UXQB
International Usability and UX Qualification Board

CPUX-F Curriculum

Certified Professional for Usability and User Experience
Foundation Level

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Publisher: UXQB e.V.

Contact: info@uxqb.org

www.uxqb.org

Author: UXQB e.V.

Contents

Introduction

This document defines what you need to know in order to pass the certification test for Certified Professional for Usability and User Experience – Foundation Level (CPUX-F). The certification test will only cover concepts and knowledge that are described in this document.

Terms that are defined in the curriculum appear in **bold** in definitions and in the introduction to each chapter.

Overview of CPUX-F resources

All relevant information about the CPUX-F certification and other types of CPUX certifications is freely available from UXQB.org – the website of the International Usability and User Experience Qualification Board.

The information on UXQB.org includes:

- A complete list of recognised CPUX-F training providers and available courses. Note that training is recommended but not required in order to take the CPUX-F certification test.
- CPUX-F Curriculum (this document) for download.
- A complete sample set of 40 CPUX-F certification questions with answers for training purposes.

This Curriculum is available in several languages. For currently available language versions, please check UXQB.org

We strongly recommend that you study the complete, publicly available sample set of CPUX-F certification questions carefully before you take the certification test.

Learning Objectives

Learning objectives (LO) are brief statements that describe what you are expected to know after studying a section. They are presented in a table at the start of each section.

In this curriculum, all Learning Objectives are characterised by the keyword Understand. “Understand” means that you must be able to recognise the corresponding concepts even when they are described using words that differ from the ones used in the curriculum. You must also be able to correctly recognise examples of these concepts.

The curriculum contains many examples. To test your understanding, the examples used in examination questions differ from the examples used in this curriculum.

Acknowledgments

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- Holger Fischer (Convenor)
- Thomas Geis
- John Goodall
- Rüdiger Heimgärtner
- Rolf Molich (Editor)
- Sandra Murth
- Elvi Nissen
- Knut Polkehn
- Matthias Reisemann (Co-editor)
- Michael Richter
- Chris Rourke
- Guido Tesch

The following persons contributed to previous versions of the document: Chris Bailey, Nigel Bevan, Kay Behrenbruch, Oliver Kluge, Julian Roland, Norbert Zellhofer, Peter Hunkirchen.

1 Human-centred design

Human-centred design (HCD) is an approach to **interactive systems** development that focuses on the use of the **interactive system** and applies usability and UX knowledge and methods.

Human-centred design is based upon an explicit understanding of **users**, **goals, tasks, resources** and **environments**. **Users** are involved throughout the design. The design is driven by user requirements and refined by **usability evaluation**. A human-centred design process is iterative – that is, refinement continues until the **user requirements** are met. Human-centred design addresses the whole **user experience** (UX).

Learning Objectives	
1.1	Understand the basic elements of human-centred design: involving users; iteration based on frequent usability evaluation; addressing the whole user experience
1.2	Understand the HCD activities and their interdependency
1.3	Understand the purpose of each deliverable of the HCD activities

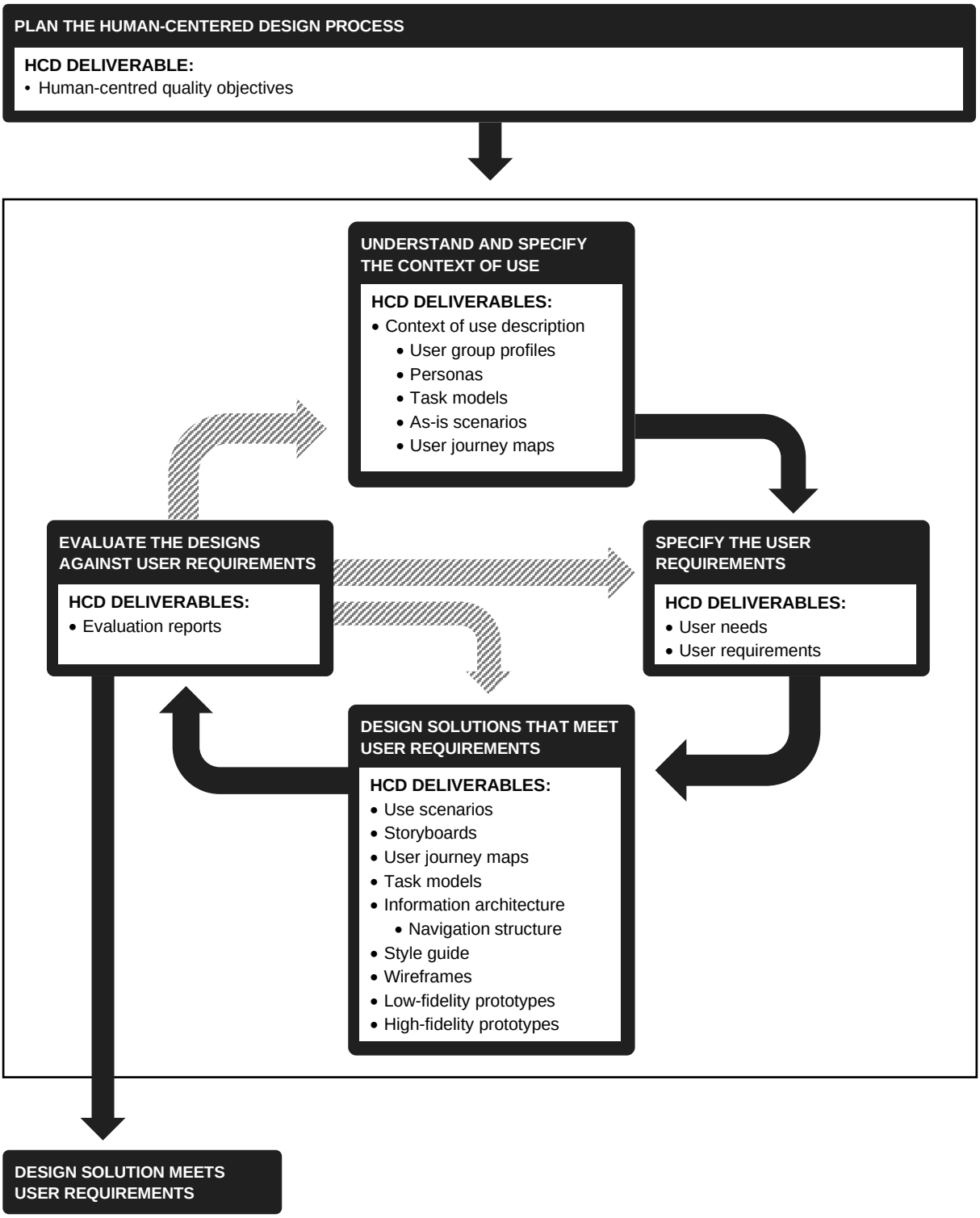


Figure 1. The interdependence of human-centred design activities according to the ISO 9241-210 standard. Appendix B contains an accessible, text-only description of this figure.

The black rectangles in Figure 1 show the 5 key HCD activities in iterative, human-centred design. “HCD deliverables” are common outputs from the corresponding HCD activity. All HCD deliverables in Figure 1 are defined in the curriculum. The hatched arrows represent iteration.

Human-centred design means planning for iteration, getting user feedback as early and as often as possible, and acting on the feedback. It is perfectly acceptable to iterate with lightweight HCD deliverables, for example in agile development.

The box surrounding the four activities in Figure 1 indicates that human-centred design can start at any point (‘Understand the context of use’ or ‘Specify the user requirements’ or ‘Design solution’ or ‘Evaluate the design’) depending on the project. Regardless of the starting point, a thorough understanding of the context of use is essential.

Example 1: In a project to identify the potential for innovation in an already successful system, the project starts with understanding the context of use to extend the knowledge of the context of use.

Example 2: Where the context of use, in particular users and their tasks, are well-known and documented, for example, from a previous project, the project starts by specifying user requirements.

Example 3: When the visual appearance of an existing system is to be improved, the project starts with design, provided that the context of use and the user requirements are well-known.

Example 4: Where users complain about an existing system and the context of use is well-known, the project starts with a systematic evaluation of the system.

Human-centred design

An approach to design that aims to make interactive systems more usable by focusing on the use of the interactive system and applying human factors, ergonomics and usability knowledge and methods.

This document provides an overview of human-centred design. Although it addresses the planning of human-centred design, it does not address all issues of project management.

The term “human-centred design” is used rather than “user-centred design” to emphasise the need to consider users and other stakeholders.

2 Basic concepts

Human-centred quality is a measure of an interactive system's **usability**, **user experience**, **accessibility** and **avoidance of harm from use**.

Usability is the extent to which an **interactive system** is **effective, efficient** and **satisfying** to use in a specified **context of use**.

An **interactive system** is **effective** if it supports what **users** need to do to reach their **goals**, and if **users** can figure out how to do it. It is **efficient** if it supports **users** in completing their **tasks** quickly and without having to think too much. It is **satisfying** if it meets users' expectations and is pleasant to use.

User experience (UX) considers **users'** anticipated use, their **satisfaction** during use and the fulfilment of their expectations after use (whereas **usability** considers **satisfaction** only during use).

Accessibility is the extent to which an **interactive system** enables **users** to interact with it, regardless of their level of vision, hearing, dexterity, cognition, physical mobility, etc.

Avoidance of harm from use aims to minimise the risk of serious negative consequences that could result from the use of the interactive system.

In a **user-system interaction**, the **user** interacts with an **interactive system** via the **user interface**, which is made up of many **user interface elements**. A **user interface element** is a basic component for **user-system interaction**.

Learning Objectives	
2.1	Understand the concept: human-centred quality
2.2	Understand usability and its three main criteria
2.3	Understand user experience (UX)
2.4	Understand the difference between usability and user experience
2.5	Understand the concepts: interactive system, user-system interaction, user interface and user interface element
2.6	Understand what accessibility is
2.7	Understand important assistive technologies
2.8	Understand avoidance of harm from use

Human-centred quality

The extent to which requirements for usability, user experience, accessibility and avoidance of harm from use are met.

Human-centred quality is the overall goal of human-centred design. For examples, see Human-centred quality objectives.

There are other quality dimensions besides human-centred quality, including technology-centred quality and business-centred quality.

Usability

The extent to which an interactive system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

Usability depends on users, goals and tasks and other aspects of the context of use.

Technical defects may lead to usability problems if they prevent users from solving their tasks effectively or efficiently.

Effectiveness

The accuracy and completeness with which users achieve specified goals.

Accuracy is the extent to which an actual outcome matches an intended outcome.

Completeness is the extent to which the use of the system, product, or service produces all intended outcomes.

Completeness can be measured as the success rate: (Number of users who achieve a specified goal) / (Number of users who attempt to reach the specified goal).

Examples:

- A hotel's website does not offer users any opportunity to cancel a booking. An analysis of the context of use shows that users need this function. There is a problem with the effectiveness of the website.
- A hotel's website enables users to cancel a booking. A usability test shows that only 5 out of 100 users are able to figure out how to cancel their booking. Those who are able to figure out how to do it, do so quickly. There is a problem with the effectiveness but not with the efficiency of the website.

Efficiency

The resources used in relation to the results achieved.

Resources include time, human effort, financial and material resources.

Efficiency is the attribute of usability that focuses on being able to accomplish a goal using acceptable amounts of resources.

Examples:

- A hotel's website enables users to cancel a booking. A usability test shows that the cancellation procedure is needlessly complicated even though all usability test participants finally manage to cancel their bookings. The effectiveness of the website is OK, since all users manage to achieve their goal. There is a problem with the efficiency of the website.
- Sluggish response caused for example by an overloaded interactive system results in prolonged waiting time and reduced efficiency.

Satisfaction

The extent to which the user's physical, cognitive and emotional responses that result from the use of an interactive system meet the user's needs and expectations.

Effectiveness and efficiency may influence satisfaction and thus user experience. For example, low effectiveness or low efficiency may lead to low satisfaction.

Satisfaction may influence effectiveness and efficiency. For example, frustration may cause users to quit a task, which influences effectiveness.

Satisfaction is often measured using a user survey. User surveys are described in section 7.3.

Examples of dissatisfaction and satisfaction:

- Users say that using a laptop without an external mouse is uncomfortable.
- Users say that it "takes forever" to book a room on a hotel's website.
- Users spontaneously say that they like the appearance of the home page of a hotel's website.

User experience

A user's perceptions and responses that result from the use and/or anticipated use of an interactive system.

