



UMEÅ UNIVERSITY

HOW TO DESIGN REMOTE USABILITY TESTING TOOLS TO ENHANCE AND SUPPORT MODERATORS SKILLS

Matilda Näsén

M.Sc Interaction Technology & Design, 300 credits

Master Thesis 30 credits
Department of Applied Physics & Electronics
Spring 2021

Supervisor: Kristina Kunert
External supervisor: Michaela Arnklint
Examiner: Thomas Mejtoft
Umeå University, Sweden

Abstract

This thesis aimed to investigate how moderated remote usability testing (RUT) tools can support the moderator's role and skills to create design principles for RUT tools. The study gathered knowledge of how to perform a RUT and the skills of a good moderator. This study resulted in a contextual inquiry with findings of what could support or obstruct the moderator according to the moderator's role and skills, opportunities and difficulties with RUT tools. The findings led to design principles of designing RUT tools to support the moderator's role and skills. The study resulted in usability, user and functional requirements with a prototype of a RUT tool to visualize how to use the design principles.

Svensk Sammanfattning

Denna studie syftade till att undersöka hur verktyg för modererade användbarhetstests på distans kan designas för att stödja moderatorns roll och färdigheter. Studien innefattar kunskap om hur man utför ett modererat användbarhetstest på distans och vilka färdigheter som krävs för att vara en bra moderator i sådana test. Studien innefattade en fältstudie som resulterade i funktioner i ett verktyg för användbarhetstester på distans som kan stödja eller hindra en moderators utförande med avseende på dess roll och färdigheter samt möjligheter och svårigheter i sådana verktyg. Designprinciper skapades i syfte att vägleda designen av verktyg för användbarhetstest på distans som stödjer moderatorns roll och färdigheter. Studien resulterade i användbarhets-, användar- och funktionskrav som med designprinciperna visualiserades i en prototyp av ett verktyg för modererad användbarhetstest på distans.

Keywords

Remote usability testing, synchronous testing, moderators skills, usability testing, software tools

Contents

1	Introduction	1
1.1	Problem	1
1.2	Objective	2
1.3	Research Questions	2
1.4	Mina Bästa Polare	3
2	Theoretical Framework	4
2.1	User Experience	4
2.2	Usability	4
2.3	User Centered Design	6
2.4	Usability Testing	7
2.4.1	User Testing vs Usability Testing	7
2.5	Moderated Remote Usability Testing	7
2.6	RUT Guide	9
2.6.1	Before Test Session	9
2.6.2	During Test Session	15
2.6.3	After Test Session	16
2.7	The Moderator	17
2.7.1	The Role of the Moderator	17
2.7.2	Moderator's Skills	18
3	Method	23
3.1	Context of Use	24
3.1.1	Literature Study	24
3.1.2	Persona	24
3.1.3	User Scenario	24
3.1.4	User Journey Mapping	25
3.1.5	Contextual Inquiry	25

3.1.6	Semi-structured Interview	26
3.1.7	Design Sprint	26
3.2	Specify Requirements	27
3.2.1	Design Principles	27
3.2.2	Functional, Usability and User Requirements	27
3.3	Design Solutions	27
3.3.1	Prototype	27
4	Result	28
4.1	Persona	28
4.2	User Scenario	29
4.3	Moderators User Journey	29
4.4	Contextual Inquiry	31
4.4.1	RUT Tools	31
4.4.2	Findings Contextual Inquiry	33
4.4.3	Design Sprint	36
4.4.4	Difficulties and Opportunities	37
4.5	Design Principles	38
4.6	Functional, Usability and User requirements	39
4.6.1	Usability Requirements	39
4.6.2	User Requirements	39
4.6.3	Functional Requirements	40
4.7	Prototype	41
5	Discussion	46
6	Conclusion	52
7	Acknowledgements	53

1 Introduction

When developing products and services, an essential part of the work is to conduct usability testing to evaluate the product or service. In the context of user experience (UX) design, it means evaluating the product or service by testing it with representative users. Usability testing of the product or services makes it possible to quickly and cheaply show how to design solutions that can be improved at an early stage before further investments in time and resources [1].

Usability testing is traditionally a moderated in-person testing, but there are various types of testing [2]. In recent years technology has made it possible to conduct high-quality usability testing remotely. Remote usability testing (RUT) is convenient for time constraints and resources, but it creates different demands on the moderators as well as the participants [1].

During usability testing, the moderator of the test has to handle several roles and tasks, such as ensuring the technology is working properly, keeping track of time limits, guiding the participant, observing the participant, and documenting the session to ensure high-quality testing results product or service. The moderator is the ringmaster of the test session and controls *"the flow of the show"* [3]. And at the same time being a *Gracious Host, a Leader* and *an Observer* [4]. Besides these roles, the moderator has additional skills to manage during a test session in the process of RUT.

The skills of a moderator are essential for the moderator to conduct the testing and can impact the test session, including the participant's performance and the results [5]. When doing moderated usability tests remotely, the moderator can use several digital tools. These digital tools offer different types of functionalities and opportunities. Using such a tool can significantly impact the RUT result by affecting the process of RUT and the moderator's role and skills.

How should a remote usability test be conducted? What are the moderator's roles and skills? And what challenges and problems occur when doing the usability tests remotely? This thesis will investigate how to design digital remote usability testing tools to support and enhance the skills of a moderator.

1.1 Problem

The decision of tools and methods to use are crucial when conducting usability tests, and there are many different tools to use. Choosing an appropriate tool and method can impact the testing result and also the product. Tools that support

the moderator in conducting a remote usability test in the specific environment can help the moderator through the procedure and keep the necessary skills to be a good moderator to collect good user experiences.

There is a lack of knowledge of moderators experience [6] and uncertainty of suitable tools and techniques for real practice. Recent articles suggest there is a need to investigate how usability testing is performed in practice, focusing on the moderator and the tools they use. Exploring and evaluating the moderator's experience could improve the intersection between the UX profession and the tools to achieve better results of the remote usability testing. [6, 7, 8, 9, 10]. There is a lack of studies with a focus on moderators with the purpose of prepare and support them for usability testing [6, 8]. Therefore, a question was raised of how the moderator's role and skills can be enhanced and supported by digital remote usability testing tools.

1.2 Objective

The objective of this master thesis is to present principles of how to design digital tools that support and enhance the moderator's role and skills for moderated remote usability testing. The focus of this study will be to investigate the best practices of how to conduct moderated remote usability testings, the moderator's role and skills and the tools used for RUT, as well as how the tools could be designed to support the moderator.

1.3 Research Questions

This master thesis will explore the field of moderated remote usability testing, digital usability testing tools, moderators skills and needs as well as the best practice of how to conduct usability testing will be studied as well. It will investigate essential factors and functions and how they can support moderator skills and needs to perform a good usability test. The goal is to explore how a moderator can be supported by digital usability testing tools and suggest design principles for such tools.

The research questions to be answered in this thesis are presented below with a main question and sub-questions.

How should a remote usability testing tool be designed to enhance and support the moderator's role and skills when conducting remote moderated usability testing?

- Based on the literature, what practices and steps are recommended to include in a moderated remote usability testing?
- What problems and challenges do a moderator face during moderated remote usability testing?
- What kind of practical experiences and recommendations for a moderated

remote usability testing tool can be gained from the study?

- What kind of functionalities in a digital tool is requested by the moderator through practical testing?

1.4 Mina Bästa Polare

This study is in collaboration with the digital agency Mina Bästa Polare. It is a digital agency that delivers digital solutions in Sweden, with an office in Östersund [11]. Many of their clients are located in other cities, and a lot of work and contact with clients is done remotely

2 Theoretical Framework

This chapter provides a theoretical framework created by a literature study to understand the concept of user experience design and usability testing. Understanding these concepts for further studies in moderated remote usability tests and the moderator's role and skills is essential. The literature study resulted in a RUT guide that aims to explain the process of RUT and is necessary for the context of the study.

2.1 User Experience

User experience (UX) is a term that encompasses all of the aspects of a user's interaction with a product or service [5]. UX can apply to different types of products and designs but mostly on digital interfaces [12] and has the role of making our physical and digital life frictionless and enjoyable. It is about the user's perceptions and responses resulting from interacting with a product or service [13]

Don Norman and Jakob Nielsen claim that there are some requirements needed to achieve a good user experience. The first is "to meet the exact needs of the customer without fuss or bother" and secondly ", simplicity and elegance that produce products that are a joy to own, a joy to use" [14].

There are some well-known and commonly used fundamental measurements for UX design, suggesting that every UX design should include the following [12]:

- **Useful** solutions that provide content, features or functions that meet user needs in all aspects.
- **Usable** solutions that provide functionality that is easy and intuitive and that does not require much from the user to accomplish.
- **Desirable** solutions that enable desirable or delightful experiences and that engages the user.

2.2 Usability

The definition of usability is a qualitative attribute. It assesses how easy a user interface is to use [2]. A usable product or service, with a focus on usability, is when *"the user can do what she wants to do the way she expects to be able to do it, without hindrance, hesitation, or questions"* [15]. When a specified user in

a specified context can use a product or system and achieve specified goals with effectiveness, efficiency and satisfaction [13]. It could also be explained as *"true usability is invisible, if something is going well, you don't notice it.."* [15]. It is an essential attribute in good products, but that can be hard to measure if it is not noticeably bad. Usability is an essential attribute for useful products [2], as unusable products are not used and thereby left abandoned by their users and not fulfilling their purpose.

There are some terms to consider to use in iterative design processes to create products and services that are useful and usable [15]. These are the five terms efficiency, effectiveness, satisfaction, learnability and accessibility [2, 5, 13, 15].

Measuring usability

Usability can be measured by the five mentioned terms [2, 5, 13, 15]. Although, it is hard to measure by generating numbers or finding crucial factors [5]. It does not generate data in terms of how to fix a problem, but behavioural data of why there is a problem [15].

- **Efficiency** Measures the accuracy and speed of a user's accomplishment to achieve a goal of a specified task [5, 13, 15] in terms of resources [13]. It can be measured in time [13, 15] of completing the task in the form of keystrokes or clicks. The product or service supports the users need to achieve the goal with accuracy and speed and to be the value-added part of usability [5].
- **Effectiveness** Refers to how accurate and complete the users achieve specified goals [5, 13, 15] and is used to bring value to the product or service [5]. Often measured in quantitatively error rates or like for efficiency with numbers of possibly time [15] to measure usability.
- **Satisfaction** Refers to the user's perceptions, feelings and opinions of a product or service [15]. It is about how the user interacts with it and how usable it is in terms of being free from discomfort and bringing positive attitudes, pleasantness and satisfaction for the user [5, 13]. Measurements of satisfaction are derived from users' perception of it [5], making it an essential measurement of usability as satisfaction also could be referred to as desirability [5]. A product or service that meets the user's needs and provides satisfaction is more likely to make a user perform well [15] than a product or service that does not. Because of this, products that satisfy the users can overcome recognized problems with effectiveness and efficiency as satisfactions can be seen as desirability[5]. It can be seen as the most useful measure of usability, as products users are satisfied with can be seen as more desirable and usable.
- **Learnability** Refers to how easy a user accomplishes a task the first time encountering the design [2] of a product or service. It is about the competence and amount of training required to accomplish a predetermined task or goal [15] or the ability after a period of inactivity to relearn a type of system [15]. It

can be measured in time or repetitions of being efficient at a task. Preferably using a learning curve, in the case of studying the learning [16].

- **Accessibility** Refers to having access to a product or service a user need to accomplish a goal [15]. The extent of products or services that a wide range of users can access to support the achievement of specified goals in a defined context of use [13]. It means widening the usage of a product or service to help users achieve their goals.

2.3 User Centered Design

User-centered design (UCD) is a term for designing with the user in focus and is a part of the more significant concept UX [15]. It aims to design products and services by focusing on the use of the system and applying human factors, usability knowledge and techniques to make interactive systems more usable [13]. It is often referred to as the process of designing with the user in the centre of the process [15]. Products and services are developed with knowledge of the user's behaviour gained by research and insights from real world-tests [5, 15]. It includes methods and procedures for designing usable products and services [15].

UCD Process

The UCD process is an iterative design process with the user in focus. It consists of four phases where the designer involve users throughout the whole procedure [17], see figure 2.1. The first phase consists of understanding the context of use, followed by the second phase, where the user's requirements are identified and specified. The third phase consists of developing design solutions. The last phase is the evaluation phase, where the result is evaluated against the context and requirements to see how well the system matches the user's needs [18]. After that, the iterations of the four phases continue until the results of the evaluation are satisfactory.

