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## **Fast, Fastere, Agile UCD**

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*Publication date:*  
2014

*Document Version*  
Early version, also known as pre-print

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*  
Øvad, T., & Larsen, L. B. (2014). Fast, Fastere, Agile UCD. Paper presented at 8th Nordic Conference on Human-Computer Interaction, Helsinki, Finland.

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# Fast, Faster, Agile UCD

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## ABSTRACT

This position paper describes an on-going PhD project exploring the opportunities of integrating user centred design (UCD) and agile software development. This is partly done by developing and integrating a UCD toolbox in the software department of a company developing medical devices. The aim is to support the software developers by enabling them to carry out some of the UCD work themselves. As preliminary steps, the current state of UCD in the Danish industry is clarified and relevant methods and processes are identified via a literature review. The current activities are focused on experimental evaluation of different UCD methods and the preliminary results from this work seem promising. However, further work needs to be done both to validate, but also to facilitate the integration of the UCD work processes in the software department.

### Author Keywords

User Centered Design (UCD), User Experience (UX) design; Agile software development; Scrum; Empirical Study; Case study; Training software developers; Focused Workshop; Position Paper.

### ACM Classification Keywords

H.5.2 User Interfaces: User-centered design; H.5.2. User Interfaces: Evaluation/methodology; D.2.2 Design Tools and Techniques: User interfaces; H.1.2 User/Machine Systems; K.6.3 Software Management: Software development

## INTRODUCTION

This position paper describes an on-going PhD project exploring the opportunities of integrating user centered

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design (UCD) and agile software development. This integration has been of interest for both academia and the industry for several years and a large number of studies have discussed different solutions to succeed i.e. [1–5,7,9,11,15–17,19]. The present workshop is also proof of this focus.

The study is done in collaboration between Radiometer Medical ApS [22] and Aalborg University. Radiometer develops medical devices. This type of company is under strict regulatory demands and U.S. Food and Drug Administration (FDA) and International Organization for Standardization (ISO) have the last five years published documents on human factors guidelines and standards. As a result it is desirable to have UCD permeate the whole development process in order to make sure that these guidelines and standards are followed and documented. Aalborg University has extensive activities within interaction and user experience design, usability studies and applying methods and theories in industry.

The present study will therefore investigate how to make an integration of UCD and agile software development. As a starting point we suggest having the software developers do some of the UCD work themselves, entailing a permeation of UCD throughout the whole software development process.

## AIM

To guide the software developers on how to make UCD work, a UCD toolbox is to be developed. This toolbox has to be suitable for deployment in an agile software development environment for medical devices.

## PRELIMINARY STEPS

To gain an insight in how companies currently work with UCD in an agile environment and the challenges they are facing, the current state of UCD in the Danish industry is clarified. This is done by semi-structured interviews with nine interviewees from eight Danish companies. The detailed findings from these interviews can be found in [13]. Furthermore, a literature review has been carried out and relevant UCD methods and processes have been identified.

## Interviews

The three main conclusions are:

1. *Two different types of organisations must be addressed:*
  - a. Larger organisations with a specialised UCD department (or team). In these organizations UCD specialists can be called upon e.g. to carry out user studies when necessary or relevant.
  - b. Smaller organizations, with no UCD specialists and no resources to build such a department (or team).

The difference between the two types of organizations induces the potential integration of UCD processes into the agile development may need to be implemented in different ways, depending on the organization type.

2. *Lack of processes when working with UCD:*

This indicates that UCD processes need to be developed and described before an integration into the organisation can be achieved.

3. *The companies have taken Scrum to heart:*

All of the interviewed companies used or have the opportunity to use Scrum – and when started, the companies seem to adhere to this framework. This could be a beneficial foundation for an integration between UCD and agile development, since UCD can gain some of the benefits the software development has gained from the Scrum framework; more transparent work, an incremental and iterative work process, focus on something to show to the customers etc. [13].

## Identification of Potential UCD Methods and Processes

The aim of this work is to develop a UCD toolbox to be used in line with the sprints. We will not include user research methods primarily applied prior to the development process and more formal usability evaluations at the end of the development process. This approach is suitable for the present project since Radiometer has a dedicated UCD team to take care of the initial and final phases of the UCD development. In addition to this, the methods must be applicable within a single sprint and not require a specialised background in usability engineering or similar.

Using these criteria we have identified a shortlist. These are:

- **Focused workshop** diverted from a formal focus group session as described by [10] and customized to an industrial setting, where a formal focus group can be too time and resource consuming.
- **Contextual Inquiry** as described by [1,6].

- **Cognitive Walkthrough** as first described by [21] and modified by [14,18].
- **Instant Data Analysis (IDA)** as described by [8].

We have not yet decided on a final UCD process to work with, but the potential candidates are:

- **Agile UCD** as described by i.a. [19]
- **Contextual Design Process** as described by [1,6]
- **Design Studios** as described by i.a. [20].
- **UScrum** as described by [17]

Currently, our activities are focused on experimental evaluation of different UCD methods.

