

2 – (Process of) Designing UbiComp Systems

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Days and Topics

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|------------------|--|
| March 11 | Intro |
| March 16 | Designing UbiComp Systems – Assignment 1 Published in Detail |
| March 23 (10-13) | Prototyping and Evaluating Ubiquitous Computing Systems - Paper Presentation and Discussion (Assignment 1) – Assignments 2-4 Published in Detail – Android Sensing Tutorial Day will be Announced! |
| April 20 | Presentation Assignment 2/3 |
| April 27 | Presentation Assignment 2/3 – Submission Assignment 4 |
| May 4 | User Interfaces for Ubiquitous Computing - Assignment 5 Published in Detail |
| May 11 | Context-Aware Computing - Details on Final Paper |
| May 18 | Presentation Assignment 5 |
| June 1 | Presentation Assignment 5 |
| June 8 | Submission Final Paper |

Recap

1. What is ubiquitous computing?
2. What kinds of research questions are asked in ubiquitous computing?

Forward

You should design a mobile system for police officers that offers them relevant information about a location they are in. What is your procedure towards system deployment?

Today

User-Centered Software Design: Analyse – Design/
Implement – Evaluate

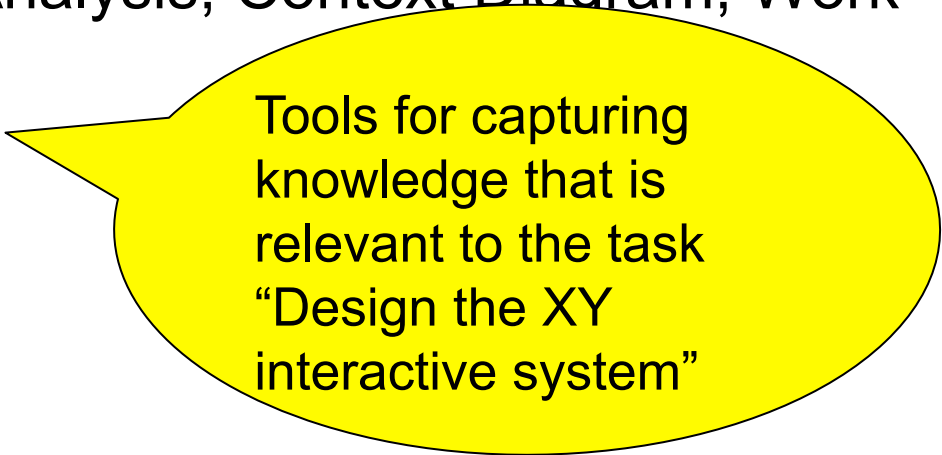
Storyboards (both Analysis + Design)

Analysis: Stakeholder Analysis, Context Diagram, Work
Modelling

Design: Prototyping

Next lecture – Evaluate

- Overview Methods
- Details on: Cognitive Walkthrough, Heuristic Evaluation,



Tools for capturing
knowledge that is
relevant to the task
“Design the XY
interactive system”

Learning Goals

After today's lecture you should

1. Remember and understand user-centered software design (UCD) principles and participatory design principles
2. Remember and understand the basic process steps of UCD
3. Be able to carry out a stakeholder analysis
4. Be able to develop a context diagram
5. Be able to develop storyboards

PROCESS

Recap: Traditional Software Engineering Process

1. Requirements
2. Software architecture
3. Coding and unit testing
4. Integration and integration testing
5. Deployment and maintenance

