Sharing and Creating Knowledge in Open-Source Communities
The case of KDE

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Abstract

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The open-source movement has recently attracted increasing attention, mostly because its mere existence and the way it works contradicts existing theories and counteracts common business practices (Kollock and Smith 1997; Kuwabara 2000; Wayner 2000; Kogut and Metiu 2001; Lerner and Tirole 2001; von Hippel and von Krogh 2002; von Hippel and von Krogh 2003). In open-source software projects expert programmers at different levels, supporters, and users voluntarily contribute to a collaborative software project that is administered via the Internet. They collectively develop software in a decentralized, self-directed, highly interactive, and knowledge-intensive process (Raymond 1999; Kogut and Metiu 2001).

Open-source projects are almost exclusively administered online. The use of knowledge requires the concentration of the knowledge resources at a certain space and time (Nonaka and Konno 1998). Internet technology can be used in various ways to pool and archive knowledge resources (Haythornthwaite et al. 1998). The design of those online platforms provides the frame in which knowledge is concentrated and activated as a resource for creation. While Internet technologies are highly effective at facilitating the transfer of codified knowledge, it is considered difficult to share and create tacit knowledge online and collaborate on tasks with high complexity (Nemiro 2002). “Physical activities and face-to-face interaction are the key to sharing tacit knowledge.” (Nonaka, Reinmoeller et al. 2000).

Despite the increasing research effort into open-source communities of practice (Tuomi 2001; Lanzara and Morner 2003), existing literature nevertheless leaves us uninformed about how knowledge sharing and creation processes develop at the interface of technology and communal

structures that effectively exploit the advantages of Internet technology and at the same time are able to overcome the problem of tacit knowledge transformation.

Theoretical Background

We approach the research objective with a social view of learning and knowledge creation. This view promotes the idea that knowledge is deeply embedded in the technological and social context of a community that creates and reproduces knowledge (Nonaka and Konno 1998; von Krogh, Ichijo et al. 2000). In conceptualizing ways how to enable sharing and creating knowledge online, we draw on the communities of practice literature (Lave and Wenger 1990; Brown and Duguid 1991; Wenger 1998; Wenger 2000) and on Donald Schön's notion of 'the reflective practitioner'(Schön 1999).

According to Schön (Schön 1999), learning a professional skill is based on social interaction and competent use of technologies. Many key skills are tightly bound to the tools and material artifacts used by a professional community. 'Reflection-on-action' is the intellectual work individuals have to do when they want to share and create know-how and skills with others through social interaction (Schön 1999). However, Nonaka and Takeuchi (Nonaka and Takeuchi 1995) suggest that tacit knowledge transfer is enabled primarily by observation, imitation, and practice, and not through language.

Lave and Wenger (1990) introduced the concept of legitimate peripheral participation that allows new members to move towards full participation in the socio-cultural practice of a community. This participation leads them to share a common understanding which is essential for collaborative work and knowledge creation. Central to this concept is that learning does not take place by being taught or instructed but by *becoming* a practitioner (Brown and Duguid 1991).

Helping others to experience, what oneself has experienced before is fundamental for knowledge creation (Maturana and Varela 1992).

This article advances the perspective that knowledge in online communities of practice is shared and co-created through the establishment of processes and 'technologies' that indirectly enable re-experience. Three questions guided our research. The first one concentrates on how community members organize content with regard to their daily routines that potentially transforms into knowledge for other members. Secondly, as open-source communities depend on attracting and socializing new members, we inquired how new members are enabled to accumulate the knowledge necessary for becoming a valued member. Thirdly, we asked how members co-create and conceptualize new ideas – create new knowledge – in absence of physical proximity.

Methodology

According to four pre-established requirements, the KDE (The K Desktop Environment) project was selected as the most suitable case study to investigate online knowledge sharing and creation processes. Within a four months period the KDE community was thoroughly observed, memos were written, categories were developed and coded in accordance with Kozinet's (Kozinets 1998; Kozinets 2002) netnography and Glaser and Strauss' (Glaser and Strauss 1967; Glaser 1978; Kollock and Smith 1997; Goulding 2002) grounded theory approach. In an attempt to further our understanding of how virtual communities overcome the problem of physical distance, we analyzed which tools they use depending on the knowledge they want/have to share or co-create, and what forms of communication they choose to enable re-experience. We also asked for feedback from community members with regard to our findings (Kozinets 2002).

Results and discussion

Within the three areas of knowledge sharing and creation depicted, several processes have been identified that are fundamental for the community's brain to work, grow, and think.

Enabling re-experience by decreasing complexity and transactive group memory

Building up memory and organizing new content is the backbone of a community's knowledge system. In order to be able to digest the huge amount of knowledge technologies and task-related features are implemented that decrease complexity. This is, for instance, the modular structure of tasks, keeping track of code in a CVS repository, and shifting the locus of knowledge from individuals to a transactive group memory where members know *where* to find information. To foster comprehension developers also add comments to their source code (reflection-on-action) which enables a re-thinking and re-experiencing process among the other community members. However, the most important building block of the community's knowledge system consists of 81 mailing lists which are the platforms where discourse (Habermas 1981) and open reflection (Senge 1994) takes place and is archived as the transactive memory of the learning community.

Enabling re-experience by guidance, openness and legitimate peripheral participation

New members are integrated through a standardized entry and rigid guidance in the adoption of tasks and cultural norms. 'Newbies' are encouraged to *observe* common practice and communication in an attempt to foster re-thinking and re-experiencing processes before they are allowed to *become a practitioner*. Because of the reflective nature of the commented source code, the interactive tutorials, and the social interaction on asynchronous communication tools learning can take place without person-to-person interaction. Openness to all tools and communication is key to knowledge sharing, building a 'hall of mirrors' (Schön 1999) for the learners to reflect their doing.

Enabling re-experience by asynchronous communication and virtual experimentation

Asynchronous communication tools are also primarily used for new knowledge creation. Conceptualizing problems and new ideas are important creative processes in the KDE community. Using synchronous tools for other than coordination tasks or discussing solutions is actively avoided because this could hinder further reflection in a double-loop manner (Argyris 1992) and thus, new knowledge creation. For joint conceptualizations KDE developers use stories and usage scenarios for collective reflection-on-action. They create a 'virtual' world, a constructed representation of the future realization of their ideas. This 'objectification' of ideas provides the necessary 'tangibility' (Bechky 2003) a team needs in order to be able to co-create a common understanding and imagination of their future action.

This research demonstrates that online communities of practice successfully overcome the problem of tacit knowledge transformation through technological tools, task-related features, collective reflection, stories and usage scenarios. Doing this, online communities of practice constantly support knowledge creation and dissemination not only for the current actors involved, but also for future generations.

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