## CURRENT WORK

To investigate our ideas further, we are currently working with an iterative process at Radiometer. This process is switching between experimental evaluation and analysis of the chosen methods. One iteration is roughly estimated to take three months.

The first method through the process is, as mentioned above, focused workshop.

The process for the experimental evaluation and analysis was structured as following:

- Interviews with ten developers to hear about their expectations and reservations towards doing UCD work.
- Two of the software developers participated in a focused workshop as note takes in order to have first-hand experience of the method.
- An interview was conducted with each of the participating software developers to hear their thoughts about the method and how the training had affected their knowledge, skills and current work procedures.
- One (so far) of the participating software developers planned and conducted a focused workshop.
- An interview was conducted with the software developer, who had conducted the focused workshop. The interview was done to hear about his experiences from conducting the focused workshop and if he had changes to method.

The idea is that the experimental evaluations of the other chosen UCD methods should follow the same processes as the focused workshop has followed. Ending with the methods are either; accepted, discarded or customized to suit the context of development of medical devices in an agile process.

## Preliminary results

The preliminary results from the focused workshop are promising. The software developers expressed a great interest in doing some of the UCD work themselves, however some of them expressed that they may not be the best to do the job, but they were willing to try.

After participating in the focused workshop session as note takers, the two software developers expressed that they were very satisfied about how rewarding the focused workshop had been regarding information and insights in the work life of the participants. Furthermore, the developers felt a higher degree of confidence in conducting such a session on their own.

Since it is of importance to know the timeframe of using the method when planning a Scrum sprint, the time consumption of the method is calculated see table 1.

Task	Time spent
Planning the workshop (experienced facilitator)	8 hours
Conducting the workshop	1.5 hour
Analysing the notes	5 hours
Presentation (incl. preparing)	2 hours
<b>In total</b>	<b>16.5 hour</b>

**Table 1: Estimated time consumption for a focused workshop**

Based on these findings, it seems reasonable to assume it will take a trained developer approximately 16.5 hour to plan, conduct, analyse the data and present the results. However, the planning time of the focused workshop can however vary considerably regarding the topic. For more details on the work read [12].

After having planned and conducted a focused workshop, the software developer was very positive towards the method, this was supported by a statement like: *“I think it [the session] was very rewarding and my impression was that the four others, who also participated, thought it was worth attending”*. Furthermore, the time consumption for this session corresponds to the estimated time consumption shown in table 1.

We have also engaged in similar activities in the company TC Electronics (see [23]). This company differs from the present, as there exists no dedicated UCD experts in the organisation. In this case the Contextual Inquiry method was used and we achieved similar promising results. These are presented in the NordiCHI2014 Industry Experience session (see [12]).

To make a final validation of the focused workshop method, more sessions have to be conducted. Furthermore, more UCD methods have to be evaluated and customized in close collaboration with the software developers at Radiometer.

## CONCLUSION

This paper introduced an on-going PhD project investigating which UCD methods and processes are suitable for integration into an agile software development environment with a focus on developing medical devices.

Through a series of interviews with Danish companies it is observed that an integration between UCD and agile development may be dependent on the company type – does the company have a specialised UCD department (or team), or not? The interviews also revealed a lack of processes when working with UCD in an agile development. However, Scrum seems to have gained its grounds and we will therefore aim at using the Scrum framework as a lifter for developing a UCD process suited for the agile software development, supported by one or more of the UCD processes identified by the literature review. Radiometer has a goal of having the UCD work conducted synchronously with the software development throughout the development process. It is therefore of importance that the UCD process is tailored to this type of approach.

Different UCD methods and processes are identified as being suitable to be used in an agile environment. We have devised an iterative process to evaluate these through an experimental test process. The first method, focused workshop, is currently under development and preliminary results seem promising: the developers are interested in doing some of the UCD work themselves and the time frame for a focused workshop shows it is suitable to be used in an agile development sprint.

Furthermore, it is of importance to look into how to facilitate this integration, an idea could be to look into change management to success with facilitating the integration of UCD and agile software development.

The expected outcome of the work is a described and documented integration of UCD and agile software development. This is done by means of the UCD toolbox, containing:

- A description of different UCD methods, including the effects of them, the load of using them and the data generated from them in an agile development process.
- Recommendations on how to integrate UCD and Scrum.

Via the UCD toolbox the software developers have the possibility to make UCD work on their own. Potential this can result in UCD permeating the development process, entailing better compliance of the guidelines and standards put forward by e.g. FDA and ISO. If you work in a company with a specialised UCD department (or team), the UCD toolbox makes it possible to have time allocated from the UCD practitioners ensuring them more resources to focus on the UCD vision and make more extensive UCD work. If you work in a company without a specialised UCD

department (or team), the UCD toolbox makes it possible for the developers to make extensive UCD work themselves.

#### ACKNOWLEDGMENTS

We wish to thank the participating people from Radiometer Medical for their participation and time.

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