

Foundation Level Syllabus

Usability Tester

Version 2017

German Testing Board



Software. Testing. Excellence.

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Revision History

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0. Introduction to this Syllabus

0.1 Purpose of this Document

This syllabus forms the basis for the Usability Tester at Foundation Level. The GTB® provides this syllabus as follows:

1. To ISTQB National Boards, to translate into their local language and to accredit training providers. National Boards may adapt the syllabus to their particular language needs and modify the references to adapt to their local publications.
2. To Exam Boards, to derive examination questions in their local language adapted to the learning objectives for each syllabus.
3. To training providers, to produce courseware and determine appropriate teaching methods.
4. To certification candidates, to prepare for the exam (as part of a training course or independently).
5. To the international software and systems engineering community, to advance the profession of software and systems testing, and as a basis for books and articles.

The GTB® may allow other entities to use this syllabus for other purposes, provided they seek and obtain prior written permission.

0.2 The Foundation Level Usability Tester

The Foundation Level qualification is aimed at anyone involved in software testing who wishes to broaden their knowledge of usability testing or anyone who wishes to start a specialist career in usability testing. The qualification is also aimed at anyone involved in usability engineering who wishes to understand usability testing.

0.3 Business Outcomes

This section lists the Business Outcomes expected of a candidate who has achieved the Foundation Level Usability Tester certification.

- | | |
|--------|--|
| UTFL-1 | Understand the basic concepts of usability and usability testing. |
| UTFL-2 | Identify and classify the severity of usability risks and potential accessibility violations in a given product at any stage of a development cycle. |
| UTFL-3 | Cite relevant standards for usability, user experience, and accessibility and verify their implementation in a given product. |
| UTFL-4 | Set up procedures so that stated usability, user experience and accessibility goals may be verified in practice for a given product. |
| UTFL-5 | Design and monitor the implementation of a test plan for achieving stated usability, user experience and accessibility goals. |
| UTFL-6 | Explain the rationale, process and results of usability, user experience and accessibility evaluations to non-specialist stakeholders. |

0.4 Examinable Learning Objectives

The Learning Objectives support the Business Outcomes and are used to create the examination for achieving the Foundation Level Usability Tester Certification. Learning objectives are allocated to a cognitive level of knowledge (K-Level).

A K-level, or Cognitive level, is used to classify learning objectives according to the revised taxonomy from Bloom [Anderson 2001]. GTB® and ISTQB® use this taxonomy to design its syllabi examinations.

This syllabus considers four different K-levels (K1 to K4):

K-Level	Keyword	Description
1	Remember	The candidate should remember or recognize a term or a concept.
2	Understand	candidate should select an explanation for a statement related to the question topic.
3	Apply	The candidate should select the correct application of a concept or technique and apply it to a given context.
4	Analyze	The candidate can separate information related to a procedure or technique into its constituent parts for better understanding and can distinguish between facts and inferences.

In general, all parts of this syllabus are examinable at a K1 level. That is, the candidate will recognize, remember and recall a term or concept. The learning objectives at K2, K3 and K4 levels are shown at the beginning of the pertinent chapter.

0.5 Recommended training times

A minimum training time has been defined for each learning objective in this syllabus. The total time for each chapter is indicated in the chapter heading.

0.6 Handling of Standards

Standards (IEEE, ISO, etc.) are referenced in this syllabus. The purpose of these references is to provide a source of additional information if desired by the reader. Please note that only the items from these standards that are referenced specifically in the syllabi are eligible for examination. The standards documents themselves are not intended for examination and are included only for reference.

Please refer to section 9.1 for a list of referenced standards.

0.7 Sources of Information

Terms used in the syllabus are defined in ISTQB's Glossary of Terms used in Software Testing [ISTQB_GLOSSARY]. A version of the Glossary is available from ISTQB.

Section 9.3 contains a list of recommended books and articles on usability evaluation.

1. Basic Concepts – 200 mins.

Keywords

accessibility, context of use, effectiveness, efficiency, formative evaluation, human-centered design, summative evaluation, usability, usability evaluation, usability requirement, user experience, user interface

Learning Objectives

1.1 Fundamentals

- UTFL-1.1.1 (K2) Understand the concepts of usability, user experience and accessibility (45 mins)
- UTFL-1.1.2 (K2) Understand the objectives of usability, user experience and accessibility evaluation (30 mins)

1.2 Evaluating Usability, User Experience and Accessibility

- UTFL-1.2.1 (K2) Compare usability, user experience and accessibility evaluation (25 mins)
- UTFL-1.2.2 (K2) Understand the three approaches to usability, user experience and accessibility evaluation: Usability review, usability testing and quantitative user surveys for satisfaction measurement (40 mins)
- UTFL-1.2.3 (K2) Understand the differences between formative (qualitative) and summative (quantitative) usability evaluation (15 mins)

1.3 Usability Evaluation in Human-Centered Design

- UTFL-1.3.1 (K2) Understand the key elements of human-centered evaluation (15 mins)
- UTFL-1.3.2 (K2) Understand the human-centered design process (15 mins)
- UTFL-1.3.3 (K2) Understand the usability evaluation approaches that work well in agile software development lifecycles (15 mins)

1.1 Fundamentals

This section considers the following fundamental concepts:

- Usability
- User experience
- Accessibility

1.1.1 Usability

Usability is the extent to which a software product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use [ISO 9241-210]. Usability testers should be aware that other definitions may be used in organizations (see [ISTQB_GLOSSARY]).

The user interface consists of all components of a software product that provide information and controls for the user to accomplish specific tasks with the system.

Usability evaluation includes the following principal activities:

- Usability reviews (see Chapter 4)
- Usability testing (see Chapter 5)
- User surveys (see Chapter 6)

A usability problem is a software defect which results in difficulty in performing tasks via the user interface. This affects the user's ability to achieve their goals effectively, or efficiently, or with satisfaction. Usability problems can lead to confusion, error, delay or outright failure to complete some task on the part of the user. In safety-critical systems such as medical systems, usability problems can also lead to injuries or death.

A software product can work exactly to specification and still have serious usability problems, as shown by the following examples:

- A car rental mobile app has a dead link. This is a defect which results in a usability problem.
- A car rental mobile app allows users to cancel a reservation, but the users perceive the cancellation procedure as unreasonably complicated. This is a usability problem which affects the efficiency of the mobile app.
- A car rental mobile app conforms to the specification and works both effectively and efficiently, but users think it looks unprofessional. This is a usability problem which affects user satisfaction when using the mobile app.

Usability always relates to the context of use and can be considered in different components. As the following examples show, user expectations of usability are rather different for these components.

Component	Component Name	Description of Component in Context of Use
1	Users	A user is a person who interacts with a software product by providing inputs, or by using the output of the software product.
2	Tasks	Particular activities performed by users or particular groups of users (e.g., inexperienced users, administrators).
3	Equipment	Equipment relates to the hardware, software and materials required to use a software product.
4	Environment	The environment consists of the physical, social and technical conditions in which a user interacts with a software product. The social conditions include the organizational conditions.

The following scenarios describe different contexts of use for the same software product:

- Administrative staff use Microsoft Word® to write documents in a consultancy firm
- An elderly person uses Microsoft Word® for the first time to write an invitation to her birthday

1.1.2 User Experience Concepts

User experience describes a person's perceptions and responses that result from the use and/or anticipated use of a product, system or service. [ISO 9241-210]

User experience includes the following user characteristics that occur before, during and after use:

- emotions
- beliefs
- preferences
- perceptions
- physical and psychological responses
- behaviors and accomplishments

User experience is influenced by:

- brand image (i.e., the users' trust in the manufacturer)
- presentation (i.e., the appearance of the software product, including packaging and documentation)
- functionality
- software product performance
- interactive behavior
- the helpfulness of the software product, including help system, support and training
- learnability
- the user's internal and physical state resulting from prior experiences, attitudes, skills, personality, education and intelligence
- the context of use

Usability criteria such as effectiveness, efficiency and satisfaction can be used to assess aspects of user experience such as brand image and presentation (satisfaction), functionality (effectiveness) and software product performance (efficiency).

1.1.3 Accessibility

Accessibility is the degree to which a product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use (see [ISTQB_GLOSSARY]).

1.2 Evaluating Usability, User Experience and Accessibility

The key objectives of usability evaluation, user experience evaluation and accessibility evaluation are compared in the following table and discussed in more detail in subsequent sections.

Type of evaluation	Target group	Key objective	See section
Usability evaluation	All users	<ul style="list-style-type: none"> • Evaluate the direct interaction between users and the software product. 	1.4.1
User experience evaluation	All users	<ul style="list-style-type: none"> • Evaluate the services received prior to the use of the software product. • Evaluate the direct interaction between users and the software product. • Evaluate the services received after the use of the software product. 	1.4.2
Accessibility evaluation	Users with disabilities	<ul style="list-style-type: none"> • Evaluate the direct interaction between users and the software product, focusing on understanding problems related to accessibility barriers, rather than general efficiency or satisfaction. 	1.4.3

The principal techniques applied in usability evaluation, user experience evaluation and accessibility evaluation are shown in the following table and discussed in more detail in later chapters.

Technique	Users involved?	Key characteristic	Specific techniques	Type	See Chapter
Usability review	Optionally	Experts and users evaluate the user interface of a software product for usability problems; the evaluation is based on their experience.	Informal usability review Expert usability review Heuristic evaluation	Qual	4
Usability testing	Yes	Users are observed while they perform typical tasks with the software product.	Think aloud testing	Qual, Quant	5
User surveys	Yes	Users fill out questionnaires regarding their satisfaction with the software product.	-	Qual, Quant	6

Qual = Qualitative usability evaluation

Quant = Quantitative usability evaluation

1.2.1 Usability Evaluation

A process through which information about the usability of a system is gathered in order to improve the system (known as formative evaluation) or to assess the merit or worth of a system (known as summative evaluation).