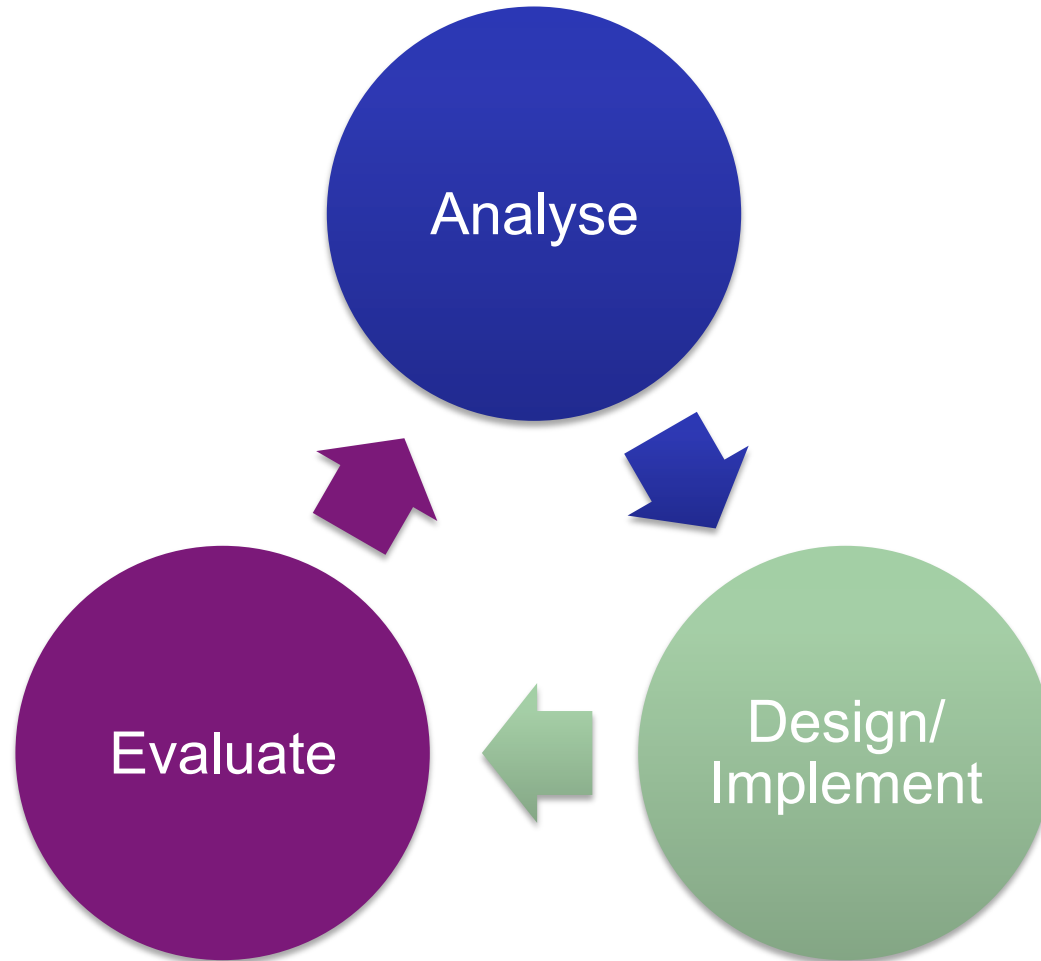


Where is the user?

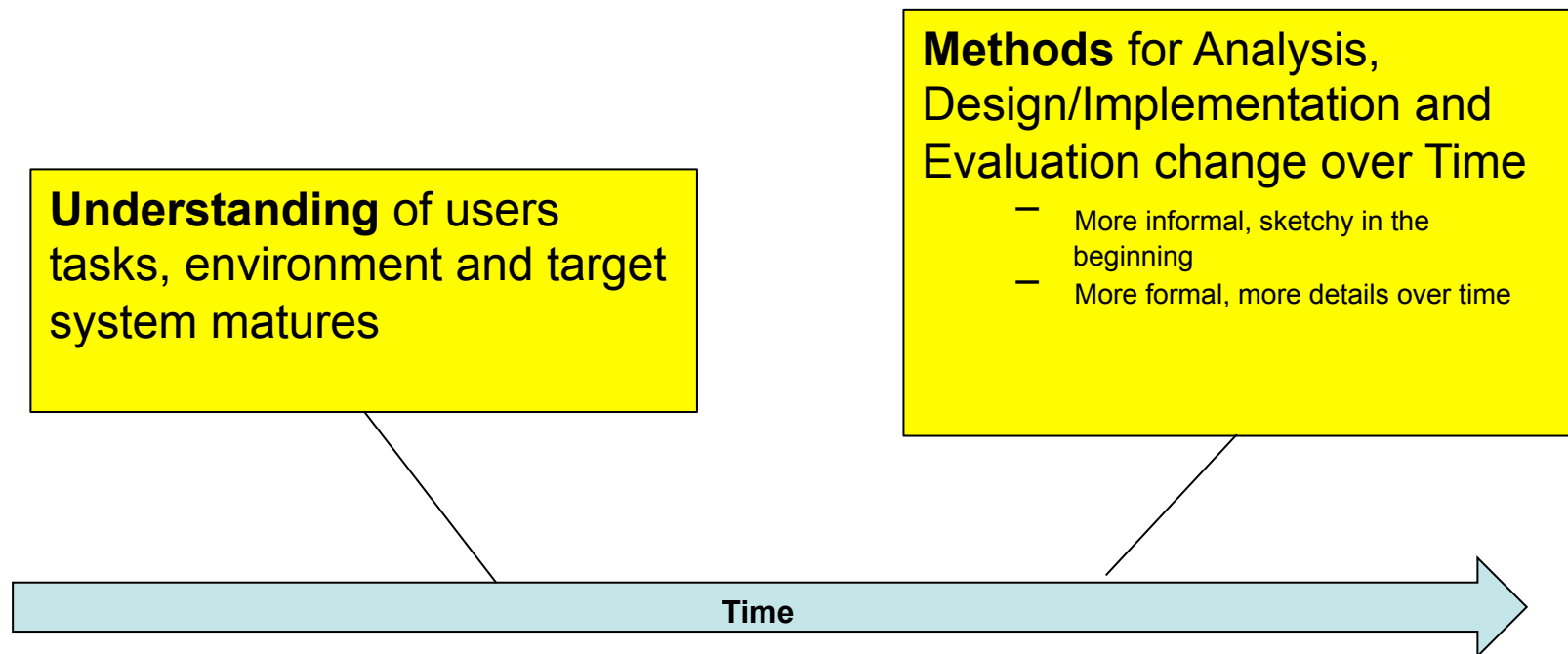
User-Centered Software Design (UCD) Principles

