Networks of Open Source Health Care Action

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Abstract. This paper reports on an effort to create a network of both developers and users of a public health information system. Through an analysis of capacity, recruitment, and power in the network, issues related to choice of technologies, global-local tensions, and parameters of institutional collaboration, we illustrate a number of challenges. Comparing OSS principles to a "Networks of Action" approach, conditions for learning in organizing training and development of software with participants from Africa, Asia, and Europe, as well as the involvement of advanced students in such efforts are discussed.

Keywords: capacity building, networks, action research, open source software

1 Introduction

Several authors underscore the significance of open source software (OSS) to countries in the South. In contrast to much outsourcing work, it enables skill development in the full software stack (Weerawarana and Weeratunga 2004), and OSS solutions are starting to appear in vertical domains such as health care (Fitzgerald and Kenny 2003). This paper explores how this has played out in practice in one such effort, the Health Information Systems Programme (HISP). HISP is a research-driven network of universities and public health care organisations in Norway and several developing countries in Africa and Asia, targeted at improving development and implementation of computerised health information systems in the south. HISP is developing and providing implementation support of an open source software application (DHIS), a system supporting local level information use and analysis in the primary health care sector.

Braa et al. (2004) put forward an action research approach called "networks of action" that addresses sustainability of information systems in poor countries through establishing a network of sites mutually supporting local learning processes, and aligning interventions with existing institutions. The basic tenets of the open source development model, as spelled out in the classic essay by Raymond (2000) would seem a near perfect fit for such an effort. However, Heeks (2005) is skeptical, and questions whether this isn't a blind alley for developing countries, pointing out that

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extensive piracy, lack of awareness of OSS, and poor links to global developer communities limit its potential.

Monteiro et al (2005) point out that the dominant accounts of OSS tend to emphasize high quality code and the elite character of hackers. However, just releasing source code (to Sourceforge for example) is not likely to attract enough capable developers, and many projects struggle with labor shortage. In line with the recommendations by Watson et. al. (2004), the project described here has so far relied on advanced students, as well as on hiring fresh local graduates. The strengthening of local knowledge, skills, and institutional capacity in a global network is a central goal to the project addressing sustainability of local implementations.

An important research question is how this "networks of action"-influenced approach affects issues of quality, openness, and participation is a globally distributed OSS development process.

Krishna et al. (2004) point out how differing conceptions of "politeness"can be a source of tension in cross cultural software teams, whereas OSS relies on the initiative of individuals with "itches to scratch" (Raymond 2000) and vigorous discussion. The HISP network represents an interesting case for cross cultural collaboration and the authors will explore how cultural differences have influenced participation around the network.

2 Method

HISP is organized as a long term action research network of researchers and organizations, where researchers must participate in the specific context(s) to obtain insights that can not be understood by studying it "from a distance" (Greenwood and Levin 1998). The empirical evidence was collected partly through interviews and the reading of documents, but mainly through participant observation. Like Duchenaut (2005), we take an interest in the trajectories of the various developers over time, as they e. g. grow into core roles or leave. The authors have been involved with the project for over three years and are coordinating the development process. Additionally, the authors have created and conducted a master level course around HISP development, with student reports and feedback providing additional material.

3 The development network

HISP was initiated in South Africa after the fall of apartheid, and is based on collaboration between academic institutions, health authorities, and private organizations. Funding has been secured through various local and global donors,

though mainly by the Norwegian Agency for Development Co-operation (NORAD) and the European Commission (EC). The District Health Information System (DHIS) software was developed in South Africa, and is presently rolled out on a national level there. It has also been introduced in several African and Asian countries. The versions up to and including the current 1.4 are built on the MS Access platform, and the software is provided gratis and with the source code available. A DHIS2 effort was initiated in 2004 aiming to make the DHIS platform and database independent and web enabled (while still serving users without internet connection). There was also need for a more layered and modular architecture supporting distributed development, to allow for the creation of developer teams in several nodes in the global HISP network. Local involvement and capacity building around the network are seen as central to the viability of the project.