There are two types of usability evaluation:

- Formative (or “exploratory”) evaluation is conducted to understand usability issues. Formative evaluation is often conducted early on in the development lifecycle during the design and prototyping stages to get ideas and to guide (or “form”) the design by identifying usability design problems.
- Summative evaluation is conducted late in the development lifecycle shortly before or after implementation to measure the usability of a component or software product. Summative usability testing is quantitative; it focuses on obtaining measurements for the effectiveness, efficiency or satisfaction of a software product. A summative usability evaluation can be used to evaluate a design based on usability requirements so that the design’s acceptability can be established from the users’ point of view.

Both types of evaluation can be conducted iteratively.

This syllabus discusses usability evaluation relating to software products. Usability evaluation can also be applied to other products or services where usability is important, such as with user guides, vending machines, aircraft cockpits, medical systems and train stations.

Usability evaluation addresses the direct interaction between users and the software product. The direct interaction occurs via a screen dialogue or other form of system use. Usability evaluation can be based on a software application, on design documents and on prototypes.

The objectives of usability evaluation are:

- to assess whether usability requirements have been met (see section 1.3.1)
- to uncover usability problems so they can be corrected

- to measure the usability of a software product (see below)

Usability evaluation addresses the following:

- Effectiveness:
 - The extent to which correct and complete goals are achieved
 - Answers the question: “Does the software product do what I want?”
- Efficiency:
 - Resources expended to achieve specified goals
 - Answers the question: “Does the software product solve my tasks quickly?”
- Satisfaction:
 - Freedom from discomfort, and positive attitudes towards the use of the software product
 - Answers the question: “Do I feel comfortable while using the software product?”

If users are involved, a usability evaluation can be carried out by performing usability testing, conducting user surveys and performing usability reviews. If users are not present, usability reviews may still be performed. If software will be used by disabled individuals, include them early in usability reviews (i.e., color blind users).

A qualitative usability evaluation enables identification and analysis of usability problems, focusing on understanding user needs, goals and reasons for the observed user behavior.

A quantitative usability evaluation focuses on obtaining measurements for the effectiveness, efficiency or satisfaction of a software product.

1.2.2 User Experience Evaluation

User experience describes a person's perceptions and responses resulting from the use or anticipated use of a software product.

Usability is part of the user experience. Consequently, usability evaluation is a part of user experience evaluation. The principal techniques used for user experience evaluation are the same as those used for usability evaluation.

User experience evaluation addresses the whole user experience with the software product, not just the direct interaction. User experience includes:

- Advertisements that make users aware of the software product
- Training in the use of the software product
- Touchpoints with the software product other than screen dialogue, such as encounters with support, letters or goods received as a result of interaction with the software product
- Problems that are not handled by the user interface of the software product, such as the notifications of delays, handling of complaints and unsolicited calls

User experience can be evaluated using the principal techniques outlined in the tables of section 1.2. In a user experience test, time gaps can be bridged during a usability test session.

1.2.3 Accessibility Evaluation

Accessibility evaluation is a usability evaluation which focuses on the accessibility of a software product. It addresses the direct interaction between a user with disabilities or limitations and the software product.

The following advice applies specifically to accessibility evaluation:

1. Define the ambition level for accessibility

The Web Content Accessibility Guidelines (WCAG) document (see section 3.2.2) defines three priority levels for accessibility; A, AA and AAA. It is recommended to adopt conformance level AA, which implies satisfying the most basic requirements for web accessibility and the biggest barriers for users with disabilities.

2. Create or adapt guidelines for accessible design

These guidelines should comply with legal requirements. They should also be in accordance with the chosen ambition level for accessibility. Additionally, the usability of the guidelines for developers should be verified.

- Review the guidelines for accuracy
- Establish an accessibility hotline, where accessibility questions from development teams can be answered competently within an agreed time limit

3. Train development teams in order to prevent as many accessibility problems as possible. This includes factors such as:

- Legal requirements for accessibility
- Guidelines for accessible design and how to interpret and apply them
- Tools and techniques to use when evaluating accessibility
- The relationship between usability and accessibility

4. Accessibility testing focuses on the following aspects:

- Use of a think aloud technique (see section 5.1) to understand the test participant's thoughts and vocabulary during accessibility testing
- Focus on understanding mistakes related to accessibility barriers, rather than on efficiency or satisfaction
- Use tasks that concentrate on specific areas of concern for potential accessibility problems, rather than on general software product usage [Web-8]

Accessibility evaluation should consider relevant accessibility standards, which are listed in section 3.2.

1.3 Usability Evaluation in Human-Centered Design

Human-centered design activities and their interdependence, according to [ISO 9241-210], are shown in Figure 1.1. Human-centered design is an approach to design that aims to make software products more usable by focusing on the use of the software products and applying human factors, ergonomics, and usability knowledge and techniques.

The human-centered design process shown in Figure 1.1 can be summarized as follows:

- Analyze: Talk with people and discover "what is the problem?"
- Design: Prototype what you assume is a solution
- Evaluate: Watch people use the prototype and learn from their experiences
- Iterate: Repeat until the usability requirements are achieved

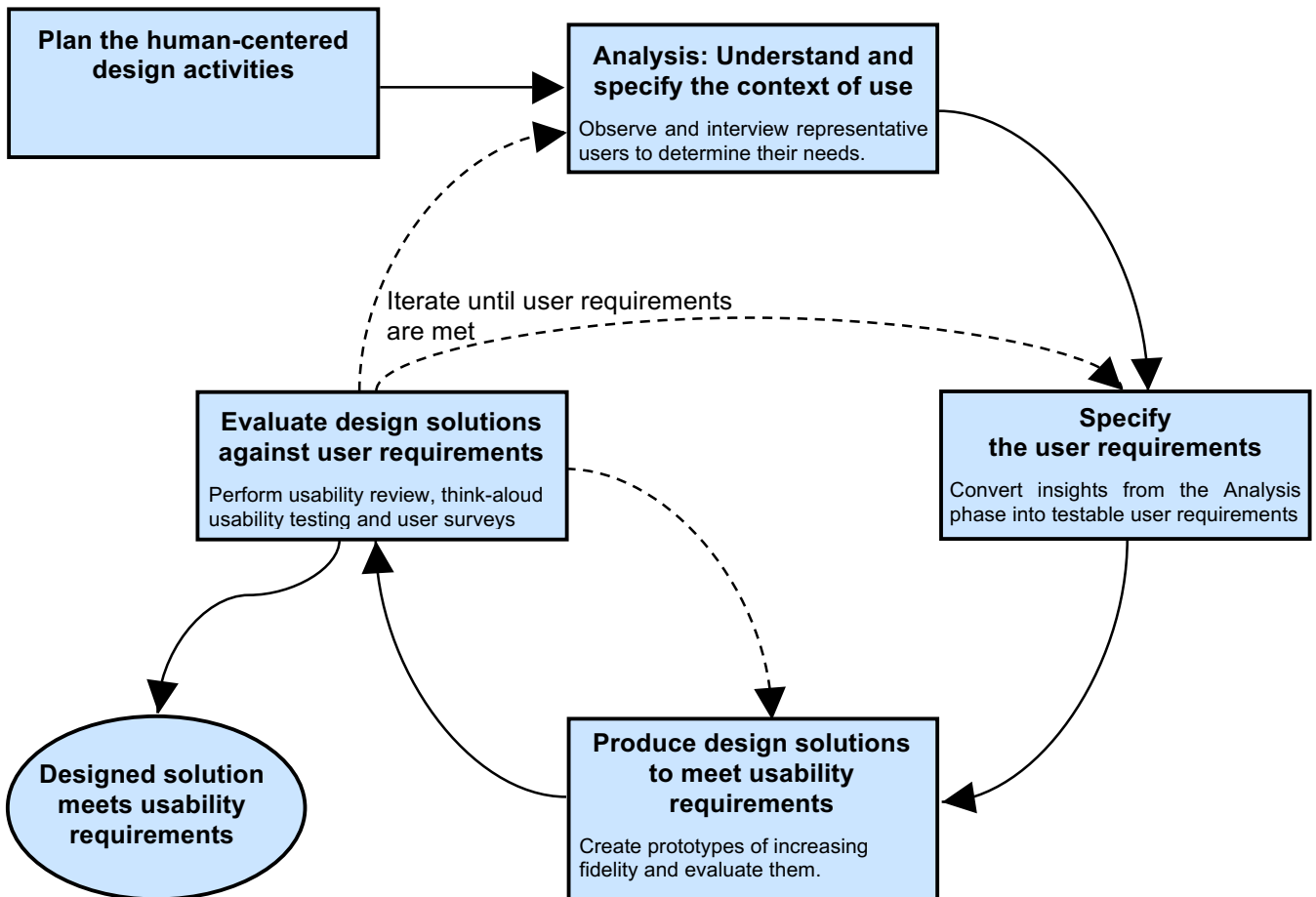


Figure 1.1 – Human-centered design activities and their interdependence [ISO 9241-210]

The human-centered design activities are based on the following three key elements:

1. Users

Observe and interview users in their work environment. Users are involved throughout the design stage by discussing designs and alternatives with them directly (where possible), or with representative users. In agile software development, representative users are typically the product owners, who are an integral part of the development team and enable frequent feedback to be given to designers and developers on usability issues.

2. Evaluation

Perform usability evaluation on the software product. A usability evaluation may take place at any time during human-centered design, from early analysis through software product delivery and beyond. A usability evaluation may be based on a prototype, as mentioned above, or on a completed software product. Usability evaluations that are conducted in the design phase can be cost effective by finding usability problems early.

3. Iterations

Iterate between design and usability evaluation.

Considering the human-centered design process shown in Figure 1,1, the most frequent iterations take place between the activities “Produce design solutions” and “Evaluate design solutions”. This generally involves the successive development of a prototype, which is a representation of all or part of a software product’s user interface. Although prototypes are limited in some way, they can be useful for usability evaluation. Prototypes may take the form of paper sketches or display mock-ups, as well as software products under design. Starting with an initial prototype, the following activities are performed:

- The prototype is evaluated. The person who performs the evaluation conducts usability testing on the prototype.
- The prototype is improved and refined based on the results of the evaluation. The person who performs the evaluation helps the developers evolve the prototype by incorporating user feedback into the design.

