Aalto University
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In-house software development process:
The usability perspective

Master's Thesis
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Abbreviations

CI	Contextual Inquiry
ERP	Enterprice Resource Planning
HCI	Human-Computer Interaction
ISI	Interaction Sequence Illustration
SUS	System Usability Scale
UI	User Interface
UX	User Experience

Contents

Chapter 1

Introduction

In this chapter, the background and reasoning for the thesis is described together with the focus and limitations of the research. In the text, research problems and the structure of the thesis will be also defined.

1.1 Motivation and aim of the thesis

In the 1980s, when the usage of personal computers (PCs) became more common, software design practices were still falsely assuming that the users were knowledgeable and competent in computer science. As an outcome, big part of the users were practically incapable of using operating systems and applications. During these times, the concepts of Human Computer Interaction (HCI) and usability, became important. Since then, the design process of interactive software for common people emphasized usability. This process is called human-centred design. [4]

The term Enterprise Resource Planning (ERP) was invented in the early 1990s.[6] The purpose of the ERP software is to offer techniques and concepts for integrated and thorough management of business, as well as making it more efficient. The usage of ERP software has increased globally and nowadays even service organizations have invested a lot of resources in ERP implementation.[7, 2]

Despite the importance of the efficiency aspect, the usability of ERP systems is not a widely studied topic. However, weaknesses in usability may lead into a low productivity and make it harder for users to achieve their goals.[9]

The aim of this thesis is to examine how the usability of a service-oriented ERP system can be enhanced by integrating usability inquiries, inspections and measures into the software development process. In the research, one

well defined business process is examined and the state of its usability in the system is determined by using variety of applicable methods:

- Contextual Inquiry to define the business process.
- Cognitive walkthrough for usability inspection.
- Interaction Sequence Illustration (ISI) to measure the amount of interaction steps and to understand them.
- System Usability Scale (SUS) to give a global view of subjective assessments of usability.
- Remote Usability evaluation and Usability logging for remote usability evaluation.

The measurements are focused on time, error rate and user satisfaction.

According to the ISO standard of Human-centred design for interactive systems [5], many benefits can be gained by using human-centred methods as a part of software development process. The productivity of an individual user can be increased, as well as the operational efficiency of an organisation. Usable and useful systems also reduce training and help-desk costs together with stress and discomfort since they are understandable by the users. In other words, human-centred design improves the UX (User Experience).

The benefits of human-centred methods (for a software development process) are increased total lifecycle of product and likelihood of project succeeding on time and withing budget. Human-centric approach also decrease the risk of software being rejected by the users or failing to meet the requirements. [5]

1.2 Background and research questions

The subscriber of this thesis is a middle-sized company which is offering information services globally and practicing in-house software development. Because of the fast pace of growth, the company is willing to reform their current ERP system as well as the whole software development process. The aim of this thesis is to join usability perspective into this process and give answers to following research questions.

- ***How usability methods can help to identify critical disparities in the usage of a system?***

Understanding the differences in the system usage between individuals can help to understand and deploy best practices throughout the organization and therefore improve efficiency.

- ***How the user efficiency is affected by the usability measurements?***

  It is important to find the most effective and usable user interface solutions and thus decrease the average time spent on tasks. Local differences can be tracked with remote usability measurements.

- ***What usability methods can be practically joined with the software development process of an ERP system?***

  Finding practical and efficient usability methods to be joined with the software development process can improve the quality of the end product.

1.3 Scope and structure of the thesis

This thesis covers research about usability of the in-house software development process and its scope does not include any other aspects of the process. The literature research consists of a few usability methods and even though the target of the research is ERP software, literature about them are not covered in the thesis. The results of the research may not be suitable for every organization.

The first actual chapter of the thesis is about the usability methods. Every usability method used in the research is discussed carefully. In the second chapter the process experiment is being introduced. It covers the experiment steps and the implementation details. In the third chapter, the data gathered in the experiment, and the implementation process is being analyzed. In the last chapter the research will be summed up and discussed.

Chapter 2

Methods

In order to be able to discover reliable research data, the research methods must be understood thoroughly. In this research, the data is gathered with a few types of usability methods and they are selected according to their practicality and utility. Inquiries are used to study the business process and the process itself is measured from many different aspects and also remote evaluation is utilized to gather data easily from distributed locations.

Methods are used in different stages of the research to fulfill the needs of human-centred design activities and they are described in detail in the following chapter.

2.1 Contextual Inquiry

`Handbook of human-computer interaction - T-TALON KIRJASTOSTA! historiaa menetelmästä.`

Contextual Inquiry was originally developed to overcome three following challenges [8]:

1. To identify a design process for systems that will be used similarly in different business contexts and in different cultures.

2. To identify a convenient process for gathering user information in limited time.

3. To identify a way to acquire information about users' work in an eligible format.

In addition to those challenges, the technique is capable of much more. CI cherish participatory design and, because of that quality, users are able to involve in the design. Users' contributes to the design by providing a deep

understading about the nature of the work. This is done through inquiry and it's a basis for fundamental work concepts. As soon as the understanding about the work is available design for a system model can be created. [8]

2.2 Process measurement

2.2.1 System Usability Scale

In his paper Brooke [3] argued that usability is not any real existing quality, but a good usability artefact is *approppriate to its purpose*. In other words "the usability of any tool or system has to be viewed in terms of the context in which it is used, and its approptiateness to that context"[3]. Still in many cases, context related usability evaluation is not desirable. The reason for this is that a large scale context analysis is usually neither cost-efficient nor practical.[3] SUS responds to these challenges by offering an easy and quick way to get subjective ratings about the usability of a system. It is not limited to any specific tehnology, which makes it universal tool for usability evaluation. [1]

