How to Integrate Usability into the Software Development Process

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ABSTRACT
Usability is increasingly recognized as a quality attribute that one has to explicitly deal with during development. Nevertheless, usability techniques, when applied, are decoupled from the software development process. The host of techniques offered by the HCI (Human-Computer Interaction) field make the task of selecting the most appropriate ones for a given project and organization a difficult task. Project managers and developers aiming to integrate usability practices into their software process have to face important challenges, as the techniques are not described in the frame of a software process as it is understood in SE (Software Engineering). Even when HCI experts (either in-house or from an external organization) are involved in the integration process, it is also a tough endeavour due to the strong differences in terminology and overall approach to software development between HCI and SE. In this tutorial we will present, from a SE viewpoint, which usability techniques can be most valuable to development teams with little or no previous usability experience, how a particular set of techniques can be selected according to the specific characteristics of the organization and project, and how usability techniques match with the activity groups in the development process.

Categories and Subject Descriptors
D.2.9 [Software Engineering]: Management – software process

General Terms: Management, Human Factors.

Keywords: Usability integration into software engineering activities, software development process, Human-Computer Interaction.

1. GOAL AND OBJECTIVES
Participants in the tutorial will understand how usability needs to be integrated into the activities of the software development process instead of being addressed by a separate process, and which usability techniques may be more useful for a successful software product development in a SE environment.

In particular, participants will:
- Understand the HCI view of software process and how it differs from the SE perspective.
- Be able to select which specific set of usability techniques may be more appropriate for the objectives and restrictions of a given project and/or organization.
- Understand which activities in the overall software process are affected by usability.
- Map usability techniques to activity groups present in typical software processes.
- Be able to choose the best moments of application for each usability technique in an iterative development.

2. SCOPE
We assume some prior knowledge of software process issues and life cycles, but not necessarily a deep knowledge. No previous HCI and usability knowledge is required. Given the novelty of the subject and the major lack of knowledge in usability issues in the SE field, we see the tutorial as a starting point for any software engineer interested in usability integration into the process. Therefore, we classify this tutorial as a basic level one.

3. TEACHING METHOD
The tutorial will consist of lecture introducing the material, followed by a participatory exercise in groups and a report out to the larger group. The lectures will include many anecdotes from the instructors’ personal experience in industry and academia, including recent experience using the material of this course in several development projects. The exercise will consist on examination of a participant’s development process for usability integration possibilities.

4. SUMMARY OF CONTENTS
Usability has been present in software quality attribute decompositions since the late 70s, but it has been recently that it has begun to appear as a highly relevant attribute for customer-perceived software quality. For managers, for example, usability is a major decision factor, particularly for selecting a product, and emerging fields like web development have contributed to this increased impact of usability into software development. The HCI field has been pursuing the development of usable software products for a long time. HCI offers a large number of techniques which may be applied for the aim of producing usable software. They are widely applied in development projects where usability is the main (or only) quality attribute taken care of. But the application of HCI techniques is decoupled from the overall software development process. This state of things is changing. Recently, software developers are becoming aware of the importance of usability issues and a growing number of software
development companies are addressing the integration of usability techniques into the software development process.

In order to carry out the usability integration endeavor, the software developer needs to read several HCI books to know about the usability techniques available, which are scattered between the methods by different authors, to be able to select a set of techniques which may better suit the needs of the company and of the project at hand. These techniques are not integrated into the software process as understood in SE, so each individual usability technique has to be considered for its mapping to the company software process activities.

As part of the European Union funded IST STATUS research project, a framework has been developed for giving an answer to this problem. The project goals included outputting methodological guidelines for integrating usability techniques into the software process, which we present in this tutorial. The two industrial partners in the project consortium helped us to establish the framework’s underlying premises and to test the results for their practical applicability. Pragmatically speaking, the industrial partners asked for a roadmap that could tell them which usability techniques and activities they should incorporate, and when in development time. An open solution that fits a wider range of processes is preferred to the option of establishing the “perfect” software process integrating usability and SE practices. The application of such a perfect process from a usability point of view would mean abandoning their current software process, which most companies are not wishing to do.

Not all processes can be converted into proper user-centered processes by making just a few modifications. The transformation required for a process or an organizational culture based on a waterfall lifecycle approach to become user-centered would be far too drastic. This approach implies that detailed specifications are produced before any design and implementation is performed. The complexity of the human side in human-computer interaction makes it almost impossible to create a correct design at the first go. Cognitive, sociological, educational, physical and emotional issues may play an important role in any user-system interaction, and they cannot be completely predicted in advance. Therefore, the candidate for usability integration needs to be an iterative process. Of the characteristics of a user-centered process, iterativeness is the only one that is intrinsically inherent to the software process. Therefore, the framework presented in this tutorial can help any organization with an iterative process to enhance this process with usability activities and techniques. This approach increases the practical applicability of the framework, since it does not require any specific original process as long as it is iterative.

A few integration proposals exist. Proposals from the HCI field are mainly advice found in a particular usability method about how it could be integrated with high level development stages and, thus, they are not highly detailed. Consequently, a software engineer looking for an answer to the integration problem may find the information in these sources defined at a different level of detail than is usual in a defined SE software process, and with important differences in terminology and overall view of software development. On the other hand, proposals from the SE field are usability extensions to particular methods and they do not explicitly detail the rationale behind the selection of a particular set of usability techniques.

For the definition of the framework that will be presented in this tutorial, it has been necessary to perform a study on HCI activities and techniques in the first place, given the great diversity present in the field. Each HCI author has a particular view of the development in terms of what activities should be undertaken to produce a usable software product, and techniques for this purpose are not always described associated to a particular activity. Given the great number of techniques obtained, we performed next a characterization of techniques according to a set of criteria relevant to software developers aiming to integrate usability into their current development process from a SE viewpoint. Based on this characterization we have selected a set of 35 techniques, which we consider the best fit for their integration into the development process of an organization with little or no previous experience in usability. HCI Activities and techniques have been mapped to SE activities so that developers know how they fit in their process. Additionally, as development time has particular milestones from a usability point of view, and some techniques have a preferred application time, techniques have been also assigned to usability-relevant development stages in an iterative development. The framework has three different views (by techniques, by activities and by application times) which can be combined in the task of selecting the usability techniques most appropriate for integration into a given project process.

The tutorial will provide attendants with focused information, so that they will be able to take tuned decisions in the usability integration effort. Their participation in the tutorial will allow them to understand the HCI view of software process and how it differs from the SE perspective, and to select which specific set of usability techniques may be more appropriate for the objectives and restrictions of a given project and/or organization. They will also understand which activities in the overall software process are affected by usability and how to map usability techniques to typical activity groups present in any software process. Finally, they will know about the best moments of application for each usability technique in an iterative development as well.

5. REFERENCES