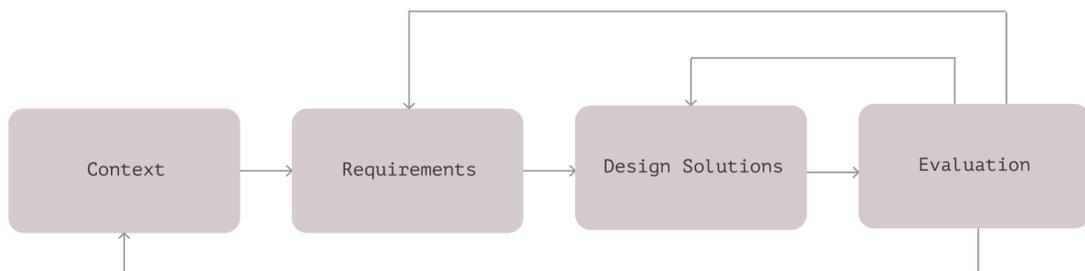


Figure 2.1: UCD process, adapted from [18].

2.4 Usability Testing

Usability testing is a standard method for testing and measuring the usability of a product or service [19]. It is one of the significant parts of the UX process [19], by evaluating a product or service with having real persons, preferably end-users, interacting with the product or service in a natural and meaningful way [5].

There are many ways of conducting usability tests. It is either moderated or un-moderated, formative or summative, face-to-face or remote, in the field or a lab, using various techniques. The traditional way of conducting usability tests is to do a moderated in-person test. It means that a moderator, also known as a facilitator, observes a representative user performing practical tasks on a product or service [15].

Usability testing aims to detect possible problems and to improve with the product or service [15], and create valuable and usable products that are delightful to use [15]. The method can help discover unforeseen problems at an early stage [12]. It is done to measure how a product or service meets specific usability criteria [15], often based on the five factors of usability [2, 5, 13, 15].

Usability testing takes planning and practice to be successful. It is with advantages conducted at an early stage in the UX process, to quickly find problems and areas of improvement [12]. Testing at an early stage can also save time and resources in the development of a product or service [20].

2.4.1 User Testing vs Usability Testing

User testing and usability testing are two terms that are important to distinguish. User testing is basically to test and explore the utility of ideas or apps. It involves understanding how people currently do something and the alternatives to doing it. User testing is done immediately after a new idea is created by asking potential users what they would like to do or how they would do it. User testing is to create an understanding of what they need [21].

Usability testing is done early in the development process of a product or service, immediately after a sketch or prototype has been produced, possibly as the outcome of user testing. The idea of usability testing is to test whether the users can use the product or not by observing the users performing a given task. It is to identify issues and problems and examine if end-users can do what they need based on experiences.

2.5 Moderated Remote Usability Testing

This study applies to moderated remote usability testing (RUT) with a formative and explorative approach.

Method

Moderated studies mean the test session is held by a person from the design team that moderates and guides the participant through the test session. The moderators interact with the participants by presenting the test, introducing the task and technique to use. Observing and listening to the participants, holding interviews and follow-up questions [5, 22]. The difference from traditional usability testing is that a moderated RUT means the moderator and the participant are geographically separated.

The result of moderated usability testing is often formative, with an in-depth as the outcome to the interaction between the moderator and test participant [5]. The strength of moderated tests is the opportunity for the moderator and participant to interact with each other to clarify questions and dig deeper into the study [23].

The formative method of usability testing is used early in the design or development process to identify problems and challenges with a product or service [22]. It is typically used repeatedly [5, 15] in small studies, for finding qualitative data [15]. Formative usability testing is effective for finding user's goals, motivations and engagements by conducting small informal studies that also reveals what users like and what works best for them [5, 22]. It often provides a list of findings with insights into what users like and what can be improved and developed at an early stage of the development process.

When using a moderator in a RUT to usability test a product or service can be convenient to use an explorative approach. The explorative approach is also referred to as generative, often meaning using techniques like open-ended user interviews. It allows the moderator and test participant to explore parts of interest. It is a valuable approach when facing problems that are not entirely obvious to the design team or when there is a lack of contextual and behavioural knowledge of the user [24]. It aims to tell why users are doing certain things and what they are thinking [25].

Setup

The methods and practices of RUT are essentially the same as of traditional in-person usability testing [26], with the same quality of results [27]. Thompson et al. suggest the RUT method can follow the procedures and protocols such as provided by Rubin [15, 28]. However, there are some adaptations to make due to the remote situation. Adaptions to be made considers the digital tools used, the material and provide the participant with the essentials [27, 28].

This study focuses on moderated RUT that can be defined as the moderator and participant **geographically separated**. A **software tool** is used to **share task/work space** for observing and analyzing the participant's interactions with the product or service being tested. A software tool is used to mediate the moderator and participants **communication**. The **think-aloud method** is used to gather data [29, 30].

Tools

Fidas et al. suggest a RUT tool should include certain functions and features to support the skilled moderator to facilitating, interviewing, and observational skills [26]. It should include the "traditional setup" [30] and minimum[29]:

- Direct communication (audio)
- Application sharing
- Think-aloud
- Screen readers
- Web-cameras

Fidas et al. suggest further that improving features such software tool should include the [29]:

- Direct communication (Video)
- Data gathering (Video, Audio, screen)
- Post-Hoc Discussion
- Multiple Observers support
- Participants recruitment

2.6 RUT Guide

The purpose of this guide is to explain the process of moderated RUT. The aim is to describe and support a moderator through the process of testing with suggestions of methods and steps to include. The guide consists of three main parts: Plan, Prepare and Conduct. The guide applies to the definition of moderated remote usability testing, where the moderator and participant are geographically separated. A software tool is used to share task space and to mediate communication between the participant and moderator.

2.6.1 Before Test Session

The first phase of conducting a usability test is the "Before" phase, which consists of planning and preparing. The plan includes creating a test plan, choosing a test method, screening test participants, creating tasks, choosing measurements, setting a moderator, and deciding when what, and where to do the test. Preparing includes creating an invitation, consent forms, questionnaires, recruiting and create a moderators script.

Plan

Test Plan

The test plan forms the core of the usability test. It aims to answer: *how, when, where, who, why, and what*. It is essential to plan what and how to test it. A test plan is preferably written down to be used as a blueprint for the testing. It also describes the required resources [15]. The parts of the test plans vary depending on the aim, team, participants and resources [15].

The first step in conducting a usability test is to set up test goals. These are why conducting a usability test and deciding what is essential to learn from the users. The why part can also be explained as the research questions, which the test is built upon. Before creating the test, the research questions have to be stated. Three main goals for conducting a usability test is *uncover problems, discover opportunities and learn about users* [2].

Test Method

A significant step in conducting a usability test is to decide how to test. The "think-aloud"-method is advantageously used when doing moderated RUT [5]. Data is collected by the moderator taking notes during the test, pre or post questionnaires and semi-structured interviews. By recording the moderator's screen, test participant and test participants screen, data can also be collected by watching the recordings.

Participants

The test participants in a usability test are preferably realistic users of the product being studied. They can be defined by characteristics using user profiles or personas [2], then selected by screening questions[15]. They aim to narrate their actions and thoughts as they perform tasks in the usability test so that the moderator can observe and gather usability testing data [2]. For qualitative usability testing, 5-8 participants are recommended [2].

Tasks

The tasks created and used in usability tests are based on realistic activities that the participants could have performed in real life with the product. They are used with real scenarios based on test goals [5]. Therefore, a task is selected by matching the team's and user's goals. Depending on the research question and the type of usability testing, the task is either open-ended or specific. Most essential to result in accurate and actionable findings [31], the task is accurately and adequately reflecting the research goals and provides clear instructions for the participants. It is also essential to use the right words and be clear and specific to avoid misunderstanding, mislead or influence the participant in the testing [2] that could lead to physical

phenomena priming [32]. The task and instructions can be provided to the test participant verbally or written on task sheets.

Measurements

The usability testing is done by collecting data about the interaction of users and the product to evaluate the usability of the product. The type of data to gather must be specified and how to collect and measure the data. When conducting moderated RUT, qualitative data is collected by using the think-aloud technique. A method for collecting data is to make notes on a script, form or log findings on the laptop. It can also be done by watching recordings afterwards [5].

Moderator

A moderator is a person from the development team that moderates the usability tests. The moderator's task is to guide the participant through the process of testing and administer tasks and give instructions to the test participants. If the moderator works alone when conducting usability tests, it is also her task to observe the participants behaviour, listen for feedback, ask follow-up questions and hold interviews. This is done to gather and ensure results in high quality, valid data preferably without influencing the participant or the result [2].

Tools and technique

It is essential to consider the equipment and tools used when usability testing. Therefore an essential part of the test plan is to decide what tools are to be used when connecting the moderator and the test participant with the product or service. The test team must ensure that the participants access the tools and equipment needed and know how to use them. Consider how to introduce the technique and make the test participants comfortable with it before the test session [2, 5].

When What and Where

The final steps in creating a test plan are to decide when and where to test. When testing remotely, the place will be a digital meeting room, depending on what tools and techniques have been chosen for the testing. If possible, it is good to consider where the moderator and test participant is located, to avoid interference from the surrounding. Set the dates for testing and also the dates for deliverable for the test and the test results [5].

Prepare

To recruit participants, it is essential to use an invitation. It is preferably sent by e-mail and is suggested to be structured as follows. A moderators script is also to be used with the task plan. The invitation in figure 2.2 is based on research and Barnum's suggestion of an invitation [5].

Test Participants Invitation

Invitation

Participants can get invited by a written invitation. It is with advantage created by including the following parts. An invitation is preferably sent 2-3 weeks before the event.

Introduction

The company is introduced with the team members that will conduct the testing by name and job role. It should also be mentioned whom the company seeks to participate.

Purpose of the study

The reason for testing should be explained, and that the results will be used to improve the product. Appreciation is to be expressed and that the participation means improvement of the product and how it benefits all users.

Requirements

The requirements of participation must be declared. E.g. a smartphone (Android or iOS) or a computer (laptop or desktop) with a web camera, microphone and audio or other.

Test Session

The invitation should explain how the test session will work. The time of test session and tools used for the remote connection. It should also explain that it will be recorded to help analyze the product but never used again. If the participation is nonrecurring, it should inform the participant that it won't obligate them again after the session.

Date and Time

The date and time should be stated for when the test sessions are aimed to be held and that it will be agreed on together after enrolment to the study.

Questions

The invitation should include that the company is happy to answer any questions regarding the test session and how to get in touch.

Regard

Closing the invitation with regards.

"Best regards"

Company name

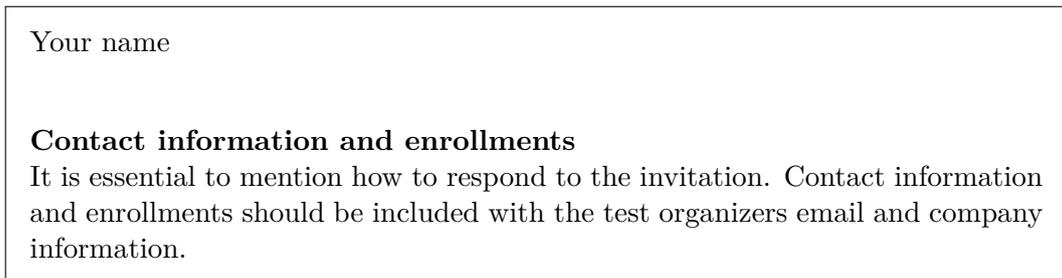


Figure 2.2: Test participants invitation

Consent forms

Form or consents needed must be prepared and obtained. It can be video consent for permission to record the session, a particular consent form when testing with minors, a nondisclosure agreement or an observer form to standardize the note-taking process [5].

Questionnaires

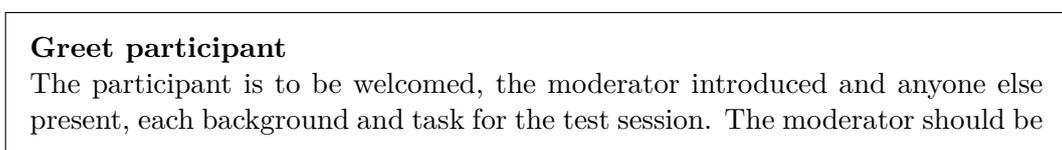
If questionnaires are to be used, these are also to prepare. Questionnaires could be used as pretest questionnaires, post-task questionnaires. What to use depends on the study and the research goals.

