8 GUIDING DESIGNERS TO THE WORLD OF USABILITY: DETERMINING USABILITY REQUIREMENTS THROUGH TEAMWORK

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Abstract

A teamwork method for determining usability requirements based on the definition of usability of ISO 9241-11 is proposed. A usability specialist facilitates a software development team in determining usability requirements in a set of workshop sessions. The concrete outcome of the workshops is a set of measurable usability requirements (in a form of usability requirements table) which form design drivers for the later phases of software design. Another outcome of the workshops is of educational and motivational nature. We found that the workshops are effective training of usability and make the design team committed towards user-centered design. On the other hand, systematic determination of usability requirements following the definition of usability of ISO 9241-11 was found to be a complex process, and it is challenging to fully determine the usability requirements.

A. Seffah (eds.), Human-Centered Software Engineering – Integrating Usability in the Development Process, 127–145.

8.1 INTRODUCTION

Usability is one of the most important quality characteristics of software intensive products. Usable systems are easy to learn, efficient to use, not error-prone, and satisfactory in use (Nielsen, 1993). Usability brings many benefits, which include "increased productivity, enhanced quality of work, improved user satisfaction, reductions in support and training costs and improved user satisfaction" (ISO/IEC, 1999).

Usability has not been defined consistently, and various definitions exist. Probably the best-know definition of usability is by Jacob Nielsen (Nielsen, 1993) usability is about learnability, efficiency, memorability, errors, and satisfaction. However, the definition of usability from ISO 9241-11 (ISO/IEC, 1998) – "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" - is becoming the main reference of usability. In addition that it is largely recognized in recent literature, the new Common Industry Format, CIF, for usability testing (ANSI/INCITS, 2001)—supported by a number of corporations and other stakeholders - uses this standard definition as the reference of usability. In our study, we took this definition as the reference of usability.

In this chapter, we describe the KESSU URD[1] method for determining usability requirements and experiences on using the method. The method has two objectives. First, it aims to be a systematic approach for the determining usability requirements based on ISO 9241-11 definition of usability. Second, it aims to help integration of usability into software development through making project staff understand and get committed to design usability. A specific feature of the method is that it is implemented as teamwork where the designers and other project staff are the key stakeholders of the process.

Based on the definition of usability from ISO 9241-11, we consider usability requirements as *of effectiveness, efficiency and satisfaction of users achieving their goals in the defined contexts of use*. In other words, we talk about measurable requirements which are critically important to be determined as a part of development process (Good et al., 1986; Wixon and Wilson, 1997; Jokela and Pirkola, 1999; Göransson and Gulliksen, 2003; also Chapter 2 of this book). As stated in Good et al., 1986: "Without measurable usability specifications, there is no way to determine the usability needs of a product, or to measure whether or not the finished product fulfills those needs. If we cannot measure usability, we cannot have usability engineering".

Determination of usability requirements is an important factor in the process of integrating usability into the product and software design process. Usability requirements – which include the definitions of the users, users' goals, environments of use etc. – are *design drivers*. Design drivers do not provide technical solutions but guide, probably implicitly, the project team towards designing usable software. We use the KESSU UCD process model (Jokela, 2004b; Figure 8.1) – which is elaborated from the well-known process model of ISO 13407 - as generic reference for user-centered design. A specific feature in the KESSU model is that it presents usability data explicitly as design drivers. The usability requirements process covers the three first

[1] KESSU = name of a research project; URD = usability requirements determination

activities of the usability lifecycle (Figure 8.1): Identification of user groups; Context of use analysis; and User requirements determination.

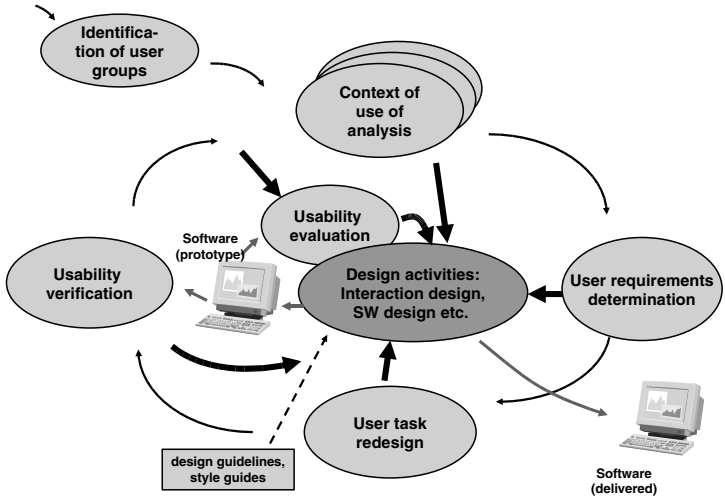

Figure 8.1 Usability activities (yellow circles) provide design drivers (the double lines) to design activities (grey circles)

