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New approaches to usability evaluation in software development: Barefoot and crowdsourcing

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ABSTRACT

Usability evaluations provide software development teams with insights on the degree to which software applications enable users to achieve their goals, how fast these goals can be achieved, how easy an application is to learn and how satisfactory it is in use. Although such evaluations are crucial in the process of developing software systems with a high level of usability, their use is still limited in small and medium-sized software development companies. Many of these companies are e.g. unable to allocate the resources that are needed to conduct a full-fledged usability evaluation in accordance with a conventional approach.

This paper presents and assesses two new approaches to overcome usability evaluation obstacles: a barefoot approach where software development practitioners are trained to drive usability evaluations; and a crowdsourcing approach where end users are given minimalist training to enable them to drive usability evaluations. We have evaluated how these approaches can reduce obstacles related to limited understanding, resistance and resource constraints. We found that these methods are complementary and highly relevant for software companies experiencing these obstacles. The barefoot approach is particularly suitable for reducing obstacles related to limited understanding and resistance while the crowdsourcing approach is cost-effective.

1. Introduction

Usability is a quality attribute of a software application that reflects "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO, 1998). Usability evaluations provide software development teams with insights on the degree to which software application enable users to achieve their goals, how fast these goals can be achieved, how easy an application is to learn and how satisfactory it is in use (Rubin and Chisnell, 2008).

Despite the general agreement that usability evaluations are crucial in the process of developing software systems with a high level of usability, their adoption is still limited in small and medium-sized software development companies (Bak et al., 2008; Ardito et al., 2011).

1.1. Obstacles for adopting usability practices

Studies from around year 2000 started to examine a range of obstacles prohibiting adoption of usability practices in software development companies. The obstacles identified in some of the first studies by Gunther et al. (2001) and Rosenbaum et al. (2000) include resistance towards usability practices by members of development teams, limited understanding of the usability concept and resource constraints. A few years later, Gulliksen et al. (2004) made a similar study uncovering factors for successful adoption of usability practices in Swedish companies. One of the key factors was to obtain acceptance from the development team, which is related to the resistance obstacle identified in the earlier studies. More recently, Bak et al. (2008) and Ardito et al. (2011) studied obstacles in Danish and Italian companies, respectively. Bak et al. (2008) found the main obstacles to be perceived resource constraints, limited understanding of the usability concept and resistance among development team members towards adopting usability practices. Similarly, Ardito et al. (2011) found the main obstacle to be related to perceived resource constraints. These studies have identified several causes for limited adoption of usability practices, but they generally agree that the three main obstacles are perceived resource constraints, limited understanding of the usability concept and methods, and developer resistance towards adopting usability practices.

Even though these obstacles have been known for over a decade, they are still highly relevant. Perceived resource constraints are especially important in small and medium-sized software development companies. Typically, such companies do not have funding for comprehensive consultancy or hiring usability specialists (Häkli, 2005; Juristo et al., 2007; Scholtz and Downey, 1998) as they are exceedingly expensive (Nielsen, 1994). The resistance obstacle concerns the level

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of acceptance, where problems identified through usability evaluations are not always accepted by members in the development team (Bak et al., 2008). Resistance also encapsulates low priority on fixing of identified usability problems whereas implementation of functionality and bug fixing have higher priority (Bak et al., 2008). Limited understanding of usability reflects that software development practitioners and management have no (or very limited) knowledge of the usability concept and the related core methods (Gulliksen et al., 2004).

1.2. Overcoming the obstacles

The literature on usability evaluation includes a variety of means that have been proposed to overcome the obstacles towards adoption of usability practices in software development companies. A significant number of these proposals are based on the idea that software development practitioners should conduct their own usability evaluations. It is typically argued that if software development practitioners are enabled to conduct usability evaluations, it will lessen the need in small and medium-sized companies to employ usability specialists, and this will resolve challenges in relation to resource constraints. Moreover, letting software development practitioners conduct usability evaluations will provide them with first-hand observations of users, which in turn will overcome the obstacles related to limited understanding and resistance. Software development practitioners are generally lacking usability evaluation skills (Gulliksen et al., 2004), thus some proposals employ this approach:

(1) A method approach where software development practitioners are provided with methods to support them in conducting usability evaluations

The assumption is that software development practitioners can conduct their own usability evaluations if they are provided with the right methods. An early example of this is Nielsen's (1992) study of the performance of specialists, non-specialists and double-experts in conducting heuristic inspection.

