HUMAN-COMPUTER INTERACTION THIRD EDITION

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User Centered Design (UCD) and Usability

User Centered Design (UCD)

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- introduction
- defining UCD
- usability
- characteristics of UCD
- UCD activities

Introduction

- The primary aim of the process of design and implementation of an interactive system should be to *maximize the usability* of the system.
- It is therefore important for us to understand:
  - The characteristics, methods and tools of a process of design and implementation that can maximize usability
  - The characteristics of usability
  - How to measure and/or evaluate the usability of an interactive system (*another class on evaluation*)

Defining UCD

- UCD is also referred to as the *user-centered methodology* or *human-centered design* or *human-centered methodology*.
- UCD is an approach to design that grounds the process in information about the people who will use the product.
- UCD follows a series of methods and techniques for analysis, design, and evaluation of software products.
- The UCD process is iterative and focuses on users through all the life-cycle phases in order to realize usable products.
- "*UCD is an iterative process whose goal is the development of usable systems, achieved through involvement of potential users of a system in system design.*" (Karat, 1996)

Defining UCD

- There is an international standard that forms the basis for UCD (ISO 13407: Human centred design process for interactive systems)
- "*Human-centred design is an approach to interactive system development that focuses specifically on making systems usable. It is a multi-disciplinary activity which incorporates human factors and ergonomics knowledge and techniques.*"

Defining UCD

- Note that the ISO 13407 standard defines a general process for including human-centered activities throughout a development life-cycle, but does not dictate the specific methods.
- UCD intends to ensure that the user is at the center during the design process in order to realize products that meet usability requirements.

Usability

- Definition of usability:
  - A commonly used definition of usability is that given by International Standards Organization (ISO/DIS 9241): Usability refers to "*the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.*"
  - Note that *context of use* refers to a set of associated or corresponding real-world conditions and constraints in which the user interacts with the software system [toward achieving purpose of the user and their organization].

Usability

- Advantages of usability
  - Allows you to focus on user needs and organization
  - Increases productivity
  - Improve the quality of products
  - Improve quality of life
  - Allows compliance e.g. with ISO standards, European directives on displays

Usability

- We observed that a common definition of usability is: "*the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.*"

- Effectiveness:
  - the accuracy and completeness with which users of the system reach the purposes for which the system has been designed.
  - the extent to which the user is able to reach goal while using the system.
- Efficiency:
  - the relationship between the effectiveness of the interaction and the allocated or expended resources to achieve the goals.
- Satisfaction:
  - the users' comfort with and positive attitudes towards the use of the system.

Usability

- Measures of effectiveness:
  - They are related to the purposes and activities planned for the system and measure the accuracy with which the system supports the user to achieve those purposes.
    - For instance: measure of the outcome of user's interaction, error rates, etc.
    - Example: if the aim is to "type a letter" then possible measures are: the number of misspellings, document formatting features, etc.
    - Example: if the aim is to "search articles on a certain topic" then possible measures are: the number of relevant articles in the result, etc.

- Measures of efficiency:
  - They are linked to the consumption of resources required to attain the purposes.
  - For instance: task completion time, learning time, physical resources expended, etc.
  - Example: if the aim is "to print a report" then possible measures are: number of copies printed in a unit of time, ratio between the total number of copies printed and the number copies printed correctly, etc.

- Measures of satisfaction:
  - They are linked to the users' comfort with and positive attitudes towards the system, or pleasantness of interacting with the system.
  - Users' satisfaction can be measured subjectively (e.g. by rating/preference scales, etc) and/or objectively (e.g. , physiological monitoring, etc). [Note the subjective rating scales could be based on effectiveness and efficiency]