Usability requirements, however, are effective design drivers only when the software designers and other members of a design team are truly committed in achieving the usability requirements. There is a risk is that usability requirements may be cast aside if time is running out in the development project (McCoy, 2002). Our basic means for achieving commitment is through active role of each member of the project team in the process of usability requirements determination. Citing the well know phrase of Stephen R. Covey, 1994: "Without involvement, there is no commitment" (Covey, 1994).

Other chapters of this book present related approaches. A user needs analysis method is proposed in by Kujala (Chapter 7 of this book) where user needs are represented as problems and possibilities in a user needs table and transformed into use case descriptions, including definition of actors, pre- and post-conditions, task sequences and exceptions. The PUF method (Chapter 9) has related elements as our method does (definition of users and tasks) but really does not address to usability requirements and mainly focuses on integration of usability to UML. Our approach provides a complementary view through describing how usability requirements in the meaning of ISO 9241-11 can be determined as teamwork.

In the next section, we briefly discuss existing methods and relate our method with them. Then we present the general features of the method, and thereafter the steps of the method. Finally, the lessons learnt and the ways how the method can be altered are discussed.

8.2 RELATED METHODS

The standard ISO 9241-11 and the evolving Common Industry Format for Usability Requirements, CIF-R, NIST, 2004, provide guidelines and examples for how to determine usability requirements following the definition of usability of ISO 9241-11. They mainly focus describing and exploring the concepts and formats related to the definition of usability: how to define measures for effectiveness, efficiency and satisfaction, and how to define context of use. Research carried out in European projects has produced guidance and templates—such as Maguire, 1998, and Thomas and Bevan, 1996—for describing users, tasks, and environments of use.

These guidelines, however, provide only limited guidelines for the *process* of determining usability requirements. For example, ISO 9241-11 states that usability measures can be specified "for overall goals (e.g. produce a letter) or for narrower goals (e.g. perform search and replace)" and "focusing . . . on the most important user goals may mean ignoring many functions, but is likely to be he most practical approach". CIF-R focuses on describing the contents of usability requirements document, and does not provide guidelines for how to generate the requirements. The handbook of Maguire, 1998, provides general techniques such as stakeholder or context meetings, interviews, observations, questionnaires and task analysis. The standard ISO 13407 (ISO/IEC, 1999) identifies a process 'Specify the user and organizational requirements', including statements such as "provide measurable criteria against which the emerging design can be tested", and that the requirements should "be stated in terms that permit subsequent testing and should be confirmed or updated during the life of the project". The experience report by Bevan & et al. (Bevan and Claridge, 2002) guides: "For each chosen task and user type, estimate. . . " and "usability for the new system should be at least as good as for the old system".

Most of other usability engineering literature such as Nielsen, 1993, Wixon and Wilson, 1997, Beyer and Holtzblatt, 1998, Hackos and Redish, 1998, Mayhew, 1999, Rosson and Carroll, 2002b, do not explicitly use the ISO 9241-11 definition. They, however, do provide guidance for individual aspects of determining usability requirements: for identifying user groups, determining user goals and environments of use; and specifying measurable usability requirements. Some of these guidelines are rather abstract. For example, for determining user goals Nielsen presents statements such as "the users' overall goals should be studied" and "a typical outcome of a task analysis is a list of all the things users want to accomplish with the system" (Nielsen, 1993). Wixon & Wilson (Wixon and Wilson, 1997) define a six-step process for determining usability requirements but the guidance is given at rather high level of abstraction. Contextual Design, CD (Beyer and Holtzblatt, 1998) has a strong focus on understanding users' work: the three first phases of the methodology are about gathering data from users and analyzing it. CD implicitly recognizes that there are different user groups. It, however, does not provide any systematic method specifically for identifying those. It neither discusses the determination of quantitative usability goals. Altogether, we found the existing guidance quite general.

But, naturally, there exist also concrete guidelines. For example, Mayhew, 1999, has a specific step for determining 'usability goals'. She first emphasizes the importance of quantitative goals and then discusses the different types of quantitative

usability goals: ease-of-use vs. ease-of-learning goals; absolute vs. relative goals; and performance vs. preference vs. satisfaction goals. She then provides a step-by-step procedure to determine quantitative usability goals: first determine qualitative goals, and then determine quantitative goals in the categories of "ease-of-learning", "ease-of-use" and "satisfaction" that are "relatively high in priority". In other words, Mayhew addresses the topic, provides guidance but not systematically driven by the ISO definition.