Recruiting

Participants are recruited by the user profile or screening of the test participants. The test participant might not be the actual users but preferably like the "real users" with the same background or skills.

A moderators script is used to support the moderator during the test session. It can be used to make sure the moderator remember all essential steps for the testing and to ensure the moderator says the same thing to all test participants [5]. It is essential to follow the script and not try to memorize or wing it [5] and to keep the speech short [15]. It is a help to conduct the usability test and ensure high-quality results. For moderated RUT, it includes the following steps, see figure 2.3 [5]:

Moderator's script



presented as a "non-association" with the product, and ideally, the moderator is not affiliated with the product. The role of the moderator should be explained as someone who will be moderating the test, observing and taking notes. It is also essential to explain that the moderator follows a script to ensure consistency and that it is read from. It is crucial with a nervous participant.

State the purpose of the study

The test's purpose should be explained to the participant and what the test will be used for. Remember the participant that it is the product, not the participant, that is being tested.

Explain and introduce the technique

Make time to ensure that the participant understands what technique is to be used and make the participant comfortable using it.

Explain the process of screen sharing and use of webcam

Explain for the user that the webcam and screen share will be used. That both will be recorded and what the recording will be used for.

Confirm audio and webcam video

Confirm that audio works for all involved and that everyone can see each other.

Confirm receipt

Consent and nondisclosure forms are to be signed. If already done, it should be confirmed that it has been signed.

Explain the process of the study

The process of the study should be explained to the participant, why the participant is there, the use of scenarios and questionnaires, the process of think-aloud process. Offer details and context about the product to perform the task without giving any clues about the test. It is essential to express appreciation of the participant's participation and input that helps to improve a product.

Remind participants

The participants should be reminded that they can stop at any time if uncomfortable and explain any unusual requirements. And that it is the product that is being tested, not them.

Ask any questions

Before beginning with the study, make sure the participants understand the procedure and provide the opportunity to ask questions.

Start the study!

Figure 2.3: Moderator's script

2.6.2 During Test Session

During the test session, there are several tasks to handle. It is crucial how the moderator acts during the test session, and therefore there are some things to consider for acting during the test.

Tasks

- Prepare
- Invite
- Tech setup and troubleshoot
- Greeting and introduction
- Record session
- Task Plan and Questions
- Handle material
- Probe think-aloud
- Observe
- Document/Collect Data
- Chat/Team Work
- End session

How to Moderate

The moderator has the pivotal role of the test session and can be described like three roles of being a Gracious Host, The Leader and the Observer [4]. Some guides for how to act and support for during the test session are [4, 5, 15]:

The Gracious Host

- Greet participant and get participant comfortable
- Be relaxed and warm but not overly friendly
- Accommodate the participants in every way possible
- Treat every participant as an individual

The Leader

- Control the environment and test session
- Project a sense of confidence and an aura of authority
- Protect participants privacy and integrity both external and internal
- Respect participants as experts but remain in charge
- Ensure participants are finished before continue on
- Knows when and how to intervene, end task, move on, provide hints but do not rescue participants when struggling
- If you make a mistake, continue on
- Troubleshoot tech problems smooth
- Uses a checklist and script to procedure
- Clothing as appropriate to the target group

The Observer

- Moderate impartially, neutrally, unbiased and avoid loaded words
- Stay objective and let participants speak
- Ask "good" questions and comments with neutral prompts and balance your praises
- Keep a neutral tone of voice and body language
- Treat participants individually
- Use think-aloud technique
- Avoid defending product design

2.6.3 After Test Session

It consists of gathering data, compiling data, summarising data, analyzing data, developing recommendations, and producing the final report.

Gather input and preliminary analysis

When the test session is finished, the data should be gathered and reviewed by the moderator and observers to contribute to the findings. Have a last debrief session to find out how the testing went and to find issues. These issues should quickly ascertain and prioritize some hot spots [15]. A preliminary analysis could also be done by sorting top positive, negative or surprise findings or using a top-down or bottom-up method [5].

Compile Data

Data collected from the test should comply with the testing and be gathered at the end of every session. And organized if possible [15].

Summarize Data

When all test sessions are completed, the generated data should be compiled with and then summarized. It can be summarized by performance or preference data, task accuracy, task timings, or other measures [15].

Analyze Data

After the data is summarized and organized, it can identify issues, errors or difficulties by analyzing the data. It is the source of error analysis and tool to identify tasks where the success criterion is not met [15].

Develop Recommendations

When the data is gathered, compiled, summarized and analyzed, it can be reviewed to develop recommendations for improvements of the product or service being tested.

Produce the Final Report

The findings from the test with gathered data and recommendations of improvements are then to be written down in a final report of the testing.

2.7 The Moderator

The moderator of a usability test has a role with several skills necessary to be a good moderator.

2.7.1 The Role of the Moderator

The moderator of a usability test has the pivotal role of the test session [4] and is responsible for the test session, participants, research and test goal, moderators role, including the company's reputation [3, 5]. The moderator is in ultimate control by being the person that interacts directly with the participants [5] from the first recruit to the end of the test session [4], making the moderator very important [3]. Hence, the moderators have many tasks and roles in administering, such as manage the

testing, including preparing, guiding the participant, asking questions and holding interviews [5].

"A test facilitator is like a duck—serene on the surface, but paddling like heck underneath" (Snyder, 2003) [3]

An effective moderator must manage several tasks at the same time as being responsible for creating the proper interaction and well-being of the participant to conduct reliable results from the user's experience [5]. As Tedesco and Tanquada explain, a moderator could be seen as a ringmaster handling and balancing several needs [3]. As the ringmaster, you *"actively listen to and monitors everything that is going on around her, directs the audience, and controls the overall pacing and flow of the show"* [3].

The role of the Moderator can be described as maintaining the three roles of being a *Gracious host, a Leader* and an *Observer* as suggested by Dumas [4]. By being a gracious host, it is essential to make the participant feel comfortable through the session [5], and the Moderator is responsible for the participants emotional and physical state as well as the moderators own [3]. The Moderator is a leader and is responsible for the study's research goals as well as general session managements [3], and control of the test session and open to an approachable to the participants [4]. Also, the Moderator is an Observer that must interact with the participants but avoid biasing the participant through body language, tone of voice, comments, and questions [5]. It is essential to get a mix of being unbiased, neutral to the product and in control [4]. Find a balance between these roles that can be stressful and difficult, and it can be the difference between success and failure of the test session [3].

2.7.2 Moderator's Skills

Specific skills and qualities are advantageous to have and manage to be a good moderator. With the three moderator roles, the following are essential skills to conduct reliable and high-quality usability testing results.

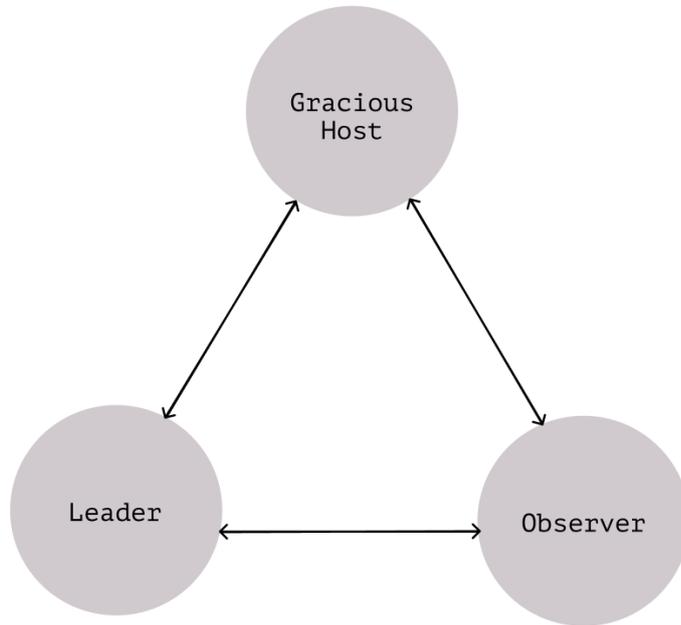


Figure 2.4: The three roles of a moderator.

The Gracious Host

Good Communicator

The Moderator is responsible for communication between the participants, the development team and other involved persons. The results must be communicated correctly and motivated so that the development team is convinced of the feedback and changes [15]. Good communication skills are also needed to write the result into a report.

Empathy

The moderator's task is to collect the participant's feedback. Empathy is essential to recognize and identify the participant's feelings to help feel comfortable during the testing [3]. Empathy is an essential factor when trying to elicit participants' thoughts, and feelings [15]. It can also be used to make the participant relate to the moderator. If participants cannot relate to the moderator in particular situations, they tend to hold back their feelings [15]. Participants are often put in uncomfortable and stressful situations where they have little control where it is the moderator's task to comfort them and ease. As a moderator, it is important to treat the participants

with respect but always remain in charge [4], that greater the chances of accurate results [15].

Comfortable with Ambiguity

Ambiguity can be a result of usability testing when observing humans with imprecise, varying and conflicting observations. The moderator must therefore be comfortable with ambiguity and understand the appearance of unclear test results. Ambiguity during the testing makes it especially important to have patience, perseverance, with the ability to negotiate as these situations often lead to the moderator rationalising and blaming participants for unplanned choices [15].

A Sense of Humour

Humour is a good skill for unpredictable situations. When things do not go as planned, it is necessary to take a breath and manage the situation without getting upset or nervous. The situation must be overcome, and it can be helpful to appreciate the humour of the situation [3].

The Leader

An aura of Authority

The moderator is the controller of the session and is responsible for everything during the testing. It is important to manage body language and voice of tone to establish the authority for the participants, and possible observers [3]. Although it must be balanced with empathy to make the participants comfortable [3]. The moderator must be professional, genuine and protect participants' privacy [4].

Good Organizer and Coordinator

Usability testing can be seen as a project within a project and needs a lot of organizing and coordination. Regardless of size, it requires a lot of management [15]. It includes creating a test plan and research goals, screening and recruiting participants, conducting the test and managing the technical setting to evaluate the results.

Troubleshooter

Anything can happen during the test sessions. As with flexibility, it is essential to troubleshoot any of the problems that could arise as it can be the deciding factor between success or failure [3]. It is also necessary to be flexible when conducting a

usability test as unexpected situations often arise. This means that the plan may not be followed, resulting in uncomfortable situations and biased results [3]. Therefore, it is essential to be prepared and to know when and how to deviate from a test plan and the consequences of it to reach the research goals [15]. The moderator must have the ability to be flexible. A supportive skill to flexibility is creativity to handle unexpected situations [3].

When moderating a test, it is important to be a quick learner. To absorb new concepts, understand participants actions and comments, and the implications behind those actions and comments. Quick learning leads to effective probing and questioning [15]. The moderators must remember the participant's comments and behaviours through the testing to proceed. Even though the session most likely is recorded, the moderator must remember or take notes about interesting parts or moments for the evaluation phase [15].

The Observer

Neutral

For valid results, the moderator must not bias the participant [4]. It is of great importance to avoid the problem of leading rather than enabling [15]. The test moderators tone of voice, body language as small movements or leaning forwards, or the type of questions can influence the participants, and the results [15]. Loaded words should be avoided [5], as well as giving the participants too many affirmations. The praise should be balanced as the participants are eager to please, and it is essential to phrase meanings so that they are unbiased to avoid suggesting the participant did something wrong [5]. The moderator must be neutral.

Know-how and when to Intervene

The moderator must know how and when to intervene with the participant in the testing. Intervention must be done when the participant struggles with the same task without any results or interesting data. The moderator can intervene by giving them hints or gently ask them to continue with the next task. Interventions may be needed if the system crashes, the participant wanders off task or goes too deep into a task or scenario [5].

Good Listener

It is essential to listen to the participants when moderating a usability test. Letting participants speak [3] enables an opportunity to understand the content and the implication of the user's experience and the rationales behind the behaviour. When moderating several sessions, it is essential to listen with "new ears" to avoid biasing, and strong opinions based on earlier experiences [15]. Usability tests are often long,

with many test sessions in a row containing long moments of observing participants reading or thinking. It is, therefore, crucial for the moderator to possess a long attention span, to be able to focus, observe and listen to the participants during all test sessions [15].

“Big Picture” Thinker

Lots of data is collected during a usability test. The moderator must therefore sort and collect essential data. Various inputs from single test sessions must be drawn together to focus on the critical findings. It can be difficult to not focus on details and to see trivial observations. To be effective, it is essential to focus on the “big picture” [15].