These activities are repeated until the usability requirements are achieved. When prototypes are developed in iterations, the steady refinement gives the user a more realistic impression of how the finished product will look and feel. Additionally, the risk of forgetting or ignoring usability issues is reduced.

Both usability and accessibility must be considered during the design phase. Usability testing often takes place during system integration and continues through system testing and into acceptance testing.

1.3.1 Usability Requirements

A usability requirement is a requirement on the usability of a component or system.

It provides the basis for the evaluation of a software product to meet identified user needs. Usability requirements may have a variety of sources:

- They may be stated explicitly, such as in requirements documentation or a user story
- They may be implicit, undocumented user expectations (e.g., a user might implicitly expect that an application provides shortcut keys for particular user actions)
- They may be included in adopted or required standards (see Chapter 3)

Examples of usability requirements (in this case described as user stories) are:

- “As a frequent user of the airline’s booking portal, an overview of my currently booked flights shall be automatically shown after I log on. This shall enable me to get a quick overview of my booked flights and quickly make any updates.”
This usability requirement is about the effectiveness component of usability.
- “As a help-desk assistant, I must be able to enter and log the details of a customer request into the Customer Relations database in no more than two simple steps. This shall enable me to focus on the customer request and provide them with optimum support.”
This usability requirement is about the efficiency component of usability.

1.3.2 Agile Usability Evaluation

Usability evaluations are also suitable in agile software development.

Agile software development is a group of software development methodologies based on iterative incremental development, where requirements and solutions evolve through collaboration between members of a self-organizing team.

In agile software development, teams work in short iterations, each of which has the goal of designing, implementing and testing a group of features. (Please refer to [ISTQB_FL_AGILE] for further details on agile software development).

The following usability evaluation approaches work well with agile software development:

- Rapid Iterative Testing and Evaluation (RITE) is a qualitative usability test method where changes to the user interface are made as soon as a usability problem is identified and a solution is clear. The RITE method focuses on instant redesign to fix problems and then confirming that the solution works with new test participants (real users or representative users). Changes can occur after observing as few as one test participant. Once the data for a test participant has been collected, the usability tester and the stakeholders decide if any changes are needed prior to the next test participant. The modified user interface is then tested with the remaining test participants. [Medlock02]
- Informal and quick usability test sessions are useful where many potential users can be accessed (e.g., a cafe, a conference or a trade show). Such forms of usability test sessions typically last less than fifteen minutes and apply techniques such as think aloud (see section 5.1) and heuristic evaluation (see section 4.5).
- Weekly testing. Test participants are recruited well in advance and scheduled for a particular day of the week (e.g., each Tuesday), so that the software build can be usability tested on that day. Usability tasks are prepared shortly before the scheduled testing day and may include exploratory testing sessions, where the knowledge of the tester and heuristic checklists are used to focus on usability issues.
- Usability reviews (see Chapter 4).

2. Risks in Usability, User Experience and Accessibility – 80 mins.

Keywords

project risk, product risk

Learning Objectives

2.2 Typical Risks

UTFL-2.2.1 (K2) Understand typical usability, user experience, and accessibility risks (20 mins)

UTFL-2.2.2 (K4) Analyze a given project at the design or evaluation stage, and identify the types of usability risks that are likely to occur (60 mins)

2.1 Introduction

A risk is a factor that could result in future events with negative consequences; usually expressed as the impact (that is, harm resulting from the event), and the likelihood of the event happening.

Product risks can impact the overall quality of a software product. Section 2.2 provides examples of typical product risks relating to usability, user experience, and accessibility.

Project risks may impact a project's capability to deliver its usability objectives.

A risk assessment should be performed by identifying those features that most heavily relate to the product risks listed in sections 2.2.1, 2.2.2 and 2.2.3. These risks should be tested using usability testing techniques.

A risk assessment should identify the project risks, such as those listed in section 2.2.4. These risks provide valuable information to help the project to meet its usability objectives.

Risks can be identified through one or more of the following techniques:

- Interviews
- Risk workshops
- Brainstorming
- Calling on past experience

Checklists such as those shown in section 2.2 support these techniques and help to focus on specific aspects of usability and user experience.

During the product risk assessment, the various features that will be supported by the product under development are analyzed for usability risks. The assessment focuses aspects such as numbers of users, type and background of users, usage frequency, risks (damage) when user tasks cannot be completed, criticality of user tasks for the business, and external visibility.

By involving the broadest possible sample of stakeholders, the risk identification process is more likely to identify the most significant usability risks. The participating stakeholders are typically domain experts, end-users, usability experts, user-acceptance testers, usability professionals who are not experts, design team members and customer representatives.

2.2 Typical Risks

2.2.1 Usability Risks

Typical product risks relating to usability:

- Users won't buy or use the software product because it lacks effectiveness, efficiency or satisfaction.
- Users buy the software product, but return it and demand their money back because they can't make it work. The software product works as specified, but users can't figure out how to use it.
- Users buy the software product but repeatedly need to call support because they don't understand how to use it.
- Users buy the software product but find it difficult to use. They report their dissatisfaction to friends and social media, which causes a decrease in consumer trust and brand equity.
- Users resist using a software product which is essential for their daily work because it lacks usability. If users are forced to use it, stress is generated, productivity falls and an oppressive atmosphere builds up.
- Increased liability through risk to human health or risk of financial loss caused by a poorly designed or deceptive user interface.

2.2.2 User Experience Risks

User experience risks can result in a user experience failure in a software product or its support systems.

Typical user experience risks:

- Users are unable to buy a product because the app used to buy the product:
 - Does not perform some of the functions required by the users (lack of effectiveness)
 - Performs intended functions slowly or awkwardly
 - Is unpleasant to use or does not provide satisfactionSuch problems often result in breaking off the purchase, such as shopping cart abandonment or mobile payment drop off.
- The software product is usable, but the associated artifacts and procedures are not.
Examples:
 - Support answers reasonable customer inquiries slowly, rudely, superficially or not at all
 - User documentation is deficient
 - Delays in delivery of products ordered are not communicated
 - The delivered product does not match the users' expectations
 - The product arrives in an unattractive or impractical packaging

2.2.3 Accessibility Risks

An accessibility risk is a potential failure in a software product relating to accessibility.

Typical accessibility risks:

- The software product cannot be used by people with disabilities, thereby violating regulations
- The software product is not compatible with other software or hardware used by people with disabilities

2.2.4 Project Risks

Organizational risks

- Lack of qualified specialists in usability, user experience or accessibility
- Insufficient knowledge of basic usability principles for those responsible for designing and developing the product and its associated processes and artifacts
- Lack of knowledge, criteria and process for selecting qualified usability specialists
- Low usability maturity in the organization (see section 7.1.1, bullet 2)
- Insufficient management attention for usability test and review results, possibly because they are considered subjective
- Inappropriate decisions by management, such as not postponing a release even when usability evaluation results clearly show a need for action
- Insufficient independence of QA for usability testing processes and deliverables
- Unsuitable usability evaluators who establish themselves in a “police function” and exaggerate minor usability issues
- Poor or missing usability requirements
- Not addressing usability in the project assessment and/or test plan

Technical risks

- No usability evaluation performed, in particular no usability test
- Usability evaluations are conducted so late that there is no time to perform the required changes before the software product is implemented
- Usability evaluations not performed after the software product has been implemented and experienced users have become available
- Problems in defining testable usability requirements for usability testing
- Non-availability of precise, written and reviewed procedures for usability evaluation
- Insufficient adherence to documented best practices for usability testing
- Late availability of environment required for usability evaluation
- Unrealistic environment for usability evaluation: The sample data set is too small or inconsistent; there are no interruptions when in real use there are many interruptions
- Usability test report is unusable because it is too long, difficult to understand, or based on opinion
- User experience testing does not focus on the full user experience
- "Taboo" topics, such as bad underlying software architecture, which the organization tries not to change
- No clear statement of what constitutes a typical user system. For example, usability tests in companies might use higher-end hardware that might mask performance problems
- Late and possibly unplanned repair costs threaten project cancellation or delay
- Limited number of qualified and trained users available

Supplier risks:

- Suppliers do not have the required qualifications in usability testing
- Suppliers do not follow agreed guidelines for usability evaluation
- Usability evaluation results provided by suppliers are delivered late or not at all

3. Usability and Accessibility Standards – 105 mins.

Keywords

user interface guideline, Web Content Accessibility Guidelines

Learning Objectives

3.1 Usability Standards and Manufacturer Guidelines

UTFL-3.1.1 (K2) Understand the general content and applicability of ISO usability standards and manufacturer guidelines to particular types of project/application (45 mins)

3.2 Accessibility Standards

UTFL-3.2.1 (K2) Understand the general content and applicability of ISO 9241-171 (Software Accessibility) and the Web Content Accessibility Guidelines (WCAG) 2.0 to particular types of project and applications (45 mins)

UTFL-3.2.2 (K2) Understand the general content of accessibility legislation (UK Equality Act 2010 and Americans with Disabilities Act) (15 mins)

Please note that only the information explicitly provided in this chapter is examinable and not the entire contents of the standards themselves.

3.1 Usability Standards and Manufacturer Guidelines

A usability standard is a collection of user interface guidelines for the design of efficient and satisfactory dialogues.

A user interface guideline is a low-level, specific rule or recommendation for user interface design. It leaves little room for interpretation so that designers can implement it consistently. A user interface guideline is often used to ensure consistency in the appearance and behavior of the user interface of the systems produced by an organization.

User interface guidelines are helpful in detecting and reporting usability problems during all human-centered design activities. Without user interface guidelines, it may be difficult to decide on what is “unacceptable” usability. For example, is it reasonable for a user to perform ten steps to log on to an application? User interface guidelines should include precise rules for the size and placement of buttons and other controls (e.g., entry fields, list boxes), clarity of instructions and prompts, helpful error messages, screen layout, use of colors and sounds, and any other factors that affect the user’s experience.

