues dealing with collaboration with open-source communities are explored.

Keywords: open-source, social networks, entrepreneurship, facebook, spotify, netlog.

1 Introduction

This article develops a deeper understanding on how providers of popular social networking Internet sites employ open-source technologies, that are freely available on the Internet and within the public domain, in their inner technological operations realizing social network services targeting a global community of Internet users.

Even thought studies on social networks have been conducted in fields like sociology and anthropology for decades (Oinas-kukkonen et al. 2010), only more recently it captured massive attention from computer scientists and information systems researchers.

In this paper, we cross the social networking phenomenon with the open-source phenomenon by assessing how social networking providers are employing open-source technological components in their in-house software development. The open-source phenomena also gather extensive research attention in the last decades such as Stallman(1993), Raymond (2001) and Lerner and Tirole (2005).

In this research, we engaged what is role that the open-source software phenomenon plays as a enabler of the social networks and its applications.

2   Literature Review

The existence of recent literature reviews on social networks and applications across different disciplines such as entrepreneurship (Hoang & Antoncic 2003); marketing (Cooke & Buckley 2008); computer science (Mislove et al. 2007); information systems (Parameswaran & Whinston 2007) and (Oinas-kukkonen 2010) facilitated the process of identifying relevant literature that guided this research.

A first stream of research address the topology of networks of open-source developers as investigated by Valverde and Solé (2007), Madey et al. (2002) and Xu et al. (2005). A second research stream addresses social aspects such as communication, socialization and motivation withing open-source social networks as explored by Ducheneaut (2005), Barcellini et al. (2008) and Crowston and Howison (2005).

Both streams of research, the researchers point their lenses to social networks of open-source software developers. In this paper however, we turn the lenses from a completely different perspective by looking at organizations developing digital technology that realize social networks and how they use and benefit from public domain software artifacts developed by the open-source community.

3   Methodology

The research question guiding the preliminary research efforts was: "what role the open-source software phenomenon plays as a enabler of the social networks and correspondent applications". In this paper we address first, what are the open-source software technological components embedded by social networking players; and second, how are those players collaborating with the open-source community.

This research efforts took the form of a multiple descriptive case-study in the molds of Eisenhardt (1989), Miles and Huberman (1994) and Yin (2002). In Table 1, we present the three unit of analysis from this multiple descriptive case study. By interviewing staff from those three social networking providers,   we searched for consistent patterns of evidence across the three units taking a recognized role within the same phenomenon being studied.

Table 1. The multiple case-study organizational unit of analysis

Organization	Description	Country
Facebook	Biggest and most studied social network	USA
Spotify	The leading peer-assisted music streaming system	Sweden
NetLog	One of the most global social networks for the youth	Belgium

This research was guided by the case-study process proposed by Eisenhardt (1989), we simply and modestly aim at providing a rich description of the observed phenomenon. Also methodologically inspired by Dyer and Wilkins (1991), we seek to provide a good and rich phenomenological description, emphasizing on contemporary relevance over rigor. Therefore, this paper is detached of any generalization reasoning, but rather invites the readers to thereafter address it.

In the following sub-sections, we provide more detail on methodological issues embedded on the design and execution of this research.

3.1   Preparation and Fieldwork Strategies

This research was partially driven from an event organized by the Canada-Norway partnership program in higher education (CANOE) and hosted by the University of Oslo between 22 and 26 of August 2011 in Sundvolden, Norway. This event was a rare opportunity for researchers with interests on social networking topics to meet together with industry practitioners from major providers of social networks and services.

Both the case study protocol as described by Yin (2002) and phenomenological interviewing by Thompson et al. (1989) guided the author semi-structured interviews during the fieldwork phase of the study.

A total of five semi-structured interviews were conducted by the author in a very informal setting. Small pauses were requested by the interviewer to transcript important parts of the conversation. After each interview, the author rapidly produced several textual notes capturing information he considered relevant.

4   Findings

Directly addressing the first research question, the following Table 2 presents a stack of open-source technological components used by the studied organizations. Due to informal non-disclosing agreements with the interviews,   we do not reveal what technologies are used specifically by each organization but by the overall set of three organizations.

Table 2. Technological stack realizing social networks

Technological function	Integrated open-source software packages
Client-side programing languages	C, C++, Java
Server-side programing languages	Python, Java, Scala, Ruby, PHP
Database/Persitence	Mysql, ext3 file-system
Server operating system	GNU Linux kernel
Web server	Apache, nginx, php-fpm, HipHop
Load balancer	haproxy
Object cache	jemalloc, memcached
Search and indexing	ubersearch, unicorn, sphinxsearch
Configuration management	Puppetlabs
Process orchestration	cron, gearman
Network monitoring	Zabbix
Backup systems	Bacula
Version control	CVS, SVN, GIT
Statistics/BI/DW	hadoop, hbase, HIVE, Sqlite
Testing	phpunit, seleniumhq, jenkins-ci

Addressing the second research question, even if the collected data was consensual with existing knowledge, we could observe some unexpected findings evidenced by patterns on the collected multi-organizational data. Following we report three descriptive findings with potential to rise debate among this paper readership.

First, the satisfaction of the studied organizations with open-source technologies seems quite high, specially among the R&D teams. It was observable that some of those organizations ownership and governance changes led to pressures on the R&D staff to roll-out from open-source software to proprietary technology.

"we been told several times to embrace cloud-computing technologies from a particular vendor, we tried and failed several times" … "Many proprietary , expensive and complex solutions are designed as if one would fit all" … "Vendors are focused in attracting user base over our specific needs"

Second, the collaboration with the open-source communities seems to be taken more at a personal level than at institutional level. As reported by one of the interviewees, the support provided by the open-source community is more ad-hoc and the solution for the problems is available earlier

"we have very good contacts with the open-source community, this enable us to fix complex problems just by chatting with key developers of the project" ... "In our experience in dealing with cloud computing vendors, bug reporting was tedious, passing over slow and complex processes, often resulting in nothing"

Finally, and for an entrepreneurship perspective. Open-source was present from the beginning of the organizations venture.

"We use a lot of open-source stuff. That's what made sense" … "We never got together and discuss about open-source vs proprietary, it just came naturally" … " startups need to get used to the idea of rapid-prototyping cycles … open-source software development tools are friendly for rapid interactions".

Following we discuss the implications of the previous reported findings encompassing a set of open-source technological components and three descriptions regarding the collaboration of the social networking industry with the open-source community.

5   Discussion

5.1   Theoretical and Practical Implications

Our theory testing approach did not falsify any open-source theoretical proposition refereed in the literature review. As inspired by Dyer and Wilkins (1991) we focus more in providing a good description on the phenomena being studied, leaving out space for refined theoretical contributions.

From the practical point of view, industry players can benefit from the suggested technological stack realizing social networks and applications. Moreover, our limited

but in-depth description raises managerial awareness for issues that might pop-up when collaborating with the open-source community.

5.2   Limitations of the Study and Future Research

Limitations of the sample in this regard do not allow us to make any substantial assertions but these initial findings certainly point to the value of examining this unexplored issue further. It matters to apply other theoretical lenses covering fields such as marketing, entrepreneurship and social science disciplines that already deal with social networks for decades.

6   Conclusions

In our sample, the satisfaction from social networking technological developers   with the open-source phenomena is extremely high. The use of open-source technological components started from the beginning, as early as the company founders developed their first software pieces.

   This research contributes with a technological stack for realizing social networks and applications as proposed by our sample organizations. In addition, and perhaps more prone to foment future research, we provide a simple and rich description on how three popular and innovative organizations integrate technological components from the open-source community into their social networking platforms.

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