# **Course:** Human Computer Interface (HCI)

## **Week 6:** User-Centered Design

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# Course Description

- The course begins with an introduction to Human Computer Interface (HCI) concepts, i.e. the human (brain, human visual system, visual perception and optical illusions), the computer and the interface perspectives.
- Theories and principles to design for attention will be covered and thereafter psychological and social interaction to address use of cognition and use of proper language and metaphors (menus).
- User-centered design and human-centered design will be covered in detail to understand how the two terminologies are similar and how they differ.
- Architectures for user interfaces mainly Graphical User Interface will lead the course coverage to user experience, universal design, design principles, heuristics and golden design rules.
- Information retrieval and utilization architectures will then be connected to designing rich interactive systems using styles that enhance usability (web and mobile) and easy navigation.
- User experience and support will be covered as we look into methods of evaluating interactive systems

# **Learning outcomes Week 6:** User-Centered Design

At the end of the lecture, you will be able to:

i. Define basic user-centered design concepts

ii. Describe the typical user centered design methodology

iii. Describe the international standards for user centered design processes

# INTERACTIVE SYSTEMS DEVELOPMENT:

## What is User-Centered Design?

- ✓User Centered-Design (UCD) is a **process** that places the person (user) at the center of system design
- ✓The focus is on **cognitive** factors such as perception, memory, learning, problem-solving etc. since these are crucial during human and computer interactions[1].
- ✓UCD approach focuses on the people who will use the product throughout the planning, design and development phases of a product.

1. Designing for Effective Human/Computer Interaction (4th ed.), Schneiderman, B., Plaisant, C.: Pearson Education, Inc.: ISBN 0-321-19786-0, (2005). Pg 136

*UCD seeks to answer questions such as:*

- ✓ Who are the system users?
- ✓ What are the users' tasks and goals?
- ✓ What is the level of user experience?
- ✓ What functions do users need from the system?
- ✓ What information might the users need, and in what format do they need it?
- ✓ How do users think the system should work?
- ✓ How can systems design facilitate users' cognitive processes?

## *User-Centered Design*

- HCI is to be used by real users, hence the design process should be centered on the user (user-centered design)

✓ UCD is user centric, not data centric and

✓ UCD extensively involves users in the process of creating the interface by observing users while designing and evaluating the prototypes

- ✓ UCD is interdisciplinary i.e. draws on knowledge from art, psychology, technical writing, and computer science.
- ✓ UCD is highly interactive and involves many tests and revisions.

**General UCD process follows the following steps**

a) Needs analysis

b) User and task analysis

c) Functional and requirement analysis

d) Setting usability Specifications

e) Designing and prototyping

f) Evaluation of prototype

- ✓UCD improves system usability and usefulness[2].
- ✓***Usability*** relates to *ease-of-use*; simple concept, but not always easy to implement.
- ✓***Usefulness*** relates to relevance; do the functions, information, etc., match what the user actually needs?

2. Designing for Effective Human/Computer Interaction (4th ed.), Schneiderman, B., Plaisant, C.: Pearson Education, Inc.: ISBN 0-321-19786-0, (2005). Pg 136

# Usability Guidelines

Certain global usability principles or guidelines exist and they can be summarized as follows[3]:

i. **Visibility -** helps users form correct mental models to predict the effects of their actions. Users should tell at a glance what they can and cannot do, therefore, important elements such as navigation aids should highly be visible.

3. Designing for Effective Human/Computer Interaction (4th ed.), Schneiderman, B., Plaisant, C.: Pearson Education, Inc.: ISBN 0-321-19786-0, (2005). Pg 139

ii. **Memory Load -** The system should reduce user memory load. Screen elements should be meaningful and consistent across the system for users to recognize and not remember, what the elements mean from one page to another. New items and functions should relate to the ones the user already knows.

iii. **Feedback-** When a user performs an action, he should receive immediate feedback. E.g. upon clicking a button, some screen elements should change as indicator that the system has registered some form of action.

iv. **Accessibility -** Users need to find information quickly and easily. Several ways to find information such as navigational elements, search functions etc. should be offered. However, too many options offered at once may bring confusion to many users.

## v. Errors

- ✓These occur due to incorrect user action(s) such as clicking the wrong link or button.
- ✓User errors need to be minimized and mechanisms to allow users recover quickly from errors provided[4].

4. Human-computer interaction (3rd ed.), Dix, A., Finlay, J., Abowd, G., & Russell, B. New Jersey: Prentice Hall. ISBN-10: 0130461091, ISBN-13: 978-0130461094, (2004). Pg. 30 Pg 313

vi. **Satisfaction** - Programs should be pleasant to use and look at since this influence user perception of ease-of-use, motivates users to learn how to use the software program and builds their confidence in the reliability of the program

vii. **Legibility -** Text should be easy to read and some guidelines could suffice e.g., some fonts are easier to read than others especially in body text. Text written in all capital letters is hard to read, italics are hard to read online and change of font sizes should be allowed.

viii. **Language -** for clarity, it is important to use short sentences, verbs and simple sentence structures

**ix. Visual Design -** helps users manipulate systems effectively and to achieve this, one should: -

- ✓ create simple, neat interesting pages
- ✓ use graphics to illustrate/inform (not decorate).
- ✓ increase the user's satisfaction/motivation.
- ✓ display important elements in a visually prominent way
- ✓ conservatively use color since misapplication of color creates negative outcome. Color can engage users, both emotionally and cognitively. Monochrome designs can be tried first, then, colours can be added one at a time.