Examples of individual user interface guidelines:

- “For all controls, such as buttons, select the safest, most secure value by default to prevent loss of data or system access. If safety and security are not factors, select the most likely or convenient value.”
- “The company logo must appear in the upper left corner of each page. It must be positioned at exactly the same place as on the home page. Clicking the logo must cause the home page to be displayed.”
- “The height of a button must be twenty-three pixels.”

3.1.1 ISO Usability Standards

Several usability standards are issued by ISO, the International Organization for Standardization [Web-11], most of which belong to the ISO 9241 family of standards. Currently, there is no ISO standard for usability evaluation or usability testing.

ISO 9241-110 – Ergonomics of human-system interaction

This standard deals with the ergonomic design of interactive systems (software products). It describes the seven dialogue principles listed below, each of which is a general goal for the design of effective and efficient dialogues.

The seven dialogue principles described in detail in this standard are:

- Suitability for the task,
- Self-descriptiveness,
- Conformity with user expectations,
- Suitability for learning,
- Controllability,
- Error tolerance,
- Suitability for individualization.

Dialogue principles resemble heuristics (see section 4.5) and are generally independent of any specific dialogue technique. They are applicable to the analysis, design and evaluation of software products, although they can be difficult to apply in a usability evaluation because their general nature makes them subject to interpretation.

ISO 9241-210 – Human-centered design for interactive systems

This standard describes the principles of human-centered design and the related activities. Section 1.3 provides an overview of this standard.

ISO 25066 (2016) – Common industry Format for Usability Evaluation Reports

This standard describes the Common Industry Format (CIF) for reporting usability evaluations. It provides a classification of evaluation approaches and the specifications for the content items in a usability evaluation report (content elements). The intended users of the usability evaluation reports are identified, as well as the situations in which the usability evaluation report can be applied.

3.1.2 Manufacturer Guidelines

A list of important manufacturer guidelines is given below. To give an impression of the contents, the section titles are provided for each guideline.

Guideline Name	Section Titles	Reference
Apple OS X Human Interface Guidelines	Starting and Stopping, Modality, Interoperability, Feedback and Assistance, Interaction and Input, Animation, Branding, Color and Typography, Icons and Graphics, Terminology and Wording, Integrating with OS X.	[Web-1]
Android User Interface Guidelines (Google)	Animation, Style, Layout, Components, Patterns, Usability	[Web-2]
Microsoft Windows User Experience Interaction Guidelines	Design Principles, Controls, Commands, Text, Messages, Interaction, Windows, Visuals, Experiences, Windows Environment	[Web-3]
SAP design guidelines and resources	Action, Container, Data visualization, Display, Filter, List, Loading, Popover, Table, Toolbar, User input.	[Web-4]

3.2 Accessibility Standards

An accessibility standard is a collection of user interface guidelines for the design of accessible dialogues.

3.2.1 ISO Standards

ISO 9241-171 – Guidance on software accessibility

This standard provides guidance on the design of the software of interactive systems to achieve as high a level of accessibility as possible.

The standard provides the following information:

- Definitions of accessibility related terms. For example, the term "Screen reader" is defined as "assistive technology that allows users to operate software without needing to view the visual display."
- Guidelines for accessible software products. In this main body of the standard over 140 guidelines are provided, together with additional notes and examples. An example guideline is "8.1.4 Make names available to assistive technology: Each name of a user interface element and its association shall be made available by the software system to assistive technology in a documented and stable fashion".

3.2.2 The Web Content Accessibility Guidelines (WCAG)

The Web Content Accessibility Guidelines [Web-7] are a part of a series of web accessibility guidelines published by the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C), the main international standards organization for the internet. They consist of a set of guidelines for making content accessible, primarily for people with disabilities.

The following tables show the three WCAG conformance levels and examples:

Level A

Description	Examples
Guidelines that will have a high impact on a broad array of user populations and therefore don't focus on a single type of disability. The guidelines have the lowest impact on the presentation logic and business logic of the site, but their implementation will typically be the easiest.	<p>Text Alternatives (Guideline 1.1.1): All non-text content that is presented to the user has an equivalent text alternative. Example: Images should include equivalent alternative text in the markup/code.</p> <p>Keyboard Accessible (Guideline 2.1.1): All functionality of the content is operable through a keyboard interface, without requiring specific timings for individual keystrokes. Example: An accessible website does not rely on mouse input because some people cannot use a mouse. All functionality is available via a keyboard or assistive technologies that mimic the keyboard, such as speech input.</p>

Level AA

Description	Example
Guidelines that will also have a high impact for users. Sometimes only specific user populations will be impacted, but the impact is important. Adherence to these guidelines may impose changes to a system's presentation logic or business logic.	<p>Distinguishable: (Guideline 1.4.4): Except for captions and text images, text can be resized up to 200 percent without assistive technology and without loss of content or functionality.</p>

Level AAA

Description	Example
Guidelines that are often focused on improvements for specific user populations. They may be difficult or expensive to adhere to, depending on platform limitations. The cost-benefit	<p>Keyboard accessible (Guideline 2.1.3): All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes.</p>

Description	Example
ratio may be low enough to reduce the priority of these items.	

3.2.3 Accessibility Legislation

A number of countries have passed laws aimed at reducing discrimination against people with disabilities. Examples are:

Equality Act (UK)

The Equality Act 2010 legally protects people from discrimination in the workplace and in wider society.

While the Equality Act does not expressly refer to websites, a Statutory Code of Practice explicitly states that websites are included under the ambit of the Equality Act for the provision "of services". Websites which provide access to services and goods may in themselves constitute a service, for example, where they are delivering information or entertainment to the public.

Organizations are obliged to take reasonable steps to make a site accessible. There is no definition of "reasonable" in the Act, but a Code of Practice issued in 2002 suggests that the cost would be taken into account. Based on the WCAG conformance levels shown in the table above, Level A is generally regarded as the minimum standard to meet legal obligations, although that does not mean that an organization will win a court action if it achieves Level A and gets sued; it just improves their chances. Some regard Level AA as the minimum standard for proper accessibility.

Americans with Disabilities Act (USA)

The Americans With Disabilities Act prohibits discrimination based on disability. In particular, it requires that private websites be accessible to blind and visually impaired Internet users. The Americans With Disabilities Act generally dictates that all "places of public accommodation" and all "goods, services, facilities, privileges, advantages, or accommodations" of places of public accommodation, must be made accessible to disabled citizens.

In addition, the Rehabilitation Act of 1973 requires Federal agencies to make their electronic and information technology accessible to people with disabilities. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. Under Section 508, agencies must give disabled employees and members of the public access to information that is comparable to access available to others.

4. Usability Reviews – 90 mins.

Keywords

expert usability review, heuristic

Learning Objectives

4.1 Introduction and Approach

UTFL-4.1.1 (K2) Understand usability review as a method for evaluating usability, user experience and accessibility (15 mins)

4.2 Types of Usability Review

UTFL-4.2.1 (K2) Understand the differences between informal usability review and expert usability review (15 mins)

UTFL-4.2.2 (K4) Analyze the usability aspects of a software application using the usability review method “heuristic evaluation” according to a checklist provided in the syllabus (60 mins)

4.1 Introduction and Approach

A usability review is a usability evaluation based on the judgment of one or more reviewers who examine or use a software product to identify potential usability problems and deviations from established criteria.

Usability reviews are often performed by usability experts, other usability professionals, subject matter experts, design team members, (acceptance) testers, customer representatives and potential users. Usability reviews are based on one or more of the following:

- Usability requirements
- Applicable user interface guidelines
- Usability standards
- Prior experience of usability problems encountered by users

Usability reviews are more effective when the user interface can be seen. For example, sample screen shots are usually easier to understand and interpret than a narrative description of the functionality provided by a particular screen. Visualization is important for an effective usability review of the documentation.

4.1.1 Step-By-Step Approach to Usability Reviews

A usability review has the following six steps [Nielsen94]:

Step 1: Prepare usability review

- Determine goals in cooperation with stakeholders.
- Select appropriate method(s): informal usability review, expert usability review, heuristic evaluation.
- Select reviewers (see list provided in the introduction above).

Step 2: Optionally, the author of the software application to be evaluated presents it to the reviewers. This should only be done to provide information, and care should be taken not to introduce a source of bias to the reviewers before they evaluate the software application.

Step 3: The reviewers evaluate the software application in solitude and write down their findings. Each reviewer should start by considering:

- Who is using this software application?
- Why are the users using the software application?
- What goals do the users have?
- In what ways do the users see the software application with a different perspective? (e.g., particular domain-specific aspects more important than technology-specific aspects)

The reviewers should then use the software application bearing the above questions in mind.

Step 4: Assuming that more than one reviewer is involved, the reviewers meet to reach consensus on the positive and negative aspects in their findings.

- This consensus building is of particular importance. It removes any findings that are peculiar to a specific reviewer.
- Only findings that find consensus between the reviewers are included in the review report.

Step 5: The reviewers present the findings which have majority agreement to the author and interested stakeholders. This and the previous step may be combined.

Step 6: One of the reviewers writes the usability review report. The contents of the usability review report are similar to the contents of the usability test report described in section 5.6.4.

4.1.2 Risks and Challenges

Usability reviews are opinion based and may result in a clash of views where the key arguments are opinions rather than based on data or facts. Such clashes are a sign of an organization that lacks a full understanding of usability issues, or of inexperienced usability professionals.

The value of usability reviews may be diminished by the following risks:

- If candid discussion of the findings among reviewers does not take place, an incorrect finding suggested by just one reviewer may be accepted. It is crucial for the success of a usability review that reviewers are capable of rejecting questionable findings and recognizing good findings even if they are suggested by one reviewer only.
- If reviewers are not sufficiently familiar with the software product and its restraints, their findings may not be useful for development teams.
- If reviewers are not respected by fellow reviewers, their valuable findings may be too easily dismissed.
- If reviewers only focus on minor details like user interface guideline violations and graphic design, any serious problems with effectiveness and efficiency may remain undetected.