3 Method

The method for this study is based on the UCD process according to its character. The method was chosen as it focuses on the user’s needs and challenges and consists of four steps: Context of Use, Specify Requirements, Design a Solution and Evaluate against Requirements. The UCD process was adapted to fit this study with the steps in figure 3.1. With this method, the study aims to investigate the challenges and needs of a moderator. By gathering knowledge about the process of moderated RUT, the moderator’s role and skills, and the tools used to perform the procedure. This study focuses on moderated RUT with exploratory approaches to gather formative data insights of products and services with the traditional remote setup and RUT process, based on traditional usability testing.

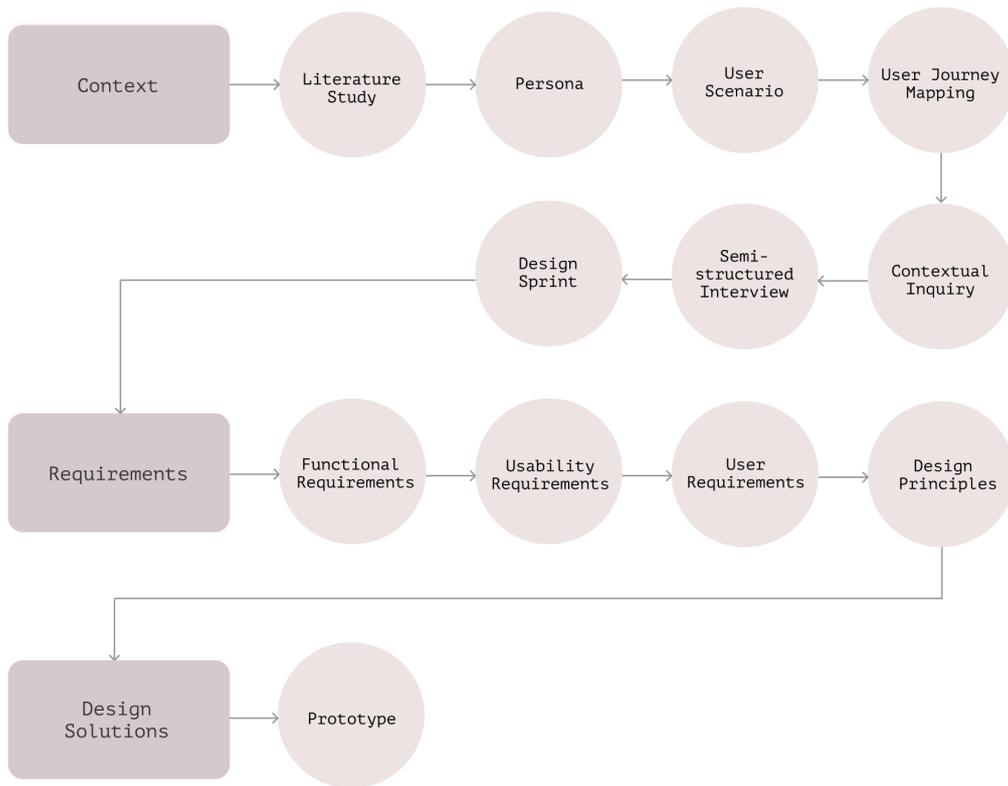


Figure 3.1: The steps in method.

3.1 Context of Use

UCD is a method that put the user in the centre of the design process. It aims to understand the user's needs, wants, limitations and the product. The first step in UCD is to specify the context of use by answering who the user is and how will they use the product or service [33].

A literature study was done to gain knowledge of usability testing and the moderator's role and skills. The literature study resulted in a persona of a typical moderator and specifying the context of use with a user scenario to describe and specify the context of interest. Then a contextual inquiry was made to observe real users and collect field data followed by semi-structured interviews. The contextual inquiry was made to understand the process of performing a RUT, observe the moderators skills in the context and evaluate how the RUT tools supported the moderator's role and skills and the process. With the gained knowledge, a user journey map was done with the pain points of the moderator's experience. The user journey aims to visualize the moderator's experience of moderating the remote usability testing.

3.1.1 Literature Study

A literature study was done to understand the best practice of moderated RUT, the moderator's role and the skills needed to be a good moderator. This knowledge was essential to understand the concept of usability testing and to gain a deeper insight into the moderator's skills and tasks. The literature study aimed to answer the following questions:

- What is the best practice of moderated remote usability testing?
- What are the moderator's role and skills?

3.1.2 Persona

A persona was created to specify the users of digital tools used for usability testing. It aims to help understand the user's problems and support design decisions. The persona was based on the literature study of a typical moderator's desired skills, tasks and qualities. It also aims to explain in detail who the person is, what they want, and their frustrations [33].

3.1.3 User Scenario

A user scenario was created based on the theoretical framework to put the study to specify the context of use and scenarios of interactions. To create an understanding of the environment where the RUT is conducted, what devices that are used, involved participants and their emotional states [33]. The context was specified with a user scenario based on the persona of the moderator based on the literature study.

3.1.4 User Journey Mapping

A user journey was created to document the user's, the moderator, steps to complete a moderate RUT. It reflects the experiences through research and observations to understand, identify and specify issues and pain points of the moderator's journey using a RUT tool to moderate a RUT. It visually shows the moderator's experience through a series of chronological events, and it was based on research, personas and observations. It aims to get a better understanding of the user and the challenges for the moderator and can be used for design decisions [34]. For this study, the user journey was used to visualize the moderator's experience using a digital tool for remote usability testing.

3.1.5 Contextual Inquiry

A contextual inquiry was made to understand the users and the behaviour in the specific context. Contextual inquiry is appropriate when researching the user's work and potential pain points to help improve a user's journey. A contextual inquiry consists of observation and inquiry in the form of interviews. The users complete the tasks as if nobody was watching, and the researcher only observes and asks questions afterwards. The goal is to observe the users acting in the natural environment and to understand the goals behind the user's actions [35].

The contextual inquiry was made by observing moderators performing a moderated RUT at Mina Bästa Polare, where this master thesis is done. The testing consisted of moderated remote usability tests with actual prototypes and test users.

The test was created based on the RUT guide in section 3.6. The aim was to observe moderators performing RUT by using the guide, observing the moderators task and skills in the process when using different types of RUT tools to explore how functionalities and attributes could impact the process of RUT and the moderator's role and skills.

The tools used in the testing were chosen from several popular tools with different functionalities and attributes. Due to the limitation of time, resources, and the study's extent, the number of tools tested were three diverse but complementary tools.

The contextual inquiry took place at Mina Bästa Polare, where the testing was held. The testing followed the guide and was prepared by the moderators from the company. Different RUT tools were used for each test session. The participants were invited, and the moderator tested the prototype using the prepared script and the different tools. The session took place in a conferencing room with the moderator using a laptop with the RUT tool for testing and a team member observing the session through the RUT tool from another location. The participants were located in different places around the country and had no in-person contact other than remote digital communication. The moderator's tasks and skills using the tools according to the process was observed during the test session.

3.1.6 Semi-structured Interview

The contextual inquiry consisted of observation and semi-structured interviews by combining pre-defined questions with open-ended [36]. Semi-structured interviews are used to gather knowledge about a new topic or issues in a study [33]. The interviews were held after the moderator's observation to gain knowledge of the overall experience of the moderated RUT with the different tools.

The interviews were held after each test session in the contextual inquiry. It was dynamic and focused on challenges and events that occurred during the testing. It was based on the following questions:

- How did it feel to moderate the session?
- How did the tool support you in the process?
- Were there any challenges?
- Could you follow the task plan?
- Were there any tech problems or troubleshooting?

3.1.7 Design Sprint

The UX designers at the company, in collaboration, held a smaller design sprint focusing on being a moderator. The UX designers had also participated as moderators in the contextual inquiry. The design sprint was held to start the phase of exploring design solutions and to evaluate and share the experience of moderating remote usability tests done in the contextual inquiry. The design sprint was an opportunity to discuss with the moderators and help gain a deeper understanding of the context and the experience of being a moderator.

A design sprint is a methodology based on design thinking, and UCD [37]. The design sprint consists of five moments, Understand, Diverge, Decide, Prototype and Validate, usually divided over five days. The sprint can be customized to fit the time, resources or size of the project. It intends to answer critical questions through design, prototyping and testing ideas to solve design problems quickly. In this study, a design sprint was used to kick start the design phase and to help gain a deeper understanding of the context and the experience of being a moderator.

This design sprint was customized and divided into two days. The first day focused on learning and consisted of empathizing and defining what moderated RUT is. Day two focused on creating and consisted of ideation focusing on challenges and opportunities with a technical aspect. For this study, the design sprint was used to focus on the experience of conducting a moderated RUT and later used as material for the user journey and the design principles. Ideas, thoughts and emotions were written down by each participant on post-its to and on the visual collaboration platform Miro.

3.2 Specify Requirements

Requirements for how to design a RUT tool were created based on the theoretical framework and contextual inquiry. Design principles to guide how to design and functional, usability and user requirements for more specific suggestions were created.

3.2.1 Design Principles

Design principles for how to design a RUT tool was created. The principles are based on the knowledge of the RUT process, the moderator's tasks and skills, and the result of the contextual inquiry and the evaluation of different RUT tools. The principles aim to guide the design of a RUT tool to create tools that support the moderator's tasks and skills in the RUT process to conduct high-quality RUT.

3.2.2 Functional, Usability and User Requirements

Some requirements were specified as suggested functionalities that are essential to include in a RUT tool for supporting the moderator through the RUT process, performing the tasks, and maintaining the moderator's skills. The requirements are based on the design principles resulting from the contextual inquiry, including research, testing, evaluation and interviews. The categories of requirements for this study are based on functional requirements, usability requirements and user requirements.

3.3 Design Solutions

The design solutions of this study resulted in visualizing the design principles and the functionality, usability and user requirements. Based on the steps of the method in the UCD process, the design principles were visualized in a Lo-Fi prototype to demonstrate how such a RUT tool could be designed with suggestions of functions and features.

3.3.1 Prototype

The prototype was created to visualize the principles and the flow of how a RUT tool might be designed. It is a basic prototype and aims to explain the essential functions and features of a RUT tool.

4 Result

This chapter presents the study results based on the method, including a persona, a user scenario, moderators user journey, contextual inquiry, evaluation of RUT tools, findings of contextual inquiry, design sprint, difficulties and opportunities, design principles, functional, usability and user requirements. And finally, the prototype. The result of the literature study is presented in the theoretical framework.

4.1 Persona

A persona was created to create a reliable and realistic representation of an archetypal UX designer. The persona is based on the literature study and research. The persona of the optimal moderator that possesses the moderator's skills, shown in figure 4.1, was made with the digital tool Miro.

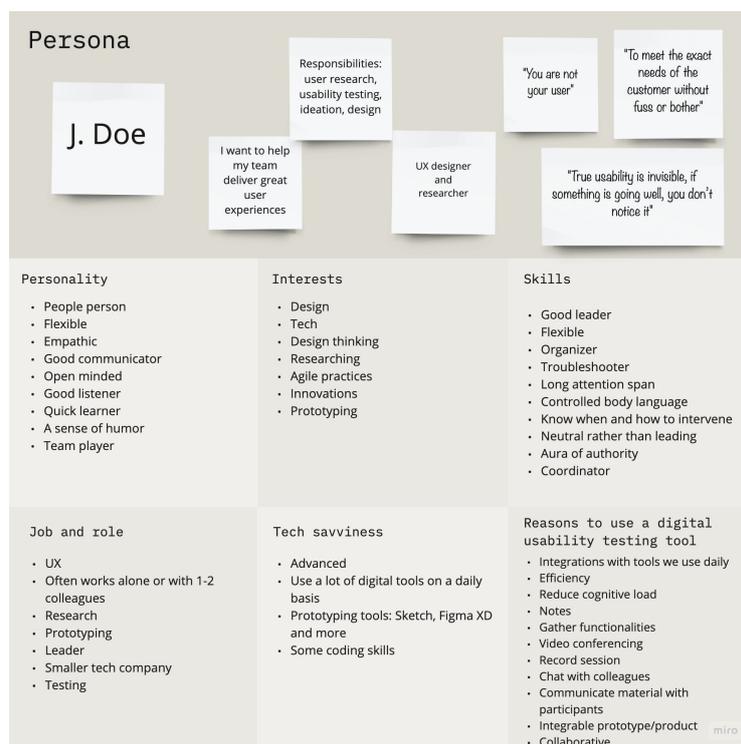


Figure 4.1: Persona of a UX designer, created with the digital tool Miro.