# International Standard

- ✓There is an international standard that is the basis for many UCD methodologies (ISO 13407: Human-centered design process), which defines a general process for including human-centered activities throughout a development life-cycle[5].

5. Human-computer interaction (3rd ed.), Dix, A., Finlay, J., Abowd, G., & Russell, B. New Jersey: Prentice Hall. ISBN-10: 0130461091, ISBN-13: 978-0130461094, (2004). Pg. 30

The following four activities form the main cycle of work applicable after the need to use a human centered design process has been identified[6].

i. **Specify the context of use** by identifying the people who will use the product and for what purpose and the conditions under which they will use it.

ii. **Specify requirements** by identifying any business requirements or user goals that must be met for the product to be successful.

6. Human-computer interaction (3rd ed.), Dix, A., Finlay, J., Abowd, G., & Russell, B. New Jersey: Prentice Hall. ISBN-10: 0130461091, ISBN-13: 978-0130461094, (2004). Pg 30

iii. **Create design solutions** for the problem at hand. This may be done in stages as the designer builds from a rough concept to a complete design.

iv. **Evaluate designs -** this entails usability testing with actual users and it is essential as quality testing is to good software development. The development process ends and the product can be released to users once the requirements are met[7].

Human-computer interaction (3rd ed.), Dix, A., Finlay, J., Abowd, G., & Russell, B. New Jersey: Prentice Hall. ISBN-10: 0130461091, ISBN-13: 978-0130461094, (2004). Pg 140

# Typical User Centered Design (UCD) Methodology

- ✓UCD activities are broken down into four phases: analysis, design, implementation and deployment.
- ✓Usability testing appears several times throughout the phases meaning that providing a great user experience is an ongoing process[8].

8. Human-computer interaction (3rd ed.), Dix, A., Finlay, J., Abowd, G., & Russell, B. New Jersey: Prentice Hall. ISBN-10: 0130461091, ISBN-13: 978-0130461094, (2004). Pg. 136

# I. Analysis Phase

- ✓ Meet the key stakeholders and set the project vision
- ✓ Add usability tasks in the project plan
- ✓ Build a multidisciplinary team for complete expertise
- ✓ Develop usability goals and objectives
- ✓ Conduct field studies and check on competitive products
- ✓ Create user profiles and develop a task analysis
- ✓ Document user scenarios and user performance requirements

# II. Design Phase

- ✓ Brainstorm design concepts and metaphors
- ✓ Develop screen flow and navigation model
- ✓ Perform a walkthrough the design concepts
- ✓ Draft the design with paper and pencil
- ✓ Create low-fidelity prototypes and conduct usability testing on them
- ✓ Create high-fidelity detailed design
- ✓ Perform *usability testing* again
- ✓ Document standards and guidelines
- ✓ Create a design specification

# III. Implementation Phase

- Perform continuous heuristic evaluations
- Work closely with delivery team as the design is implemented
- Conduct *usability testing* as soon as possible

# IV. Deployment Phase

- Use surveys to get user feedback
- Conduct field studies to get information about actual use
- Check objectives using *usability testing*

## HCI Design Process and User-Centered Design

Basic design processes in software engineering or HCI that are widely adopted include: -

i. The waterfall process

ii. The iterative process

iii. Rapid prototyping

# A. Waterfall process

✓ A straight forward process that follows three sequential steps i.e.:-

a) Analysis of the proposed product,

b) Design and implementation and

c) Testing of the implementation.

- *Primary advantage* - a **clear method** that results in a product at the end of the process.
- *Disadvantage* - **Hard to discover** many issues in the **early phas**es of the process until later phases, e.g., testing of the implementation may reveal design flaws that require re-consideration.

# B. Iterative process

- ✓ The process assumes that the final product can be made correct the first time and is more appropriate for the design of products with many unknowns i.e. *intricate* software products
- ✓ Two main phases are repeated until the product passes specification. These are: -
    a) Design and code
    b) Test and evaluate
- ✓ *Disadvantage* - **it implies product evaluation occurs only after coding;** this is an expensive proposition

# C. Rapid prototyping

- ✓ A variation of the iterative process more appropriate to HCI systems design involving four steps: - design, prototyping, evaluation and implementation
- ✓ A prototype is the model on which something is based or formed.
- ✓ Here, several levels of prototyping known as *fidelity*, which varies from text documents, drawings, mock up, and programs are designed to allow rapid iteration of the process.
- ✓ Advantage – Product designers and consumers can view or try early versions of the product - very ideal for HCI products since they cannot really be evaluated until they are tried

# **Content Covered in Week 6:** User-Centered Design

i. We have defined basic user-centered design concepts
ii. We have also described the typical user centered design methodology
iii. We have discussed the international standards for user centered design processes

# Course Text Books

1. Human-computer interaction (3rd ed.), Dix, A., Finlay, J., Abowd, G., & Russell, B. New Jersey: Prentice Hall. ISBN-10: 0130461091, ISBN-13: 978-0130461094, (2004).

2. Designing for Effective Human/Computer Interaction (4th ed.), Schneiderman, B., Plaisant, C.: Pearson Education, Inc.: ISBN 0-321-19786-0, (2005).

3. The design of everyday things, Norman, D. A. New York: Basic Books. ISBN-10: 0465067107, ISBN-13: 978-046506710, (2002).

4. Designing the user interface: Strategies for effective human-computer interaction (5th ed.), Shneiderman, B., Plaisant, C., Cohen, M., & Jacobs, S. New Jersey: Prentice Hall. ISBN-10: 0321537351, ISBN-13: 978-0321537355, (2009).