A different group of proposed solutions to overcome the key obstacles focus on tools instead of methods, thereby relating to this approach:

(2) A tool approach where software development practitioners are provided with tools to support them in conducting usability evaluations

The assumption is that a tool can replace some of the skills that are needed when conducting a usability evaluation. The tool can be either a software tools or a conceptual tool. One example is a software tool aimed to support the transformation of raw usability data into usability problem descriptions (Howarth, 2007; Howarth et al., 2007). Another example is a conceptual tool aimed to support identification of usability problems in a video recording or a live user session (Skov and Stage, 2005).

The method and tool approaches have been studied to a great extent. Less research has been committed to the idea of training software development practitioners who are usability novices to conduct usability evaluations. This is summarized as:

(3) A barefoot approach where software development practitioners are trained to drive usability evaluations

The assumption is that software development practitioners who have little to no knowledge on how to conduct usability evaluations can be trained to achieve basic evaluation skills. Häkli (2005) presents a study in which she trained software development practitioners without a usability background to conduct heuristic inspections and user based evaluations. Høegh et al. (2006) conducted a study of usability evaluation feedback formats where they examined how software development practitioners' awareness of usability problems could be increased; one of these formats was to let practitioners observe a user-based evaluation and thereby involve them directly in the process. Although no training was done in that study, it is an example of including the developers in the evaluation process in order to increase awareness.

An entirely different idea is to involve end-users in usability evaluations. It is argued that if end users are able to conduct such evaluations, it will lessen the need for small companies to employ usability specialists. This can be summarized in this approach:

(4) A crowdsourcing approach where end users are given minimalist training to enable them to drive usability evaluations

The assumption is that end users provided with minimalist training in driving usability evaluations will alleviate the need to involve usability specialists. This was originally proposed by Castillo et al. (1998) as a feasible alternative to traditional usability evaluations conducted by usability specialists. A main purpose of their User reported Critical Incident (UCI) method was to reduce the amount of resources required for having usability experts analyze data from system usage. Instead, users would receive minimalist training in identifying and describing usability problems after which they would report the problems (Castillo et al., 1998).

1.3. The barefoot approach

The barefoot approach has been suggested as a way of overcoming the key obstacles towards adoption of usability evaluation practices. With this approach, existing software development practitioners are trained to plan and conduct usability evaluations and to take on the data logger and test moderator roles. The practitioners are also trained to analyze usability data and fix identified problems. These developers would continue doing their usual development tasks, but would also be conducting usability evaluations.

This approach inherits the idea behind the barefoot doctors that emerged during the Cultural Revolution in China in the 1960s. According to Daqing and Unschuld (2008), getting healthcare services embedded in the rural areas of China was an ongoing challenge dating back to the early 20th century. Early attempts to resolve this challenge included drafting doctors from private practices, but healthcare services in these areas remained scarce. In 1964, the Chinese state covered healthcare expenditures for 8.3 million urban citizens, which exceeded the expenditures for more than 500 million peasants residing in rural areas. Mao Zedong criticized this urban bias of healthcare services, and in 1965 he emphasized the importance of solving this challenge. Accordingly, one vision behind the Cultural Revolution was to bring better healthcare services to the rural areas. To counter this problem, Mao sent mobile teams of doctors into these areas with the purpose of training local peasants in basic medicine such as delivery of babies, ensuring better sanitation and performing simple surgical procedures. In order to keep up the level of mass production, peasants who received this basic medical training, would generate work points from their medical services as well as they would receive points for doing agricultural work. Thus, some of the peasants would work part time in the rice fields walking around barefooted and part time as doctors in the local area, which coined the term of barefoot doctors (Daqing and Unschuld, 2008).

Although barefoot doctors did not have the same level of competences and equipment as urban doctors, the barefoot programme did, according to the World Health Organization (WHO), effectively reduce healthcare costs as well as provide timely care. Thus, the WHO considered the barefoot doctors programme successful in terms of solving the challenge of healthcare shortages (Daqing and Unschuld, 2008).