

Job-Based Usability Testing to Enhance Tool-Prototyping

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Abstract

In software development, it is long been understood that usability testing is a prerequisite to intuitive and usable user interfaces. But there is still no known method to integrate usability tests early into the development process of software, especially if it is meant to be used by specific users. The literature describes several specialist techniques to measure the usability and to set up usability experiments, but all of these involve recruiting specific users for testing, and thus risking a shortcoming of usability tests throughout the development process. This work introduce a new usability testing technique, that allows early and continuous usability testing, without the need to recruit expert users. The approach of job-based usability testing is to iteratively test and improve prototypes for software that is meant to be used by specific users to perform specific tasks and achieve specific goals, and still can be tested with average users. This new approach is expected to dramatically reduce the cost of recruiting participants for testing throughout software development projects, and hence make continuous usability testing viable.

1 Introduction

Software and tools are supposed to assist humans in the production process. Therefore usability is a key success factor. Appropriate usage of software and tools includes intuitiveness, no matter if the user is an expert or if it is his first contact with the topic. History shows that software is never perfect, usability problems are an ongoing research topic and it is a continuous task to find and fix these issues. Performing usability tests in the development process try to improve usability cost efficiently (Krug 2010). Within the approach to separate the user interface from the underlying business logic, job-based usability testing provides the opportunity to test early and iteratively without the need of expert users for testing. According to Davis (Davis 1986), the technology acceptance model (TAM) has *perceived usefulness* and *perceived ease of use* as key dimensions. Input for the

dimension of *perceived ease of use* can also be delivered by non-experts. Furthermore *perceived ease of use* has two perspectives: first, the *ease of learning* for beginners and domain experts who rarely use the tool and secondly, the *effective and efficient use* or achievement by experts in the domain and the tool. Usability testing leads to effective software that is more efficient and satisfying to use than software that has not been tested. Tool developers are too much involved into tool details and can not be aware of all usability problems to test their own software. Recruiting people from the target audience (e.g. domain experts) is not always possible and therefore many development teams lose track of usability testing. Instead of skipping usability tests, job-based usability testing, described in chapter 2, tries to involve non-expert users as much as possible, so that expert users are needed for fine adjustment only.

2 Job-based Usability Testing

As shown in Figure 1, a person (worker) who handles a task interacts with tools and the environment (Richter & Flückiger 2010). Based on this key role of the person, design decisions should be based on user research. User interviews and questionnaires have both proven to be effective research methods and they can provide that kind of information needed for design, development, and usability testing.

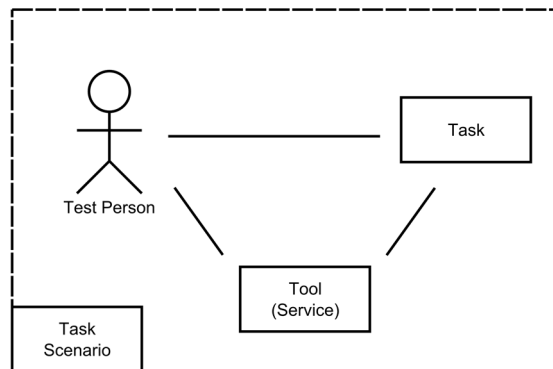


Figure 1: Job-Based Usability Testing according to men-computer-system at the workplace according to Richter & Flückiger (2010)

In agile software development *personas* and *scenarios* help each team member, either visualize the best product behaviour or see why the recommended design is useful. Personas and context scenarios are derived from research data (interviews, questionnaires, etc.). *Personas* are archetypes or typical representative of a category of potential users. A persona encapsulates and explains the most critical behavioural data in a way that designers and stakeholders can understand, remember, and relate to. *Scenarios* are plausible descriptions of the future based on a coherent set of assumptions. Their use ranges from developing

requirements to ensure that a design accounts for the full range of possible interactions. (Goodwin 2009)

In case of usability testing, scenarios help a non-expert to imagine how an expert would interact with the software or the system. Architecture of software products can be separated into three layers: presentation, business logic and persistence. This gives the opportunity to develop and test each of them separately. As the presentation layer is the interface to the user, this is the point where job-based usability testing enhances prototyping and building the user interface.