Further, there are only few empirical studies on the use the definition of usability if ISO 9241-11 in practical usability requirements determination. Case studies, such as Bevan and Claridge, 2002, have been contacted on how to use the definition in usability testing. However, there is a gap in research on how to use the definition systematically when determining usability requirements.

Our study complements the existing research by presenting the KESSU URD method that specifically aims for usability requirements that conform to the ISO 9241-11 definition of usability. Further, the method specifically aims to overcome the communication gaps between usability and software and other designers.

8.3 DEVELOPMENT OF KESSU URD

The development of the method stems from our experiences when carrying out *usability maturity assessments*. Usability maturity assessment is about examination of the user-centredness of a development organisation[2]. In an assessment, one may examine the extent to which development projects include user-centred activities, the extent to which UCD is part of the quality system of a company, the extent to which developers have received training on UCD, etc. The usefulness of usability maturity assessments is in the hypothesis that knowing the strengths and weaknesses in UCD provides a good basis for choosing those organizational areas where to improve the performance of UCD in the development organisation.

Probably the best-known approach for usability maturity assessment is *process assessment*, an approach that is widely used in software process improvement. There are specific models developed for process assessment of UCD processes: ISO/TR 18529 (ISO/IEC, 2000a) and ISO/PAS 18152 (ISO/IEC, 2003). These kinds of process assessment models are typically used for the examining on how user-centred activities are managed across a development organization.

In our assessments – lessons learnt of which are reported in Jokela, 2004a—we found reasonable to limit our focus on assessing the user-centredness of individual development projects (and pay less attention on management issues). Therefore, we ended up to have a simplified model of process assessment (Jokela, 2004b). A specific feature of our KESSU assessment model is that it uses the definition of usability from ISO 9241-11 as the reference of usability.

In one assessment case our finding was that the development project under assessment had included practically no UCD activities: the users of the product had not been identified, the user goals had not been determined, user tasks had not been analyzed,

[2]In other words, usability maturity assessment is not about evaluation the usability of the product or system.

etc. We did not find it constructive to report these kinds of 'poor' results to the project team. Instead, we organized a workshop where we started to explore together with the project team what kinds of things user-centred design had concretely meant in the context of that specific project. We brainstormed together with the project team the different kinds of user data that should have been generated: who would be the users of the product, what kinds of goals the users might have, etc.

Our experience was so positive that we used the approach also later as a kick-off of user-centred activities in other development projects. Step by step it evolved into an approach that we describe in this chapter. In total, we have had used the approach eleven times in different contexts. The applications have included mobile services, telecommunication software, and transportation and healthcare systems.

Some cases composed of several workshop sessions while other cases were carried out during one day. There was variation in the styles in which the workshops were carried out. The variation was not only due to the different time available but also due to the challenges that we met. We found that the determination of usability requirements (using the ISO 9241-11 definition as a reference) is not an easy task.

One aspect, however, remained stable throughout the cases: we used the ISO 9241-11 definition of usability as the reference. This is also probably one of our key findings: the ISO 9241-11 definition of usability was sense-making both to us - usability practitioners and researchers - and to the designers. We did not consider taking any other definition as the basis; we perceived determining usability requirements using the ISO 9241-11 definition not easy but most motivating.

8.4 GENERAL FEATURES OF KESSU URD

The KESSU URD method generally implements the principles of UCD such as user focus, iteration, and specifically multidisciplinary teamwork. On the other hand, we have typically not included end users in the requirements process, which basically violates 'user involvement', one of the basic principles of UCD (although one of the objectives of the method is that it motivates to user involvement at a later stage of development cycle).

Technically, our approach for determining usability requirements is a set of workshop sessions where usability requirements are brainstormed as teamwork. The method is a systematic process from the identification of users to the determination of usability requirements, following the definition of usability from ISO 9241-11.

At the stage of requirements determining, we do not pay attention on how to later test the designs against the requirements. As Wixon & al. (Wixon and Wilson, 1997) state: "The greatest impacts of usability engineering are related to the initial stages of goals setting. Even if you do not test at all, designing with a clearly stated usability goal is preferable".

