

USER-CENTRIC USABILITY EVALUATION FOR ENTERPRISE 2.0 PLATFORMS

A Complementary Multi-method Approach

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Abstract: Enterprise 2.0 projects offer a great potential for enabling the effective identification, generation and utilization of information and knowledge within complex organizational processes; and have a deep impact on organizational changes. This paper focuses on a usability methodology, whereby the critical success factors include (i) efficient organization, (ii) guided by organizational needs, (iii) dealing with organizational complexity, and (iv) providing end user requirements. We present a complementary multi-method approach of user-centric usability evaluation methods including eye tracking, heuristic evaluation and a feedback blog. This evaluation approach in combination with continuous user training allows comprehensive enhancement of ability and motivation of the users, which leads to excellent project performance.

1 INTRODUCTION

Enterprise 2.0 (McAfee, 2006), the use of interactive and collaborative Web 2.0 concepts and technologies within and between enterprises, offers great potential for flexible, loosely-coupled integration and ad-hoc information exchange. This requires organizations to move away from their traditional concepts of competition towards a networked, service-oriented economic thinking and the dissolution of hierarchical structures in favour of decentralized, networked forms of organization. But Enterprise 2.0 projects are different from common IT projects by their nature (Chui et al., 2009; Koch and Richter, 2009). They always have a deep impact on organizational and cultural changes by enabling employees to pro-actively enlarge their own role, mandatorily need a critical mass of user involvement (Chui et al., 2009), have to face the fact of missing best practices and reputation, confront the users with unused ways of working with IT systems (e.g. the use of tagging, the syntax of enterprise wikis, etc.)

and are not yet an established part of a company's state-of-the-art IT portfolio. In addition, the value of an Enterprise 2.0 platform for organizations and their employees is – in contrast to e.g. an ERP system - still neither clear nor proven, however, seems to address an increase of the enterprises' productivity by enabling the users to do their job more effectively and efficiently through better availability of resources including organizational knowledge (Koch and Richter, 2009).

If Enterprise 2.0 projects are carried out without considering the aspects mentioned above, they often fail because of e.g. long lasting implementation processes without delivering results accepted by the users or additional projects of higher priority using resources necessary for the Enterprise 2.0 projects. Consequently, to increase the success of Enterprise 2.0 projects, the whole project's phases and tasks must be organization-driven to consider the increasing complexity of organizations. The critical success factors identified range from (i) *technical barriers* as in usability issues that lead to the denial of the new system (Venkatesh, 2000), (ii)

managerial barriers, as in a lack of commitment from the executives, mis-alignment of project goals and enterprise goals, insufficient resources, time or money resulting from concurrent projects, or the fact of volatility in customer requirements (Mohan et al., 2008; Franken et al., 2009; Sirkin et al., 2005), to (iii) *cultural barriers*, such as the “Not Invented Here” syndrome, the fear of the unknown, or apathy (Chesbrough, 2006).

In respect of the complex variety of these success factors, the *main focus* of this paper is to address the mentioned *technical barriers*, especially in the means of *usability* issues. The objective of this paper is to present a complementary multi-method approach of usability evaluation methods using eye tracking, heuristic evaluation and a feedback blog, and its contribution to the successful implementation of Enterprise 2.0 platforms. Consequently, the authors show the use of these methods, and how they complete each other in order to deliver practical insights into employee-driven usability issues. The remaining of the paper is arranged as follows: In section 2 the projects’ implementation methodology is explained. Section 3 provides insight into the usability testing methodology and presents key results of the usability evaluation. Section 4 discusses the contribution of the multi-method approach and section 5 closes with findings, limitations and possible future research.

2 THE IMPLEMENTATION METHODOLOGY

In the course of the 3-year R&D project „SCIM 2.0” (funded under the program “COIN – Cooperation & Innovation“, a joint initiative by the Austrian Federal Ministry for Transport, Innovation and Technology and the Austrian Federal Ministry of Economy, Family and Youth) the authors have created a participative, evolutionary design (Koch and Richter, 2009) for the implementation of Enterprise 2.0 projects and practically evaluated it in two separate projects within Austrian mid-sized companies. The overall methodology included the phases: (i) *Assessment* (“Whether to start the Enterprise 2.0 project”), (ii) *Analysis* (“What are the requirements”), (iii) *Design* (“How can the requirements be realized”), (iv) *Realization* (“Do the implementation and roll it out”), and (v) *Operation* (“Support and evaluate the productive information system”). Within these for IT projects common and well-established phases, the authors used specific methods to explicitly address the success factors of

Enterprise 2.0 projects and the corresponding change management issues.