System Usability Scale (see SUS form) is a ten-item *Likert scale*, meaning that every item consist of the scale of five, ranging from "Strongly disagree" to "Strongly agree". The questionnaire is generally being filled right after the possibility to use the system to be evaluated. The focus should be on immediate responses and too much time shouldn't be given to the respondents. [3]

The outcome of SUS is a single value which express the overall usability of the system. The value consist of all the items and none of them are meaningful as such. System Usability Scale can be calculated by first summing the score contribution (range from 0 to 4) from each item. Before summing the scale positions of the items 1,3,5,7 and 9 need to be substracted by one and the scale positions of the items 2,4,6,8 and 10 need to be subtracted from 5. The last step is to multiply the sum of the scores by 2.5 to get the overall SUS value, which will range from minimum of 0 to maximum of 100. [3] The resulting single score is an easy-to-understand measure, and can therefore be discussed with the wide range of stakeholders. [1]

`TÄHÄN LISÄÄ!!!`

2.2.2 Interaction Sequence Illustration

Considering the practical impacts of the thesis, it is important to use methods and measures which can shore up the software development process in a real-

use context. This is why the process and it's interactions are reviewed using ISI method, which utilizes authentic use context and real users.

2.2.3 Time used and success rate

The last process measurements used in the research are simply the time which was consumed while carrying out the task and the success rate of the task.

2.3 Automated Remote Usability Evaluation

Chapter 3

Process experiment

Human-centred design consist a few activities and iterative process (see Figure 3.1). [5] The empirical part of this thesis comfors human-centred desing principles and the steps of the process experiment are highly linked to its activities. The steps are described in detail in section 3.1. This chapter will also describe the implementation phases of the experiment.

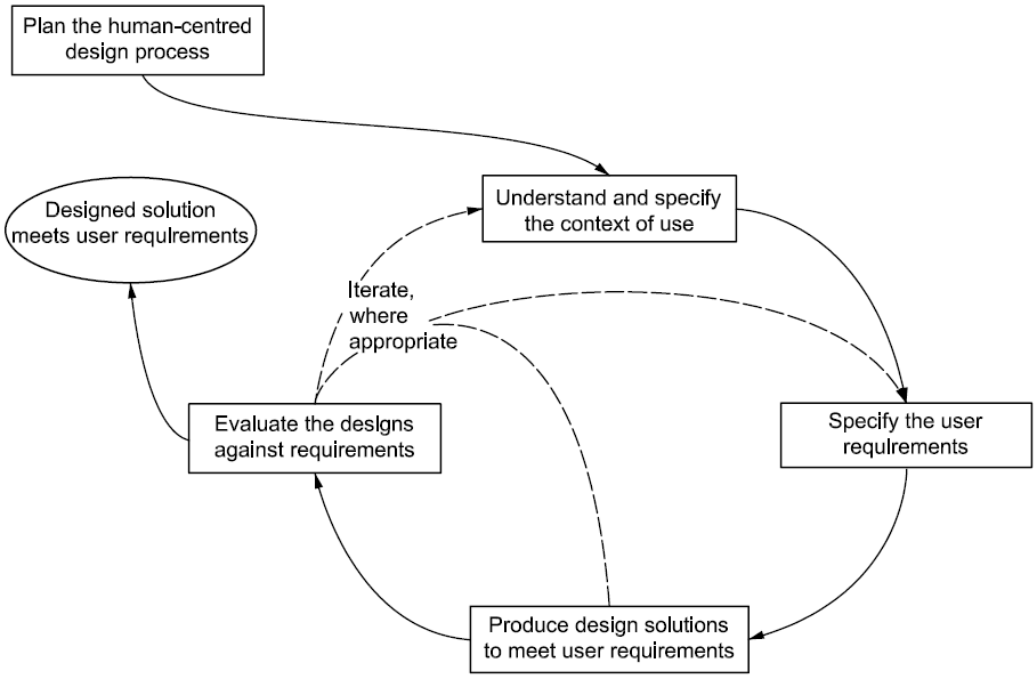

Figure 3.1: Human-centred design activities.[5]

3.1 Steps

- Creating the model for gathering data
- Modified contextual inquiry
- Process measurement methods
- Analysis 1.
- Prototype creation
- Remote evaluation - process measurement methods.
- Analysis 2.

3.2 Implementation

Kuinka monta osallistujaa, millainen ympäristö, missä maassa, minkä ikäisiä osal
kauanko tehneet työtä

Chapter 4

Analysis

4.1 Results

-Comparison between country offices -Comparison between individuals (esim. kuinka kauan kesti tietyn toiminnon tekeminen) / Overall comparison (esim. kaikkien koehenkilöiden yhteinen kehitys.) - Interaction sequence illustration (esim. kuinka monta steppiä ennen ja jälkeen)

4.2 Implementation analysis

-Should these methods be implemented as a part of the process or not.

Chapter 5

Discussion and conclusions

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Appendix A

SUS form

System Usability Scale

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	1	2	3	4	5
2. I found the system unnecessarily complex	1	2	3	4	5
3. I thought the system was easy to use	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5. I found the various functions in this system were well integrated	1	2	3	4	5
6. I thought there was too much inconsistency in this system	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly	1	2	3	4	5
8. I found the system very cumbersome to use	1	2	3	4	5
9. I felt very confident using the system	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system	1	2	3	4	5