Users' perceptions and responses include the users' emotions, beliefs, preferences, comfort, behaviours and accomplishments that occur before, during and after use.

User experience is a consequence of brand image, appearance of the interactive system, functionality, system performance, interactive behaviour and assistive capabilities of the interactive system. It also results from the user's internal and physical state resulting from prior experiences, attitudes, skills, abilities and personality; and from the context of use.

User surveys can be used to evaluate aspects of user experience.

Usability is mainly about the interaction with the interactive system. User experience also takes into account what happens before and after the interaction through to final use and recollections of use. See the examples below.

User experience is often referred to as UX.

The following figure shows the relationship between user experience and usability. Usability refers to effectiveness, efficiency and satisfaction during actual use, while user experience

encompasses the overall level of satisfaction or dissatisfaction experienced before, during and after use.

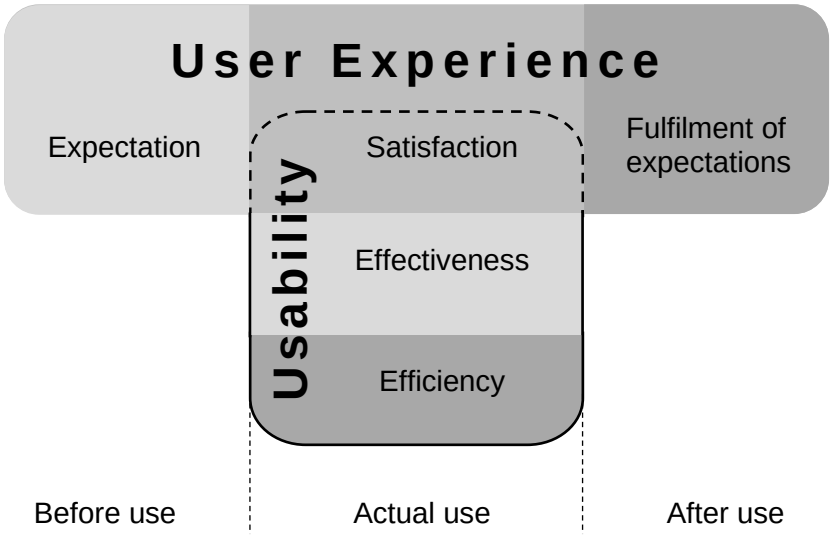


Figure 2. The relationship between user experience and usability. Appendix C contains an accessible, text-only description of this figure.

Examples that illustrate the difference between usability and user experience:

When ordering flowers for delivery from a florist's website:

- Usability problems encountered during checkout affect both the user experience and usability.
- The quality of the physical flowers delivered affects only the user experience. It does not affect the usability of the website.
- The experience of visiting the physical store affects the user experience of subsequent visits to the website. It does not affect the usability of the florist's website.
- High prices or unacceptable terms of service on the website are not part of usability because usability is about the usage of the website. They may influence the user experience.

Accessibility

The extent to which an interactive system enables users to interact with it effectively, efficiently and with satisfaction, regardless of their level of vision, hearing, dexterity, cognition, physical mobility, etc.

Standards and guidelines for accessibility are available; standards may be legally enforced in some markets. Relevant guidelines include W3C's Web Content Accessibility Guidelines (WCAG) 2.1 and ISO 9241-171, Guidance on software accessibility.

Assistive technologies, such as screen readers, may be used by people with visual impairments to help them interact with an interactive system. Screen readers rely on the addition of descriptions, for example alt tags, to the code of non-textual elements, such as pictures and diagrams, to convey their meaning.

Examples:

- Lift call buttons are positioned at a height that makes them accessible to users who are standing as well as those in a wheelchair.

- The text on a website is large enough and has sufficient contrast with the background so that users with a visual impairment can read it.
- The controls of an online video player – such as volume, play and pause – can be operated with a keyboard and have accessible labels so that their purpose can be communicated to assistive technology such as screen readers.

Avoidance of harm from use

The extent to which negative consequences to health, safety, finances or the environment that result from use of the interactive system are minimised.

Negative consequences can impact any stakeholder, for example, users, other people, organisations using or affected by the interactive system or its output, and organisations developing, supplying or acquiring the interactive system.

Complete avoidance of harm from use – that is, eliminating all exposure to risk that poses potential harm – typically cannot be achieved. The design of an interactive system should ensure that exposure to risk is kept to an acceptable minimum.

Avoidance of harm from use is particularly relevant for manufacturers of interactive systems where use errors can lead to severe consequences, for example, medical devices, cars and airplanes. Risk management identifies the tasks that may harm the user. Usability tests focus on checking if the execution of these tasks is fully understood and that any harm that could occur is minimised.

Examples of avoidance of harm from use:

- Touchscreen input for a car navigation system is disabled if the car is travelling above a certain speed.
- When abroad, users receive a message on their phones, informing them of data roaming fees. Users must explicitly confirm that they wish to turn on data roaming, thereby avoiding accidental financial harm.
- Some coin batteries have a coating that makes them taste bitter. If a child puts the battery into their mouth, they will immediately spit it out.

Interactive system

A combination of hardware, software and services that users interact with in order to achieve specific goals.

This includes, where appropriate, packaging, user documentation, online help, support and training.

Examples:

- The packaging can be part of an interactive system. A usability study of a TV set can address the device itself, or the unboxing process, for example, the usability of the packaging, the setup process and the user documentation.
- Even systems that do not accept input from users are covered by this definition, for example, arrival and departure boards in an airport or a train station.

User-system interaction

An exchange of information between a user and an interactive system via the user interface to complete the intended task.

The user interacts with the interactive system via the user interface.

User interface

All components of an interactive system (software or hardware) that provide information and controls for the user, to allow them to accomplish specific tasks with the interactive system.

A user interface is made up of many user interface elements.

User interface element

A basic component of a user interface that is presented to the user by the interactive system.

User interface elements are the basis for creating the functions that users need in order to complete tasks with the interactive system.

User interface elements may or may not be interactive

Examples:

- Common examples of user interface elements include paragraphs of text, hyperlinks, buttons, radio buttons, check boxes and tool tips.
- A single word in a paragraph of text or the words on a push button are not user interface elements.
- A log-in window, consisting of some text, two input boxes (for user name and password), and a log-in button, is not a user interface element; it comprises several user interface elements.

3 Plan a human-centred design project

Planning a **human-centred design** project involves determining the appropriate HCD techniques and deliverables, the HCD activities needed to produce those deliverables, and the people, resources and timelines required to produce them. The level of user involvement is dependent on the quality objectives and constraints of the specific project.

Planning also includes defining the **human-centred quality objectives** in cooperation with **users** and other **stakeholders**.

Learning Objectives	
3.1	Understand what the planning activities for a human-centred design project are
3.2	Understand what human-centred quality objectives are

Human-centred quality objective

An intended outcome of the development of an interactive system for the user, relating to usability, accessibility, user experience, or avoidance of harm from use.

Human-centred quality objectives define what the interactive system should achieve for the user. They are established during planning. Human-centred quality objectives are qualified guesses. They may be revised as more insight is gained into the context of use.

The purpose of human-centred quality objectives is to guide stakeholders in considering key quality objectives for the users throughout the project. Ideally, users are part of the project team from the very beginning of the project.

Examples of human-centred quality objectives:

- Travelers to the US must be able to pass through immigration twice as quickly as before (usability, efficiency).
- Blind users must be able to recognise and understand the content of the website (accessibility).
- Users must have a feeling of complete privacy when using the electronic voting booth (user experience).
- Doctors must not be able to prescribe drugs that are incompatible with each other (avoidance of harm from use).

The objectives should be supplemented with specific, actionable and measurable criteria that are designed to achieve the objectives for the user who is using the interactive system. For example, the website conforms to all vision-related success criteria in the Web Content Accessibility Guidelines (WCAG) 2.1.

4 Understand and specify the context of use

The purpose of this activity is to understand and describe the **context of use**, that is, who the **users** are, what they do, what problems they have, and what their needs are.

The **context of use** has five components: **users**, **goals** (what **users** want to achieve), **tasks** (what **users** do to achieve their **goals**), **environments** (the conditions under which the interaction takes place) and **resources** (the means required to perform the **tasks**).

Stakeholders are individuals or organisations with an active interest in an **interactive system**. All **users** are **stakeholders**, but not all **stakeholders** are **users**. Users can be **primary users**, **secondary users** or **indirect users**.

To determine the **context of use**, UX professionals conduct **contextual interviews**, **focus groups** and **user surveys**, and **observe** users performing **tasks**.

Contextual interviews gather information about the **context of use** for a planned **interactive system**. A **contextual interview** takes place at the location where **users** usually perform **tasks** related to the **context of use**. An **interview** takes place in a neutral environment, for example in a meeting room.

During a **contextual interview**, the interviewer treats the interviewee as the master while the interviewer is the humble apprentice (**master-apprentice model)**. The interviewer should use **open** and **neutral** interview questions rather than **closed** and **leading questions** to avoid influencing the interviewee. The interviewer should rely on an **interview guide** to ensure that all relevant topics are addressed; the interview guide should not be used to control or steer the **interview**.

Focus groups are moderated discussions of predetermined subjects and questions between members of one or more **user groups**.

In a **user survey**, **users** are asked to report facts and opinions about the **context of use** in a questionnaire.

A **context of use description** is a set of deliverables that describe the **context of use**. It consists of **user group profiles** and **personas** (who the **users** are), and **as-is scenarios**, **task models** and **user journey maps** (how **users** currently perform **tasks**).

A **user group profile** is a generalised description of a **user group**, that is, a group of **users** with the same or similar personal characteristics and **contexts of use**.

A **persona** is a description of a fictitious but realistic **user** and what the **user** intends to do when using the **interactive system**. The purpose of **personas** is to create empathy for **users**.

An **as-is scenario** is a narrative text description of the **context of use** that illustrates how **users** complete their **tasks** in a specified **environment**.

Task models help UX professionals and **stakeholders** understand **tasks** they are not familiar with. A **task model** is a list of **subtasks** for each **task** which **users** have to complete to reach their **goals**.

User journey maps provide overviews of the touchpoints where **users** interact with the **interactive system** and the organisation providing the **interactive system**.

Learning Objectives	
4.1	Understand the concept: context of use
4.2	Understand the concept: user
4.3	Understand the differences between primary, secondary and indirect users
4.4	Understand the concept: stakeholder
4.5	Understand the concepts: user group and user group profile
4.6	Understand the concept: goal
4.7	Understand the concept: task
4.8	Understand the difference between a task and a subtask
4.9	Understand the concept: environment and its conditions
4.10	Understand the concept: resource
4.11	Understand how and why a user survey is applied in a context of use analysis
4.12	Understand what a focus group is
4.13	Understand what observation is
4.14	Understand what a contextual interview is
4.15	Understand the difference between an interview and a contextual interview
4.16	Understand the master-apprentice model
4.17	Understand the interview guide
4.18	Understand the differences between open, closed, neutral and leading questions
4.19	Understand what an as-is scenario is
4.20	Understand what a persona is
4.21.	Understand what a task model is
4.22.	Understand what a user journey map is and what touchpoints are

Context of use

A combination of users, goals and tasks, resources and environments.

The context of use is determined through the analysis of observations, contextual interviews, focus groups and user surveys. The results are described in the context of use description.

Examples of contexts of use, users, goals and tasks, environments and resources:

Interactive system “messaging app”:

- Context of use: Teenagers on a bus use their phones to send messages to their friends to make them laugh.
  - Users: Teenagers;
  - Goal: Make friends laugh;
  - Task: Send message;
  - Environment, social condition: Friends:
  - Environment, physical condition: Bus;
  - Environment, technical condition: Connectivity;
  - Resource: Phone.

Interactive system “text processor”:

- Context of use: Secretaries in a school office use computers to create certificates for students in time for graduation; they validate the certificates with stamps.
  - Users: Secretaries;
  - Goal: Have the validated certificates ready in time for graduation;
  - Task: Create certificates;
  - Environment, social condition: School staff and students;
  - Environment, physical condition: School building and school office;
  - Resource: Stamp and computers.

Context of use description

A set of deliverables describing the users, goals, tasks, resources and environments identified through the analysis of observations, contextual interviews, focus groups and user surveys.

The context of use description is the basis for identifying user needs and tracing them back to their sources: interview, observation and focus group notes, and user survey data.