4.2 User Scenario

Jane is a UX designer working for a smaller tech company that delivers digital products and services. She primarily works alone as one of two UX designers at the company, and sometimes they work together. Jane is a curious and empathic “people person” with good communication skills that she constantly uses as she deals with users, team members and customers at work. Being an organized, flexible and quick learner is a must for her job role. Her tasks include handling loads of information in different digital tools and documents on her computer and analyzing and communicating the results to the company and other team members.

Several times a month, Jane is responsible for doing usability tests to evaluate and test to improve the products that the company develops. As the users for the product that participates in the testing primarily are located around the country, she prefers to do moderated remote usability testing to gather qualitative data about their experiences. When doing the tests, Jane likes to be effective and always try to improve her skills to do her best to achieve high-quality results unbiased and natural.

The testing is done at the beginning of the end of the development process. Jane sits in her office and uses her computer to conduct the testing with users located either at their home or at their workplace. The users are recruited and invited to a suitable date and time, and a link is sent for the participant to participate. Both Jane and the participants use their computers for the testing. The user accesses the prototype or product by a link sent from Jane, either by e-mail or in the chat in the digital tools they use for the testing. Sometimes Jane finds it hard to manage all different links to different tools that must be used. She is delighted and relieved if the digital tool used for the testing has video conferencing features as the tool must be used to observe the user during the testing. She finds it very disturbing when there is trouble with the tech as connection, audio or video disturbances. It is essential to work smoothly to make the participant comfortable and create a neutral digital environment.

Jane also faces other challenges when performing the moderated usability tests as she has multiple tasks to perform simultaneously. She must invite the participant, greet them, inform them of what to do and at the same time handle the technique and take notes. It can be very frustrating for Jane as she must also handle several tools for managing the tasks. Jane would love to be more efficient by using digital tools that support her tasks and relieve some of the burdens of the moderator’s role.

4.3 Moderators User Journey

A user journey map was created to visualize the moderator’s experience moderating a remote usability test with a digital tool, see figure 4.2. The moderators were asked to pin out the experience of the different parts in the process. It shows what moments of the process were better or worse to manage with the three different tools.

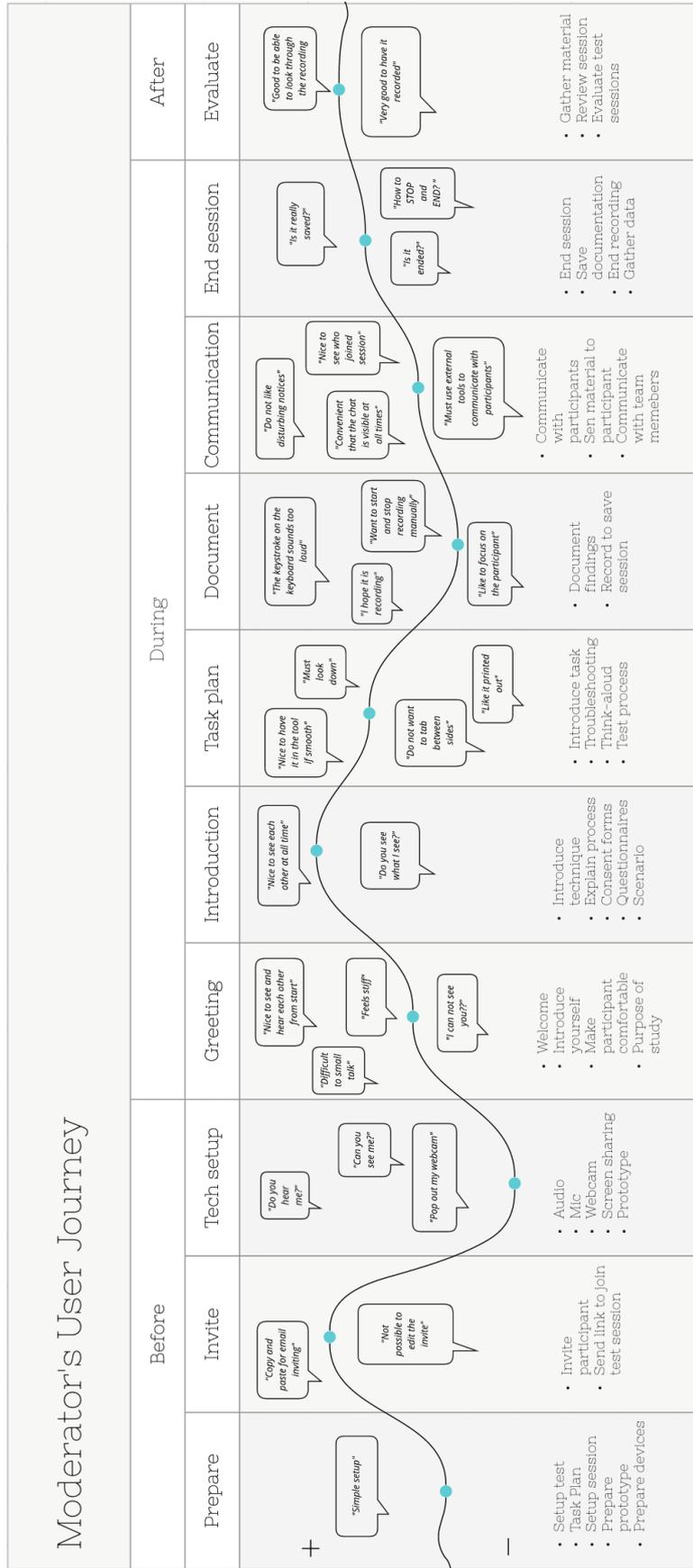


Figure 4.2: Moderator's User Journey Map based on the contextual inquiry.

4.4 Contextual Inquiry

The contextual inquiry was conducted by observing two moderators conducting RUT according to the guide. Research of RUT tools resulted in three different tools to use and evaluate for the test session. The contextual inquiry generated some findings, a user journey map with some pain points and data for requirements of a digital tool used for usability testing. The result of the contextual inquiry is described below.

4.4.1 RUT Tools

The tools were chosen by research on the web of popular tools for the purpose, RUT. It was clear what tools were suitable and commonly used for RUT. Most tools focused on unmoderated testing, which had some support for moderated remote testing as an extension. Few tools had priority to focusing on moderated RUT. A choice was made to exclude regular conferencing tools as a digital tool for moderated RUT in this study. Even though it might be one of the most used tools, this study focused on tools with functionalities aimed at RUT.

The three tools were chosen due to their popularity, accessibility, price range but most important, due to their functionalities. The tools used in the testing are UserZoom, Lookback and Loop11. The tools came from three price classes ranked from high to low. First, UserZoom was high priced with a lot of functionalities and support for RUT. Secondly, there was Lookback with a medium price that had slightly fewer functions, and lastly, Loop11 was remarkably cheaper with fewer functionalities.

Loop11

Loop 11 is a digital tool for usability testing that is browser-based with an extension that can be used to test any device and prototype or website. The tool offers different types of online testing. Creates a project for the testing and generates links to users to invite them to the test session. The user screen shares and uses the webcam to allow the moderator to observe reactions and body language throughout the test. The moderator and participant can voice communicate, but the moderator can not use a webcam to show her face. The session can be recorded. There can also be "hidden observers", meaning team members can observe the test session, write notes and chat with the moderator unseen by the participant.

- **Efficiency** The tool was not experienced as efficient as it did not offer any extra functionalities than an ordinary video conferencing tool. It even had fewer functionalities besides setting up a task and test session with an URL and having hidden observers.
- **Effectiveness** It was not effective to use the tool as it made the test session difficult with the tech trouble, user limitations and lack of a web camera for the moderator.
- **Satisfaction** The moderators were not satisfied with the RUT tool. They were rather horrified.

- **Learnability** The tool was simple to learn and easy to use due to the limited choices, but it was difficult to troubleshoot tech problems.
- **Accessibility** The tool required a plugin, yet there were major tech, security and integrity problems. The moderators did not feel in control of the test session.

Lookback

A browser-based digital tool for user research and testing any digital prototypes or products, it has multiple functions and features for usability testing, including moderated RUT. To use Lookback for testing, a project must be created in the tool and then a test. A participant link is generated for the participant to join the session. After some tech setup, the session is running and is automatically recorded from the start. Both moderator and participant use their webcam and can see each other and communicate throughout the testing. The participant can screen share. Team members can observe the test session unseen by the participant and take notes like the moderator. Observers can chat with the moderator during the testing.

- **Efficiency** The tool were quite efficient to use as it offered many solutions to help moderate, such as participant and observer links, chat and hidden observers.
- **Effectiveness** It was effective as it supported many of the moderator's skills, but some functionalities felt out of control, and there was some lack of communication opportunities.
- **Satisfaction** The moderators were quite satisfied with the tool overall but lacked some functionalities that could ease their tasks and support the feeling of control.
- **Learnability** It was an easy tool to use and learn and seemed like it for the participants as well.
- **Accessibility** All needed functionalities were easily accessible despite the feeling of lost control when not managing the recording manually.

UserZoom

Userzoom is a single platform that can be used for usability testing on any digital prototype or product. A test is created within a project, and invitation links are generated to join the test session. After the tech setup, the session is running, and the moderator and participant can use a webcam to communicate. The participant can screen share, and the moderator can send participants "demands" to screen share or enter links for prototypes etc. Team members can observe the test session hidden from the participant, take notes like the moderator and chat with the moderator during the test session. The session can be recorded.

- **Efficiency** The tool were very efficient to use as it managed to create a good experience for the moderator.
- **Effectiveness** The tool contained all necessary and desired functionalities. It eased the process of conducting a moderated RUT.
- **Satisfaction** The moderators were satisfied with the tool as it supported them in every task of the test session.
- **Learnability** It was easy to learn how to use the tool. If anything, there were some redundant features.
- **Accessibility** All needed functionalities and support were included in the tool.

4.4.2 Findings Contextual Inquiry

The contextual inquiry of observing moderators perform usability tests resulted in some findings. The study focused on how the moderators experienced conducting usability tests using different tools and how the different tools supported the process and the moderator's skills.

The Gracious Host

Communication

The three tools had a webcam and mic for the moderator and test participants to speak and hear each other. One tool did not have a webcam for the moderator. Another one had a chat for the moderator and the participant, but the chat was not used during the testing.

Most communication except for video conferencing was done by using external communication tools. External tools, such as email, Slack and phone, were used for inviting test participants, starting the test and troubleshoot.

One tool offered a function for handing over material to the test participant. It was a function that could "demand" the test participant to enter a link with the website that was being tested and also demand them to share screen etc. Otherwise, the moderator handed the material to the test participant by using external tools or in the pre-steps of the test session.

The lack of communication features did, in some cases, prevent the moderator from communicating efficiently and not supporting the moderator to be a *good communicator* as not enable face-to-face communication through the web camera and by not offering functions for handing over materials.

Webcam

The webcam for face-to-face communication between moderator and test participant was essential and significantly impacted the greeting session. This was a critical part of the tool that did not show the moderators face or show a screen. In most of the test sessions, the test participants were unsure if the webcam and mic worked adequately, and they asked the moderator if they could see and hear them.

Having the moderator and the test participant visible through a webcam enhanced the experienced presence and supported *good communication and empathy*.

Greeting

Some of the test participants mentioned that it felt “unfair” not to see the moderator through the web camera and that she would at least want an image and name with some info about the moderator that she could not see. Although the moderator did not need to be visible during the test session to produce results, it was significantly valuable at the beginning and ending to greet and make the participant feel comfortable. The web camera highly supported the moderator to be a *good communicator* and to enhance the *empathy* between the moderator and the participant.

The Leader

Control

Starting the test session with face-to-face communication where the moderator and the test participant could see each other let the moderator take control and created an *aura of authority* in contrary to the tool starting with displaying a screen according to the moderators. One of the tools started the test session automatically recording, which made the moderator a bit out of *control*.

Material and script

None of the tools supported the moderator in following the task plan, using a script or handling the material. The moderators in the study had their script printed on paper on the table in front of them, making them look down to read. The moderators prefer the printed version as they did not want to tab within the tool or computer during the testing. The lack of support for material and script made it hard for the moderator to be a *good communicator* and to *organize* their material as some were outside the tool.

Some tools enabled handling consents and forms before the actual session, meaning the moderator did not have to handle this in the test session. It supported the moderator being a *good organizer and coordinator*. However, there was no support for moderators materials as scripts, tasks and URLs during testing.