In the workshops, the grounded knowledge that the design staff has on users – i.e. knowledge from user contacts from various situations such as customer visits, customer service, etc. – is systematically elicited and analyzed. As such, the approach resembles context of use sessions (Thomas and Bevan, 1996) and stakeholder meetings (UsabilityNet, 2003). As developments compared to these approaches, our approach

has some specific features at the levels of detail: the exact steps of the workshops; the working methods used; the share of responsibilities; prioritizing of issues, etc.

The outcome of the workshop is usability requirements table which contains user group definitions, user goal definitions; measurable usability requirements, etc. (see 8.8.3).

8.4.1 The Participants and Roles

An essential feature is that all those persons who are involved in design and decision making related to the user interaction design of the product participate in the requirements process. These people include software and user interface designers but typically also the project manager, the product manager, representatives from technical documentation and customer service, etc. The workshops are facilitated by an experienced usability specialist. A workshop setting is illustrated in Figure 8.2.

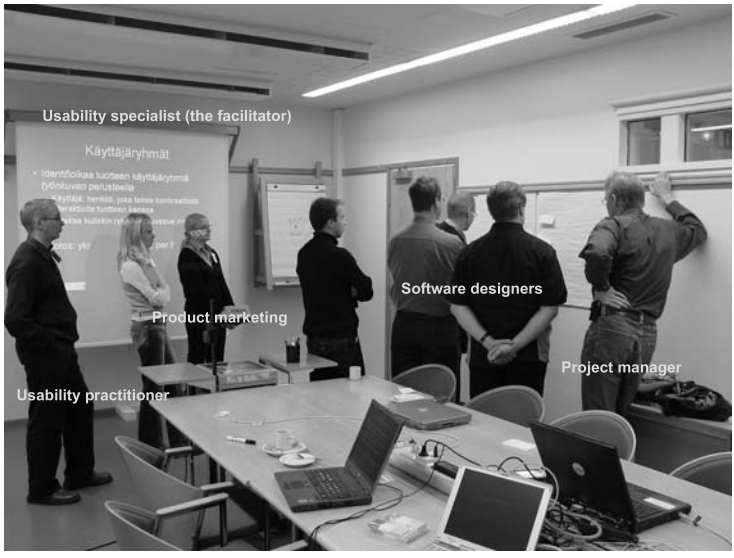

Figure 8.2 A KESSU URD workshop session

There are four specific roles in the workshop sessions:

- A facilitator: a person who facilitates and guides the workshops. He or she is typically an experienced usability professional and not a member of the project team.

- A usability responsible: a person who is responsible of usability issues in the project team. He or she is the main contact with the facilitator, takes care of the note keeping during the process and of the action points between the workshop sessions.

- The decision maker: a person who is the final decision maker in different decision making situations during the processes. He or she is typically the project manager.

- Analysts: all the other members of the workshop who contribute in the teamwork. Also the usability responsible and the decision maker are analysts (but not the facilitator).

The participants are divided into teams of 2–4 persons. Each team works parallel. The usability specialist and the project manager are also members of some of the teams. The facilitator is the only person that does not belong to a team. The facilitator's role is to follow how the teams proceed in their assignments, give feedback and hints to the teams.

The facilitator has the responsibility of running the sessions but can also take care of the documentation of the results together with the usability specialist. He or she takes pictures of the notes on the wall as well as writes down the required data with a word processor.

8.4.2 General Flow of the Process

In the first cases, we started with all-day long workshops but found it reasonable to break them into sessions. Our experience is that people feel longer sessions too tiring, and the risk that they do not show up in the next sessions is bigger. One session should last approximately three hours – it should not last longer than four hours.

The number of sessions varies, depending on the resources available. In three sessions, one can systematically go through some instances of all the steps – from the identification of user groups to determining usability requirements. Three sessions, however, are not adequate for processing the requirements fully. On the other hand, we have also conducted workshops of one session only.

The sessions compose of a set of break-outs for team work. Each break-out takes 5 to 30 minutes. After each break-out, the results are analyzed and agreed, and the assignments for the next break-out sub session are given.

8.4.3 Working Techniques

Various teamwork techniques are utilized:

- Each team (of 2 to 4 persons) works as a team, discussing and producing the outcomes that are assigned to the team.

- Depending on the phase of the process, the different teams may work on the same subject parallel, or each team may have a different subject

- If the teams have worked on the same subject, the results are put on the wall, and board walking (a technique that is used e.g. in Contextual Design (Beyer and Holtzblatt, 1998) is used to combine and organize the results.

- If the teams work on different assignments, the outcomes are presented to the other teams. The other teams may comment the results. The results are commonly agreed.

- Post-it notes are used for documenting the outcomes. The outcomes are further put on the wall of the meeting room.