3.1 The Oslo node

The HISP project is coordinated from this node, where the authors are based, and several Norwegian master students fill key roles in the development process as part of their master thesis research. These core developers have also been deeply involved as teaching assistants for a project oriented master level course designed around DHIS2 technologies, with a total of 80 students in the course of two semesters. The course projects have prototyped functionality, explored alternative technologies and project extensions. Furthermore, the course has served as a recruiting base for the project. The core developers have done field work in Vietnam and India, while conducting extensive training of the local teams in the technologies used.

3.2 The Saigon node

Initial collaboration was set up with a large local outsourcing company in Saigon where a total of six Vietnamese intern students participated in the DHIS2 development over a period of nine months. The project thus had a local base where both Norwegian researchers and master students could work for shorter or longer periods, and also hold courses in OSS Java technologies for the firm's employees. This collaboration was terminated in July 2005, which prompted the project to seek collaboration with a local university. A research group of students and faculty focusing on DHIS2 technologies was set up in September 2005, and three of the best undergraduate students from this group were subsequently hired to work full time on DHIS2, guided by Norwegian master students doing their fieldwork, who have also conducted seminars on the technologies at the university.

3.3 The Kerala node

The development process for DHIS2 was tried with a number of DHIS 1.3 implementation facilitators, who all had degrees in computer science. However, they turned out to have very little real programming experience, and were quite unfamiliar

with both Java and web programming, far less the modern frameworks suggested by the Oslo team. Close to nothing came of this initial foray into creating an Indian development hub. A subsequent effort in the spring of 2005 was similarly ill-fated, and three out of four developers were gone from the project within only a few months.

A third round was initiated in late 2005, when two developers recreated the basic parts of the DHIS 1.4 in a month's time, but using plain JSP without any of the DHIS2 layered architecture or frameworks, and in isolation from the efforts ongoing in Oslo and Vietnam. Their relative success and commitment led to their hiring, and they are now being trained in the DHIS2 technologies.

4 Technology and Process

The initial stage of the DHIS2 involved a time-consuming process of selecting the technological platform and tools to meet the new demands of platform independence, web-enabling, modular architecture and distributed development. The field of web technologies has evolved considerably over the last decade, and the pace of innovation has shown no sign of abating over the two years since the inception of the DHIS2 effort, but remains a complex undertaking.

The so called LAMP[1] stack has become widely popular, helped by a thriving market in inexpensive web hosting solutions and a large range of discussion forum, content management, and blogging software becoming available to anyone with modest technical skills. Thus LAMP were perceived to have a simpler learning curve for less well trained developers.

However, such suggestions were met with strong resistance both from developers in India who had barely heard about them (and similarly were skeptical to the web frameworks and tools introduced by the Oslo developers), as well as from the Norwegian students who regarded the other tools as "toys" (one of them being a committer to a well known open source Java project). While all saw the need to shift away from MS Access towards the web, the decision to use an "object-relational mapping" framework became more palatable to the Indian developers after one ex-employee reported being asked about this in an outside job interview. Similarly, contacts in leading consultancy companies providing views from industry served as an important legitimation strategy for the frameworks chosen. The Oslo students have all had formal exposure to Java, and its position as an established, "enterprise" language backed by huge companies, and therefore palatable to government standard bodies (see e.g. The Uttaranchal guidelines). On the other hand, sorting out the most suitable choices from the plethora of available web frameworks created stress on leaders of the effort. After much search, the project ended up with a stack of advanced modern Java frameworks.