2.1 Approach

Job-based usability testing aims to provide a framework to test (almost) any kind of tools (software) with (almost) anyone. The basic need at the beginning of job-based usability testing is to understand, what people can do or should do with the tool. The focus on different functions allows developers and designers to test their creations in a straightforward manner by writing appropriate and correct task scenarios.

With job-based usability testing it is possible to discover which features and functions of tools and software lacks and which redesign is necessary to make them *useable*. Not in scope of job-based usability testing is to discover whether these features are *useful* or not - this is part of requirement elicitation and should be done prior to product design. Regarding to the V-Model (Boehm 1979) acceptance tests happen after implementing features as one of the later verification steps. Figure 2 shows *acceptance test* on the right side of the V-Model. Job-based usability testing shift this acceptance test as an early acceptance test to the right side of the V-Model.

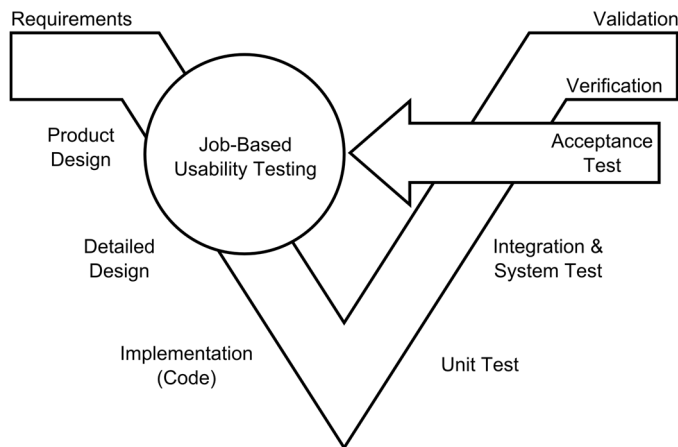


Figure 2: Job-Based Usability Testing as early Acceptance Test in the V-Model

Usability tests test the tool, the software or the system and not the user. In this case and in case of intuitive use of a tool, it is not that important which level of expertise the person has

who is doing the test. This enables developers and designers to test their applications with colleagues, friends and even family members. This gives the opportunity to integrate usability testing into their existing workflows and primarily start testing as early and often as possible.

2.2 Usability Testing and Improvement of the Prototype

Testing usability based on jobs to be done, a *testable prototype (tool or service)*, a *test person* and a *description of the job* in form of a task scenario as a summary of *tasks* is required, as shown in Figure 1. To explain these three components, they are illustrated here by an example of an online shop for smoking supplies.

The *testable prototype* is one prior condition to job-based usability testing and is already built in earlier phases of the project. Prototypes can be anything from simple click prototypes to HTML prototypes or fully working software applications. Nevertheless the term *prototype* indicates that usability testing should be done before an application is fully (functional) implemented.

Task scenarios describe the context of a realistic situation (e.g. context scenario) in which a tool will be used. The underlying information to create task scenarios is gathered in a previous phase of the development process. A key factor of successful task scenarios is keeping them independent to the test participants. In some cases test participants cannot relate to the scenarios, but they are able to imagine and to interact like described in the scenario.

Example: Imagine one of your co-workers is a heavy smoker and you are starting to get annoyed by his constant cigarette smell. Since you do not want to offend him, you decided to buy some electronic cigarettes as a present for his birthday in 2 weeks.

In case of the example above it is not necessary to recruit e.g. only smokers to test with.

Test persons are the main actors in job-based usability testing. They will be exposed to the prototype (tool or software) and were asked to perform the tasks like described in the task scenario. In some cases it might be necessary to take a specific view on the tasks in perspective of a persona.