- Voting is used when one needs to prioritise the results. Each participant is in an equal position (except the facilitator who does not vote).

- After each step, a reality check is done: do the results appear sensible. The project manager has the final word.

The facilitator has an important role. During break-outs, he or she goes from team to another and checks whether the teams are understood the assignment correctly, and whether they are producing appropriate outcomes. This is an important task. Our experience is that "usability" means a new kind of thinking to many people, and they really need guidance and probing so that they understand what kinds of outcomes to produce.

Post-it notes are the key artefacts that the participants work with. The post-it notes on the wall are recorded with a digital camera. Simultaneously the results are documented into a usability requirements table (8.8.3), either by the facilitator or the usability expert. The requirements table - projected to a screen - is reviewed by the participants especially at the later phases of the process.

8.4.4 Summary

The key features of the workshops are summarized in Table 8.1.

Table 8.1 A KESSU URD workshop session

Every project team member participates and contributes. Actually, the outcomes of the workshop, the usability requirements, are produced by the project data (not by the usability specialists).
Various teamwork techniques are utilized to achieve the involvement and contribution of everyone.
The user data is elicited from the grounded knowledge of users that the participants have.
The role of the usability specialist is to facilitate, not to produce the data. He or she guides the process and the makes sure that the required outcomes are produced.
The project manager has the authority to make decisions.
The results are commonly agreed.
Each session lasts half a day in the maximum.

8.5 STEPS OF KESSU URD

Above, we have described the general features of the workshop sessions. In this section, we describe the steps of the method. Each step provides an outcome which is documented. One should understand that, as discussed in later sections, the process is not a mechanical one.

8.5.1 Step 1. Objectives, Scope, Organization

The facilitator first briefs the participants about the objectives and contents of the workshop. This includes a brief introduction to usability and user-centred design. Some participants may expect that one would design user interfaces in the workshop. Therefore we have found it sensible to emphasize that the purpose of the workshop is not to design user interface.

Second, one needs to make everyone agree and understand what product or system is the focus of the workshop. This is the task of the project manager. Unlike some other approaches, such as the stakeholder meeting (UsabilityNet, 2003) we do not determine the business success factors of the project at this stage. Vice versa, we find that usability related business success factors could be determined based on the results of the workshop.

Third, three or four working teams are formed. Depending on the number of the participants, the number of persons in the teams may vary (two in minimum).

8.5.2 Step 2. Identify the Users

The first 'usability' step is to determine the users of the product. Each working team identifies different users and writes down the user groups on post-it notes, one group in one note. All the notes are put on the wall, and the final set of user groups are mutually agreed on. We do not try to achieve the final truth of the 'right' set of user groups at this stage – our experience is that the following steps of the process clarify what is the appropriate set of users.

We have found it sensible to guide identifying user groups by the *job role* of the users. To keep to process manageable, we do not identify the user groups based on the experience of the users (novices, intermediate, experts etc.) nor on the cultural aspects (international users). These issues are relevant, but they can be taken into account later when usability evaluations are planned.

8.5.3 Step 3: Prioritise the Users

Next, the user groups are prioritised: which group is the most important one, which one comes next, etc. The user groups are prioritised in order to determine the working order: the most important user groups will be processed first in next phases of the process.

Voting is used to determine the priority. Each member of the workshop - except the facilitator - has an equal amount of votes (three).

8.5.4 Step 4: Identify the User Accomplishments

The next step is to brainstorm the accomplishments (goals) that the users may want to achieve with the product. Because different user groups have different accomplishments, this step needs to be done separately for each user group. We start with the most important user groups, and assign one user group for each working team. Then we ask the teams to identify the different accomplishments (goals) that users would want to gain with the product under development.

We have found this to be one of the most challenging parts of the whole process. It seems to be so much easier to think of tasks of users than the accomplishments what users should achieve. The facilitator's role at this stage is critical. The facilitator should challenge the teams and constructively not to accept too simple answers.

In our first cases, we used just brainstorming for the identification of the tasks. In some cases it worked but in other cases the teams had difficulties in identifying the variety of the different tasks that users typically have. In the latest cases, we used scenarios and personas to aid in the process of identifying user accomplishments.

A Typical Sub-step: Re-identify the Users. We have often found necessary to go back and check whether refinements in the set of user groups are required. When determining accomplishments, one often realizes that the original set of user groups was not the right one.