Characteristics of UCD

1. Know your users
   - characteristics, tasks, context/organization/environment in which they use the system.

2. Actively involve users early and continuously

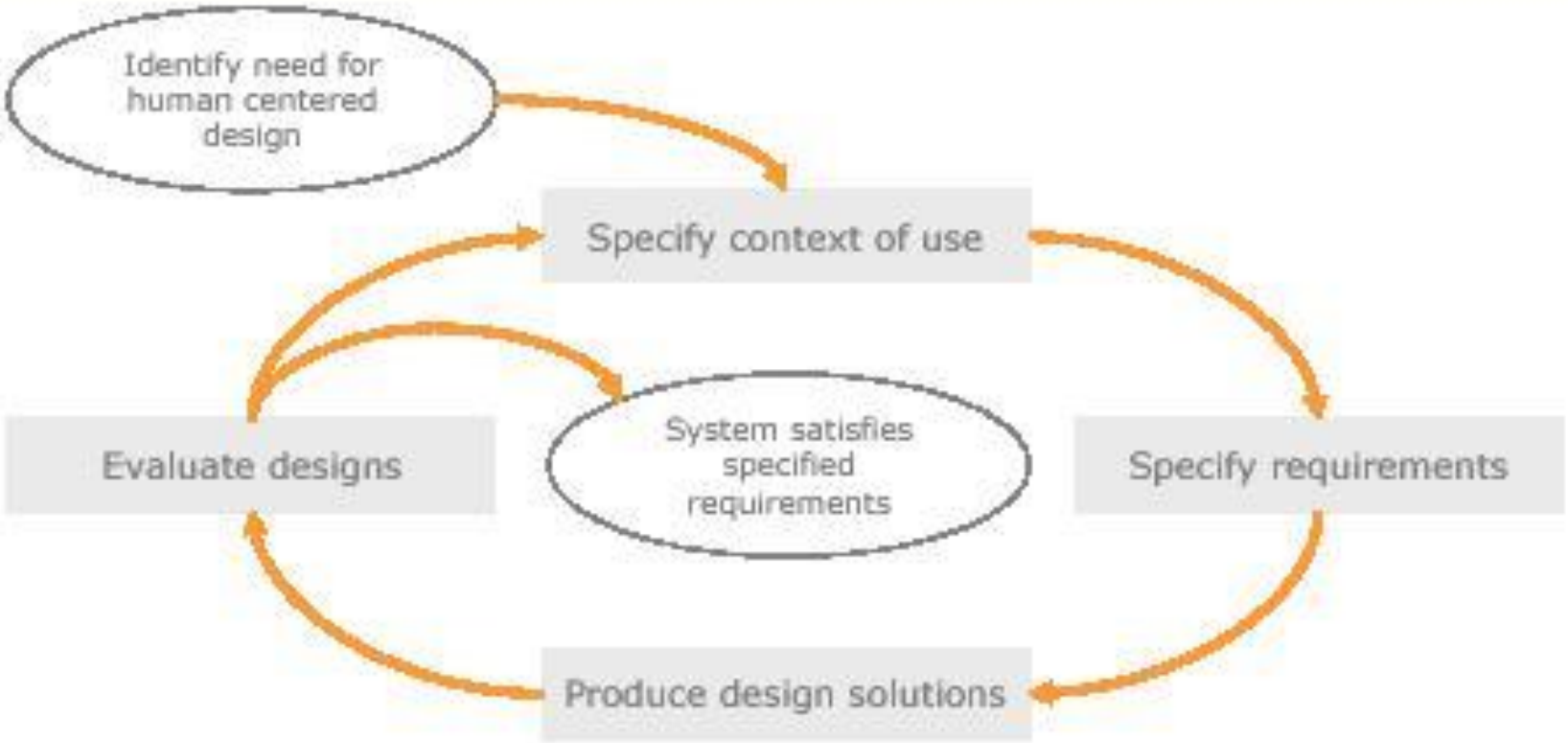
3. Rapid and frequent iteration of designs with usability assessments

4. Multidisciplinary team
   - in line with the ISO 13407 standard (Human-centred design processes for interactive systems).
   - development team is made up from representatives of all the groups who have a 'stake' in the proposed software (stakeholders) e.g. domain experts, usability specialists, software engineers, etc.

UCD activities

- According to the ISO 13407 standard, there are four essential user-centered design activities which should be undertaken to incorporate usability requirements into the software development process
  1. understand and specify the *context of use*
  2. specify the *requirements*
  3. produce *designs and prototypes*
  4. carry out *assessments/evaluations*

UCD activities



(based on ISO 13407: Human centred design process for interactive systems)

UCD activities

- 1. Understand and specify the context of use
  - The quality of use of a system depends very much upon the context in which a system will be used
  - We should seek to understand:
    - the characteristics of the intended users
    - the tasks the users will perform , and allocation of activities between users and system
    - constraints and characteristics of the socio-organizational and technological environment in which the users will use the system
  - The results of this initial activity are embodied in a document which describes the context of use for the proposed software

UCD activities

- 2. Specify the requirements
  - Building on the context of use description obtained previously, an explicit statement of the user-centered requirements for the new software should be formulated

UCD activities

- 3. Produce designs and prototypes
  - The key goal is to simulate the design solution(s) using paper or computer-based mock-ups
  - Explore design solutions by through mock-ups, and prototypes in general, of the proposed system

UCD activities

- 4. Carry out evaluations
  - The usability evaluation of design decisions is crucial!
  - Develop an evaluation plan for the current stage
  - Do an assessment during each of system lifecycle stages (with or without users)
  - This evaluation process is iterated at each stage until design/usability goals or requirements are met

UCD activities

- There are many methods which can be used to achieve the goals of user-centered design (and will be covered later in the course)
  - Requirements gathering techniques: characteristics of users, etc
  - Task analysis: analysis of user tasks/activities
  - Evaluation techniques: expert-based, user-based, etc
  - etc