4.2 Types of Usability Review

The most important usability review methods are described in this section:

- Informal usability reviews, which can be conducted by anyone. (see section 4.2.1)
- Expert usability reviews, which are conducted by usability experts or subject matter experts. (see section 4.2.2)
- Heuristic evaluations, which are preferably performed by usability experts and are supported by a limited number of heuristics. (see section 4.2.3)

4.2.1 Informal Usability Review

An informal usability review is a usability review based on the judgment of one or more reviewers who examine or use a software product to identify potential usability problems. Informal usability reviews are often based on opinion, personal experience and common sense.

No formal usability qualifications are required for a reviewer to partake in this type of review. However, some usability experience or domain knowledge is helpful, and a valuable review can be carried out by a usability professional who has one or two years of experience.

4.2.2 Expert Usability Review

An expert usability review is an informal usability review in which the reviewers are experts. Generally speaking, an expert is a person who is recognized by independent peers as being an expert. They can be usability experts and/or subject matter experts.

Expert usability reviews are often based on extensive experience, mainly from usability tests, and introspection, where experts observe themselves as they carry out tasks.

It is common to combine expert usability review and heuristic evaluation (see section 4.2.3 below), for example by starting with an expert usability review and then going back over the heuristics later to reduce the risk of missing something.

4.2.3 Heuristic Evaluation

Heuristic evaluation is a usability review in which one or more reviewers, preferably experts, compare the user interface of a software product to a list of heuristics and identify where the user interface does not follow those heuristics.

A usability heuristic is a generally recognized rule of thumb that helps to achieve usability. The purpose of a heuristic is to provide reliable and useful guidance to a reviewer during the usability evaluation of a software product.

The following criteria apply to heuristics:

- They are generally recognized as being valuable
- They are comprehensible for all reviewers

Heuristics are typically grouped into sets of about ten to ensure ease of use and maintenance. The following set is widely recognized and was created by Jakob Nielsen [Nielsen94] [Web-10]:

	Name of Heuristic	Description of Heuristic
1	Visibility of system status	The system should always keep users informed about what is going on by providing appropriate feedback within reasonable time.
2	Match between system and the real world	The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
3	User control and freedom	Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support "undo" and "redo" functions.
4	Consistency and standards	Users should not need to consider whether different words, situations, or actions mean the same thing. Follow platform conventions.
5	Error prevention	Even better than providing good error messages is a careful design

		which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
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(continued)

	Name of Heuristic	Description of Heuristic
6	Recognition rather than recall	Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
7	Flexibility and efficiency of use	Accelerators which are often not noticed by the novice user may speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
8	Aesthetic and minimalist design	Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
9	Help users recognize, diagnose, and recover from errors	Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
10	Help and documentation	Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Even though heuristic evaluation is a powerful approach, the reviewer should be aware of the following risks:

- Heuristic evaluation requires the reviewers to make judgments by comparing a software application to a limited set of heuristics. Usability issues are often complex and cannot always be represented in a limited set of heuristics.
- Heuristics cannot take context of use into account. This can make judgment difficult.
- It is relatively easy to apply an incorrect approach to heuristic evaluation. If the evaluation is based on intuition rather than on heuristics, then findings become assigned to one or more heuristics after the findings have been found. The correct approach is to let the heuristics drive the heuristic evaluation and to only report findings that can be directly attributed to one of the heuristics. If findings are reported that are not linked to a heuristic they may still be valuable, (especially if found by a usability expert), but they are the product of an informal or expert usability review rather than an heuristic evaluation.
- Heuristics are designed to be compact, and interpreting them correctly requires some experience. Reviewers must fully understand the heuristics they will be applying before the heuristic evaluation commences. They must avoid the temptation to create their own set of heuristics, which may not meet the “recognized” and “comprehensible” criteria mentioned at the start of this section.

5. Usability Testing – 270 mins.

Keywords

finding, moderator, think aloud usability testing, usability test participant, usability test script, usability test session, usability test task, usability testing

Learning Objectives

5.2 Step-By-Step Approach to Usability Testing

UTFL-5.2.1 (K2) Understand the principal steps in the usability testing approach (15 mins)

5.3 Preparing a Usability Test

UTFL-5.3.1 (K2) Understand the content of a usability test plan (15 mins)

UTFL-5.3.2 (K2) Understand the content of a usability test script (15 mins)

UTFL-5.3.3 (K3) Define a simple usability test task for a given project (30 mins)

UTFL-5.3.4 (K2) Understand considerations to be applied when deciding on a location for usability tests (15 mins)

UTFL-5.3.5 (K2) Understand the advantages and disadvantages of a usability test lab (15 mins)

5.4 Conducting a Usability Test Session

UTFL-5.4.1 (K2) Understand the key activities in a usability test session (15 mins)

5.5 Analyzing Findings

UTFL-5.5.1 (K2) Understand the procedure to apply for analyzing findings from a usability test (15 mins)

UTFL-5.5.2 (K2) Understand the classifications and ratings for usability findings (15 mins)

5.6 Communicating Results and Findings

UTFL-5.6.1 (K3) Review a usability test report for a given project (45 mins)

UTFL-5.6.2 (K2) Understand how to overcome internal resistance to usability findings (15 mins)

UTFL-5.6.3 (K3) Apply a given list of best practices to report and communicate results (30 mins)

5.7 Quality Control of a Usability Test

UTFL-5.7.1 (K2) Understand the quality control activities for a usability test (15 mins)

5.8 Challenges and Frequent Mistakes

UTFL-5.8.1 (K2) Understand the most frequent and serious mistakes in usability testing (15 mins)

5.1 Introduction

Usability testing evaluates the degree to which the system can be used by specified users with effectiveness, efficiency and satisfaction in a specified context of use. Usability testers should be aware that other definitions may be used in other organizations (see [ISTQB_GLOSSARY]).

Further details about usability testing are included in the individual sections of this chapter and in references [Molich07], [Barnum11], and [Hartson12].

5.2 Step-By-Step Approach to Usability Testing

A usability test has the following three principal steps and associated tasks [Hartson12], [Molich07]:

Step 1: Prepare usability test

- Create usability test plan
- Recruit usability test participants
- Write usability test script(s)
- Define usability test tasks
- Pilot usability test session

Step 2: Conduct usability test sessions

- Prepare session
- Perform briefing with pre-session instructions
- Conduct pre-session interview
- Moderate session
- Conduct post-session interview

Step 3: Communicate results and findings

- Analyze findings
- Write usability test report
- Sell findings (i.e., convince people)

A usability test consists of a series of usability test sessions. In each session, a usability test participant performs representative tasks on the software product or a prototype of the software product. A test session is moderated by a moderator (a neutral person who conducts the usability test session) and observed by a number of observers.

Usability testing should be done under conditions which are as close as possible to those under which the software product will be used. This may involve setting up a mock up office or a living room. It should be possible to observe usability test sessions from a neighboring room so that stakeholders can observe the effect of the actual software product on real people.

5.3 Prepare Usability Test

5.3.1 Usability Test Plan

Preparations for a usability test are started by writing a usability test plan. The plan is a short description of the purpose and extent of a usability test and helps management or a client to decide on the usability testing to be conducted.

The usability test plan [Barnum11] includes the following information:

- The goals of the usability test. These could include very short descriptions of the key tasks to be tested and the following typical objectives:
 - To assess whether usability requirements have been met
 - To uncover usability problems so they can be corrected
 - To demonstrate convincingly to stakeholders that their software product contains serious usability problems

Note that the first two objectives apply to any type of usability evaluation (i.e., usability review, usability testing, usability survey). The last objective, however, is unique to usability testing. As a result, usability testing can be an effective tool in convincing management and developers that usability is indeed a problem in their software product.

- The user group or user groups for the usability test. The following people may attend a usability test session:
 - The moderator is a neutral person who conducts a usability test session (and is therefore a usability expert). The moderator is the only person who is allowed to talk to the test participant during the usability test session.
 - The usability test participant is a representative user who solves typical tasks in a usability test.
 - The note-taker is a usability expert who records important usability findings.
 - Observers are generally stakeholders who have an interest in the software product or in the characteristics required to meet their needs and expectations. It is not essential that they attend a usability test. Examples of observers are users, supporting staff, trainers, documentation writers, developers, managers of developers, product management, designers and marketing people.
 - Chapter 8 shows the roles of the usability tester, the moderator and the note-taker.
- A reference to the usability requirements for the software product (if the purpose of the usability test is to evaluate the design solution against usability requirements)
- The principal techniques that will be employed. A technique that may be used for usability testing is the think aloud technique. This enables test participants to share their thoughts with the moderator and observers while they solve usability test tasks. The advantage of this technique is that it helps the moderator, note-taker and the observers to understand the test participant's thoughts and vocabulary during usability testing.
- The number of planned test participants
- Schedule and approximate length of each usability test session
- The name of the moderator who is responsible for the usability test
- A resource and cost estimate for the usability test, including person hours and incentives
- Location where the usability test will be conducted. The concept "usability testing" usually refers to a test where the usability test participant and the moderator are face-to-face in the same physical location. The following other forms of usability testing can be performed:
 - Remote usability testing is performed when the usability test participant and the moderator are in different physical locations and communicate using media such as instant messaging, webinar or video conferencing.
 - Unmoderated usability testing, which is discussed in section 7.1.1
- How the findings will be communicated

The usability test plan must be short and to the point. Usually, one or two pages are sufficient. Stakeholders and management review the plan and any necessary modifications are made until it is considered acceptable.

5.3.2 Usability Test Script

A usability test script is a document specifying a sequence of actions for the execution of a usability test. It is used by the moderator to keep track of briefing and pre-session interview questions, usability test tasks, and post-session interview questions.

A usability test script [Krug 10] is a checklist used by the moderator of a usability test. It contains the following information:

- Activities for preparing the usability test session before the test participant arrives
- Briefing instructions
- Pre-session interview questions.
- Usability test tasks
- Post-session interview questions

The sample usability test report provided at [Web-9] includes a sample usability test script.