Example: Go ahead and find a product you can imagine giving to your co-worker and try to find out if it can be delivered to you on time and how much you would have to pay in total.

Observing the test participants during their interaction with the tool while executing the given tasks gives an idea about intuitiveness of the tested prototype and shows which perceived features are not available or could not be found as expected. The prototype, the test scenarios and the test results influence each other. Improve them iteratively brings higher quality in intuitive use of the tool.

3 Case Study

As part of a research project that examines gender¹ aspects on the engineering workplace, a prototypical software demonstrator will be created to show the information flow within the product development process in an intuitive way. The way people socialise, approach work and how they use technology is influenced by a number of factors (Denger et al. 2014). This makes an impact in different perceptions and behaviour of use to the provided systems, as shown in Figure 3.

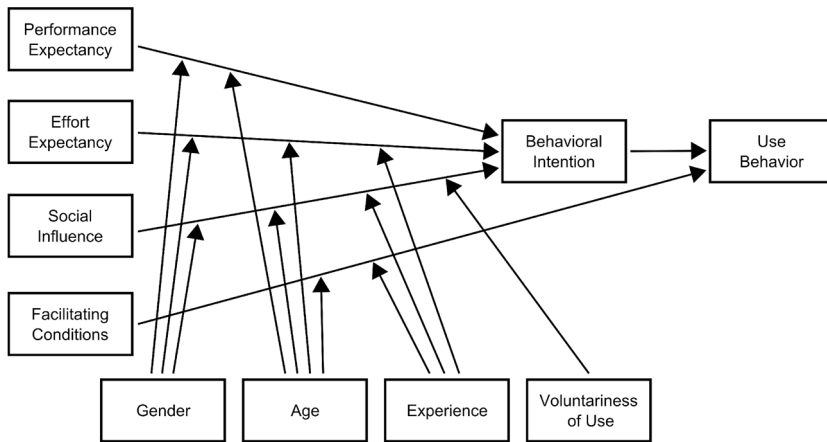


Figure 3: Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003).

In the first phase of the project, the requirement phase, interviews and a survey gave an overview on the current situation on the engineering workplace at the project partners. Together 40 people, each 20 men and women, were part of this first research phase. Based on these results, *personas* and *context scenarios* including the *main tasks* were derived. Personas and context scenarios built the bridge between the research and the design phase. They clarified the view on the engineers work and workplace and were the base to build a first prototype of the user interface in form of a paper prototype.

The scope of functionality scope of the prototype in this project is the user interface. This interface shall demonstrate a design, that cares on the difference of people and provide them a usable and intuitive interface. Regarding to the three layers of software architecture (presentation, business logic and persistence) only the presentation layer is in focus.

¹ To raise the awareness and point out the benefits of male and female collaboration, also in the STEM fields (academic fields of science, technology, engineering, and mathematics), the feminist technology research addresses the gender differences in the development and use of technology.

In the next steps the prototype of the user interface and also the job descriptions for the usability tests will be improved iteratively by job-based usability testing. In case of unavailability of domain experts from the project partners, the first test persons will be random users. In this phase of the project the most severe usability problems will be fixed. Usability tests will be continued with domain experts from the project partners, to make sure the revised solution will work for them.

4 Summary and Discussion

Usability including intuitiveness is a key success factor in software and also in tools and services that assist humans in the production process. Job-based usability testing discovers required redesign in the user interface. Separating the user interface from business logic gives the opportunity to test and improve the user interface separately. Task scenarios helps understanding the actual jobs people will do. The first tested prototype of the user interface can be a paper prototype and there is no need to recruit experts for testing throughout the whole project. By iterating tests together with improvements of the prototype the most severe usability problems can be fixed before tests are continued with domain experts.

Job-based usability testing can also help in existing projects, where business logic is flawed or unknown, to create a concept for a redesign. Job-based usability testing enables testing early and often. This raises the quality of tools and services and saves money by testing with non-experts.

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