Troubleshooter

Some of the tools allowed the participant to make changes, like clicking away from the moderator’s webcam, so neither of them could see the moderator. The moderator could not control this, and it had to be *troubleshooted* by the moderator guiding the test participant to show the webcam.

When creating the test, the moderator chooses “requirements”, like a web camera, for the test participant to participate and start the test. This created trouble as some test participants did not have a good webcam and could not start the test session.

In some of the sessions, the test participant navigated to different parts of the website and got lost. The moderator could not see where the participants were and how to proceed. Simply the test participant had to use the URL to start over. There was no support for the moderator to *troubleshoot* or take *control* over the prototype to help get the test participant right.

Simple interface

When the test participant had too many choices in the interface, it ended up with problems like clicking away from the webcams. In another tool, the test participant had to pull in the moderator's webcam to be seen, which was an unnecessary step in the test session. The moderator seemed more in *control* and *organized* when there were fewer unnecessary functions and steps to go through and when the test participant's actions could be more controlled. This was especially noticed in the tool where you could "request" the test participant to share a screen or send a link to enter.

Tech setup

Some of the tools had tech setup before starting the session, meaning that the test participant and the moderator go through a few steps to make sure the technology works. It helped troubleshoot some problems and ensured the technology worked as it should, but there was some uncertainty overall about whether the other could hear or see each other and who could see what on the screens. Almost every test session contained uncertainty about whether the technology worked as it should or how it worked. However, some of the tech trouble was handled by the tool supporting the moderator to *troubleshoot*.

The Observer

Teamwork

All tools allowed for having "hidden observers", meaning that team members could watch the test session without the test participant knowing or seeing them. The moderator had a chat with the observers enabling them to communicate and support the moderator with input and questions during the test session.

Notes

There were note functions in all the tools, but none of the moderators used them during the testing. But the observers, team members, used them. One moderator also mentioned that except for focusing on the testing, the keystroke was too loud when taking notes. It would make them tab between functions within the tool during the testing. The moderators skipped taking notes during the testing to be *Good Listeners* as they wanted to focus on the test participant.

Recording

All test sessions were recorded and it was supported by all tools. The moderators relied on the recordings to be able to focus on the test participant and therefore also skipped taking notes. The moderator wanted to start the recording on their own as they wanted to make sure the participants gave their consent, even if they had agreed to the consents before the testing. One tool recorded the test automatically meaning they had no choice to ask for consent or choose what to record, as the greeting session was not recorded when the recording was manually handled. This feature supported the moderator to be a *good listener*.

Web cam

The webcam made it possible for the moderators to see themselves. It was unsure if the moderators used the camera to watch themselves during the session. But in some cases, it seemed like the moderator had more attention to their body language when

they could see themselves. This function also meant face-to-face communication with the test participant. There was a slight improvement in not “reading directly” from the script, making the approach more natural when the moderator could not be seen. This feature supported the moderator being *neutral*.

4.4.3 Design Sprint

The design sprint resulted in an empathy map, see figure 4.3, for moderating usability tests. It is used to clarify and enhance the moderator’s experience by visualizing it on the map.

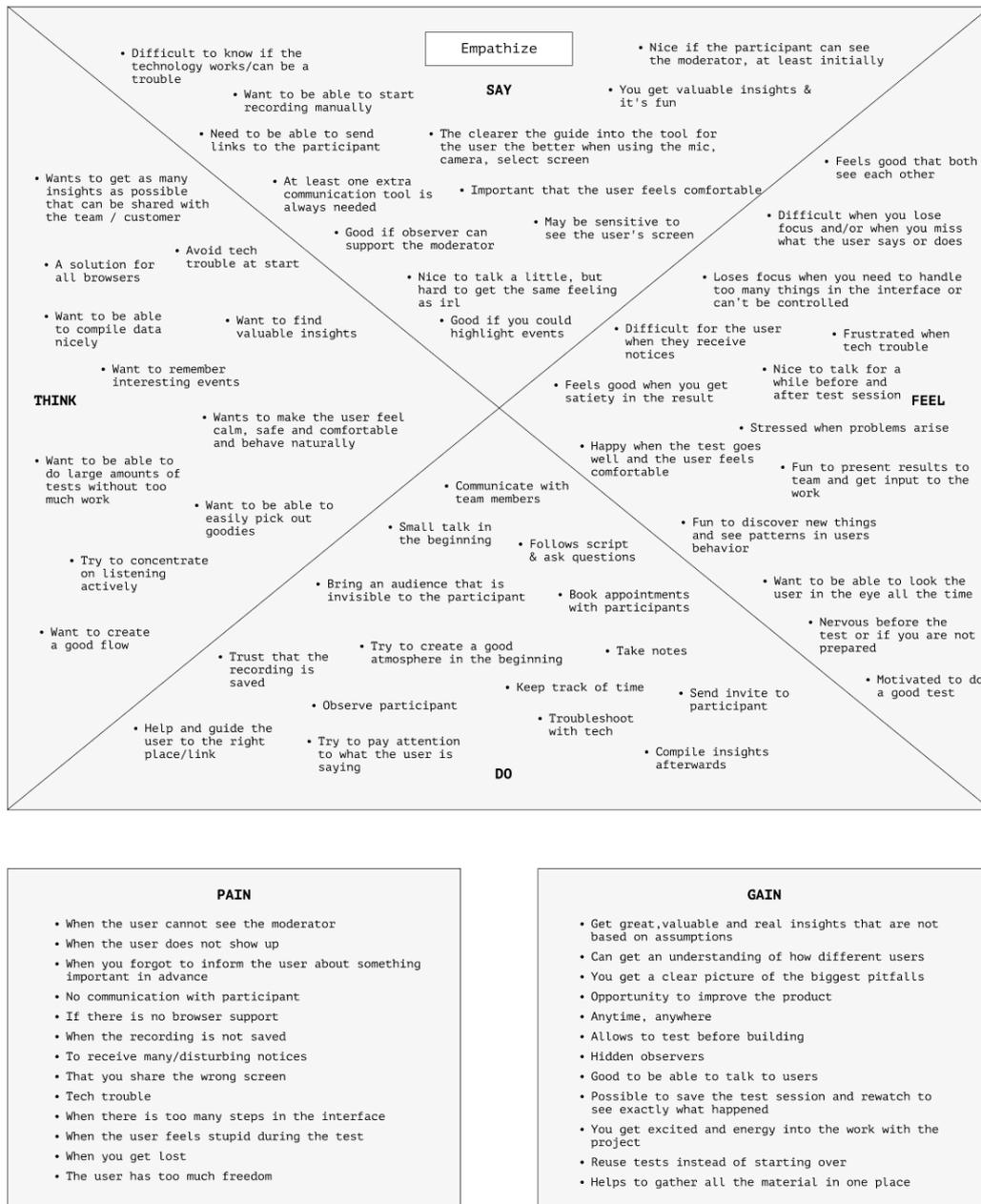


Figure 4.3: Empathy map from day one of the design sprint.

4.4.4 Difficulties and Opportunities

From the contextual, the moderator's user journey, findings and the experiences from the design sprint and the empathy map resulted in difficulties and opportunities for conducting a remote usability test with a digital tool.

Difficulties

- Control the participant's environment
- Comfort the participant
- Make a natural/comfortable greeting
- Tech troubleshooting
- Document/note-taking
- Help participant with the tool or in the product
- Control participant's device
- Integrity on the device, surroundings from webcam
- Body language, no natural relation
- Human interactions such as keeping natural eye contact and body language

Opportunities

- Save entire session
- Hide moderators notes, behaviour or actions on computer etc.
- Better visibility of participants screen and body language/reactions/expressions
- Session is quick and easy
- Greater possibilities to participate unseen
- Allows teamwork with minimal biasing (physical)
- Document afterwards
- Tool supports the process to proceed
- Rewatch
- Use own device
- Easier to share the link rather than interrupt the session and send a link via any communication tool
- Waiting room
- Hand over introduction and tasks to the tool
- Save session material to show team members and clients

4.5 Design Principles

The results of the contextual inquiry, the study of moderated RUT and the moderator's role and skills resulted in some design principles for a RUT tool. The suggested principles aim to guide how to design a digital tool for moderated remote usability testing. It focuses on some principles that seemed undoubtedly crucial for a usable tool for the purpose.

The moderator is in control of test session and environment

The moderator is in optimal control over the test session with functions, actions, prototype and tech setup to prevent errors and guide the participant smoothly and efficiently.

Easily accessible communication between all participants

The tool provides simple communication for the moderator and test participants. As well as communication for the moderator and team members. The moderator should be able to hand over material such as links to the product or prototype to the test participant during the test session.

Participants are visible and identified

All participants of the test session should be visible and identified for the moderator. The moderator should be able to see who participates and when as well as who does what.

System status is prioritized to keep all participants up to date

The system status is always well displayed for the moderator and participant at all times. It should be clear what is going on, how to proceed and what happened through appropriate feedback and options to succeed.

Documentation of test session that helps the moderator to focus on test session

The tool should provide options for documentation. The moderator can focus on participants without compromising between focusing and document test data. It utilizes the benefits of digital tools to offer appropriate documentation options.

Team work is supported without affecting the test environment

The tool supports teamwork that could help improve the testing and support the moderator without affecting the participant's performance and not the moderators.

The moderator is supported to follow the task plan and proceed in the process

The digital tool should support the moderator to follow the test plan as tasks and the script to perform the test. To help focus on reaching the test goals.

Integrity is highly prioritized to create a user safe environment

The tool should consider the integrity of the participants and possible risks and threats to create a safe environment for the test session. Integrity and safety are considered within the device, the tool and the physical environment.

The interface focus on creating a comfortable environment for the par-

participant

The participant's environment is comfortable and secure, with clear instructions that keep the participant up to date on what is going on and how to proceed.

Error prevention and troubleshooting through simplicity

Simplicity is prioritized in the digital tool to prevent errors and troubleshooting. The digital tool should aim to prevent common errors and provide tech support and help through test sessions to overcome common difficulties with remote work and keep minimal remote human help support.

4.6 Functional, Usability and User requirements

Some requirements can be made from the contextual inquiry, the test session, observations, evaluations, and interviews. The requirements mainly focus on the moderator's view, and therefore requirements for the participant's view is omitted.

4.6.1 Usability Requirements

- Pleasant, satisfying and appropriate for the purpose
- Quick and easy to perform a test session with few errors
- Intuitive and easy to learn
- Make the moderator feel in control
- Support for troubleshooting tech problems
- Low cognitive and work-load
- Simple interface
- Include all the tools needed to complete the test session
- Enhance moderators skills
- Support moderators task and process
- Create good flow in the test session

4.6.2 User Requirements

- Video conferencing with the participants
- Observe participant during task
- Share material like prototypes or products and links
- Record test session
- Document findings

- Gather all material to reduce cognitive load
- Support for focus
- Ease troubleshooting
- Communicate with team members that observe test session
- Save session recordings and documentation

4.6.3 Functional Requirements

- Browser supported
- Chat with team members
- Communication tools for handing over materials to participants
- Webcam for both moderator and participant
- Mic for both moderator and participant
- Recording for screen, webcam and audio
- Notes and documentation
- Highlights
- Screen share
- Optional view for moderator
- Start/stop recording, mic, audio, webcam buttons
- Participants are visible
- Demands for moderator
- Notices for messages
- Support for task script
- Hidden observers
- Support for the moderator's test process, keep track of time, tasks and achieve the research and test goal
- Safe environment (integrity, error prevention)
- Error prevention

4.7 Prototype

The prototype was created to visualise how the design principles and results from the study could be manifested into a RUT tool and functionalities that should be included. The prototype consists of 6 pages that represent the flow for moderated RUT. The main focus of the prototype is frames 5 and 6, as they represent the actual test session.

Frame 1 - Project Dashboard

The tool has a project dashboard for an overview of the projects, that is, usability tests. It is possible to create, edit and delete projects. It offers coordination and organization for the work and material for the tests gathered in one place.



Figure 4.4: Frame 1 - "Project Dashboard".

Frame 2 - Create Test

New tests are created from the dashboard. Test and tool settings are set, and the test session can be prepared with materials such as invites, date and time, participant links, prototypes, consents and enable team members to join.



Figure 4.5: Frame 2 - "Create Test".

Frame 3 - Tech Setup

There is a tech set up before entering the test session. These steps are to ensure the technique and settings works. And to ease these kinds of problems and troubleshooting during the test session and to create high-quality results. This step should preferably be used for the participants as well. It tests internet connection, audio, mic, webcam, and screen share, including consent forms and questionnaires.