Context of use description	Components of the context of use covered
User group profiles	Users
Personas	Users, goals
As-is scenarios	Users, goals, tasks, resources and environment
Task models	Goals, tasks
User journey maps	Users, goals, tasks, resources and environment

User

A person who interacts with an interactive system, or who uses the output of the system.

A user is one of the following:

- **Primary user**: a user who uses the interactive system for its intended purpose.
- **Secondary user**: a user who carries out support tasks with the interactive system, for example to maintain it or to train primary users.
- **Indirect user**: a user who uses the output of the interactive system, but who does not interact directly with it.

The distinction between primary, secondary and indirect users is important, because

- sometimes one or more of these user groups are overlooked;
- the needs of secondary and indirect users must be considered when designing for primary users; for example, an interactive system may need to ask for information that is important to secondary users but may not seem important to primary users, such as 'reason for purchase'.

  Examples:
  - A customer uses a hotel booking website to book a room; the customer is a primary user of the system.
  - A customer calls the booking centre where a customer service representative uses the same system to book the room for them; the customer is an indirect user of the system.

Primary user

A user who uses the interactive system for its intended purpose.

Examples of primary users:

- A bank customer who uses a cash dispenser to withdraw money is a primary user of the cash dispenser.
- A call centre operative who uses a system to book hotel rooms for customers is a primary user of the booking system.

Secondary user

A user who carries out support tasks with the interactive system, for example to maintain it or to train primary users.

Secondary users – in particular maintenance staff – typically interact with a different user interface than primary users. Sometimes, secondary users carry out specialised tasks using the same user interface as the primary users. These user interfaces also require context analysis and specification of user requirements to be usable.

Examples of secondary users:

- A user who prints a document on a printer is a primary user of the printer. When the same user a moment later changes the ink on the printer, they are a secondary user of the printer.
- A bank employee who restocks a cash dispenser with cash is a secondary user of the cash dispenser.

- A trainer who teaches a call centre operative how to use a hotel booking system is a secondary user of the booking system.

Indirect user

A user who uses the output of the interactive system, but who does not interact directly with the interactive system.

Examples of indirect users:

- A bank customer who receives a paper or electronic statement is an indirect user of the bank's computer system.
- A customer who contacts the call centre to book a hotel room is an indirect user of the computer system used by the call centre operative to make the booking.

Stakeholder

An individual or organisation with an active interest in an interactive system.

All users are stakeholders, but not all stakeholders are users. To highlight the distinction, it is acceptable to use the phrase "users and other stakeholders".

Stakeholders are not considered to be users if they are affected by an interactive system but do not interact with it or use its output.

The interests of stakeholders who are not users are represented by market requirements and organisational requirements.

Stakeholders who may not be users might include designers, developers, managers of development teams, shareholders, board members and marketing professionals.

Examples:

- Developers of a supermarket's self checkout system are stakeholders. If they use the check-out system for their weekly purchases, they are also users.
- Developers of a flight control system are stakeholders; they are unlikely to be users.
- Investors in a company that develops flight control systems are stakeholders; they are unlikely to be users.

User group

A group of users with the same or similar personal characteristics and contexts of use related to the interactive system.

User group profile

A generalised description of a user group.

Example of a user group profile for "Home-movers", a user group for the website of a van rental company:

Home-movers are people who rent a van because they want to move house. Most rentals are booked in advance and last 2-3 days. Most home-movers are one-time only customers.

Home-movers have no particular experience with vans – they are used to smaller cars. They are unfamiliar with business terms and conventions in van rental.

Home-movers are reasonably familiar with the internet and are reluctant to provide their email address unless there is an explicit guarantee that they will not receive spam emails as a result.

Goal

The intended outcome.

Goals are the intended outcome of the task. They express what users want to achieve when carrying out a task with an interactive system. Goals are understood by interviewing users in the context of use.

Examples of goals

- For users of a ticket app: “The user knows that they have a valid ticket”
- For users of an automated parking system: “The car is in a parking space without the driver having had to park it”
- For users of a bookseller’s website: “The user has bought an appropriate guidebook for their holiday in Porto, Portugal”
- For users of a bookseller’s website: “The user can start reading the e-book immediately after paying for it”

Task

A set of activities undertaken in order to achieve a specific goal.

Most tasks can be broken down into subtasks.

Tasks are suitable as the basis for usability test tasks because they achieve users’ goals with the interactive system.

A task, the reason for starting the task, the subtasks that have to be carried out to complete it, and the goal it supports, can be described in a task model.

Examples of tasks:

- Book a hotel room
- Cancel a hotel booking

Subtask

A step undertaken to complete a task.

Subtasks describe the decisions and actions needed to complete a task. The interactive system should support users' choices and inputs when carrying out subtasks.

Subtasks are unsuitable as usability test tasks, because completion of a subtask does not in itself achieve a goal from the user’s point of view.

Examples of subtasks for the task “Book a hotel room”:

- Register on a hotel booking website.
- Log in to a hotel booking website.

The subtask, “Log in to a hotel booking website” comprises choices and inputs, such as:

- enter the user name;
- enter the password;
- tick the ‘Remember me’ checkbox.

Environment

The physical, social and technical conditions in which a user interacts with an interactive system.

The physical conditions relate to everything that has a physical parameter assigned to it, for example, room size (in square meters), luminance (in lumen), noise (in decibels).

The technical conditions relate to access to energy and connectivity, for example, wi-fi access, power sockets, a telephone line.

The social conditions relate to the aspects of life that are shaped by society, for example, working conditions, laws and regulations, access to information, and colleagues.

Resource

All means required to achieve an intended outcome in the context of use.

Resources can be

- Reusable – for example, equipment and information; or
- Exhaustible – for example, time, human effort, financial resources and materials.

Examples of equipment are smartphones, printers and computer mice.

Examples of materials are paper and ink cartridges.

Observation

A method for gathering contextual information relating to user needs in which a UX professional watches users who carry out tasks using the interactive system.

The observer behaves unobtrusively except that they may ask an occasional clarifying question.

If no interactive system is available, existing procedures can be observed.

Observation should take place in a context that is as natural as possible, for example at the user’s workplace, their home or in a shop.

Users can be observed remotely, for example:

- by observing the user’s behaviour when using a web application using a video link over the Internet.
- by recording the user’s actions by screen recording and analysing the videos later on.

The outcome of an observation is documented in the observer’s notes.

Interview

A data-gathering method where carefully selected individuals are asked questions to gain a deep understanding of the context of use.

The purpose of interviews is to identify user needs. Through inquiry and interpretation, an interview reveals commonalities and differences across the user base.

In an interview, the interviewer (a UX professional) typically conducts a briefing and then encourages the user to talk about the current context of use in the light of an existing or planned interactive system. The interviewer uses an interview guide to ensure that all relevant topics are covered.

A low-fidelity prototype based on preliminary data collected from users through previous observation and interviews may be discussed or even evaluated with users as part of an interview to clarify the understanding of the context of use.

While users are experts in the current context of use, they are not necessarily experts in designing solutions for interactive systems. The interviewer should try to understand the user needs behind any suggestions for the new interactive system.

Successful interviewers
- use open questions and avoid closed questions;
- use neutral questions and avoid leading questions;
- do not talk too much;
- use an interview guide but remain flexible;
- prepare for the interview;
- remain curious;
- check their notes before the interview participant leaves so they never leave unsure about what the user said and meant.

Users can be interviewed remotely, for example, using a video link over the internet.

Important insights from an interview are documented in interview notes. The interview notes may also contain relevant information provided by the interview participant, such as suggestions and ideas regarding the planned interactive system.

Notes from several interviews, observations and user surveys are analysed to create as-is scenarios, user group profiles, personas, user journey maps and task models

Contextual interview

An interview that takes place at the location where users usually perform tasks related to the interactive system.

Whenever possible, interviews should be done contextually, because users may omit important details, believing: “Everybody knows that”, or “That is not worth mentioning”.

The goal of an interview is to have a conversation, dig deeper and ask clarifying questions. This is still possible if the interview is non-contextual, and a non-contextual interview that focuses on the context of use is better than no interview at all.

Interviews conducted in a meeting room, in a video meeting, or over the phone are non-contextual interviews.

Interview guide

A written list of suitable questions and cues used by the interviewer during an **interview** to make sure that all relevant topics are covered.

An interview guide can be adapted between interviews based on the insights that the interviewer has gained.

Master-apprentice model

A technique for a successful interview: The interviewer treats the user as the master while the interviewer is the apprentice. The goal of the master-apprentice model is to understand users' goals and tasks in detail by learning them as an apprentice would.

The interviewer asks because they sincerely want to learn – not because they want to demonstrate their knowledge.

Everything the master says is taken seriously. Sometimes the apprentice must ask several questions in order to fully understand the master – the interviewer must never leave unsure about what happened.

Typical mistakes include:
- interrupting the master;
- attempting to influence the master;
- doubting or trying to correct the master;
- using the interview guide to steer the interview rather than letting the master address issues in the way they prefer.

Open question

A question in an interview that does not give any indication of the expected format or content of the answer.

Open questions are desirable in interviews because they invite users to start talking and provide extensive answers to questions.

Closed question

An interview question that requires an answer from a predetermined set of alternatives.

Examples of predetermined sets of alternatives are "yes" and "no", or an age.

Avoid several closed questions in sequence. They stop users talking because they sound like a police interrogation.

Example:
- Closed question: "Have you ever booked a flight online?"
- A corresponding open question might be: "Please tell me about the last time you booked a flight online."

Neutral question

A question in an interview that has no built-in assumptions, and no frame that excludes anything or directs the reply in a certain direction.

Examples of neutral (and open) interview questions:

- "What happened?"
- "What do you mean by that?"
- "Can you give me an example of this?"
- "What are your options now?"
- "What information should the airline's home page provide?"

Leading question

A question in an interview that signals a preference for certain possibilities or attempts to direct the reply in a certain direction.

Examples of leading questions:

- "Would you like to be able to split customers by how much they trade with the company annually?"
- "What advantages does the current hotel booking website offer for your choice of hotel?"

Focus group

A moderated discussion of predetermined subjects and questions between members of one or more user groups.

The purpose of a focus group is to gain a deep understanding of selected subjects and key context of use questions from different perspectives in a group setting.

Participants may include stakeholders.

The moderator should use an interview guide.

A focus group typically has 4 to 8 participants. The duration depends on the depth and breadth of the research questions.

Focus groups cannot be used for usability evaluation. Focus groups are about attitude and opinion, stated and discussed in a group setting. In comparison, usability tests are about observing actual user behaviour.

User survey

A data-gathering method where users are asked to report facts and opinions by completing a questionnaire.

User surveys can be used to gather information about the context of use as explained in this definition. They can also be used to measure satisfaction or user experience (Section 7.3).

User surveys used to collect context of use information about an existing or future interactive system often consist of open questions that require free text responses.

Examples of questions in a user survey for gathering information about the context of use for a car rental website:

- "Have you ever rented a car? If so, how often do you rent a car?"
- "When did you last use a car rental website? Why were you using it? Where were you when you used it? What was the experience like? What did you enjoy most? What was most in need of improvement?"
- "What do you expect from a car rental website?"

A significant number of user survey responses (hundreds or more) is required for the results to be statistically reliable.

It is very important to test user surveys under development, to ensure questions are understood correctly by those who are expected to answer the questionnaire.

As-is scenario

A narrative text description of how a user currently completes one or more tasks in the current context of use.

The primary purpose of as-is scenarios is to identify user needs.

An as-is scenario describes how one or more tasks are carried out in the current context of use in a way that can be understood by all stakeholders and interview participants. This allows them to be used as a basis for discussion with stakeholders.

The specific user in the as-is scenario is often a persona.

As-is scenarios are developed together with personas, as thinking about users in their current context of use involves thinking about what they want to do and how they might do it, and thinking about activities involves thinking about who will be undertaking them.

As-is scenarios should be reviewed by users to detect misunderstandings that may have occurred during contextual interviews.

As-is scenarios describe how users carry out tasks in the current context of use. In contrast, use scenarios, created during design, describe how users will carry out tasks with the future interactive system.

Example:

- "John Miller is a business traveller who often takes flights in the course of a week. He prefers to take his car to the airport. But every now and then he misses a flight and then regrets not having taken a taxi or tram to the airport. He simply underestimates the queues at the front of the car park and the walking time to the gate."
  Compare this example to the corresponding example in use scenario.

Persona

A description of a fictitious but realistic user and what they intend to do when using an interactive system.

Personas are not real people; they are realistic representations of users, constructed from observations or interviews.