The implementation of the Enterprise 2.0 platform was done with Microsoft Sharepoint 2010 in an evolutionary manner – within Web 2.0 projects usually referenced as perpetual beta (Koch and Haarland, 2004). Perpetual beta is a rapid and agile software develop method which recommends to roll out the software (in our case the Enterprise 2.0 platform) in a “beta release” stadium and to train and involve the end users in a very early phase. Feedback from the users is collected by using a feedback blog and conducting usability tests including eye tracking analysis and heuristic evaluation. This multi-method approach provides multi-dimensional evaluation insights, which are discussed in the next two sections.

3 MULTI-METHOD USABILITY EVALUATION

This section highlights the methods and tools used to improve the usability of the Enterprise 2.0 platform. This includes the use of (i) a feedback blog, (ii) eye tracking, and (iii) heuristic evaluation. The usability methods (see e.g. Holzinger, 2005) were applied during the beta phase of the project which included about 50 selected beta users of departments the tools were targeted at.

3.1 Feedback Blog

A feedback blog went online parallel to the first user training for the first prototype, and was used during the rest of the implementation phase. In this period of time (about 5 months), 53 blog posts and 64 comments in total were submitted. The blog posts were categorized and clustered into general usability and functional suggestions, nice-to-have improvements, and implementation bugs. Examples of important usability issues and missing features that were identified by the users are: (i) As most user generated content will be provided in blogs and wikis, the users suggested adjusting the placement of the edit button in the Enterprise wiki layout, to meet the users’ expectations. (ii) The functionality for comments and notes within wiki pages: Microsoft Sharepoint provides this functionality within all pages, but it is hidden in a tab within “Tags & Notes“, and therefore not usable for most users. The solution was to embed this function directly on the wiki page. (iii) To make contents of blogs, wikis and lists available offline as a nice to have-feature.

3.2 Eye Tracking

The eye tracking analysis (cf. Auinger et al., 2011) was conducted with 12 test subjects using the first closed beta version of the prototype. The probands were divided into two research groups of 6 subjects each. All probands were given a two-hour training on the prototype, with one group being tested before the training and the other group after the training. The goal of the test was to complete tasks by locating pre-defined design elements or hyperlinks positioned somewhere on the web site and to confirm it by fixing the element with their eyes. For each of the 16 tasks they had up to 5 seconds time to complete the task.

The eye tracking data was recorded by a 120Hz eyegaze eye tracking system from the vendor Interactive Minds. It enabled us to elate the intuitiveness of the system for inexperienced users, and to demonstrate how the training affects the use of the system. As a side effect, it was intended to raise awareness by involving the users more deeply into the implementation process by tailoring a system that fits their needs.

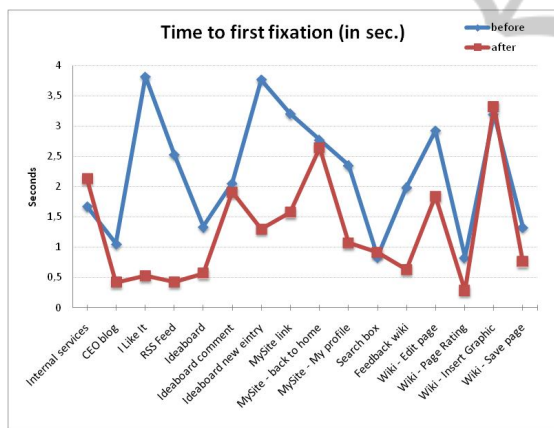


Figure 1: Time to first fixation before and after training.

In order to be able to calculate the relevant indicators, areas of interest were defined with the eye tracking analysis software Nyan 2.3.5 for each task. Additionally, it was possible to calculate the average time to finish each task. Based on the results it can be stated that the training had a positive impact on the handling of the system. As expected, the results of the analysis after training were significantly better than those carried out before the training. The average time to first fixation, i.e. the time required to find the desired element or hyperlink on the web site, was in 14 of the 16 tasks lower than before (cf. Figure 1). The highest difference in time to first fixation was observed in

the task to find the “I Like It” tag. Probands needed on average 3.82 seconds before and 0.525 seconds after the training. Before the training, the search was an unstructured hit or miss trial to find the element. After the training, the first view went in most cases straight to the “I Like It” tag and stayed there.

3.3 Heuristic Evaluation

Supplemental to eye tracking and the feedback blog the Enterprise 2.0 platform was evaluated using an adapted form of heuristic evaluation method with 6 probands. The method was deployed right after a two hours training session for the Enterprise 2.0 platform prototype. So, the users could give immediate feedback of what they had just experienced during the training. The probands were interviewed by an experienced usability expert, using a basic heuristic evaluation questionnaire as described in the following. To handle possibly bias, the evaluation was carried out individually in a separate room and the answers were made anonymous. The probands were chosen by their experience and knowledge concerning user interfaces and web applications. The questionnaire was based on (Petrie and Buykx, 2010). Probands were asked to rate the *overall satisfaction* and their *impression of the usability* of each functionality on level of top menus with a five-point Likert-type scale. With an average of 2.38 (cf. Figure 2) the overall usability was rated between “good” and “moderate”.