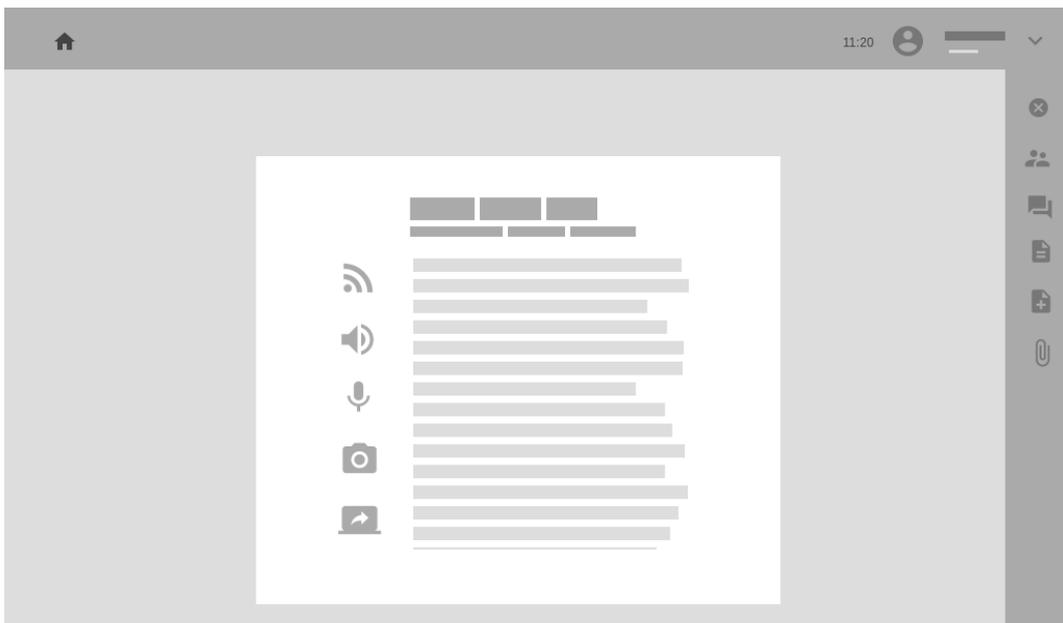


Figure 4.6: Frame 3 - "Tech setup".

Frame 4 - Greeting

When entering the test session for the first meeting between the participant and the moderator, they have face-to-face communication. They see each other from the beginning and are supposed to have a "digital coffee" in a "greeting room" before entering the "test lab". The moderator has a dashboard and material to use as the script to proceed accordingly to the task plan.

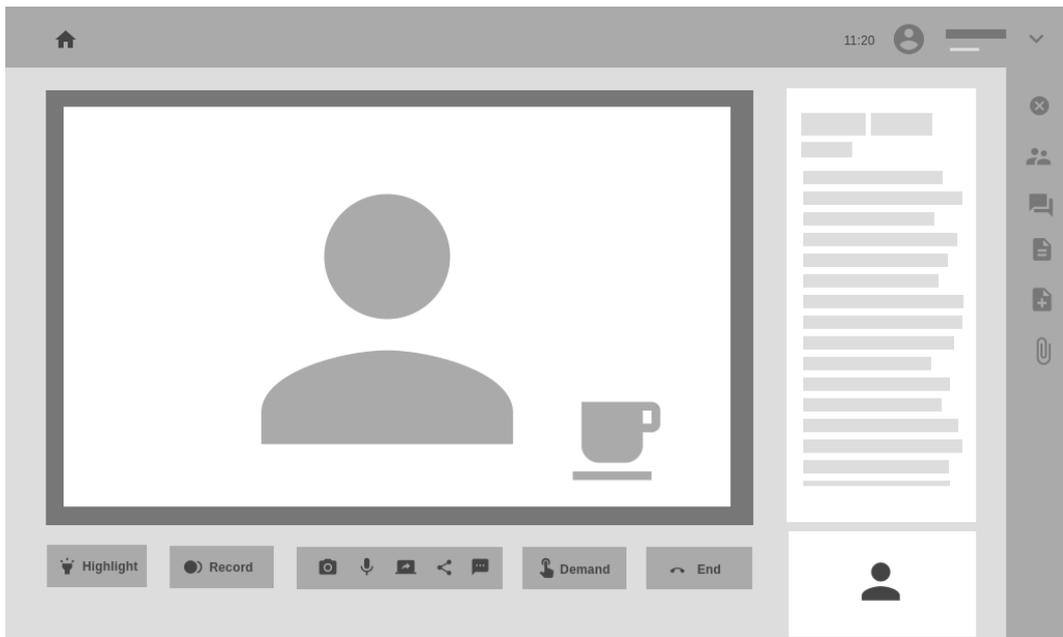


Figure 4.7: Frame 4 - "Greeting".

Frame 5 - Test Session

The test session is held in the "test lab", where the moderator and the participant see and hear each other. The test session can begin, and both the moderator and the participant can share the screen. The participants receive a prototype that may be an URL. A "safe browser" in the tool simulates the regular browser for the participants to proceed with the testing. This is the only screen share to create a safe and secure integrity place for the participant. Therefore, there will be no web browser history, notices on the computer will be blocked out, and the moderator can take control over the "web browser" to help if necessary.



Figure 4.8: Frame 5 - "Test Lab".

The functions numbered in the image are the following:

- | | |
|---|--------------------------------------|
| 1. Participants webcam | 11. Shared material |
| 2. Participants screen | 12. Highlight - quick notes/findings |
| 3. Safe browser | 13. Record screen, webcam and audio |
| 4. Moderators webcam | 14. Webcam settings |
| 5. Material (scripts, prototypes, links, tasks) | 15. Mic settings |
| 6. Complete session | 16. Share screen |
| 7. Participants, observers and team members | 17. Share material |
| 8. Chat with hidden observers/team members | 18. Chat with participant |
| 9. Notes | 19. Demand for request participants |
| 10. Material (chat, notes,scripts, task) | 20. End session with participant |
| | 21. Account settings |

Frame 6 - Evaluation

After the test session, it can be reviewed and rewatch if it was recorded. It is possible to take notes and watch the screen recording and the webcam recording.



Figure 4.9: Frame 6 - "Evaluation".

5 Discussion

This thesis is a study of moderated RUT focusing on how RUT tools support the moderator's role and skills. The study included different methods to gain knowledge about RUT, tools for RUT, the moderator's role and skills. A broad knowledge was acquired from using qualitative study methods. From different findings, conclusions can be drawn.

The method used for the study was inspired by a UCD that helped to focus on the moderator. Although the main focus of the study was the moderated RUT, the study could have benefited from using a case study method. This is as the study focused more on performing a RUT and the moderator and not on producing a product or service as the UCD method preferably results in.

The main question of this thesis was: *How should a remote usability testing tool be designed to enhance and support the moderator's role and skills when conducting remote moderated usability testing?* with four research questions that are presented and answered below.

Based on the literature, what practices and steps are recommended to include in a moderated remote usability testing?

The literature study investigated the field of remote usability testing to gather knowledge of how to perform a RUT. It also investigated the moderator's role and skills in the process [3, 4, 5, 15]

The literature study resulted in a RUT guide that aims to define and guide a moderator through the process of RUT. The guide is based on the literature study of traditional in-person testing [2, 4, 5, 15, 31, 32], as Thompson et al. suggested the process of traditional UT could be adapted to RUT [28] as there is no defined RUT process. The traditional usability testing that is moderated to gather formative data with an explorative approach like RUT [15, 26, 27] with the same approach in this study showed to have the same approach with the differences of the moderator and the participant at different locations. A software tool must be used to observe and analyze the participant's interactions with the product or service, and a software tool must also be used to mediate communication between the moderator and the participant [29]. Therefore the adaptations to the process of usability testing process were done according to the definition of RUT and adapting to the "traditional RUT setup"[26, 30].

By using the definition of RUT and the traditional RUT setup, the RUT guide benefited from following the process of traditional usability testing [2, 4, 15], with

changes to the steps and parts within to and by literature's recommendations of RUT [4, 5, 15]. The guide was used in the RUT in the Contextual Inquiry mainly to help through the process as the different tools had different functions meaning the steps in the guide was managed differently depending on what tools to be used.

The RUT guide was generally used, and it was not revised. However, it would have benefited from being revised and improved to suit the specific tools and processes better. As the RUT process is highly affected by the RUT tool used, only a general guide for the process inspired by the traditional process could be made, and a more specific guide could have been made to a specific tool according to its functions and conditions.

What problems and challenges do a moderator face during moderated remote usability testing?

The results showed that the most significant challenges and problems that occurred during the testing had to do with the limitations of the tools. It became clear what functionalities the moderators requested, and in the testing, none of the tools had all requested functions, but all tools had some of each. The tools had the Thompson et al. "traditional remote setup" [30], and the suggested functionalities suggested by Fidas et al. [29]. It supported the moderator through the process as suggested by [26]. The moderator expected these essential functions in a RUT tool of the traditional setups, and the minimum, as well as the featured functionalities [29]. Although all functions were not used as expected or fully utilized, which created problems and challenges. The traditional setup, minimum and features should with modern tech be included in a "minimum" for RUT setup. These functions should have been used as a standard, and there could be an improvement to how the functions were used in the tools to improve the usability [2, 5, 13, 15] and the user experience [12, 14] moderator in the RUT process.

The study showed that the significant challenges and problems with RUTs at the moment are the available tools. The major obstacles of conducting the RUT's are the tech and not the moderator's skills [3, 4, 5, 15]. However, some of these are quite supported by the RUT tools. But it was hard to control the participants' environment and tech setup to be a leader and control the environment [4]. The first meeting and human interaction between the moderator and the participant were in some cases affected by tech troubles making and impacting the ability to be a Gracious Host [4]. The moderator was then supposed to make a comfortable environment in a digital environment that was not pleasurable or useful. Besides that, the moderators were also supposed to act naturally as control body language and tone of voice and handle the human interactions that play a significant role in the quality of the test results [4, 5, 15]. This made the moderator focus on tech, participants, own behaviour. In other words, the maybe most important factor, the moderator herself, came last in priority.

There are advantages to do RUT with tools to make it easier for the moderator, and there seems to be great potential for "better than life". When the challenges are overcome, the challenges and problems of performing a RUT with a focus on the

moderator's skills and supportive functions beyond the standard setup [29, 30] can be studied further to support the moderator's tasks and skills [26].

What kind of practical experiences and recommendations for a moderated remote usability testing tool can be gained from the study?

The study resulted in some suggested design principles of how to design a RUT tool. These were some of the necessities to perform a RUT according to the process of RUT. The most important with the RUT tools were to support the process [26] and offer essential functions for proceeding with the process [29, 30]. The suggestions aim to create some standard principles based on the study of the literature [3, 4, 5, 15], the contextual inquiry along with the analysis. The design principles aim to support the moderator's process [5] of conducting a RUT with a RUT tool [26] by design and offer functions that manage some of the moderator's tasks and thereby supports some of the skills of a moderator [3, 4, 5].

There are many opportunities to use a digital tool for the process as they offer many functions and gather the testing and the tool in one place. Also, it offers some features that can't be represented "live". Having hidden observers proved to be very useful, as the participants are not biased with them, and the moderator gets some help efficiently. A question that arose through testing is whether this is ethical and a question of integrity. As the participants are not told, there are observers, and the interface does not indicate this in any way. But at the same time, you want to create as unbiased results as possible.

What kind of functionalities in a digital tool is requested by the moderator through practical testing?

The results showed that some functions were necessary to have in a RUT tool. These functions were such that supported the moderator proceeding with the moderator's tasks as suggested by [26] and the functions of a traditional setup [30] and Fidas et al. suggested functions [29]. Tools that did not offer any extra feature than a regular video conferencing tool were to no help, and maybe these should not be referred to as RUT tools.

As the tools somewhat offered functions and features to support the moderator's process, there were fewer functions and features that support the moderator's skills [3, 4, 5]. The tools would need more features and functionalities beyond the task-related functions and suggestions by Thompson et al. and Fidas et al. [28, 29].

There would also be good to make the function more efficient, as, with the documentation functions, the moderators in the study did not take any notes during the testing and relied on the recording. This meant that they had to rewatch the session and possibly forget some critical findings that were not noted. Watching the recording means quite heavy work afterwards, and this could be improved to make a significantly more efficient evaluation and review of the test sessions.

The teamwork possibilities were not described in the RUT guide or as a part of moderating the usability tests. The results from the test session show that there is a great advantage to include team members to participate in the test session as hidden observers, which should be included and promoted in the RUT guide.