5 Discussion

5. 1 Challenges of building a global network

As we have seen, the HISP effort to cultivate local teams around the global network has proved challenging and time-consuming. Leading forces in the project pursued the latest OSS frameworks and mechanisms, both because of a desire to work with the best tools and concern for the long term viability of the project, as well as for "marketing" within the OSS community, where high quality and general code is highly valued. Difficulties in mastering these tools and technologies has hampered the participation in India and Vietnam, and the substantial amount of time spent on training and supervision of local recruits have taken away valuable coding time from the core developers. Despite the time and efforts spent at building local teams in India and Vietnam, 80-90% of the code in the first milestone release in February 2006 had been committed by the Oslo team. Almost all the code so far produced by the Asian teams have proved to be of limited value, and has not become part of the release. Though all developers have source code commit access, the power of deciding what gets released and what gets factored out or should remain in the "incubator" rests with the coordinators and core developer in Oslo.

In India HISP pay is low, conditions can not compete with big companies, and career prospects uncertain, making it hard to attract highly skilled developers who are much sought after by outsourcing companies. In addition, the Indian project leaders were also too busy with implementation (of a previous DHIS version) to muster the energy needed to learn new technologies.

Open participation is a lot more difficult in practice than most accounts make it, probably because of a bias towards high profile projects and elite developers. The experienced Indian team lost confidence and were bewildered by the new technologies and tools introduced in the DHIS 2 process, and similarly in Vietnam HISP has struggled to establish an independent developer team able to contribute to the project.

5. 2 Distributed OSS development across cultures and contexts

The Norwegian developers had a hard time understanding the lack of internet use on the part of the other developers, both in terms of using mailing lists actively and in more independently seeking out information on technical issues. This is partly due to the fact that ready broadband access is a very recent phenomenon in these nodes. While the culture of always being online and constantly using search engines is second nature to the Oslo team, even people with IT degrees seem to use the web mainly for email. It has been frustrating for the coordinators and core developers in Oslo how difficult it has been to engage Indian and Vietnamese developers in discussions on the mailing list or to get them to document their work on the wiki website. Lack of fluency in English is probably a contributing factor, if you don't master the language you don't have a voice. But it is even more a case of not speaking

the "language" of open source and distributed development. In the early stages of the project, project staff in India were very hesitant to enter into discussions on technologies as choice of framework is more than a technological decision; it is a display of power/position. When collaborating on the same modules, the Norwegian students had difficulties of communicating directly with the Vietnamese students as almost all communication on the list from the Vietnamese side was done by the faculty coordinating the group there. To the Vietnamese students it was natural that the leader of the group took care of the communication with Oslo, while the Norwegian students were used to participating more openly in discussions and felt that this hampered effective communication.

6 Conclusion

Building networks of actions (Braa et al 2004) or distributed nodes of locally skilled software developers in a network of developing countries has proved challenging and time-consuming. The differences in programming skills and OSS experiences between the Norwegian core developers and the developer teams in India and Vietnam show that there is a need to adapt the distributed process to fit the whole network. The use of familiar tools and technologies might have changed the situation in the south, but would again have made the project unattractive to the developers in Oslo and other potential contributors. Still, a greater involvement in the technology selection from all the nodes, and especially the Indian, could have given a more unified situation. One important lesson learned here is that coordination of such a distributed process across different contexts and cultures demands much traveling and face to face communication in order to align interests of the network, and to overcome the apparent difficulties of online communication.

The fact that there is a lack of skilled developers and generally poor infrastructure for distributed development in many developing countries is nothing new, and is the very reason for the strong focus on capacity-building and university collaborations (Braa et al 2004) in HISP, and also the main reason to continue this long-term work. However, when it comes to software development and producing quality software on time to demanding customers, the distributed HISP approach seem to need adjustments. This context of software production also clashes with the OSS ethos of "It's done when it's done", and unwillingness to compromise on quality. As a short term goal it seems difficult to establish effective OSS development nodes in India and Vietnam that can deliver quality software, given the resources in HISP. However, as a long-term goal, and part of a long-term strategy on local capacity-building, such a distributed north-south-south development process will have greater chances of success.

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[1] Linux, Apache, MySql, and either PHP, Python, or Perl. Recently, Ruby has also received much publicity through the "Ruby on Rails" framework.

[2] The selected technologies are Hibernate, Spring, and Webwork