8.5.5 Step 5: Prioritise Accomplishments

The next step is to prioritise the accomplishments. We have used the following criteria for guiding the prioritisation:

- Accomplishments the achievement of which is critical
- Tasks that users do frequently (to reach an accomplishment)
- Tasks that are time critical
- Tasks that are error critical

A typical sub-step: Redefine Accomplishments. This stage, again, may lead to iteration. One is often able to refine the set of user accomplishments when the task attributes are brainstormed. For example, one may realize at there are different accomplishments related to 'testing' if one kind of testing is done frequently while another kind of testing is carried out only quite seldom.

8.5.6 Step 6: Identify Critical Accomplishments

A user-task matrix - such as proposed in Hackos and Redish, 1998 - is created. The matrix reveals whether a specific task is performed by one user group or several user groups. All the accomplishments of all the user groups are consolidated into a single table.

We ask the teams to check the priorities of the accomplishments of all the user groups, and to produce a consolidated list of most critical user accomplishments. This

outcome, the priorities of all accomplishments of all user groups, is a very central result of the workshop. We now know which accomplishments by which user groups form the basis for the usability requirements of the product or software under development.

8.5.7 Step 7: Consolidate accomplishments

At this phase, we may have quite a large number of accomplishments that may be prioritised critical. While too many usability goals are impractical, one should plan how to consolidate those accomplishments into a reasonable number of usability requirements. Different approaches may be used. For example Jokela and Pirkola, 1999, used an approach where the criteria are determined with the average performance of tasks.

8.5.8 Step 8: Produce Qualitative Usability Requirements

We distribute the most important accomplishments to the working teams, and ask them to define descriptive statements about how the requirements are successfully achieved. The statements should reflect the critical attributes of the accomplishments:

- A task that is performed frequently, would probably lead to a qualitative requirement such as: "Users should be able to do the task very quickly and with little effort".

- A qualitative requirement for a task when a user configures the system: "This task is a 'one-shot' tasks and it is utmost important that the outcome of the task is correct. On the other hand, the task is not very time-critical".

8.5.9 Step 9: Produce Quantitative Requirements

The qualitative goals are transformed into quantitative ones. This is another step – in addition to the determination of user accomplishments - that is typically very challenging for the participants.

Generally, we recommend setting goals in relation to the old version of the product (or a competitive product). This is where we have often found lack of information: the members of the project team do not know about the performance of the existing product.

8.5.10 Step 10: Do the Final Reality Check

When the final set of usability requirements are produced, we take a step backwards and make a reality check. We especially remind that much of the results of this kind of work are based on the knowledge of the participants. In this case one should consider to which extent do we really know the world of user – how valid is the data that we derived?

8.5.11 Summary

The steps, with the descriptions of outcomes and comments, are summarised in Table 8.3. Our experience is that one needs three 3-hours sessions in order to go through all the steps for one user group.

Table 8.3 Key features of workshops

No	Step	Outcome	Comment
1	Workshop objectives	Definition of the scope of the workshop (what is the product)	The project manager has a critical role
2	Identification of user groups	A set of user groups: names, brief descriptions	Identified through job role
3	Prioritizing user groups	An ordered list of user groups	Based on the size or criticality of the user group
4	Identification of user accomplishments	A set of user accomplishments per user group Refinements in the set of user groups (typically more than identified in step 2)	Describe the accomplishment (not the task performance). Perceived challenging but useful. The role of the facilitator critical.
5	Prioritizing accomplishments	An ordered list of accomplishments Refinements in the set of accomplishments (typically more than identified in step 4)	Frequency, time criticality, error criticality used as guiding factors.
6	Identifying critical accomplishments	A list of critical accomplishments of all user groups	A core intermediate result
7	Consolidating requirements	Baseline for goal setting	Challenge to cope if a large number of critical accomplishments
8	Qualitative descriptions	Qualitative descriptions of achieving goals successfully	Describe successful task performance, not the accomplishment
9	Quantitative measures	Transform qualitative goals into quantitative ones.	Challenging to determine the measures. Even more challenging to determine the 'right' requirement values.
10	Final reality check	Potentially refinements in the quantitative goals.	Taking a step backwards, taking an overview of the results.

8.6 FINDINGS FROM THE CASE STUDIES

We used the method – or more precisely, the method evolved – in a set of cases. In other words, the method was not exactly similar from one case to another. Some characteristics of the method, however, were stable. The requirements process was conducted in workshops, teamwork was utilised, the definition of usability from ISO 9241-11 drove the requirements process etc.