How should a remote usability testing tool be designed to enhance and support moderators skills when conducting remote moderated usability testing?

The study resulted in suggested design principles of how to design a RUT tool. They are quite general and should be seen as a basis. It also resulted in some requirements and a prototype to visualize these principles and requirements.

These results are quite basic and cover some of the basic but essential challenges of conducting remote usability testing. The study showed that there are no standards for the digital tools to use with modern techniques further than the suggested by Thompson et al. [28] and Fidas et al. [29]. Before proceeding to create a digital tool that can support and enhance moderators skills [3, 4, 5] some fundamental flaws must be covered. Functions and features that support the moderator's tasks as handing script, time, material, recording, teamwork etc.[26, 28] and take some burden off the moderator's tasks and role should first be offered in the tool.

When the basic features and functions suggested by Fidas et al. [29] and Thompson et al. [28], with the required functions and design principles from this study are offered, there could be great potential for RUT tools to support moderators skills of conducting a RUT but preferably enhance these skills [3, 4, 5]. Such a tool could enhance the moderator in being a Great Host by managing functions and features for communication, empathy, ambiguity, and comfort. As well as enhance the moderator to be a Leader by offer functions that support and features that enhance authority, organization and coordination and handle troubleshooting. And support and enhance the moderator to be a good observer by affording functionalities and features for supporting the moderator being neutral, knowing when and how to intervene, being a good listener, and being a "big picture" thinker.

Limitations

The study covered several areas where there were many subjects to explore. Some restrictions were made to limit the study to its scope. These may have an impact on the study and can be studied further.

RUT guide

The study resulted in a RUT guide based on traditional in-person moderated usability testing, as suggested with some adaptations to the remote approach. The guides have not been evaluated and revised, which could have been beneficial to improve

the process of RUT in this study. Even though the moderated RUT process is quite the same as traditional in-person usability testing, it may have been improved to suit the process even better with evaluation and revision.

Moderators

A main part of the study was the contextual inquiry to observe and evaluate the moderator's support and skills in the RUT process when conducting a RUT with different RUT tools that also were evaluated. Only two moderators were participating in the study, which could have impacted the result. The moderators have different experiences and backgrounds, which can have impacted the result by not involving a more extensive and more diverse group of moderators with different experiences and preferences. The moderators had further education, work experience and different personal skills. The moderators are most likely to possess different skills, as there were quite many to have as a "good moderator", and they might have needed support from the RUT tool for different skills. It would be interesting to investigate and evaluate each moderator's skills that participated in such testing before analyzing and observing them in the RUT. It could not be known whether the tool was supportive or a high skill of the independent moderator. Also, the skills of the moderator used in this study could have been evaluated to gather knowledge of which of these skills may be harder to maintain during a RUT or skills inflicting and how they shift during the process. Therefore this study fused the "three roles of a moderator" that are more general and includes these different skills, which also explains the role of the moderator in the process.

Contextual Inquiry

The contextual inquiry also consisted of several tests, including three tools and one product tested according to the RUT guide. It would be beneficial to conduct and observe more test sessions with different types of products to gather even more data and gain more knowledge. Although the results from this study were quite clear and the findings were significant problems supported by the literature and studies, as well as the functions needed, the process, skills and suggestions.

RUT tools

The tools used in the testing were chosen due to the definition of a RUT tool and the tools available on the market. They represent different functionalities and different levels of advance and pricing. However, these tools only cover a part of the range of digital tools used to conduct a RUT. There may be different digital tools that could have been evaluated and used in the testing, which could be potential tools to be used in RUT to generate other findings. The tools for this study can be seen as some of the standard tools and represent some of the most common tools for conducting typical RUT even though the study resulted in some design principles that could be

applied to a range of tools used for remote testing and most likely the problems and challenges of RUT remain.

6 Conclusion

This thesis aimed to explore how a remote usability testing tool could be designed to support and enhance the moderator's role and skills when conducting moderated remote usability tests. The study involved investigating how to perform moderated RUT, moderators roles and skills, challenges and problems of conducting a moderated RUT, and the essential functionalities for moderators performance during a moderated RUT. The goal has been to gain knowledge of how a RUT tool should be designed to enhance and support the moderator's role and skills during RUT's to generate good RUT results.

The research method inspired by UCD was used to understand the moderator's role and experience in the context of moderated RUT. Investigating how to perform a RUT and the role and skills of a moderator were done to understand the moderator. Contextual inquiries of RUT with different RUT tools were done and evaluated to study the case of conducting a moderated RUT. The findings were concluded in a set of design principles as suggestions for designing a RUT tool that was visualized in a prototype.

The conclusion that can be made from the results of the study is that certain functions are necessary to support the moderator's task when performing a moderated RUT. To support and enhance the moderator's role and skills, there are many opportunities with the tools to support the moderators. First of all, the tools should support the moderator's process by managing some technical burdens. When the problem and challenges with the technique are overcome, there will be many potential opportunities with tech that could be used to enhance moderators skills further in RUT tools. Future research may focus on supporting and enhancing the moderator's skills with intelligent software and explore the possibilities of creating RUT tools not as tools but as extensions of moderators.

7 Acknowledgements

Throughout the writing of this master thesis, I have received a great deal of support and assistance.

I want to thank my external supervisor Michaela Arnklint at Mina Bästa Polare, for the support and invaluable insight and expertise throughout the study. Moreover, for giving me suggestions and valuable pieces of advice.

Also, thanks for the support and participation of Michaela Arnklint and Bella Pelving, also at Mina Bästa Polare. Thank you for letting me study and observe your performance of remote usability testing and willingly try new tools.

A great thanks to Mina Bästa Polare for letting me be a part of your team and allowing me to do this study and experience remote usability testing.

I would also like to thank my supervisor Kristina Kunert for practical suggestions, helpful advice and guidance through the scientific writing of this master thesis.

Especially thanks to my dear family and friends for their infallible support through my studies.

Thank you all.

References

- [1] Remote moderated usability tests: Why to do them. <https://www.nngroup.com/articles/moderated-remote-usability-test-why/>. Accessed: 2021-01-19.
- [2] Jakob Nielsen. Usability 101: Introduction to usability. <https://www.nngroup.com/articles/usability-101-introduction-to-usability/>, 2012. Accessed: 2021-02-19.
- [3] Fiona Tranquada Donna Tedesco. *The Moderator's Survival Guide: Handling Common, Tricky, and Sticky Situations in User Research*. Elsevier Science, Burlington, 2013.
- [4] Beth A. Loring Joseph S. Dumas. *Moderating usability tests: principles and practice for interacting*. Morgan Kaufmann/Elsevier, Amsterdam, 2008.
- [5] Carol M. Barnum. *Usability Testing Essentials Ready, Set... Test!* Morgan Kaufmann, Unknown, 2020.
- [6] Lori M Wozney, Pamela Baxter, Hilary Fast, Laura Cleghorn, Amos S Hundert, and Amanda S Newton. Sociotechnical human factors involved in remote online usability testing of two ehealth interventions. *JMIR Human Factors*, 3(1), 2016.
- [7] Stuart Reeves. How ux practitioners produce findings in usability testing. *ACM Transactions on Computer-Human Interaction*, 26(3), 2019.
- [8] Isabel Evans, Chris Porter, Mark Micalef, Julian Harty. Stuck in limbo with magical solutions: The testers' lived experiences of tools and automation, 2019. Accessed: 2021-03-16.
- [9] Lico Takahasi, Karsen Nebe. Observed differences between lab and online tests using the attrakdiff semantic differential scale, 2019. Accessed: 2021-03-16.
- [10] Dorina Rajanen Netta Iivari Kerem Rizvanoglu Ashok Sivaji. Yavuz Inal, Torkil Clemmensen. Positive developments but challenges still ahead: A survey study on ux professionals' work practices. *Journal of Usability Studies*, 15(4):210–246, 2020.
- [11] Mina bästa polare. <https://www.minabastapolare.se/>.
- [12] Kevin Nichols Donald Chesnut. *UX for dummies*. John Wiley & Sons, West Sussex, England, 2014.

- [13] ISO 9241-210:2019.
<https://www.iso.org/obp/ui/#iso:std:iso:9241:-210:ed-2:v1:en,0000>. Accessed: 2021-02-15.
- [14] Don Norman, Jakob Nielsen. The definition of user experience (ux).
<https://www.nngroup.com/articles/definition-user-experience/>, 0000. Accessed: 2021-02-15.
- [15] Dana Chisnell Jeffrey Rubin and Jared Spool. *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests*. John Wiley & Sons, Incorporated, Indianapolis, 2008.
- [16] Alita Joyce. How to measure learnability of a user interface.
<https://www.nngroup.com/articles/measure-learnability/>, 2019. Accessed: 2021-02-19.
- [17] Kary Le. User-centered design method. <https://medium.com/redcatstudio/user-centered-design-method-28e3aafc8c8a>, 0000. Accessed: 2021-02-15.
- [18] User-centered design. <https://www.interaction-design.org/literature/topics/user-centered-design>, 0000. Accessed: 2021-02-15.
- [19] Kevin P. Nichols and Donald Chesnut. *UX for Dummies*. John Wiley & Sons, Incorporated, West Sussex, 2014-04-28.
- [20] Elvis Canziba. *Hands-On UX Design for Developers: Design, Prototype, and Implement Compelling User Experiences from Scratch*. Packt Publishing, Limited, 2018-07-31.
- [21] A beginner's guide to user usability testing.
<https://www.hotjar.com/usability-testing/>, 2021. Accessed: 2021-05-27.
- [22] Elizabeth Rosenzweig. *Successful User Experience: Strategies and Roadmaps*. Elsevier Science & Technology, 2015-10-14.
- [23] Amy Schade. Remote usability tests: Moderated and unmoderated.
<https://www.nngroup.com/articles/remote-usability-tests/>, 2013. Accessed: 2021-02-23.
- [24] Sam Enoka. When is exploratory user research relevant? <https://uxdesign.cc/when-is-exploratory-user-research-relevant-267b0810eb27>, 2019. Accessed: 2021-02-23.
- [25] Nikki Anderson. Generative research: Everything you need to know to run a successful study. <https://dscout.com/people-nerds/generative-research-complete-guide>. Accessed: 2021-02-23.
- [26] Stephanie Rosenbaum and Laurie Kantner. Learning about users when you can't go there: Remote attended usability studies. In *2008 IEEE International Professional Communication Conference*, pages 1–6, 2008.

- [27] Richard L. Horst Andrew J. Schall. Demonstration of remote usability testing practices and procedures. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 50(20):2284–2287., 2006.
- [28] Katherine E. Thompson, Evelyn P. Rozanski, and Anne R. Haake. Here, there, anywhere: Remote usability testing that works. CITC5 '04, page 132–137, New York, NY, USA, 2004. Association for Computing Machinery.
- [29] Christos A.Fidas, Christos Katsanos, Eleftherios Papachristos, Nikolas Tselios, Nikolaos M. Avouris. Remote usability evaluation methods and tools: A survey. , 2006. Accessed: 2021-05-17.
- [30] Zoe Glas Chelsea Miller Ryle Scribner Marshall Wang Rochelle Edwards Sophie Amberkar, Anna Delchamps. Best practices: Usability testing across (un)common platforms,. *Proceedings of the Human Factors and Ergonomics Society 2019 Annual Meeting.*, pages 1296–1300, 2019.
- [31] Amy Schade. Write better qualitative usability tasks: Top 10 mistakes to avoid. <https://www.nngroup.com/articles/better-usability-tasks/>, 2017. Accessed: 2021-04-21.
- [32] Raluca Budiu. Priming and user interfaces. <https://www.nngroup.com/articles/priming/>, 2016. Accessed: 2021-04-21.
- [33] Jason Nunes Andy Pratt. *Interactive design: an introduction to the theory and application of user-centered design*. Rockport Publishers, Beverly, 2012.
- [34] Steve Cable Richard Caddick. *Communicating the user experience: a practical guide for creating useful UX documentation*. Wiley, Chichester West Sussex, 2011.
- [35] Hugh Beyer Karen Holtzblatt. *Contextual design: design for life*. Elsevier, Cambridge, 2016.
- [36] Chauncey Wilson. *Interview techniques for UX practitioners: a user-centered design method*. Morgan Kaufmann, Waltham, 2014.
- [37] Brad Kowitz Jake Knapp, John Zeratsky. *Sprint : how to solve big problems and test new ideas in just 5 days*. Simon Schuster, New York, 2014.