5.3.3 Usability Test Tasks

A usability test task is a usability test execution activity specified by the moderator that needs to be accomplished by a usability test participant within a given period of time. Sufficient tasks are prepared in order to fill the time scheduled for the usability test session.

A good test task:

- Matches the goals of the usability test as defined in the usability test plan
- Is relevant from the test participant's point of view. Usability test tasks generally avoid requesting system oriented tasks such as login-in, change of password or locating the name of the webmaster. Instead, good tasks are meaningful to the test participant, such as ordering a product.
- Is relevant from the stakeholders' point of view

Usability test tasks must be consistent. A usability test task contains the following information:

- The precise phrasing of the usability test task scenario to be handed to the test participant
- Preconditions for the task, including resources available to the test participant
- A justification for the importance of the task, including what the task is intended to evaluate
- Any data given to the test participant for solving the task, for instance a delivery address, or information in the database when the test participant starts the task
- Criteria for task completion or task abandonment including the intended outcome or expected answer. A sample criterion for task abandonment is "If the test participant hasn't found an answer within 10 minutes, the task is abandoned."

The following points are relevant to the sequence in which the usability test tasks are requested:

- Where possible, the first task should be simple so test participants experience a quick success. This is particularly important if a test participant appears stressed by the situation.
- Test tasks that are essential to the success of the software product before testing tasks of less importance
- Tasks are requested in an order that seems logical from the test participant's point of view. For example, test participants are instructed to order something before they receive the task to cancel an order.
- If possible, tasks that depend on the successful completion of a previous task are avoided
- Where possible, the last task should also be simple to not let the test participant conclude with a negative and frustrating experience

The sample usability test report [Web-9] includes a sample set of usability test tasks.

5.3.4 Test Location

The test location is the place where the usability test is conducted.

Examples of test locations are:

- A dedicated usability test lab (see section 5.3.5)
- Two office rooms that are connected by a video link
- An office room
- A room at the place where the test participant lives or works
- A public place, such as a cafe. This location is most often chosen for quick usability test sessions lasting ten minutes or less.

An important part of a usability test location is that observers are able to discuss, debate, and express themselves freely without disturbing the conduct of the test. Observers should be able to come and go from the location as they please. Any regulations limiting the behavior of observers in an observation room are a sign that the usability test setup is unusable because it does not consider the needs of the primary users. The primary users of any usability test session are the observers.

It is technically possible to allow observers to witness test sessions from their work place using screen sharing. This option is less desirable because an important part of observing a usability test session is the interaction and discussion with other stakeholders.

5.3.5 Usability Test Lab

A usability test lab is two or more rooms that are specially equipped for usability testing (see Figure 5.1).

A usability test lab often consists of two rooms:

- A test room where the test participant sits
- An observation room where observers (stakeholders) and note-takers can watch test participants as they solve usability test tasks

Often, the two rooms are separated by a one-way mirror which enables observers to watch the test participant but not vice versa. Monitors (M in Figure 5.1) in the observation room connected to cameras (C) in the test room enable observers to see the test participant's face and what happens on the test participant's screen and desktop.

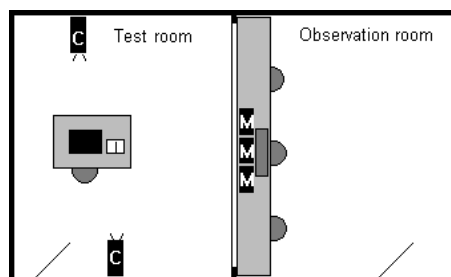


Figure 5.1 – Layout of Usability Test Lab

The following advantages are obtained by using a usability lab:

- Observers can observe usability test sessions together
- Usability test sessions are easy to observe for note-takers and observers
- Usability test sessions are conducted under similar conditions
- Usability test sessions are easy to video record
- Observers are able to enter and leave during usability test sessions
- Management can physically demonstrate to visitors that the organization is deeply committed to usability

The following disadvantages apply to using a usability lab:

- The context is artificial
- It is expensive to set up and maintain

5.3.6 Pilot Usability Test Session

A pilot usability test session is a usability test session that is conducted in accordance with the usability test script in order to check the usability test script and the usability test setup.

Tasks are defined which exercise the usability test script within the usability test setup. If serious problems in the usability test script are discovered in a pilot usability test session, the usability test script is modified and another pilot usability test session is conducted.

Where possible, real users are chosen as test participants. If this is not possible, colleagues may be chosen instead. However, people who designed the software product should not be considered.

Findings from pilot usability test sessions may be included in the usability test. For example, if the test participant in the pilot test session is over-qualified for the usability test and still encounters a serious usability problem in a valid usability test task, this may be considered as a usability problem.

5.4 Conduct Usability Test Sessions

The key activities in a usability test session are described in the following table:

Activity	Brief description of key activities
Preparation of session	The moderator prepares the hardware, the software product and the test tasks for the test session before the test participant arrives.
Briefing – Pre-session instructions	The moderator informs the test participant about the purpose of the usability test and what their role and contribution are.
Pre-session interview	The usability test participant answers questions from the moderator about his/her background and previous experience with the software product or related software products.
Moderation	The test participant solves usability test tasks, which he/she receives from the moderator. While solving tasks, the usability test participant is encouraged to think aloud. The moderator quietly observes the usability test participant during usability test task solution. The moderator guides the test participant if they get completely stuck, usually by moving on to the next test task.
Post-session interview	The usability test participant answers questions from the moderator about their experience and general impression of the usability of the software product. Key questions are “Which 2-3 things did you like most about the software product?” and “Which 2-3 things are most in need of improvement?”

5.5 Analysis of Findings

Analysis of findings is the process that extracts findings from observations during usability test sessions.

The following steps are performed:

1. During the usability test session, the note-taker records usability observations, usually by writing them down. Usability observations reflect events that cause problems with or have a positive effect on effectiveness, efficiency and satisfaction.
2. After each usability test session (while everyone still remembers what happened), the note-taker and the moderator meet and have a candid discussion about the observations taken from the usability test session.
3. After all usability test sessions have been completed, the moderator and the note-taker separately extract between twenty and thirty usability findings and between five and ten positive findings each from their observations. These findings reflect the observations that they consider most important.
4. The moderator and the note-taker meet again and have a candid discussion about their findings. The findings are merged into a common list consisting of between twenty and thirty usability problems and five and ten positive findings.
5. The moderator logs the problems in the common list on the company's usability problem tracking tool, which ideally is the same as the defect tracking tool.
6. The moderator tracks the problems to resolution and reviews the implemented solution. If the implemented solution represents a risk, it should be subject to another usability test.

Several points are of particular relevance to the analysis of findings:

- Candid discussions between the moderator and the note-taker (as mentioned in steps 2 and 4), are of essential importance to the success of the analysis. These discussions must be honest and based on observations rather than on personal opinions.
- It is important that a usability test report is usable, so the number of reported findings must be limited (the values shown in point 3 above are rules of thumb). For example, if seventy usability problems are found, it is unacceptable to simply report all of them and leave it up to the stakeholders to process them.
- It is a critical (and sometimes inconvenient) task for the moderator to prioritize the findings and report only the ones that are most important from a usability point of view.
- Comparisons of the findings between the current usability test and previous usability test reports will help detect trends and frequently occurring usability problems.

5.6 Communicate Results and Findings

5.6.1 Results

Results from a usability test are unique in one aspect: They show what representative users are able to accomplish with the software product when they carry out representative tasks. Eliciting personal opinions from users, or discussing them, does not support this objective and should be left to other methods. Examples:

- Usability test tasks like "Is the design of the home page appropriate for the online CD Shop?" are opinion based and thus inappropriate for a usability test.
- Remarks like "I can do this easily but most others will have serious problems" from a usability test participant are personal opinions. The moderator may obtain additional, valuable insight by following up on this remark with the question: "Why do you think so?"
- It is acceptable to report findings that are based on usability test participants' opinions about a software product, for example "The design of the home page is really pretty", but only if they are expressed spontaneously by a majority of the usability test participants.

5.6.2 Usability Findings

A usability finding is a result from a usability evaluation that identifies some important issue, problem, or opportunity.

Positive usability findings are important for the following reasons:

- They make it easier to sell the need for correcting usability problems by giving a balanced view
- They communicate to the development team which features should not be modified or deleted
- It enables a complete view of usability to be obtained

A usability test report should contain a section that describes the most important findings from the usability test and associated recommendations for improvement of the software product.

The description of each finding should include the following items:

- Classification and severity rating (see below)
- A header that briefly describes the finding
- A description of the finding. General statements such as “Error messages are not helpful” should be supported by at least two examples
- Relevant quotes from test participants relating to the finding (optional)
- Recommendations for improvement (optional)
- Screenshots illustrating the finding (optional annex)

Classification and Severity Rating of Findings

Severity classifications and ratings are assigned to usability problem to indicate the type of the finding, its impact and criticality on the user experience, and the consequences.

The moderator and the note-taker rate usability problems from the test participants' point of view. Sometimes, the severity ratings are allocated in cooperation with a domain expert.

Typical classifications are:

Classification	Description
Usability problem	Each usability problem must have a severity rating as described in the following note.
Positive finding	Works well. This approach can be recommended.
Good idea	A suggestion from a test participant that could lead to a significant improvement of the user experience.
Functional problem	Defect

Typical severity ratings of usability problems are:

Severity ratings	Description
Minor	Minor dissatisfaction, noticeable delays, or superficial difficulties.
Major	Substantial delays; or moderate dissatisfaction
Critical	Test participants gave up. Showstopper, substantial dissatisfaction or minor financial damage to user.
Catastrophic	Existential threat. Potentially life-threatening, bodily harm or substantial financial damage.

Important parameters that influence severity ratings are:

- Frequency: How often does the usability problem occur?
- Impact: How badly does it hurt the user and the user's environment when the usability problem occurs?
- Persistence: How quickly will users learn to avoid the usability problem?