- 1. Understand users, their tasks and environment**
- 2. Involve users in design**
- 3. User-centered evaluations are part of the design process**
4. Iterative design process
5. Complete user experience (not only functionality)
6. Design team is interdisciplinary

UCD Process: Basic Process Steps



UCD Process: Timeline



Participatory Design

End users are full participants in the design process

- Including decision making, inventing new designs, gathering field data...

Rationale:

- Users' knowledge as resource for design (overlap with UCD)
- Ideological – those affected by design should have a say

Extreme, but extremely useful to at least try!

Degrees of User Involvement

User: Uses final system

Tester: Tests intermediate versions

Informant: Helps during design process (participates in interviews, focus groups, is being observed, critiques designs...)

Co-Designer: Full design partner in the sense of PD

STORYBOARDS

Storyboard

Focus on overall picture

Tells a story (concrete user, concrete setting, concrete flow of interaction – one instance, not a generic description)

Illustrates

- Pain point: What's the problem?
- Measure of success: How will users recognise that with the new system works better?
- Vision: How will the overall interaction process look like (sequence of activities)?
 - **(This use of storyboards already belongs to “Design/Implement” activities!)**

Representation: Textual or visual

Storyboard Examples

Pain point: Never know when boss is in office / available

Measurable success: Know exactly when boss is in office

Vision: Get notified if boss moves with visitor towards door and there are at least 15min until next meeting

Storyboards

Cover UCD Principles

- “Understand users”
- “Involve Users in Design” (as storyboards are a notation that is easy to use in communication with users)
- “User-centered evaluations” if storyboard about measuring success is created

Cover Process Steps

- Analysis (Pain points, Measuring Success)
- Design (Vision)

ANALYSIS

Levels of Analysis

A solid blue rectangular box containing the word "Micro" in white text.

Micro

A solid light green rectangular box containing the word "Meso" in white text.

Meso

A solid purple rectangular box containing the word "Macro" in white text.

Macro

Stakeholder Identification

Who are Stakeholders?

- End users (Micro) – Who will use the system?
- Who else will be affected by the system (Meso)? Often people who interact with end users.
- Who else influences how the target system will look like (Macro)? Often decision makers, IT department, regulatory bodies.

End user -> Stakeholder

Stakeholders in Relation to Target System

What is stakeholders' relationship to the target system?

- Benefits
- Threats / Risks

Practice – Stakeholder Analysis

Find someone who is not your group partner

You should design a mobile system for police officers that offers them relevant information about a location they are in.

Do a rough stakeholder analysis in 5min:

- Who are the stakeholders?
- Will they benefit?
- Do they risk losing (what?) if target system is in place?

Stakeholder Analysis

Covers

- UCD Principle “Understand your users”
- UCD Process Step “Analysis”

Rationale – Knowing and Understanding Stakeholders relevant in

- Work modelling
- Organising design process (undersanding power structure, weighting requirements)

Context Diagram

Two kinds of elements in a context diagram:

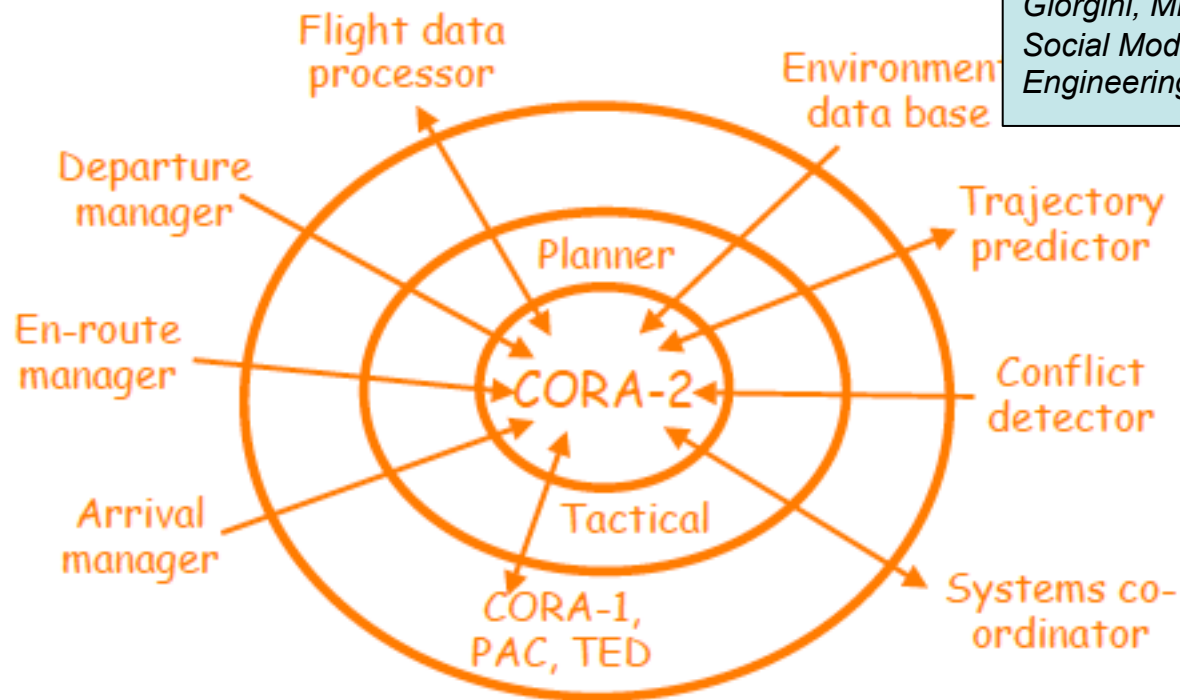
1. Actors: Stakeholders and Systems
2. Interactions (Data Flow if seen as Data Flow Diagram)

3 levels of analysis:

1. To be (re)designed: Target system and target end users (Micro)
2. Affected / potential for re-design at high costs: Connected systems and affected stakeholders (Meso)
3. Systems and stakeholders that influence the target system design, but cannot be influenced

Context Diagram - Example

Taken from: Maiden et al., Using i* in Requirements Projects, p.169. In: Yu, Giorgini, Maiden, Mylopoulos 2011 *Social Modelling for Requirements Engineering*



Exercise: Context Diagrams

With the same group partner as before

You should design a mobile system for police officers that offers them relevant information about a location they are in.

7min: Draw up a context diagram with the target system in the center, target users around the target system; affected systems and stakeholders in the next circle; and influencing systems and stakeholders in the outer circle

Work Modelling

Capture aspects of “work” (activity) that need to be known by software designers

1. Communication and coordination between people (flow model)
2. Culture and policies (culture model)
3. Detailed sequences of steps for relevant tasks; strategies for approaching tasks; underlying goals of people (sequence model, goal models)
4. Physical environment (physical model)
5. Artefact that are used and created (artefact model)

Work Modelling

Case studies: Work models of concrete people in concrete situations.

Consolidated models: Work models that abstract from individual cases to personas, whole populations.

Exercise: Work Modelling

On Monday, the 13th, Maria quickly scans through all her emails on the bus to work. She wants to have an overview of what she needs to do for others even before the first meeting at 9am. When she encounters an email that she can immediately answer, she does so. She flags emails that contain more complex tasks for working on them later.

(Individual work – 5min)

Work Modelling

- “AS IS” (main use)
- Vision: Work changes as technology is designed!

Stakeholder Analysis

- “AS IS” (main use)
- Vision: Stakeholders’ interactions may change

Storyboards

- “AS IS”: Identified Pain Points
- Measures of Success
- Vision

Context Diagram

- Vision (target system at center)

Methods: How and from whom to get all this knowledge?

Sources of knowledge

- Literature
- Domain experts
- Users

Methods

- Simply talk to users!
- Observation
- Interviews
- Focus groups / group discussions
- Questionnaires
- Experiments
-

CONCLUSION

Recap

- UCD Principles
- UCD Basic Process Steps
- Tools:
- Storyboards (Analysis + Design)
- Stakeholder Analysis
- Context Diagram
- Work Modelling (Communication/coordination, cultural, sequence, physical, artefacts)

Readings

Contextual Design at

[https://www.interaction-design.org/encyclopedia/
contextual_design.html](https://www.interaction-design.org/encyclopedia/contextual_design.html)

Dix et al., Human-Computer Interaction, Chapter 6 “HCI in the software process”

Instantiation of Iterative Process - Examples

Example: “Improve practice around lessons learned”

- Very open analysis methods initially (ethnography, field studies... with the goal to understand current practice and “pain points”)
- Vision and storyboards are “to-be-developed”

Example: “Design a system that supports the quotation process”

- Process can start with agreeing on a first vision and storyboard
- Analysis of current practice can from the beginning on be focussed on the specific work process