The purpose of personas is to create empathy for users among stakeholders; they bring users in the current and planned contexts of use to life through examples that are easily understood and can be discussed with all stakeholders.

Personas are useful in considering the goals, desires, limitations, fears and frustrations of a user group to help guide design decisions about an interactive system.

Personas typically have a name, age, some background, goals and aspirations. A persona description should include information about the persona's knowledge about and interest in the main subject of the interactive system. Including a photo helps to create the illusion of a real person.

Carol Becker, 64, Stoke-on-Trent (UK):
"It must be simple and trouble free"

Education: Secondary school.
Occupation: Helps out at the local library.
Family status: Widowed. Two children live in the London area with their families.
Hobbies and interests: Cooking and gardening.

Carol Becker lives in a large, old house several miles outside Stoke-on-Trent, which is south of Manchester.

Mrs. Becker has an old computer. She uses it to maintain and extend her extensive collection of cooking recipes and to keep in touch with the family via e-mail. She also does a bit of online shopping, "because the selection is huge and the products are cheap and brought right to my door." She only visits websites of stores that she knows, "because I am worried about scams and online fraud."

Her children gave her a smartphone for Christmas. Her son helped her install her favourite apps. She uses apps from her local stores to redeem coupons. She also communicates with her children using social media.

Mrs. Becker obtained a driver's license 45 years ago. She sold the car when her husband died three years ago. She rents a car once or twice a year when she visits her children, or when she goes to Manchester to do some power shopping. She always uses the same well-known car rental company because they provide good service and because she was able to rent a car on their website without assistance the first time she tried.

Figure 3. Example of a persona for a car rental website.

Task model

A description of a task consisting of the reason for starting the task, the goal it supports, and the subtasks that have to be carried out in order to complete it.

The purpose of a task model is to help UX professionals and stakeholders understand tasks with which they are unfamiliar.

They also help UX professionals understand the context of use in complex domains. For example, when creating an interactive robotic system to assist in kidney surgery, surgeons, surgical nurses and UX professionals can develop task models together to help the UX professional understand the complex context of use.

Task models also help designers understand what users do and the decisions they take while performing a task. This allows designers to create a future system that is suitable for the task.

Task models are created as part of specifying the context of use. They are modified during design and describe how tasks are completed with the proposed interactive system.

In low-complexity domains, task models are usually represented by prototypes, rather than being documented explicitly.

Example of a low-complexity task model:

Setting:
- Interactive system: Ticket machine for public transport.
- User group: Tourists using public transport.

- Goal: The user has purchased a suitable ticket.
- Situation that triggers the task (also called “contextual precondition”): The user has decided they need to be at a specific location at a specific time and will use public transport to get there.
- Task: Purchase a ticket for travel from the user’s current location to a specific destination using public transport.

Subtasks:

- Identify the available modes of transport to the destination, for example bus or underground.
- Establish the departure time for each mode of transport, factoring in any transfers.
- Establish the costs for each mode of transport.
- Select the preferred mode of transport (based on departure time; duration; cost; any preferences for specific modes of transport).
- Pay for the ticket.
- Take the ticket.

User Journey Map

A linear depiction of a user’s interaction with the interactive system and the organisation behind it covering encounters that influence the user experience.

The purpose of a user journey map is to provide an overview of a user’s journey through the interactive system and the associated encounters with the organisation so they can be discussed with users and other stakeholders. These encounters are often referred to as touchpoints.

User journey maps extend beyond the pure interaction, for example, from the discovery of a car rental website to renting the car, picking it up, driving it and returning it.

User journey maps include the risks, opportunities and pain points the user encounters at each touchpoint, and a sentiment line. These help to illustrate the user’s emotional experience throughout the journey. Focusing on pain points allows teams to discuss and find ways of improving the user experience.

User journey maps can be created during analysis to describe existing pain points. They can be adapted or created during design to illustrate how the future interactive system will solve these pain points. The sentiment line is still important in a user journey map created during design as it may depict problematic stages that are beyond the scope or control of the current project, or moments of delight.

Users and other stakeholders can be invited to participate in the creation of user journey maps to help validate and challenge them.

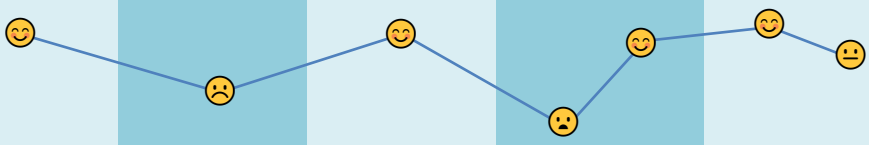
User task	**Look for a car rental company**	**Call to ask questions**	**Rent a car**	**Complete paperwork at the office**	**Pick up the car**
Touchpoint	Search engine.	Customer support.	Website.	Office. Staff at rental desk.	Car (condition of car and equipment).
Risks	Does not find our company.	Long wait. Grumpy customer support representative .	Cannot figure out how to rent a car. Gets wrong price.	Cannot find the office. Staff sloppily dressed. Long wait.	Cannot find the car. Car is damaged or dirty or smells.
Opportunities	Our company looks attractive at first glance.	Engaged supporter.	Easy to rent a car.	No wait. Well-dressed and courteous staff.	Car is parked at the office. Car is in perfect condition.
Mrs. Becker's experience					
Mrs. Becker's comments	"The website came up as one of the first search results and seemed to be exactly what I looked for."	"I spent 15 minutes on hold before my questions were answered. While I waited I had to listen to awful music."	"It was surprisingly easy to rent the car – I didn't need any help."	"At the rental office, the total price was higher than I expected because I had overlooked a substantial fee on the website." "When they noticed that I was unhappy about the fee, they offered me a free upgrade."	"The car was clean, new and in perfect order." "There was no instruction manual in the car, so I had to call to find out how to start the windscreen wiper."

Figure 4. Excerpt from an example of a user journey map with touchpoints for a persona, Mrs. Becker, who makes a trip using a rented car: The persona, Mrs. Becker, is described in Figure 3.

5 Specify the user requirements

User requirements are precise criteria from the users' point of view that must be met by the **interactive system** before its release.

User requirements are derived from **user needs**. **User needs** are identified by analysing the **context of use description**. A **user need** does not need to have been explicitly voiced by a **user**. The following table compares user needs and user requirements.

	User needs	**User requirements**
Key purpose	Understand what is necessary to reach user goals	Guide the design and serve as criteria for accepting the solution
Derived from	Context of use description	User needs whenever possible, otherwise context of use description
Can they mention a solution?	No. They must be independent of any solution	They specify what users must be able to perform on the system, but do not specify the solution itself.
Must they be verifiable?	No, they do not need to be	Yes

User requirements must be verifiable to determine whether a design solution fulfils them.

Market requirements are aimed at maximising business opportunities, sales and use. **Organisational requirements** are organisational rules that **users** have to follow when conducting their **tasks**. **Market requirements** and **organisational requirements** are not **user requirements**; they are included in this curriculum because they are often confused with **user requirements**.

Learning Objectives	
5.1	Understand the concept: user need
5.2	Understand the relationship and difference between a user need and a user requirement
5.3	Understand the concept: user requirement
5.4	Understand the difference between market, organisational and user requirements
5.5	Understand the difference between qualitative and quantitative user requirements

User need

A prerequisite identified as necessary for a user, or a user group, to achieve a goal, implied or stated within a specific context of use.

User needs serve as a helpful intermediate step in the transformation of the context of use information into comprehensive and valid user requirements.

A user need is independent of any proposed solution; it must not reference, for example, “the system” or “the website”.

User needs are identified based on various approaches including interviews with users, observations, user surveys, usability evaluations, expert analysis, etc.

User needs often represent gaps or discrepancies between what is and what should be.

Examples of user needs:

- During a presentation with a fixed time limit (context of use), a presenter (user) needs to know how much time is left (prerequisite) in order to complete the presentation in time (goal).
- As part of monitoring the cash flow (context of use), an account manager (user) needs to know the number of invoices received and their amounts (prerequisite), in order to complete the daily accounting log (goal).

See also the examples in User requirement.

Requirement

A condition or capability that must be met or possessed by an interactive system to satisfy an agreement, standard, specification or other formally imposed documents

A requirement should have a determinable condition that makes it possible to validate it.

This curriculum defines the following types of requirements:

- market requirement;
- organisational requirement;
- user requirement.

This curriculum further distinguishes between the following types of user requirements:

- qualitative user requirement;
- quantitative user requirement.

Market requirement

A requirement for an interactive system based on marketing policy aimed at maximising business opportunities, sales and use.

Examples:

- The interactive system must have at least the functionality that is common among competitors when it is introduced to the market.
- The logo of the computer processor's manufacturer must be visible to the user when their laptop is in use.

Organisational requirement

An organisational rule that users have to follow when conducting their tasks.

Organisational requirements are requirements on the users that lead to requirements on the interactive system.

Examples:

- A salesperson must have a written approval from the director for offers that exceed 100.000€.
- A support staff member must send a user of the interactive system a gift card with a value of up to 50€ if the user has a reasonable complaint.

Organisational requirements may be based on regulatory requirements.

Examples:

- Users must confirm that they have read the terms and conditions before continuing.
- Minors are explicitly told that they are not allowed to proceed past the front page of a sports betting website.

User requirement

A requirement for use that provides the basis for design and evaluation of an interactive system to meet user needs.

User requirements are derived from user needs. For simple systems, user requirements can be derived directly from the context of use description without first identifying and documenting user needs.

A user requirement can be qualitative or quantitative.

Both qualitative and quantitative user requirements provide a basis for the design of the interactive system and can be verified by evaluating the interactive system. User requirements must be precisely formulated, for example, so they can be used to settle disputes between a supplier, who strives to fulfil the user requirements, and a vendor, who defines the user requirements.

While qualitative user requirements address the way in which the interactive system is used to arrive at a user goal, quantitative user requirements set measurable objectives for human-centred quality.

User requirements are evaluated and subsequently refined, for example by evaluating low-fidelity prototypes with users.

Examples of user needs and their corresponding user requirements:

User need	Corresponding user requirements
• Users who frequently book hotel rooms need to know what options they chose for previous bookings so they can apply them to future bookings.	• With the system, the user must be able to select the types of rooms they chose in previous bookings. • With the system, the user must be able to select the payment methods they used for previous bookings.

User need	Corresponding user requirements
• During heart surgery, the anaesthetist needs to know the status of the patient's vital signs in order to keep them stable.	• With the system, the user must be able to recognise changes in the blood pressure during the surgery. • With the system, the user must be able to recognise changes in the heart activity of the patient at all times.

Qualitative user requirement

A statement of what users must be able to recognise, select or input as part of conducting a task with the interactive system to meet identified user needs in a specified context of use.

Examples of reasonable qualitative user requirements:

- "The user must be able to recognise the size of the rooms available at the hotel's website."
- "The user must be able to select a room with a view on the hotel's website."
- "With the system, the user must be able to recognise the hours when the hotel's reception is open."

Examples of incorrect qualitative user requirements:

- "The user interface must be usable and support all user tasks" (not distinct, not verifiable).
- "The user interface must have a big, red 'Book this room' button" (prescribes a solution).

Quantitative user requirement

A required level of human-centred quality to meet identified user needs expressed in terms of measures of usability, accessibility, user experience and avoidance of harm from use in a specified context of use.

Quantitative user requirements are acceptance criteria for human-centred quality, for example whether users can solve particular tasks with the interactive system in an acceptable time or with a specified maximum number of use errors.

When defining suitable quantitative user requirements:

- Look for guidance from existing systems – users will expect the new interactive system to perform better than or at least as well as the existing system.
- Consider quantitative user requirements set by stakeholders who have an interest in a specific minimum performance of the interactive system.
- Validate quantitative user requirements with users to determine whether or not they are appropriate from their perspective.

  Examples:
  - Measure of effectiveness: “95% of users who have never used the e-scooter app before must be able to install the app, rent an e-scooter, pick it up and start riding.”
  - Measure of efficiency: “80% of users who have never used the e-scooter app before, must be able to install the app, rent an e-scooter. pick it up and start riding within 5 minutes.”
  - Measure of satisfaction: “Immediately after completing an e-scooter rental, 80% of users must answer ‘Agree’ or ‘Strongly agree’ to the statement ‘The e-scooter app is easy to use.’ ”
  - Measure of accessibility: “80% of people who use voice recognition software and who have never used the e-scooter app before, must be able to install the app, rent an e-scooter, pick it up and start riding within 10 minutes.”
  - Measure of user experience: “After using the e-scooter app to rent e-scooters at least twice within one month, 80% of users must answer ‘Agree’ or ‘Strongly agree’ to the statement ‘I would recommend this e-scooter service to a friend.’ ”
  - Measure of avoidance of harm from use: “99% of users who rent an e-scooter must be aware of their liability in case they cause an accident that results in serious injury.”