8.6.1 On the Definition of Usability of ISO 9241-11

Generally, we found that the ISO 9241-11 definition of usability means that the determination of usability requirements is a complex task. A product typically has many different user groups. Each user group may have many different goals. The levels of different goals may be different in terms of effectiveness, efficiency, and satisfaction. We truly met a challenge in how to manage all this complexity. We used prioritising - e.g. focused on the most important user groups only. Still, we were able to carry out the process totally through only in one, not very complex case.

Another specifically challenging part of the definition relates to the identification of user goals (accomplishments) and determining measurable target levels for the usability attributes (effectiveness, efficiency, satisfaction). It was not easy for the participants to work on these issues. In the last case, we used the concept of persona (Cooper, 1999) to help in identifying users and user goals. This seemed to work clearly better than brainstorming.

On the other hand, the ISO 9241-11 definition of usability was sense-making both to us (usability practitioners and researchers) and to the participants. Determining usability requirements using the ISO 9241-11 definition was not easy but motivating. The participants gave comments such as “a new and meaningful way of thinking” and “we definitely should have done this in earlier projects”. We (researchers) did not even consider giving up from using the definition.

8.6.2 On Teamwork

Overall, the participants, software designers and other members of a project team found the workshops process interesting, useful and effective training of usability. Participants reported that the process has ‘opened their eyes’ and the results represent a “totally new and meaningful” perspective to product requirements. In our last case (three consecutive half-day sessions), two product managers from the marketing department – typically very busy people - actively participated in all the sessions. The number of participants increased in the last session when representatives from other department of the company were invited to follow the process. The participants generally liked to do teamwork. (“I assume that we do teamwork today, too!”)

On the other hand, three sessions in a row seemed to be the practical maximum. Finding time for more workshops would have been difficult. In our last case, it was agreed that the usability specialist would continue the determination work as an individual effort.

A considerable set of user data could be determined in the workshops, based on elicitation and analysis of the project team's knowledge on users. The process clearly helped the participants realize whether they do or do not have true knowledge on users.

Facilitating workshops was not a mechanical task. First, the facilitator had to continuously consider how to manage the complexity: which the issues to be worked and which ones to postpone or omit. Especially with systems with many different user groups and a large number of tasks, one has to tackle with 'space explosion' all the time (the number of items, and their combinations becomes so large). Second, the facilitator needed to guide the participants towards the 'right track' in the break-out session. Especially, the facilitator needed to guide the participants to determine user goals.

8.6.3 On Results

One limitation of the case studies was that we could not follow the process 'to the end'. In other words, we do not have any evidence on the impact of the usability requirements that were determined in the workshops on the final product. We neither have evidence on whether the apparent interest and commitment of the participants lasted throughout the project.

Anyway, some innovative design drivers were identified during the workshops. This happened especially when the teams brainstormed (measurable) target levels for efficiency for specific goals. For example, in two cases it was brainstormed and agreed (in step 8 of the process) that the achievement of specific user goals (which had been identified in step 4) actually should be automated: "Hey, actually this should happen automatically, without any user actions!"

8.7 CONCLUSIONS

Based on the findings of the case studies, we can draw the following conclusions. Overall, we conclude that the method provides some help for the integration of UCD to software development.

One obstacle of integration of usability and software engineering is that the essential contents and meaning of usability is often not understood by designers (see Chapter 3 in this book) and designers not understand what usability is "beyond the basic ease-of-use concept" (Chapter 2). We conclude that our method provides help in overcoming this problem. The workshops proved to be an effective training occasion on usability and help designer to get committed to usability. The definition of usability of ISO 9241-11 made sense to designers and other project staff such as marketing representatives. Usability requirements are a complex thing but on the other hand very logical and sense-making, helping participants understand what usability essentially is. The definition looks complex but makes sense to people after it is systematically explored.

We also find that the method helps in overcoming the people and responsibilities gaps (Chaper 2) and lack of collaboration (Chapter 9) through guiding software designers (and other projects staff) and usability professionals communicate and work together. There are no communication problems between usability specialists and

designers because the designers themselves generate the usability requirements. Everyone is involved, contributes and is listened to – and thereby gets committed ("no commitment without involvement"). Designers do not need to be "forced" to do usability but they make it voluntarily because they find it sense making.

Further, the workshops seem to be a true order for user studies. We did not include users in the sessions, apart from the first one. We find, however, that this kind of setting makes a good basis for UCD activities with true user involvement. The workshops help designers to understand the need for user studies and also understand what kind of data to expect from the studies.

Finally, our approach represents a case study which is an important resource in learning UCD skills (Seffah, 2003).