5.6.3 Selling Findings to Stakeholders

Stakeholders who are not usability professionals often need to be convinced about the need to take the findings from a usability test seriously and act on them. Some stakeholders are skeptical towards usability and usability tests. Some developers, for example, view “their” user interface as an extension of themselves and might take it personally when someone finds fault with it.

The usability tester needs to “sell” usability findings in a convincing way to all stakeholders and must understand their motivation and focus. If stakeholders do not accept the findings from a usability test, the risk is that little beneficial change to the software product's user interface will occur. For a general discussion about selling findings, see [Sharon12].

Knowledge and leadership from company management is important for the success of usability in an organization. The usability tester must understand the maturity of an organization regarding usability issues (see section 7.1). In organizations with low usability maturity, it may only be possible to make the consequences of ignoring usability visible by performing usability testing and then “selling” the findings in a convincing manner.

When methods such as usability review and heuristic evaluation are employed, care must be taken to manage the exchange of opinions. Certain stakeholders may have strong opinions and are skilled at arguing their case, particularly if others are willing to hold back their own opinions. There is a risk that valid usability problems may be dismissed because opinions dominate the discussion and not facts.

To help mitigate the risks mentioned above, stakeholders must be involved in the planning and execution of a usability test. This allows them to “buy-in” to the usability test and makes usability problems easier to accept. The most important stakeholders are the people who decide which changes from the usability test should actually be implemented, and the people who do the actual implementation.

Some ways of involving stakeholders are:

- Involve them in the risk assessment
- Invite them to participate in writing and reviewing the usability test plan, the usability test scripts and, in particular, the usability test tasks
- Invite them to participate in the recruitment process, in particular defining the test participant profile and creating the recruitment screener
- Invite and encourage them to observe usability tests
- Make it easy for them to observe usability test sessions:
 - Schedule usability test sessions at times that are convenient for stakeholders, for example on Friday afternoons
 - Advertise usability test sessions widely, and indicate that observing only part of a usability test session is also acceptable
 - Carry out usability test sessions at locations that are convenient for stakeholders, such as where stakeholders work, instead of at a remote location
 - Make it easy for stakeholders to observe usability test sessions as a group
 - Watching and discussing can convince skeptical stakeholders of the benefits of usability testing
- Involve them in the reviewing the usability test report

Note that agile software development implicitly includes many of these practices aimed at involving stakeholders:

- The Product Owner is part of the development team and participates in the planning and execution of usability evaluation (i.e., reviews, testing and surveys)
- The Product Owner is a source of information about usability requirements and helps to clarify situations where opinions differ (e.g., when rating the severity of usability findings).
- The “whole-team” approach adopted in agile software development encourages the regular exchange of views between team members and imparts a sense of shared ownership regarding product quality (including usability).

5.6.4 Usability Test Report

A usability test report is a document that communicates the findings from a usability test. A usability test report is mandatory for a usability test and is generally written by the usability tester or the moderator.

The purpose of the usability test report is to document and communicate the most important findings from a usability test. The report must be effective and efficient for the key stakeholders, in particular the development team and managers who make decisions about what will be changed.

A usability test report contains the following sections [Barnum12]:

Chapter	Title	Description of Contents
1	Executive Summary	A short executive summary containing descriptions of the object of the evaluation, techniques(s) used, most important findings and general recommendations based on the findings
2	Table of contents	
3	Findings and recommendations	See section 5.6.1
4	Objectives	Description of the objective of evaluation
5	Purpose	Purpose of the evaluation, including listings of or references to relevant usability requirements
6	Evaluation method	<ul style="list-style-type: none"> • Evaluation method (i.e., how the usability test was conducted) • Description of the approach used, for example the type of evaluation performed and the experimental design of the evaluation • Information regarding the physical and technical environment in which the usability test took place • The usability test script • An anonymized list of test participants
7	Contacts	Name and contact details of the moderator(s) and note-taker(s) involved in the usability test

[Web-9] provides a free sample usability test report.

5.6.5 Best Practices in Usability Test Reporting

The single most important practice in all forms of usability evaluation is to ensure that all those involved communicate in a positive and productive manner with the development team and the stakeholders. Many of the aspects discussed in section 5.6.3 about selling usability findings apply to reporting.

The following table summarizes best practices in usability test reporting:

Best Practice Name	Best Practice Description
Involve and respect stakeholders	<ul style="list-style-type: none"> Involve the stakeholders, in particular the development team, in writing the report Consider their findings, even when they differ from yours Incorporate their findings in the report Treat stakeholders as partners in the common goal to improve usability Talk the language of the stakeholder and avoid usability jargon which some stakeholders may not fully understand
Make the main report short and comprehensible	<ul style="list-style-type: none"> Apply the following recommendations, regardless of the magnitude of the usability test: <ul style="list-style-type: none"> A maximum of twenty five findings reported A maximum document length of twenty pages
Include a usable Executive summary	<ul style="list-style-type: none"> Make the executive summary short: recommended one page Include only the most important findings Put the executive summary at the start of the usability test report where stakeholders can easily find it
Keep to the point	<ul style="list-style-type: none"> Write crisp and precise descriptions of usability findings Avoid lengthy passages of text (e.g., an explanation of what usability is, transcripts of usability testing sessions and descriptions of the human-centered design process). However, short notes of what a test participant said, such as quotes of one or two lines, are recommended. Include references to information if it supports the content of the report
Rate the severity of all findings	<ul style="list-style-type: none"> Refer to the discussion in section 5.6.2
Include positive findings	<ul style="list-style-type: none"> See the discussion in section 5.6.3
Ensure completeness	<ul style="list-style-type: none"> Ensure that all sections of the report (as listed in section 5.6.4) are included
Respect private or sensitive information	<ul style="list-style-type: none"> Do not include details about recruitment, such as copies of the recruitment screener and the confirmation sent to test participants

The best practices described above are exemplified in a free, sample usability test report. [Web-9]

Note that in agile software development, the above-mentioned best practices may not have the same level of importance:

- There is less emphasis placed on documentation. Usability findings may not be formally documented and the usability test report may take the form of a verbal briefing. A written usability test report is not excluded, but the best practices mentioned above concerning brevity and keeping to the point will be given a high level of importance.
- Agile teams may turn test results directly into backlog items or bug reports.
- Usability results and findings are discussed within the entire team and corrective measures agreed. This often takes place without formal documentation on a daily basis or in a retrospective meeting at the end of an iteration.

5.7 Quality Control of a Usability Test

To verify that a usability test has been conducted properly, the following quality control tasks are performed:

- Check that the usability test plan contains at least the information required by section 5.3.1
- Check that the usability test plan has been properly reviewed and approved by all relevant stakeholders
- Check that the usability test script (in particular the usability test tasks) matches the purpose of the usability test as described in the usability test plan
- Check that the profiles of the actual test participants match the purpose of the usability test as described in the usability test plan
- Observe the first two or three test sessions to ensure that they are conducted in accordance with the usability test script
- Compare the notes made by the moderator and the note-taker from each test session with your own observations
- Raise an issue if important problems or positive findings have not been noted
- If directed by the Project Leader or Test Manager, regularly compare the actual time plan and consumed resources with the estimates in the usability test plan
- Raise an issue if there are important discrepancies
- Check that findings are communicated to the stakeholders in accordance with the usability test plan
- Check whether the usability test report conforms to the best practices given in section 5.6.5
- Discuss the usability test report with some representative stakeholders to find out if it is comprehensible and meets their needs
- Attend discussions and presentations of the usability test results
- Check that communication is two-way and that constructive and professional discussions of the results takes place

5.8 Challenges and Frequent Mistakes

The ten most frequent and serious mistakes in usability evaluation, in particular usability testing, are:

Type of Mistake	Description
The purpose of the usability evaluation is not clear	The purpose should be described in the usability test plan and approved by the stakeholders before the usability evaluation starts. (see section 5.3.1)
Scheduling too late	The usability evaluation happens so late in the development process that there is no time to correct any usability problems before the software product is implemented. Note that this mistake is less likely to occur if an agile software development lifecycle is used.
Critical results ignored	Critical usability evaluation results are overruled by management.
Incorrect focus	The usability evaluation focuses on minor details like user interface guideline violations and graphic design and does not address serious problems with effectiveness and efficiency.
The moderator is too active	The moderator's main purpose is to passively observe what a test participant can do on their own with the software product. The moderator should not interview or entertain test participants, or demonstrate the software product to them.
No post-session interview	A short interview after a usability test session is important to summarize the test participant's impression from the usability test. (see section 5.4)
No involvement of stakeholders	The stakeholders should be involved in various activities of the usability test (e.g., planning, reviewing), as noted in various sections of this chapter.
Unusable usability test report	The usability test report is unusable, for example because it is too long, contains too many findings or has no one-page executive summary. (see section 5.6.4)
No positive findings reported	The usability test report contains no positive usability findings. Positive findings are important to get acceptance of the results. (see section 5.6.3)
Usability findings are not categorized	The reader of the usability test report must be able to quickly distinguish between critical and minor usability problems. (see section 5.6.4)

6. User Surveys – 30 mins.

Keywords

Software Usability Measurement Inventory, SUMI, SUS, System Usability Scale, user survey, WAMMI, Website Analysis and MeasureMent Inventory

Learning Objectives

6.2 Step-By-Step Approach to User Surveys

UTFL-6.2.1 (K2) Understand the purpose and approach adopted in user surveys (15 mins)

6.3 Standardized Questionnaires

UTFL-6.3.1 (K2) Understand the principal content and objectives of the public user questionnaires SUS, SUMI and WAMMI (15 mins)

6.1 Introduction

A user survey is a usability evaluation whereby a representative sample of users are asked to report subjective evaluation into a questionnaire based on their experience in using a component or system. User surveys can be used to evaluate the levels of user satisfaction with a software product.

6.2 Step-By-Step Approach to User Surveys

A user survey has the following steps [Wilson07]:

Step 1: Write a survey plan.