To evaluate in practice whether a quantitative user requirement has been fulfilled, further details must be added to the quantitative requirement.

Example: Measure of effectiveness: “95% of at least 25 users who have never used the e-scooter app before must be able to install the app, rent an e-scooter, pick it up and start riding.”

6 Design solutions that meet user requirements

6.1 Design process and deliverables

In the activity ”Design solutions”, UX professionals convert **user requirements** into a working **interactive system**. HCD deliverables from the analysis of the **context of use**, such as **user groups**, **as-is scenarios**, **personas**, **user journey maps** and **task models** are also used.

The conversion considers **interaction principles**, **heuristics**, **style guides**, **design patterns** and more as described in section 6.2.

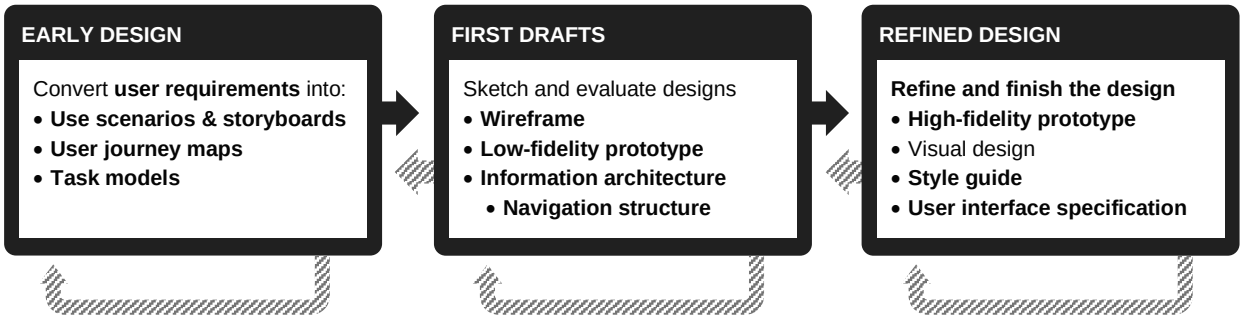


Figure 5. An iterative approach to designing solutions.

The approach is iterative as shown in Figure 5. The hatched arrows indicate iterative cycles that are required when a **usability evaluation** shows that **user requirements** have not yet been fully met. Many iterations may be required before the **interactive system** meets the **user requirements**.

Use scenarios and **storyboards** are easily produced deliverables for describing how **tasks** could be accomplished with the intended **interactive system**. They tell **stakeholders** how **user needs** could be met. **Use scenarios** are text-based while **storyboards** are comic-book like depictions.

A **prototype** is a representation of all or part of an **interactive system. Prototypes** can range from simple sketches on paper to fully interactive simulations that very closely resemble the **interactive system** in appearance and behaviour. The primary purpose of a **prototype** is to serve as the basis for a **usability evaluation**, often a **usability test**. The results from the **usability evaluation** guide the redesign and refinement of the **prototype**. A secondary purpose of a **prototype** is to give **stakeholders** and **users** an early impression of the design of the **interactive system,** in order to promote constructive discussions.

Prototypes can be **low-fidelity** or **high-fidelity** and contain varying amounts of detail and interaction.

Low-fidelity prototypes are based on **use scenarios** and **storyboards**. They may look sketchy. They are cheap to create and thus easy to discard if they do not work. They may include **wireframes**, which are screens consisting solely of straight lines, rectangles and text. They may also include screens drawn on paper. In a **usability evaluation** of a paper-based **low-fidelity prototype**, a human being replaces the computer.

The iterative process gradually refines **low-fidelity prototypes** into **high-fidelity prototypes**, which in turn steer the development of a working **interactive system** that can be released once it meets **user requirements.**

The **information architecture** and the **navigation structure** are developed in parallel with the **prototypes**. From a human-centred point of view, the **information architecture** is the naming and structuring of the information that must be available to **users**. The **navigation structure** is the logical organisation of the screens, pages and windows that comprise the **user interface** – it includes the links and menus that enable **users** to get from one set of information to another.

Card sorting can be used to create a human-centred **navigation structure**.

The result of the design activity is a **user interface specification**, which describes in detail the outcome of the **human-centred design** process. The **user interface specification** is used by developers to implement the **interactive system**.

User assistance focuses on how to help the **user** to best apply the capabilities of the **interactive system** to their needs, for example through documentation and online help.

Ethical design is design made with the intent to do good. **Sustainable design** is design that minimises the resources required for the use of **interactive systems**.

Learning Objectives	
6.1.1	Understand what a use scenario is
6.1.2	Understand the concept: storyboard
6.1.3	Understand the concepts: information architecture and navigation structure
6.1.4	Understand what card sorting is
6.1.5	Understand prototypes and wireframes
6.1.6	Understand the concepts: low-fidelity prototype and high-fidelity prototype as well as the differences between them
6.1.7	Understand the concept: user assistance
6.1.8	Understand the contents and purpose of the user interface specification
6.1.9	Understand what ethical design is
6.1.10	Understand what sustainable design is

Use scenario

A narrative text description of how a user will carry out one or more tasks with the planned interactive system.

A use scenario tells a story of how the planned interactive system could be used in the future. If a persona is available for the user group in question, they will usually represent the user in the use scenario.

The primary purpose of a use scenario is to serve as a basis for discussing the planned interactive system with users and other stakeholders. A secondary purpose is to inform and guide the creation of low-fidelity prototypes.

A use scenario should avoid placing unnecessary constraints on the design by referencing specific user interface elements, such as command buttons, in the user interface.

Use scenarios describe how users will carry out tasks with the future interactive system. In contrast, as-is scenarios describe how users carry out tasks in the current context of use.

Example of a use scenario:

- “Before leaving for the airport, John Miller checks the availability at the airport car park with his new application. If enough parking spaces are available, he reserves one with his new application and then calmly drives to the airport. He knows that since the application has been launched there is a separate entry for cars with reservations.”
  Compare this example to the example in as-is scenario.

Storyboard

A sequence of visual frames illustrating the interplay between a user and an interactive system.

A storyboard is a comic book style representation of a use scenario.

The purpose of a storyboard is similar to the purpose of a use scenario.

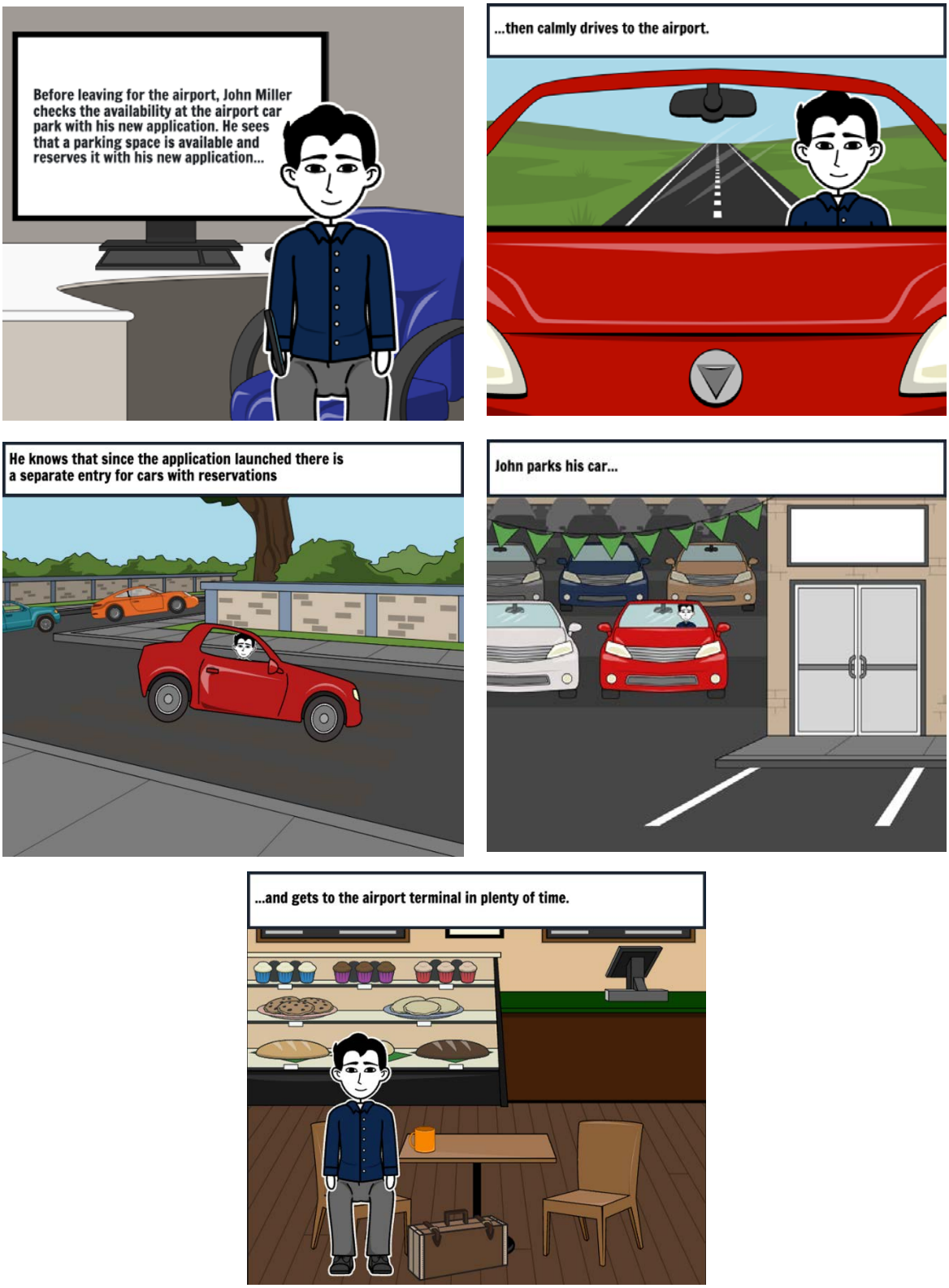


Figure 6. A storyboard for the parking assistant, which is described in the definition of Use scenario

Prototype

A representation of all or part of an interactive system that, although limited in some way, can be used for analysis, design and usability evaluation.

The key purposes of a prototype are

- To facilitate early evaluation of the effectiveness and efficiency of an interactive system at a time when it is still reasonably cheap to make fundamental changes to information architecture and design.
- To increase the interest of prospective users and stakeholders in the planned interactive system based on a concrete example. Users often find it easier to criticise something than to answer the open question “What do you want?”.
- To serve as a specification for the implementation of the interactive system. This particularly applies to high-fidelity prototypes.

This curriculum distinguishes between low-fidelity prototype and high-fidelity prototype.

Wireframe

A screen or page in a low-fidelity prototype for a user interface comprised of lines, rectangular boxes and text that represent the intended interaction design.

Wireframes typically do not address visual design and precise layout.