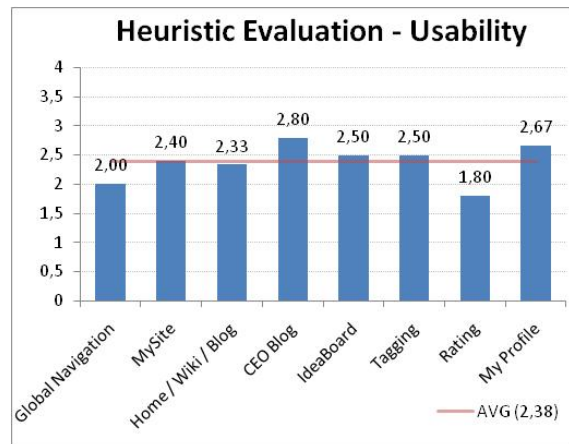


Figure 2: Heuristic evaluation of usability.

Additionally, the probands were asked for the exact reason for usability problems, in line with the following criteria, based on the dialog principles of the ISO 9241-110 (ISO, 2006) standard (the “heuristics”, cf. Table 1). Each criterion was rated

on a 5-point Likert-type scale for heuristic evaluation (Petrie and Buykx, 2010). Whereas the overall satisfaction and usability was rated as “good” on the average, the deeper look revealed some more severe usability issues. Table 1 contains a summary of the critical and catastrophic usability problems identified grouped by the heuristic the problem mainly addresses. The table shows that primarily the heuristic “self descriptiveness and findability” was concerned. In terms of Enterprise 2.0 tools the main identified areas with usability issues were blogging (6 issues), personal profile & social networking (i.e. Sharepoint’s My Site, 4 issues), tagging (3 issues), and wikis (2 issues).

Table 1: Critical (Rating = 3) and catastrophic (Rating = 4) usability problems identified by the heuristic evaluation.

ISO 9241-110: Dialog principle / Short description of the problem	Rating
ISO: Self descriptiveness and findability	
Where and how can I add a colleague to “My Team” within the My Site?	4
The link back to the homepage (from the My Site) is not present/findable	4
The link to the edit page of a blog is hard to find	4
It is not clear how to find certain ideas in the IdeaBoard when the entries increase	4
The tag cloud is hard to find	4
How can I find new blogs (e.g. knowledge blogs)	3
The term “Manage posts” is not self descriptive	3
It is unclear how I can tag external sources and make tags “private”	3
ISO: Suitability for the task and functionality	
It is unclear how the structure of a wiki is generated	3
The IdeaBoard surely gets a mess if no clear guidelines are applied	3
ISO: Controllability and completeness of functionality	
The My Site is rather complex, therefore it should be “clearer” and with less functionality	3
ISO: Consistency & conformity with user expectations	
The edit functions of the blog are missing	3
ISO: Understandability & suitability for learning	
For what can I use tagging in the context of my work?	4
A user documentation (wiki) should be made available for all users	3
The My Site is hard to understand because of the complex functionality	3

4 DISCUSSION OF THE MULTI-METHOD APPROACH

As usability is multifaceted it must be assessed by using a variety of different measures (Agarwal and Venkatesh, 2002). The mix of the three usability methods described in the previous section provides insights that would not have been possible with only one source of data (Cyr et al., 2009) and therefore

increases the overall usability of the system. Especially involvement of the users including the possibility to articulate, publish and rate continuous feedback is a key factor for successful Enterprise 2.0 projects because it addresses the reputation, fosters participation and reflects the intrinsic motivation of the users (Chui et al., 2009). Factors which are most often ignored are control (internal and external self-efficacy and facilitating conditions), intrinsic motivation, and emotion (also conceptualized as computer anxiety) (Venkatesh, 2000). Indeed the motivation of employees is the most crucial success factor in any enterprise and must be considered of top importance (Holzinger, 2011). Actually, ability and motivation are the two top factors for performance (Lawler, 2003).

It is known that *blog-based* knowledge management solutions can contribute to solve the problem of knowledge sharing and knowledge creation in organizations where the emphasis is both on push and pull style in knowledge capturing (Li, 2007). In a previous study it could be shown that blogs can be used to increase learning performance (Holzinger et al., 2009). In the described case the blog used as feedback channel proved very useful as not only that issues that occurred during usage of the system could be directly reported but also the practice of blogging was trained. It could be proven that users that were posting in the feedback blog were subsequently also intensively utilizing the various blogs to inform on new issues and comment on other’s posts. Even sceptical users, identified by the stakeholder analysis during the analysis phase, behaved that way. Thus, the feedback blog helped to reduce barriers against the new system, motivated the users to participate on the new system and positively influenced the overall acceptance of the system.

