Integrating User-Centered Systems Design in the Software Development Process

Usability Design

− Integrating User-Centered Systems Design in the Software Development Process

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Definition of User-Centered Systems Design

“User-centered systems design is a process focusing on usability throughout the entire development process and further throughout the system life cycle. It is based on the following key principles.”


To practice UCSD – Usability Design
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Usage example

Usability Design – from principles to process

- Adds essential UCSD activities and roles to any process.
- Easy to communicate.
- Easy to integrate: in organizations and projects.
- A subset of a development process.

Plan the UD process

- Must also be an integral part of the overall project planning.
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**Usability Design Process**

**Requirements analysis**
- Contextual inquiries and user goals
- Usability Design Guide
  - Evaluation
  - Prototypes
  - Usability Design Guide
  - Evaluation

**Usability Design in Systems Development**
- User Focus
- Active user involvement
- Evolutionary development
- Simple design representations
- Prototyping
- Evaluate use in context

Driven by the **Usability Designer**

**Active user involvement**
Growing software with iterative design

**Deployment**
- Introduction and operate
- Goals met?
- Yes
- No!

**Growing software with iterative design**
- **Usage Scenarios**
- Concepts Design
- Evaluations
- Usability Design Guide
- Evaluation
- Goals met?
- Yes
- No!
- Yes

**Usability Design Guide**

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**Contextual Inquiries and User Profiling**

- Background: electrician, maintenance/process technician
- Hostile Electrical applications
  - Some also do mechanical applications and process dependent applications
- Problem identification/solving (70%)
- Regular maintenance (30%)
- Uses camera in the facility where he works or travels to different sites: schools, hospitals, goas stations, hotels, etc. (for power problems, fire prevention)
- Hostly indoors, very little office work.
- Uses the camera <10% of work time.
- Uses other tools: screwdriver, pliers, amperemeter, etc.
- Some also carry protocol/notepad

- For regulatory reasons: certificates/training can be mandatory in some cases.
- Quick and efficient for finding problem that would otherwise take more time.

**Functionality Needed in Camera**
- View Image
  - Focus
  - D-style color scheme (palettes)
- Use color alarm – white/black
- Manually adjust viewed temperatures (scale)
- Use focus point
- Mount camera on tripod (adjustable)
- Measure temperature
  - Measure comfort temperature
  - Find hot/cold spots
  - Measure humidity - adjust emissivity
- Store image
- Manage stored images (view/delete)

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Focusing on users

- Design criteria are complementary to usability goals.
- As we iterate through analysis, design and evaluation we learn more about what kind of design that will work best.
- Design criteria is an “aid” to design for usability.
- These criteria are derived from user profiles and work tasks, and gives the direction for the design (layout and interaction).
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Design criteria:

Image size. Make the area for images as large as possible.

Minimal user load. Make the handling of the application as easy as possible. No extra load should be put on the user. This includes short access paths to functions and minimized navigation paths within the application.

Work oriented. The application should map (support) the actual work situation (work flow) and domain to further minimize the mental load.

Support multiple user levels. The same application should allow both novice and expert users to gain maximal usability. There should be no expert mode needed.

Design criteria, an example

Design decisions:

• No navigation through menus. Supporting criterion 2.
• Fixed and static layout. Supporting criteria 1, 2 & 3.
• Clean layout without unnecessary graphical effects. Supporting criterion 1.
• Focus on content. Supporting criteria 2 & 4.
• Restricted use of metaphors, use only when appropriate. Supporting criterion 4.

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Usability Design Guide

Example TOC

- Customizing the usability design process for the project
- Plan for user participation
- Overview of the system – goals and functionality
- User profiles and/or personas
- Contextual task analysis
- Platform capabilities and constraints
- Usability goals
- Design decisions and criteria
- Usage scenarios
- Conceptual design
- Interaction design, navigation and information structure
- Detailed design
- Design artifacts
- Feedback and evaluations

Usability Design Process

Requirements analysis

- Contextual inquiries
- System goals, design criteria and usability goals
- User profiles
- Problem analysis

User Focus

- Evolutionary development
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- Evaluate use in context

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- Explicit design activities
- A professional attitude
- Usability champion
- Holistic design
- Processes customization
- A user-centered attitude

Active user involvement

- Growing software with iterative design
- Evaluation

Yes

No!

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Deployment

Introduction and operate

Yes

No!

Yes

No!
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**Scenarios – User stories**

- **Scenarios for describing:**
  - Current work situation
  - Elicit requirements
  - Future usage

**PREPARE THE SOLUTION**

**User role:** Laboratory staff.

**Priority:** 1=must have, 2=should have, 3=could have

**Context:** The user wants to prepare the solution for a particular step in an activity, for example Stock Solution in 2D. The user does not know how to prepare the solution but knows which activity in the System to use it in. The user is able to check the recipe under the column and then use it. Another common situation is that the laboratory staff wants to prepare different solutions in advance. They start with preparing all solutions for a certain activity, and continue to add solutions in the next activity. An example is when an HPLC buffer has been created, and laboratory staff is going to use the solutions for the next activity (i.e. next activity in the workflow).

**Issues for the prototype:** The user starts with searching among all chemicals etc. Criteria may be short name, long name, application (both types of chemical and activity information displayed in result list is the short name). When selecting the name, a view containing information of the solution is displayed. From this view it is never possible to edit information about a specific solution and create new code for the next time and register it.

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**Conceptual design**

- **Abstract description of the overall concept.**
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Refined conceptual design

Example of conceptual design
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Interaction design

- Interaction sequences, information architecture, the dynamics, navigation, menus, etc.

Interaction design – example of navigation structure
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Interaction design | structured information architecture

Navigation with work task buttons

Detailed design

- Exact placement, accurate components, colors, fonts, graphics, etc.
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Prototyping

Prototyping – going from simple and comprehensible paper sketches to a completed system.
Prototyping – low fidelity

Prototyping – high fidelity
Prototyping – Quick and efficient

- Visual Basic prototype...

Participatory prototyping

User profiles

User profiles

Personas

User

Drawing area

Drawing material
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Usability Design Process

Requirements analysis

- Contextual inquiries
- User profiles
- Technical description
- User needs, design criteria and usability goals

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- High-level concepts
- Evaluation

Design Scenarios

- Concepts
- Select
- Refine
- Test

Prototypes

- Conceptual
- Evaluation
- Goals met?

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Deployment

- Introduction and operate

Usability evaluations

- Preferable in users’ natural work environment.
- Powerful when seen as a part of the explorative process of finding (inventing) solutions.
- It’s an interaction between analyzing the problem, seeking solutions to the problem and evaluating solutions.
- Evaluations as a tool to explore the design space and learn more about possible solutions.
- Possible to combine field studies with evaluations.
Out in the field, meeting users

Evaluation – mock-up example
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Evaluation – example mock-up and paper

Usability Design Process

Requirements analysis
- Stakeholder and business objectives
- System goals, design criteria, and usability goals
- User profiles
- Contextual inquiries
- Usability Design Guide

Analysis and design
- Analyze and refine models
- Usability Design Guide
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Deployment
- Introduction and operation
- Goals met?
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- No!
- Yes
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To deploy and introduce a system

- Critical to the success of the system.
- Usually gets too little attention.
- Must start when the project starts.
- Involves: organization, work processes, work force competence, etc.
- The system owners must be involved from the start of the project.
- Education and support.
- Use “ambassador users”.

Studies
Vision, change of business and the need of a system.

Analysis
Requirements on the system.

Design
Design the system.

Construction
Construct the system.

Deployment
Deploy and use the system.

Maintenance
Maintenance and further develop of the system.