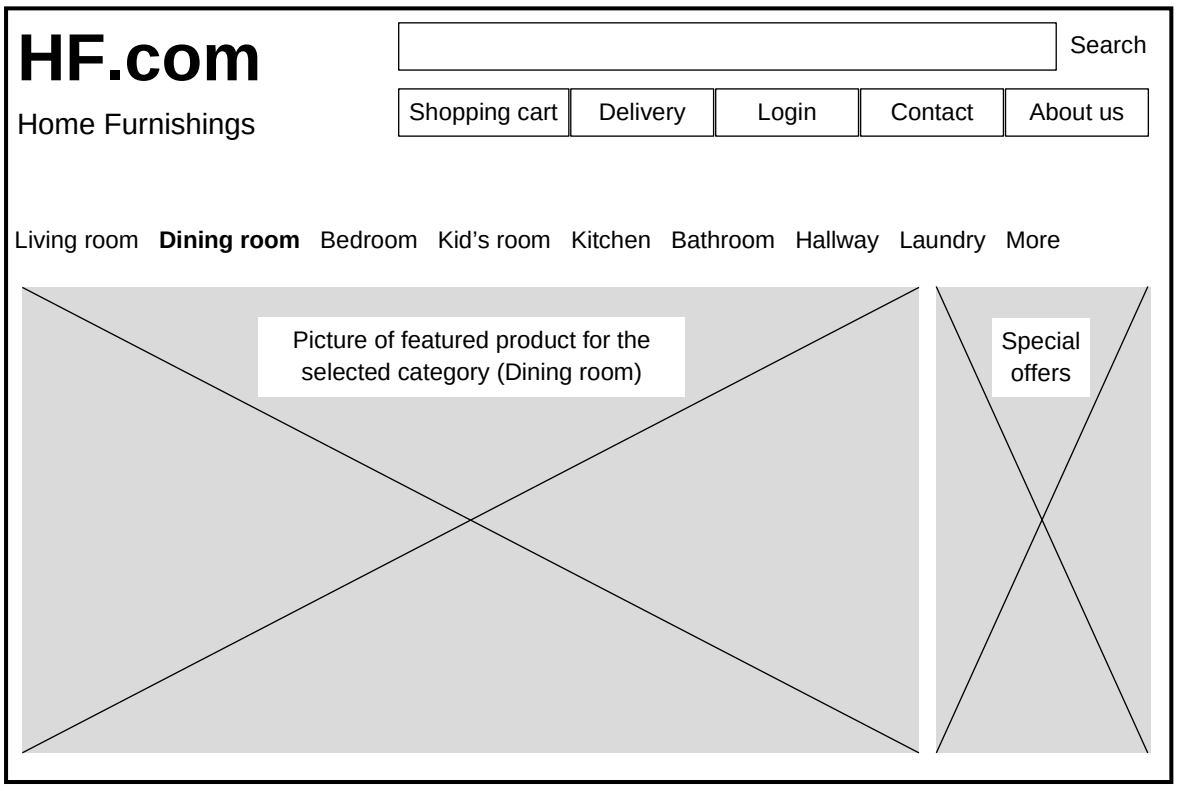


Figure 7. An example of a wireframe that shows a proposal for the home page of a home furnishings retailer. Note that the wireframe contains neither colours nor graphics.

Low-fidelity prototype

A low-cost illustration of a design or concept used to gather feedback from users and other stakeholders during the early stages of design.

A low-fidelity prototype is often created using paper, pens, sticky notes and so on. Digital prototypes are often created with a prototyping tool.

A low-fidelity prototype may be operated by a human in order to simulate a running system.

A low-fidelity prototype should be capable of being updated in moments.

Information architecture

The naming and structuring of the information that must be available to the user.

The purpose of the information architecture is to structure the information in the interactive system, to name all functions and content, and to derive an effectively labelled navigation structure that facilitates access to them.

The information architecture includes the words used in the user interface for navigation and content.

Navigation structure

The logical organisation of the units of displayed information that comprise the user interface.

In practice, the “units of displayed information” are often screens or pages.

The navigation structure can be determined by carrying out HCD activities such as card sorting.

The navigation structure comprises:
- the logical structure, for example hierarchy, the order and grouping of elements of the user interface and navigation items;
- the navigation elements that are used to navigate the structure, for example menus and breadcrumbs.

The navigation structure is part of the information architecture.

Card sorting

A method for structuring information – such as menus in a navigation structure – that involves writing key concepts onto different cards and asking users to sort these cards into groups.

There are two methods of card sorting – open and closed:
- During open card sorting, users are asked to sort the cards into groups that they feel represent distinct domains of information.
- With closed card sorting, the number and names of groups is pre-defined, usually by a prior round of open card sorting, and users are asked to populate those groups with the cards.

After an open card sort, users are asked to name each group. If a majority of users suggest the same name, use that name as the group title.

The groups provide important clues as to how human-centred menus could be structured and named.

Hints:

- If a user ask about the meaning of a concept, explain it to them and ask, “what do you call this?”
- Encourage users to add additional concepts that are important to them during the card sort. Have blank cards ready for this purpose.
- If several users consider a concept superfluous or irrelevant, consider dropping it from the menu.

Various tools are available to help you prepare, execute and analyse card sorting sessions.

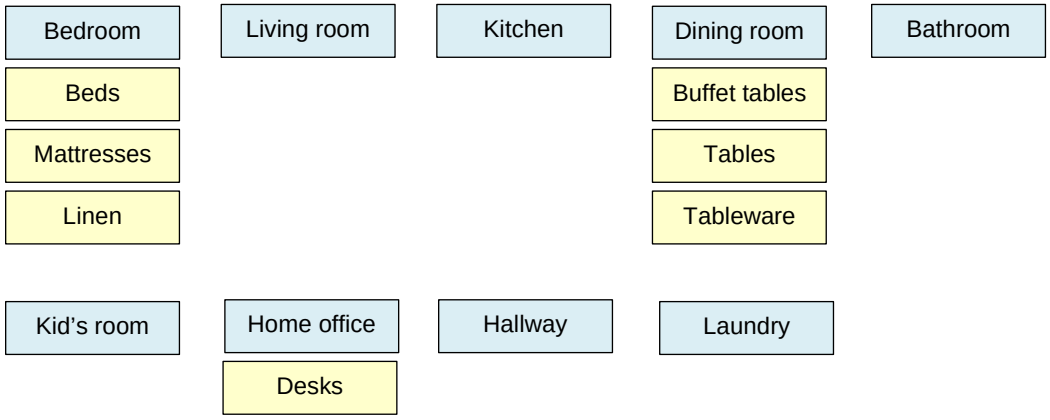


Figure 8. An example of a partially completed closed card sort for the website of a home furnishings retailer. Blue cards show the pre-defined group names, while yellow cards show concepts. The user needs to sort many more cards, for example, solar panels, bookcases, rugs, curtains and lighting.

High-fidelity prototype

A prototype that mirrors the user interface of an interactive system as closely as possible, often displaying pixel-perfect user interface elements and visual design.

A high-fidelity prototype may be created using dedicated prototyping tools or implemented in code by front-end developers. After a successful usability test, the high-fidelity prototype informs the development of the interactive system.

User assistance

Information in addition to affordance and instructions that helps or guides a user in interacting with an interactive system.

User assistance can include describing the user interface, but it also focuses on how to help the user to best apply the capabilities of the interactive system to their needs.

User assistance incorporates all forms of help available to a user, for example,
- user documentation: written or other information for users about an interactive system, how it works and how to use it;
- online help: assistance delivered through computer software that can be topic-oriented, procedural or reference information.

User assistance also includes system-initiated guidance, that is, unsolicited, explicit information about an event or a condition from an interactive system to a user, including,
- messages that require confirmation (informative, warning, error), for example “Your battery is almost empty. Please connect your notebook to a charger”;
- status information that does not require confirmation, for example, “You have 7 new messages”;
- instructions, for example, “Separate e-mail addresses by a space, comma, semicolon or line break.”

User interface specification

A description of the appearance and behaviour of the user interface of an interactive system.

The purpose of a user interface specification is to provide a description of the interactive system that it can be implemented by developers.

The user interface specification describes the behaviour of the user interface. This includes all screens, the flow between them and all the content that appears on them. Content includes text, images, video, warning and error messages and user assistance as well as translations.

Annotated low- or high-fidelity prototypes can serve as user interface specifications if they describe the complete user interface.

Ethical design

A behavioural principle that prioritises user needs over personal or organisational objectives.

When creating interactive systems, UX professionals influence the mindset and behaviour of users. Potential conflict arises when the design of an interactive system favours the goals of the organisation over the rights and needs of the user. Therefore, UX professionals have a responsibility to make ethical design decisions.

For example, it is unethical to guide users into potentially harmful behaviours to achieve business goals.

A popular description of ethical design is “Design made with the intent to do good.”

Examples of ethical design:
- An online streaming service offers a one-month free trial period. The free trial is automatically terminated after a month. The user is informed about the termination one week in advance and given the option to register a credit card to pay to continue their subscription.

- A social networking site displays the time the user has spent actively browsing over the last 24 hours underneath their profile picture to make them aware of the time they are spending on the site.

Examples of unethical design:

- An online streaming service offers a one-month free trial period. Part of the sign-up process involves registering a credit card for future subscription payments. Users are not informed in advance that their trial period is about to end, and their credit card is charged to pay for their subscription
- During checkout, an e-commerce website displays a box that allows customers to sign up for promotional emails. By default, the box is checked. To avoid receiving unsolicited email, users must uncheck the box.

Sustainable design

An approach to design that prioritises people and planet by minimising the resources required for the use of interactive systems.

The cumulative impact of the world's websites is such that if the Internet was a country, it would have been the sixth largest polluter in 2021.

Examples:

- Design efficient site navigation and search.
- Explore better solutions for data-heavy UI patterns such as carousels.
- Avoid decorative video and images, use lower resolutions, avoid auto-playing video content.
- Provide downloads as compressed files.
- Use hosting platforms that run on renewable energy.
- Reduce or remove embedded third-party technology such as social sharing buttons, embedded maps, ad pop-ups and published content services.
- Reduce standby power consumption and encourage full shutdown.

6.2 Guidance for user interface design

Interaction principles, heuristics and **user interface guidelines** are rules, of varying levels of specificity, used to guide the design of the interaction. They are intended to make interactions effective, efficient and satisfying, to avoid common **usability problems** and to ensure a **consistent user interface**.

Comparison of **interaction principle**, **heuristic** and **user interface guideline**:

Concept	Purpose	Specificity
Interaction principle	General guidance for the design of usable **user-system interactions**. Example: **Conformity with user expectations**	General
Heuristic	General guidance for the design of usable **user-system interactions**. Example: Speak the users' language	General
User interface guideline	Low-level, specific rule that leaves little room for interpretation and helps to achieve **consistency**. Example: Links must be underlined	Specific to a **user interface** platform, technology, application domain or organisation

The seven **interaction principles** are: **suitability for the user's tasks**, **self-descriptiveness**, **conformity with user expectations**, **learnability**, **controllability**, **use error robustness** and **user engagement**.

Affordance is an aspect of an object that makes it obvious how the object could be used. A **mental model** is the perception people have of themselves and of the things with which they interact.

Style guides are collections of **user interface guidelines**; they are used to ensure **consistency** in the appearance and behaviour of **user interfaces** across **interactive systems** produced by the same organisation.

A **design pattern** is a general solution to a commonly occurring design problem within a given context in software design.

Learning Objectives	
6.2.1	Understand the concept: interaction principle
6.2.2	Understand each of the seven interaction principles
6.2.3	Understand the concept: heuristic
6.2.4	Understand the concept: affordance
6.2.5	Understand the concept: mental model
6.2.6	Understand the concepts: user interface guideline and style guide
6.2.7	Understand the differences between interaction principles and user interface guidelines
6.2.8	Understand the concept: design pattern

Interaction principles

General goals for the design of useful and usable user-system interactions.

Interaction principles are not bound to any specific technology or method.

ISO 9241-110 lists the following seven interaction principles:

- Suitability for the user's tasks;
- Self-descriptiveness;
- Conformity with user expectations;
- Learnability;
- Controllability;
- Use error robustness;
- User engagement.

Suitability for the user's tasks

The interactive system supports the users in the completion of their tasks – that is, when the operating functions and the user-system interactions are based on the task characteristics (rather than the technology chosen to perform the task).

Examples of how to observe the interaction principle:

- The interactive system should avoid imposing steps on the user that are derived from the technology rather than from the needs of the task itself.
- The interactive system should offer defaults, where appropriate.

Self-descriptiveness

The interactive system presents appropriate information, where needed by the user, to make its capabilities and use immediately obvious to the user without unnecessary user-system interactions.

Clear and descriptive titles, breadcrumbs, appropriate feedback and progress indicators, and affordances, including clear instructions, are means to make an interactive system self-descriptive.

Examples:

- **Make it obvious what users can do**: The home page of an app for a pet adoption service clearly and briefly describes the purpose of the app and provides an overview of the five key functions offered by the app: The adoption process, Adopt a dog, Stories from users who adopted a dog, Donate, Help.
- **Make it obvious what users cannot do**: A ticket machine for train tickets clearly states that it only accepts credit cards (no cash) and provides a list of the accepted credit cards.

Conformity with user expectations

The interactive system's behaviour is predictable based on the context of use and commonly accepted conventions in this context.

Consistency is an aspect of Conformity with user expectations. Compliance with style guides is a means to establish consistency.