Eye tracking has been chosen as additional method for evaluation in this multi-method approach because it is a reliable method in many studies (Duchowski, 2007). Eye tracking has also been approved as an appropriate methodology for usability studies (Nielsen and Pernice, 2010), especially in Enterprise 2.0 environments in order to test user experience (Djamasbi et al., 2010; Herendy, 2009; Jacob and Karn, 2003). User experience encompasses emotion, which is an important mental and physiological state, influencing the cognition, perception and communication of the users and can be measured by application of the valence arousal space for emotion modelling, e.g. to test the correlation between performance and emotional states (Stickel et al., 2009). The essence is to avoid negative emotional influences within the application.

The eye tracking result in the first impression was what was to be expected, as training definitely improves response time to obtain an eye fix. But the eye tracking method was intended to provide more insight than just measuring the effectiveness of training. By comparing the before and after results the study the need for training and familiarization of the prototype to avoid negative emotional influences could be demonstrated. Especially users that are not familiar with the concepts of Enterprise 2.0 (like blogs, wikis, tagging, and rating) and their implementation within Microsoft Sharepoint 2010 are more likely to get frustrated. The scan paths and heat maps revealed that the probands sometimes had problems to find the desired functionality leading to frustration and denial of the new system. Furthermore, during the beta test, additional usability flaws were discovered by eye tracking. For example, the “My Site – Home” task proved that it is hard to find the way back to the home page from the My Site even after a training due to inconsistencies in navigation in Microsoft Sharepoint 2010. To summarize the outcome of the eye tracking evaluation it can be stated that it improved the motivation of the users to participate as they are more involved. It also showed the need for continuous improvement of the platform in rather short cycles via perpetual beta.

Heuristic evaluation is a systematic usability inspection method for evaluation of a user interface design (Nielsen and Molich, 1990) that still appears to be one of the most actively used method (Hollingsed and Novick, 2007). The goal of this informal method is to find usability problems in the user interface in an early phase and address them as part of an iterative process. These characteristics made the heuristic evaluation the ideal supplemental method for receiving user feedback from the experienced beta users. In addition it served as kind of a fallback to the feedback blog, if the blog would not have been accepted as feedback channel by the users. Nielsen and Molich recommended using three to five probands for heuristic evaluation, as five probands detect between 55% and 90% of usability problems. Adding more probands will not significantly increase the detection rate (Nielsen and Molich, 1990). We used six evaluations because our probands were no usability experts, but were identified as the most advanced system users. To compensate the lack of usability know-how, the evaluation was conducted in an interview setting by an usability expert. The heuristic evaluation served well as quick and easy evaluation method to get immediate feedback from the users after the training. The main outcome was that several urging usability

problems could be identified and consequently be addressed during the perpetual beta implementation. The heuristic evaluation also was a motivating factor for the users, when they saw that their individual recommendations became part of the system during the perpetual beta.

5 CONCLUSIONS

Enterprise 2.0 offers the great potential for enabling the effective identification, generation and utilization of information and knowledge within complex organizational processes. Hence, Enterprise 2.0 projects always have a deep impact on organizational and cultural changes and consequently to the individual users. To increase the success of such projects, the critical success factors of Enterprise 2.0 projects have to be considered in the single project phases and tasks, which requires to be (i) well and tight organized, outlined by the organizational experiences and parameters, (ii) driven by organizational needs, (iii) consider the organizational complexity, and (iv) care for the user-individual functional and usability requirements. This paper focused on the demonstrated usability methodology in order to address the critical success factor “technical barriers”. The main objective was to present a complementary multi-method approach of a user-centric usability evaluation using eye tracking, heuristic evaluation and a feedback blog, and its contribution to the successful implementation of Enterprise 2.0 in companies. Hence, the main findings of the paper are: (i) The strength of Enterprise 2.0 lies in the possibility of linking well-defined processes and standardized information flows with unstructured communication and collaboration processes that have high priority but are insufficiently supported by existing enterprise solutions. (ii) The social dimension in general is one of the biggest challenges within an Enterprise 2.0 project and needs to be addressed from the beginning of the project. This starts with the identification and motivation of key users and promoters that support and push the project is crucial. (iii) The conducted user-centric multi-method usability evaluation approach in combination with continuous user training allows comprehensive enhancement of ability and motivation of the users, which leads to excellent project performance.

As the current research is limited to pilot project implementations, future research is needed to consolidate the user-centric multi-method usability evaluation methodology and, to embed it into an

overall Enterprise 2.0 project framework.

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