- The survey plan is similar to a usability test plan; it describes the goals of the user survey, the required resources, and a schedule
- Stakeholders are involved in reviewing and approving the survey plan

Step 2: Interview users and stakeholders

- Obtain feedback on issues that the user survey should focus on
- Focus on recent, vivid experience

Step 3: Select a questionnaire

- A questionnaire is a set of questions that is used to collect data from users
- A decision is taken between using a standard usability questionnaire or developing one. (Note that the development of a dedicated questionnaire is not considered in this syllabus)

Step 4: Deploy the questionnaire.

- Recruit user survey participants
- Publish the user survey
- Follow up with a reminder to user survey participants who have not responded within a reasonable time, if possible

Step 5: Analyze the responses from the user survey

Step 6: Communicate the results of the user survey

- Write a report that answers any questions posed by stakeholders in a useful and usable way and is based on the results of the user survey

- Present the results of the user survey

6.3 Standardized Questionnaires

Standardized questionnaires are preferred over self-invented questions. Three commonly used, standardized and publicly available questionnaires are briefly described below. Each questionnaire can be used to measuring software quality from the end user's point of view.

SUS – System Usability Scale

SUS is a simple, ten-item attitude scale giving a global view of subjective assessments of usability. SUS has become widely used, with references in over 1300 articles and publications [Brooke96]. When a SUS is used, participants are asked to score 10 items with one of five responses that range from Strongly Agree to Strongly Disagree.

Sample SUS statements are:

- I think that I would like to use this system frequently.
- I found the system unnecessarily complex.
- I thought the system was easy to use.

SUMI – Software Usability Measurement Inventory

SUMI is a questionnaire with fifty statements to which the user has to reply that they either Agree, Don't Know, or Disagree. [Web-5]

Sample statements are:

- This software responds too slowly to inputs.
- The instructions and prompts are helpful.

WAMMI – Website Analysis and MeasureMent Inventory

WAMMI is a questionnaire with twenty statements which focuses on the usability of web sites from the end user's point of view. WAMMI questions have been selected from a large range of questions about user experiences with websites. The questions focus on aspects of attractiveness, controllability, affect, efficiency, helpfulness, and learnability. WAMMI has five responses that range from Strongly agree to Strongly disagree. [Web-6]

Both SUS, SUMI and WAMMI permit benchmarking against a database of previous usability measurements. They also provide concrete measurements of usability which can be used as completion or acceptance criteria.

7. Selecting Appropriate Methods – 40 mins.

Keywords

none

Learning Objectives

7.1 Criteria for Selecting a Method

UTFL-7.1.1 (K4) Select appropriate method(s) for verifying and validating usability, user experience and accessibility in a given project (40 mins)

7.1 Criteria for Selecting a Method

7.1.1 Selecting a Usability Evaluation Method

Important criteria for selecting a usability evaluation method are:

1. The purpose of the usability evaluation

- To evaluate effectiveness, use usability testing or usability review
- To evaluate whether efficiency requirements have been fulfilled, or whether the usability of a product has measurably improved, use a quantitative usability test
- To evaluate whether satisfaction requirements have been fulfilled, use a user survey
- To increase usability awareness or usability maturity in the organization, run a usability test to help convince skeptical stakeholders

2. Usability maturity of the organization

Usability maturity is the capability of an organization with respect to the effectiveness and efficiency of its usability processes and usability work practices. Usability maturity can be categorized as follows:

- High: The organization has implemented a human-centered design process, with multiple activities and milestones
- Medium: Quality, time, and resource requirements for the human-centered design process are known and controlled
- Low: Individuals adhere to human-centered processes, but often in an unsystematic way
- Very Low: Indifference or outright hostility towards usability

Usability testing should be favored over usability reviews if the usability maturity of the organization is low or very low. In such organizations, controversial outcomes from a usability review could be dismissed as just opinions.

3. Completion time

Usability reviews are fastest with respect to elapsed time and can often be completed within a few days. Unmoderated usability tests, (see bullet 5 below), can also be completed within a few days.

4. Project stage

If the project is in the early design stage where only prototypes are available for evaluation, use a formative method such as usability review, quantitative usability evaluation or user survey.

5. Resources

If resources are limited (e.g., time, money and qualified usability specialists), consider the following options:

- Perform a short form of usability test. This is particularly relevant in agile software development (see section 1.3.2) and has one or more of the following characteristics:
 - The moderator also takes notes; there is no separate note-taker (see Chapter 8)
 - No usability test lab is used; the test sessions take place, for example, in a meeting room
 - The test is limited to 3-5 test participants
 - The usability test report is short and lists a limited number of findings, for example 15
- Unmoderated usability testing
With this form of usability testing the test participants solve usability test tasks without being observed by a moderator. The actions of test participants are video recorded for later analysis. The main advantages of an unmoderated usability test are that the recruitment process is fast and the test is cheaper to perform. The analysis effort is the same as for other types of usability testing covered in this syllabus.
- RITE – Rapid Iterative Testing and Evaluation
This form of usability testing involves making changes to the user interface as soon as a usability problem is identified and a solution is clear. Changes can occur after observing as few as one test participant.

6. Availability of end users

If representative end users are not available or require too many resources to recruit or compensate, usability reviews are better than usability testing.

7. Type of software development lifecycle model: sequential, agile or other

All methods described in this syllabus can be used with a sequential lifecycle model, such as the V-Model. The description of the Human-Centered Design approach in section 1.3 is based on the sequential model, but the principles of Human-Centered Design apply universally for most other types of lifecycle model.

In agile software development, design teams work in short development iterations and fast delivery of usability evaluation results is important when choosing methods. As mentioned in section 1.3.2, methods such as RITE and short forms of usability testing work well in agile software development. Please refer to [ISTQB FL AGILE] for further details on agile software development.

It is highly recommended to mix several recognized usability evaluation methods in one project. These should suit the stage in the development lifecycle so that, for example, usability reviews are performed early on and usability testing later. Other examples of mixed evaluation methods are:

- An informal usability test of a mobile application in a cafe with five or six test sessions each lasting approximately ten minutes followed by more formal in-depth usability test sessions
- A quick usability review that uncovers the most serious usability problems so they can be eliminated before an expensive usability test

7.1.2 Selecting a User Experience Evaluation Method

Important criteria for selecting a user experience evaluation method are similar to those used for selecting a usability evaluation method as described above.

7.1.3 Selecting an Accessibility Evaluation Method

Important criteria for selecting an accessibility evaluation method are:

- Legal requirements
- Organizational requirements
- The number of users with disabilities in the target groups for the software product

8. Summary of Roles and Responsibilities – 30 mins.

Keywords

none

Learning Objectives

8.1 Usability Tester

UTFL-8.1.1 (K2) Understand the principal tasks and responsibilities of the Usability Tester (15 mins)

8.2 Moderator and Note-taker

UTFL-8.2.1 (K2) Understand the principal tasks and responsibilities of the Moderator and the Note-Taker (15 mins)

8.1 Usability Tester

A Usability Tester performs the following principal tasks:

Task Name	Reference
Organize and participate in the assessment of usability risks	Chapter 2
Write a usability test plan	
Prepare a usability testing session <ul style="list-style-type: none"> • Create test scripts • Create Briefing instructions • Pre-session and post-session interview questions • Defined testing tasks 	Section 5.3
Prepare a usability review <ul style="list-style-type: none"> • Determine goals • Select appropriate review method(s) • Select reviewers 	Section 4.1.1
Conduct a usability survey <ul style="list-style-type: none"> • Create a survey plan • Select an appropriate questionnaire • Analyze responses • Report results 	Section 6.2
Perform the role of the Moderator if no separate Moderator is defined	Section 8.2
Perform the role of the Note-Taker if no separate Note-Taker is defined	Section 8.2

8.2 Moderator and Note-Taker

A Moderator performs the following principal tasks:

Task Name	Reference
Participate in the assessment of usability risks	Chapter 2
Conduct a usability testing session: <ul style="list-style-type: none">• Perform pre-session briefing of participants• Run a usability testing session according a usability test script• Communicate with test participant during the usability test session• Perform a post-session interview	Section 5.4
Analyze and discuss findings from a usability review or usability test	Section 5.5
Log usability problems	Section 5.5
Track usability problems to resolution	Section 5.5
Review implemented solutions to usability problems	Section 5.5
Perform the role of the Note-Taker if no separate Note-Taker is defined	(see below)

A Note-Taker performs the following principal tasks:

Task Name	Reference
Record important usability findings	Section 5.6.2
Analyze and discuss findings from a usability review or usability test	Section 5.6.2

9. References

9.1 Standards

The following standards are mentioned in these respective chapters.

- ISO 9241-110 – Ergonomics of human-system interaction
Chapter 3
- ISO 9241-171 – Guidance on software accessibility
Chapter 3
- ISO 9241-210 – Human-centred design for interactive systems
Chapter 1 and 3
- ISO 25066 – Common industry Format for Usability Evaluation Reports
Chapter 3

9.2 ISTQB Documents

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- [ISTQB_FL_AGILE] ISTQB Foundation Level Extension Syllabus, Agile Tester, 2014
- [ISTQB_FL_SYL] ISTQB Foundation Level Syllabus, Version 2015
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9.3 Books

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9.4 Other References

The following references point to information available on the Internet. Even though these references were checked at the time of publication of this syllabus, the GTB cannot be held responsible if the references are no longer available.

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<https://developer.apple.com/library/mac/documentation/UserExperience/Conceptual/OSXHIGuidelines/index.html>
- [Web-2] Android User Interface Guidelines, <http://developer.android.com/design/index.html>
- [Web-3] Microsoft Windows User Experience Interaction Guidelines,
<https://www.microsoft.com/en-us/download/confirmation.aspx?id=2695>
- [Web-4] SAP design guidelines and resources, <https://experience.sap.com/fiori-design/explore/>
- [Web-5] What is SUMI?, <http://sumi.ucc.ie/whatis.html>
- [Web-6] WAMMI – Web Analytics Service, <http://www.wammi.com>
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Chapter 4: [Web-10]

Chapter 5: [Web-9]

Chapter 6: [Web-5], [Web-6]

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