Examples:

- **Speak the users' language**: An insurance company's website uses words that are understood by users who have little experience with insurance. Whenever the use of technical terms is unavoidable, the meaning of the words is explained in a tooltip with examples.
- **Consistency**: In an organisation, all systems consistently use the same phrases for login, for example, "user name" (not user-id) and "password" (not access key).

Learnability

The interactive system supports discovery of its capabilities and how to use them, allows exploration of the interactive system, minimises the need for learning and provides support when learning is needed.

Examples:

- The interaction should provide sufficient feedback about the intermediate and final results of an activity so that the user learns from successfully accomplished activities.
- If appropriate to the tasks and learning goals, the interactive system should allow the user to explore by trying out interaction steps without negative consequences.

Examples:

- **Make it obvious what users can do:** A hotel booking app clearly displays the functions that are of most interest to users on the home page: Book a room; Modify a booking; Cancel a booking; Special deals; Property reviews.
- **Support when learning is needed**: An application has step-by-step guides on how to use some of the key features. Initially, the guide will display a short explanation of a feature. On pressing 'Next,' it will explain the next feature, and so on.

Controllability

The interactive system allows the user to maintain control of the user interface and the interactions, including the speed and sequence and individualisation of the user-system interaction.

Properly placed and labelled exit-buttons ("Cancel", "Skip", or "Stop"), undo and redo are means to make an interactive system controllable.

Examples:

- **Interruption by the user**: An antivirus program that is scanning a hard disk drive for viruses can be stopped at any point of time by the user pressing a prominent stop button.
- **No surprises**: On a newspaper website, a video starts playing only when the user explicitly starts the video. By default, the video's sound is muted.

- **Flexibility**: In an online questionnaire, users can move forward and backwards between questions and pause the session at any time.

Use error robustness

The interactive system assists the user in avoiding errors and in case of identifiable errors treats them tolerantly and assists the user when recovering from errors.

Examples of error avoidance:

- **Selection rather than typing**: On a flight booking website, users have the option to enter dates by using a date picker. This avoids confusion around date formats when entering day and month into the same input field.
- **Provide clear feedback**: When entering a password, the user has the option to display the password on the screen.

Examples of error tolerance:

- **Allow the user to correct mistakes**: A drawing application offers users undo and redo functions, so any mistake can easily be corrected
- **Support error recovery**: A file management system keeps a copy of a file that the user has deleted, in case the user deletes the file by mistake.

Examples of error recovery:

- **Be constructive**: “There is no service between these stations on December 25th. This service is available on December 23rd and December 26th. Please select a different departure, destination or date” (rather than, “Illegal service selected”).
- **Be precise**: “Passwords must consist of at least 14 characters. The password you entered contains 13 characters” (rather than, “An error occurred”).

User engagement

The interactive system presents functions and information in an inviting and motivating manner supporting continued interaction with the system.

User engagement can lead to a positive user experience. Excessive or inappropriate application of techniques intended to increase user engagement can lead to a negative user experience.

User engagement must be done in an ethical manner. Some aspects of user engagement can be inappropriate for some interactive systems.

Adherence to the other six interaction principles is an important precondition for user engagement.

Examples:

- **Build trust**: An e-commerce website clearly displays its physical address and contact information together with pictures and biographies of key people. It also links to independent mentions and reviews of the company, for example in newspapers.
- **Assure the user that everything is OK**: An anti-virus program displays a clear assurance “You are protected” together with a large, green checkmark and the link “More information”.

Consistency

The same information is presented in the same way throughout the interactive system, in accordance with the user's expectation.

Consistency is an aspect of Conformity with user expectations.

Consistency is relevant on several levels, for example;
- within a screen;
- across screens in the same interactive system;
- across interactive systems from the same manufacturer;
- across similar interactive systems from different manufacturers.

Heuristic

A generally recognised rule of thumb that helps to achieve usability.

Heuristics are a popular alternative to interaction principles.

Examples of generally recognised heuristics:
- Speak the users' language (related to the interaction principle, conformity with user expectations).
- Visibility of system status (related to the interaction principle, self-descriptiveness).
- Help users recognise, diagnose and recover from errors (related to the interaction principle, use error robustness).

Affordance

An aspect of an object that makes it obvious how the object can be used.

Designing objects to have a clear affordance may help to achieve usability by supporting self-descriptiveness, conformity with user's expectations, and learnability.

Examples of affordances:
- A handle on a teapot or teacup provides an obvious affordance for holding.
- The appearance of a button on a web page suggests it is clickable.
- The "swipe to delete" gesture has no affordance at all, assuming that there are no instructions or labels.

Mental model

The concept people have built of themselves, others, the environment and how things with which they interact work.

Alternative, popular definition: A person's thought process about how something works in the real world.

People form mental models through experience, training and instruction. The mental model of an interactive system is formed largely by interpreting its perceived actions and its visible structure. Expectations resulting from the use of other or similar systems are also of importance.

If a user's mental model of an interactive system is incomplete or contradictory, then the user cannot easily use the interactive system.

Example:

- For a word processing system, a user's mental model may be that all changes to a document are saved instantly. An alternative mental model is that changes are saved only when the user selects "Save". The two mental models make a difference for the user's actions if the word processing system crashes.

User interface guideline

A low-level, specific rule or recommendation for the design and implementation of a user interface that leaves little room for interpretation, allowing everyone to implement it consistently.

User interface guidelines cover the behaviour and appearance of user interface elements, fonts, use of colours, phrasing of error messages, interaction structure and more.

To achieve user interface consistency, user interface guidelines should be mandatory with clearly specified procedures for allowing deviations, for well-founded reasons.

Examples of user interface guidelines:

- For all controls, such as radio 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. Its position must be exactly the same as on the home page. Clicking the logo must cause the home page to be displayed.
- The height of a button must be 23 pixels.

Style guide

A collection of user interface guidelines used to ensure consistency in the appearance and behaviour of user interfaces across interactive systems produced by the same organisation.

Collections of user interface guidelines are called style guides.

Many organisations have a style guide to ensure the consistency of their corporate design, for example how to use and how not to use the logo, corporate colours and standard layouts for print and advertising.

Examples of style guides:

- Windows User Experience Interaction Guidelines for Windows Desktop apps ("UX Guide");
- IOS Human Interface Guidelines

Design pattern

A solution to a commonly occurring design problem within a given context of use that describes the design problem, a general solution and examples of how to apply it.

A single user interface element to solve a certain design problem can be considered a design pattern, for example a tab.

Design patterns must comply with relevant user interface guidelines.

Examples:

- Accordions, tabs
  Solve the design problem “The interactive system has more data to display than can fit in the available screen area.”
- Wizards
  Solve the design problem “Novice users need a complicated procedure explained in small, easy-to-digest steps.”
- Frequently asked questions (FAQ)
  Solve the design problem “Users may have one of many questions concerning an interactive system.”

7 Evaluate the designs against user requirements

7.1 Usability evaluation

The purpose of a **usability evaluation** is to determine whether or not an **interactive system**, or a **prototype** of an **interactive system**, meets the **user requirements** and applicable **interaction principles**, **heuristics** and **user interface guidelines**.

This curriculum addresses three forms of **usability evaluation**: **usability test**, **usability inspection** and **user survey**. In **usability tests** and **user surveys**, users are involved in the **usability evaluation**, while **usability inspections** are carried out by UX professionals or subject matter experts.

Learning Objectives	
7.1.1	Understand usability evaluation
7.1.2	Understand the role of usability evaluation in human-centred design
7.1.3	Understand the key differences between usability tests, usability inspections and user surveys for usability evaluation
7.1.4	Understand why interviews and focus groups are unsuitable for usability evaluation

Usability evaluation

A common term for a process through which information about the usability of an interactive system is gathered in order to improve the interactive system or to assess the usability of an interactive system.

Usability may be evaluated by conducting
- usability tests;
- user surveys;
- usability inspections.

Usability evaluations may occur at any time during a human-centred design process, from early analysis through interactive system delivery and beyond. Usability evaluations may be based on paper sketches or display mock-ups, as well as on interactive systems under design and completed interactive systems.

The primary focus of usability evaluation is on finding problems. Positive findings are an important by-product.

7.2 Usability tests

A **usability test** shows what representative **users** are able to accomplish with the **interactive system** when they carry out representative **tasks**. Eliciting personal opinions from **users**, or discussing them, is not part of a **usability test**.

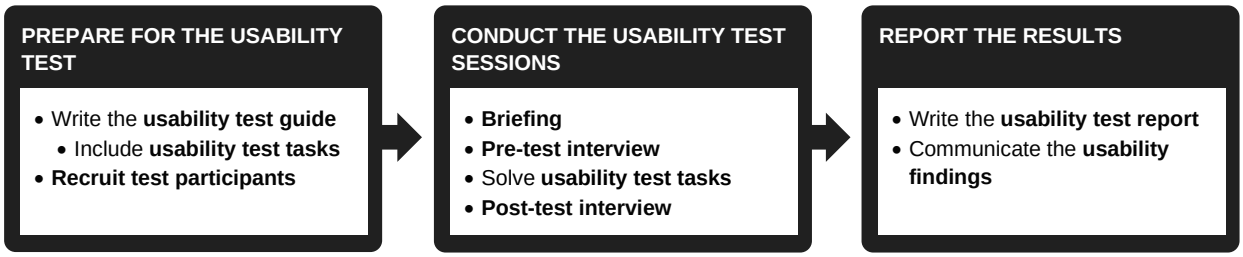


Figure 9. The main activities in a **usability test**.

A **usability test** consists of **usability test sessions**. In each **usability test session**, a **usability test participant** carries out specific, representative **usability test tasks** with the **interactive system**.

The **moderator** starts a **usability test session** by **briefing** the **usability test participant** about what will happen during the session. The **moderator** then conducts a **pre-test interview** with the **usability test participant** to learn about their background and knowledge of the **interactive system** they will be testing. During moderation, the **moderator** quietly observes the **usability test participant**, who is encouraged to think aloud as they solve **usability test tasks**. A **note-taker** documents use difficulties, successes and failures. **Stakeholders** are often **observers** of **usability test sessions** to see for themselves how the **interactive system** is performing. Finally, the **moderator** conducts a brief **post-test interview** with the **usability test participant** to understand their overall impressions of the **interactive system**.

After all **usability test sessions** have been completed, the results are analysed and documented. A **usability test report** is written which describes the **usability findings** from the **usability test**. A **rating** is assigned to each **usability finding** to indicate its impact and criticality on the **usability**. The **usability test report** contains both **usability problems** and positive **usability findings**.

A **usability test** can be face-to-face or an **unmoderated usability test**, where **usability test participants** solve **usability test tasks** without a **moderator**.

Learning Objectives	
7.2.1	Understand usability test and the main activities in a usability test
7.2.2	Understand the concept: unmoderated usability test
7.2.3	Understand how a usability test is prepared
7.2.4	Understand the concept: usability test guide
7.2.5	Understand usability test task
7.2.6	Understand how usability test participants are recruited
7.2.7	Understand the activities in a usability test session: Briefing, pre-test interview, moderation and post-test interview
7.2.8	Understand the concept: usability test report
7.2.9	Understand the concept: usability finding
7.2.10	Understand the value of positive usability findings
7.2.11	Understand the concept: ratings used for usability findings
7.2.12	Understand the responsibilities in a usability test: Moderator, note-taker, observer and usability test participant

Usability test

A usability evaluation that involves representative users performing specific tasks with the interactive system to enable identification and analysis of usability problems, or the measurement of effectiveness, efficiency and user satisfaction.

A usability test usually has three phases:
- planning – this includes writing the usability test guide and recruiting suitable usability test participants;
- conducting usability test sessions;
- communicating usability findings – this includes writing the usability test report.

A usability test typically consists of 3 to 5 usability test sessions per user group. In each session, a usability test participant attempts to carry out representative usability test tasks using the interactive system or a prototype of the interactive system.

Usability test session

A part of a usability test where one usability test participant carries out representative usability test tasks using the interactive system or a prototype of the interactive system.

In a usability test session, the moderator typically:
- greets the usability test participant;
- conducts the briefing and pre-test interview;
- provides the usability test participant with usability test tasks;
- quietly observes the usability test participant while they carry out usability test tasks;
- conducts the post-test interview.

Moderators often encourage usability test participants to think aloud during a usability test session, because they need to understand the thought processes of the usability test participants. Such qualitative usability tests are sometimes referred to as “think aloud tests”.

Usability test sessions are conducted by a moderator and viewed by a number of observers – these are often stakeholders. A note-taker records important usability findings.