On the other hand, the method also has limitations. The inherent complexity of usability makes it challenging to determine the usability requirements systematically 'to the end'. One would need many more resources than we had to complete the requirements process. The number of workshop session would be quite many, and one cannot assume that people would have time and be motivated to participate in many more sessions.

The outcomes of the workshop are typically based only partially on true user data. The quality of the outcome (i.e. the validity of usability requirements) depends on the grounded knowledge that the participants have about users. The idea behind the workshops is that the results – usability requirements - would be later refined based on true user data. However, there is a risk that the refinement work will not take place.

The process is not a matured one. Its nature is not mechanical – although systematic – especially due to the complex nature of usability. The role of the facilitator is critical. It well may be, although we do not have evidence, that (the quality of) the results depends on the personal characteristics and viewpoints of the facilitator.

8.8 DISCUSSION

A teamwork method for determining usability requirements based on the definition of usability of ISO 9241-11 is proposed. A usability specialist facilitates a software development team in determining usability requirements in a set of workshop sessions. The concrete outcome of the workshops is a set of measurable usability requirements (in a form of usability requirements table) which form design drivers for the later phases of software design. Another outcome of the workshops is of educational and motivational nature. We found that the workshops are effective training of usability and make the design team committed towards user-centered design. On the other hand, systematic determination of usability requirements following the definition of usability of ISO 9241-11 was found to be a complex process, and it is challenging to fully determine the usability requirements.

8.8.1 Limitations

An obvious limitation of the case studies is that we were not able to determine usability requirements fully, apart one relatively simple case. Therefore, we do not have data to

which extent it is feasible to systematically determine usability 'to the end' in a typical case, and how to make practical use of such apparently large set of requirements.

Another clear limitation is that we could not follow-up most of the case studies. In other words, we do not have evidence on whether the interest and commitment of the participants lasted throughout the project, nor whether the usability requirements would truly have impact on the final product.

All of our cases have been product development projects – both consumer and business-to-business products. We have not had a single system development project so far. It, however, might be that the process would easier in the case of a system development project. Especially, it could be easier to understand the 'right' user groups, and the number of user groups probably would be smaller. Thereby, the process might be less complex.

8.8.2 Implications

We suggest the KESSU URD method as a useful means for determining usability requirements. If it is not feasible to assign resources for several workshops, one could make use of the method for training and motivating designers towards usability. For that purpose, even one day workshop could be enough. Anyway, the case should be real, i.e. a development project that is about to start. We suggest using a 'narrow' approach. One could start by identifying the different user groups but then start working on one (important) user group only. Further, one should continue working with the main user accomplishments only. Anyway, one should aim to go all the steps through so that at least some measurable usability requirements are determined.

The results of this study indicate that the ISO 9241-11 definition of usability a useful reference in practical usability work. There exist different definitions of usability, and there is a need for commonly agreed definition (Seffah and Metzker, 2004). We propose that the definition of ISO 9241-11[3] could be used as the 'basic' definition of usability'.

Our experiences show that it is not feasible to determine the requirements fully in workshops. Individual work is required, too. One solution could be to first run two or three workshops with the whole team, and then let the usability team to complete the work. Finally, a final workshop could be organized where the results are shared and agreed on with all the development team. It is important that there are resources are planned for the work to be carried out from the very beginning.

8.8.3 Further Research Topics

We find a true need for 'full' cases where the usability requirements could be explored 'to the end' and one could be able to follow the impact of the requirements throughout the project life-cycle. This kind of study would help in finding solutions to the management of complexity of the requirements, as well as finding effective solutions

[3]There are some minor problems in the definition of usability of ISO 9241-11, not discussed in this chapter.

to other challenges of the requirements process, such as determining the 'right' target levels of effectiveness, efficiency, and satisfaction.

The method could be expanded by coupling financial incentives of a development project (project bonuses that given to the project staff) with usability requirements. There is evidence (Jokela and Pirkola, 1999) that when such incentives are coupled with the achievement of usability requirements, the designers truly consider the requirements and produce highly usable design solutions.

Acknowledgements

The author would like to express sincere thanks to all the participants in the workshops: from the companies Buscom, Elbit, Nokia, Polar Electro, and TeamWARE and from the research projects KESSU and ITEA Nomadic Media. The research projects were performed with financial support from Tekes, the National Technology Agency of Finland.

Appendix

Table 8.5 Usability requirements table

Task name	Initial state	Accomplishment name	Attributes of the accomplishment	Usability requirement, qualitative description	Quantitative usability requirement (in terms of effectiveness, efficiency or satisfaction)	
					The reference level	The target level