The usability test participant and the moderator can be in the same or different physical locations. If in different locations, the test participant and the moderator usually communicate and share screens over the internet.

Unmoderated usability test

A usability test where usability test participants solve usability test tasks without a moderator.

Unmoderated usability tests are usually conducted on the usability test participant’s computer. The usability test session is recorded and sent to the client for analysis.

Usability test guide

A guide used by a moderator in a usability test to prepare for and conduct a usability test session.

The guide includes
- checklist for what to do before the test participant arrives;
- topics for the briefing;
- pre-test interview questions;
- usability test tasks;
- post-test interview questions.

Usability test task

A description of a task that a moderator asks a usability test participant to carry out during a usability test.

Examples of usability test tasks for a hotel's website:
- You need to speak to the reception. Find information on the website that helps you in doing that.
- Please book a room that suits your needs and is in a price range that you'd normally consider. You can choose the date of arrival and the length of your stay.
- Please book the cheapest room possible for one night, arriving tomorrow.
- Please could you cancel the booking that you made earlier.

Examples of invalid usability test tasks:
- Tell me what you think of the home page (opinion).
- Stroll around on the website for 5 minutes and tell me what you think (hazy, opinion).
- Are the policies for cancelling a booking agreeable? (does not address usability).

Recruiting

A process for selecting candidates that have the appropriate characteristics to participate in an HCD activity such as a focus group, contextual interview, or usability test.

A recruitment screener is used to determine whether candidates have the appropriate characteristics that make them suitable to participate in an HCD activity. Relevant characteristics might include: personal and professional background, knowledge of the subject matter, attitudes and interests. The characteristics originate from the personas and user group profiles derived from analysis of the context of use.

Usability test participant

A representative user who carries out usability test tasks in a usability test session.

Briefing

The first activity in an interview or a usability test session where the usability test participant is informed about the purpose of the interview or usability test and what their role and contribution will be.

Pre-test interview

An activity in a usability test session where the usability test participant answers questions about their background and previous experience with the interactive system and related interactive systems.

The pre-test interview takes place after the briefing but before the usability test participant starts carrying out usability test tasks.

Post-test interview

An activity in a usability test session where the usability test participant answers questions about their user experience and general impression of the interactive system.

The post-test interview takes place after the usability test participant has carried out as many usability test tasks as time allows. Often, just two questions are asked, "What did you like most about the system?" and "What is most in need of improvement?"

The opinions that surface during the post-test interview can help the moderator in understanding causes for usability problems, rating usability problems and understanding what the usability test participant liked.

Usability test report

A document reporting the results of a usability test.

A usability test report typically contains:
- an executive summary;
- all usability findings (including positive usability findings), meaningfully grouped;
- screenshots or pictures that supplement the description of important usability findings;
- characteristics of the test users, including selection criteria for recruiting;
- the usability test guide.

A usability test report is always required. If you have limited resources, produce a basic usability test report. This may consist of 3-5 pages or slides, which include an executive summary, the key findings and the list of usability test tasks.

Usability finding

A result from a usability evaluation.

A usability finding can describe:
- a usability problem;
- a positive finding – something that worked well in the context of the current usability test or that test participants liked.

Reporting positive usability findings ensures that
- Teams are aware of aspects of the interactive system that currently work well, so that they are not unintentionally changed.
- A more positive attitude is adopted towards the usability test report and the usability evaluation in general.

Usability problem

A difficulty in using the user interface that affects the ability of the user to achieve their goals effectively, or efficiently, or with satisfaction.

Usability problems can lead to confusion, error, delay, or outright failure to complete a task.

Examples of usability problems are:

- Search is not error tolerant. For example, a city search for “brigton” (instead of “brighton”) provides no results.
- A car rental website uses insurance terms that users do not understand, for example, CDW (Collision Damage Waiver), and the website provides no explanation of the terms. This may result in users purchasing an insurance that costs too much or provides insufficient coverage.
- A website has complicated rules for new passwords.
- A loud video starts playing the moment a user lands on a web page.
- A virus scan of a disc takes several hours. The anti-virus program offers no way of pausing or stopping the scan.

Rating

A measure given to a usability finding from a usability evaluation to indicate the impact and criticality on the usability and the consequences.

The rating can help teams prioritise the order in which they address usability problems.

Usability findings are rated from the usability test participants’ point of view. Sometimes, the ratings are done in cooperation with a domain expert.

Typical ratings are:

- Positive finding – something that worked well in the context of the current usability test or that test participants liked;
- Minor problem – noticeable delays or minor dissatisfaction;
- Major problem – substantial delays or moderate dissatisfaction;
- Critical problem – test participants gave up or experience substantial dissatisfaction, or there is a risk of minor harm to the user;
- Catastrophic problem – existential threats, there is a risk of major harm to the user or to the organisation. Usability problems should only be classified as "catastrophic" after consultation with the risk manager or a top-level manager, as a UX professional should not have the authority to declare a problem as catastrophic.

  Examples of critical usability problems:
  - inability to book a flight:
  - booking a wrong, expensive, non-refundable flight due to poor usability.

  Examples of catastrophic usability problems:
  - renting a car with inadequate liability insurance because information about liability insurance is difficult to understand on the car rental website;
  - administering a lethal dose of medication because the control that specifies the dosage is easily misinterpreted .

Moderator

A neutral person who conducts a usability test session or a focus group session.

The moderator's tasks during a usability test session are described under usability test session.

Note-taker

A UX professional who makes notes of usability findings during a usability test session, focus group or interview.

Note-taking can be handled by the moderator in order to keep costs down.

The use of an additional note-taker allows the moderator to concentrate fully on the usability test participant.

Observer

A person who watches users in an observation, usability test session or focus group.

Observers do not interfere with the usability activity. Observers may be actively involved in the analysis of the results. Observers can be local or remote.

7.3 Usability inspections and user surveys

Usability inspection is based on the judgment of one or more evaluators who examine or use an **interactive system** to identify potential **usability problems** and deviations from **user requirements** and established principles, for example, **interaction principles**, **heuristics** and **user interface guidelines**.

User surveys are used to evaluate **users' satisfaction** or **user experience** with an **interactive system**. In a **user survey**, **users** report facts and opinions by completing a questionnaire.

Learning Objectives	
7.3.1	Understand what a usability inspection is
7.3.2	Understand how and why a user survey is used for usability evaluation

Usability inspection

A usability evaluation based on the judgment of one or more evaluators who examine or use an interactive system to identify potential usability problems and deviations from user requirements and established interaction principles, heuristics and user interface guidelines.

Usability inspection is often performed by UX professionals or subject matter experts, who base their judgement on prior experience of usability problems encountered by users and their own knowledge of user interface guidelines and style guides.

User survey

A data-gathering method where users are asked to report facts and opinions by completing a questionnaire.

User surveys can be used to measure satisfaction or user experience as explained in this definition. They can also be used to gather information about the context of use (Chapter 4).

User surveys for measuring satisfaction or user experience often consist of closed questions.

Examples of questions to evaluate satisfaction:

On a scale from 1 to 5, where 1 means ‘strongly disagree’, 3 means ‘neutral’ and 5 means ‘strongly agree’, please rate the following statements:

- The new ticket app looks cool.
- The new ticket app is easy to use.
- The new ticket app lets me buy tickets quickly.
- The new ticket app meets my expectations.

A significant number of user survey responses (hundreds or more) are required for them to be statistically reliable.

It is very important to test user surveys under development, to ensure questions are understood correctly by those who are expected to answer the questionnaire.

8 HCD maturity

An organisation's **HCD maturity** expresses its receptiveness to HCD activities and findings. It can be expressed in a model with six levels.

Learning Objectives	
8.1	Understand how to boost the HCD maturity of an organisation whose HCD maturity is at a low level
8.2	Understand the HCD maturity levels incomplete, performed, managed, established, predictable and innovating

HCD maturity

The level of understanding and implementation of a systematic human-centred design process that helps an organisation to achieve business goals.

HCD maturity can be expressed in a model with six levels:

0. *Incomplete*: The HCD process is not implemented or fails to achieve its purpose.
1. *Performed*: Some HCD activities are carried out by enthusiastic people. The HCD activities may or may not be performed correctly.
2. *Managed*: The Performed process is implemented in a managed fashion. It is planned, monitored and adjusted, and its work products are appropriately established, controlled and maintained
3. *Established*: All projects comply with the quality system for HCD consisting of standards for carrying out HCD activities, style guides and rules for following up on the quality system.
4. *Predictable*: User needs are quantified, measurement data are collected and analysed. Corrective action is taken whenever measurements deviate significantly from quantified user needs
5. *Innovating*: HCD runs perfectly and steers business strategy. For example, the organisation's business goals and strategy are based on user research and user involvement in addition to financial goals, personnel goals, etc.

To boost the HCD maturity of an organisation that is at level Incomplete or Performed, carry out HCD activities that clearly demonstrate the benefits of usability, for example:

- Run usability tests of the organisation's products. Invite stakeholders to participate in the planning of the usability tests. Ask stakeholders to observe usability test sessions and to participate in identifying usability findings.
- Address HCD repeatedly and consistently in plain language with examples from the organisation.
- Conduct short HCD seminars that explain the benefits of HCD using examples from the organisation.

HCD maturity is also known as usability maturity or UX maturity.

Appendix A. Important changes to this document

Version	Changes
07-11-2022, v4.01	Reformatted text Changed all learning objectives to “Understand” and clarified the meaning of “understand” Removed the following definitions: 1. Iterative 2. Agile development, 3. Lean UX 4. User experience project plan 5. ISO 9241 6. User experience professional 7. Remote usability test 8. Usability test plan 9. Moderation (of usability test), 10. Usability lab 11. Heuristic evaluation, 12. Questionnaire (still mentioned in user survey) Added the following definitions: 1. Avoidance of harm from use 2. Human-centred quality 3. User interface specification 4. Ethical design 5. Sustainable design 6. Use error robustness (replaces Error tolerance) 7. User engagement (replaces Suitability for individualisation) Other important changes: 1. HCD maturity, description improved and renamed from Usability maturity 2. Dialogue => User-system interaction 3. Goal: examples changed and moved to chapter 4 4. User journey map: Figure added, tabular representation removed 5. Dialogue principle => Interaction principle 6. Pre-session interview => Pre-test interview. Post-session interview => Post-test interview. 7. User survey, split into two definitions: usability evaluation, context of use

Appendix B. Accessible, text-only description of the human-centred design process diagram, Figure 1

Figure 1 shows the 5 key HCD activities in an iterative, human-centred design process:

1. Plan the human-centred design process
2. Understand and specify the context of use
3. Specify the user requirements
4. Design solutions that meet user requirements
5. Evaluate the designs against user requirements

HCD activities 2 to 5 are arranged in a circle: activity 2 is at the top, activity 3 is on the right, activity 4 is at the bottom and activity 5 is on the left. Activity 1, planning, is a preliminary activity and sits outside of the circle.

Each of the 5 key HCD activities include specific HCD deliverables:

1. HCD deliverables for “Plan the human-centred design process"
   - Human-centred quality objectives
2. HCD deliverables for “Understand and specify the context of use”
   - User group profiles
   - Personas
   - Task models
   - As-is scenarios
   - User journey maps
3. HCD deliverables for “Specify the user requirements”
   - User needs
   - User requirements
4. HCD deliverables for “Design solutions that meet user requirements”
   - Use scenarios
   - Storyboards
   - User journey maps
   - Task models
   - Information architecture
   - Navigation structure
   - Style guide
   - Wireframes
   - Low-fidelity prototypes
   - High-fidelity prototypes
5. HCD deliverables for “Evaluate the designs against user requirements”
   - Evaluation reports

Appendix C. Accessible, text-only description of the relationship between user experience and usability diagram, Figure 2

Figure 2 shows the relationship between user experience and usability.

It has an area for user experience and an area for usability.

User experience has three sections: “Expectation”, “Satisfaction” and “Fulfilment of expectations”. Usability also has three sections: “Effectiveness”, “Efficiency” and “Satisfaction”

There is an overlap between “Satisfaction” in both areas, indicating that “Satisfaction” is part of both.

Figure 2 is further categorised by three chronological phases: “Anticipated use”, “Actual use” and “After use”.

Within “User experience”, “Expectation” happens in “Anticipated use”, “Satisfaction” happens within “Actual use” and “Fulfilment of expectations” happens within “After use”.

The whole of “Usability” falls within “Actual use”

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