Fun, Networking & Jobs
Die Campus-Messe der Universität des Saarlandes

Donnerstag, 11. Mai 2017
10 bis 15 Uhr
Universität des Saarlandes | Campus Saarbrücken
Geb. E1 3 - E1 5
User Interface Design and Usability

Software Engineering
Rahul Premraj + Andreas Zeller • Saarland University

Credits: Robert Miller, MIT
Mary Czerwinski, MSR
Next Tuesday

Software Design
Andreas Zeller
Saarland University

Recaps material from BSc studies at Saarland
User Interface Design and Usability

Software Engineering
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WE INTERVIEWED HUNDREDS OF USERS AND TURNED ALL OF THEIR SUGGESTIONS INTO FEATURES.
What we expect

1. A set of requirements
   contract style • ≤4 pages

2. A set of use cases
   Pressman style • ~10–20 pages

3. A GUI design
   covering all “must-have” and most “may-have” use cases

4. Architectural models and data models
   covering all “must-have” and most “may-have” use cases

5. An executable prototype
   covering all “must-have” use cases
User Interface Design and Usability

Software Engineering
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What is good design?
Don't go to the right?

http://www.baddesigns.com/examples.html
What do these symbols mean?
How much is the gas?
Interface
Interface

definition

interface

n. Computer Science

• The point of interaction or communication between a computer and any other entity, such as a printer or human operator.

• The layout of an application's graphic or textual controls in conjunction with the way the application responds to user activity: an interface whose icons were hard to remember.
What is Design?
What is Design?

Design is not just what it looks like and feels like.

Design is how it works.
What is Design?
What is Design?

2007
Balenciaga Collection
The User at the centre of any design activity
User-Centric Design

- Cost saving!
- Competitive market - user expectations.
- Political demands
- Is Help always helpful?

Credits: Mary Czerwinski
Human Capabilities

- Memory
- Attention
- Visual Perception
- Learning
- Color
- Language + Communication
- Ergonomics
Memory

• Associations are built by repetition.
• Scaffold model (more likely to remember items that have many associations).
• Recognition is easier than recall.
• Working memory has small capacity.
• Long-term memory has large capacity.
Attention is a resource – gets divided amongst tasks.

Automatic well-learnt processes not need much attention.

Important to get (for you as a designer).
Visual Perception

- We excel at pattern recognition.
- We automatically try to organize visual displays and look for cues.
- Motion, grouping, contrast, color can make different parts of a display more or less salient.
Learning

- Learning is improved by organization.
- Consistency and mnemonics improve learning.
- Targeted feedback facilitates learning.
- Learning occurs across people and organizations.
Learning

• Incrementally presented information accelerates learning.

• Some users like to explore systems to learn; others will not.

• Workers focus on accomplishing tasks, not learning software.
• Red-green color blindness (protanopia & deuteranopia)
  • 8% of males
  • 0.4% of females
• Blue-yellow color blindness (tritanopia)
  • Far more rare
• Guideline: don’t depend solely on color distinctions
  • use redundant signals: brightness, location, shape
Language + Communication

syntax, semantics, pragmatics; conversational interaction, specialized languages
Ergonomics

arrangement of displays and controls; cognitive and sensory limits; effects of display technology; fatigue and health; furniture and lighting; design for stressful and hazardous environments; design for the disabled...
Where does user-centered design fit into the development process?
Traditional Waterfall Model

Requirements ➔ Design ➔ Code ➔ Integration ➔ Acceptance ➔ Release
Traditional Waterfall Model with Feedback

1. Requirements
2. Design
3. Code
4. Integration
5. Acceptance
6. Release

With Feedback
Waterfall Model Poor for UI Design

• UI design is risky.
  - So we are likely to get it wrong.

• Users are not involved in validation until acceptance testing.
  - So we won’t find out until the end.

• UI flaws often cause changes in requirements and design.
  - So we have to throw away carefully written and tested code.
Iterative Design

- Design
- Implement
- Evaluate
Why NOT Iterative Design?

- Every iteration corresponds to a release
  - Evaluation (complaints) feeds back into next version’s design
- Using your paying customers to evaluate your usability
  - They won’t like it
  - They won’t buy version 2
Spiral Model
Spiral Model Iterations

• Early iterations use cheap prototypes (paper prototyping).
• Later iterations have richer implementations.
• More iterations generally means better UI.
• Only mature iterations are seen by the world.
Figure 1.1 A hand-drawn paper prototype of a screen from an application used to design filters for scientific data.
Paper Prototyping

Credits: Nielsen Norman Group
Register

First name:  

Last name:  
Browse by Category:
- Arts
- Basic
- Education
- Children
- Computer
- Cooking
- Environment
- Health
- History

- Sign up for an account for quick and easy check out
- Search Books
- Featured Books
Payment Information

Credit Card Type:
- [ ] Amex
- [ ] Discover
- [ ] Mastercard
- [ ] Visa

Order Total:

Name on Card:

Card Number:

Expiration Date:

CVC:

Cardholder Signature:

[Signature]
Profile Name
245 Blackfriars Road
Ludgate House
London, SE1 9UY
Email:  firstname@surname.com
Telephone:  0207 955 3705


Benefits

• Fast way to mock up an interface - no coding required.

• Finds a variety of problems with the interface.

• Allows an interface to be refined based on user feedback before implementation begins.

• A multidisciplinary team can participate.

• Encourages creativity from the product team and users alike.
Disadvantage

- Doesn’t produce any code.
- Does not find all classes of problems with an interface.
- Can affect the way users interact with the interface.
- Users might think it is unprofessional.
- Has stronger benefits in some situations than in others.
UI Analysis & Design

- Iterative Design using a Spiral Model.
- Early focus on users and tasks.
  - User analysis: who the users are.
  - Task analysis: what they need to do?
  - Involve users as evaluators, consultants and sometimes designers.
- Constant Evaluation
Know Your User

- Novice
- Knowledgeable, intermittent user
- Knowledgeable, frequent user
- Age, gender, ethnicity
- Physical abilities
- Domain experience
- Application experience
- Work environment
- Communication patterns
Know Your User

• Techniques
  • Questionnaires
  • Interviews
  • Observations

• Obstacles
  • Artificial barriers between developers and users.
  • Some users are expensive to talk to.
User Design Principles
Nielsen’s Principles

1. Match the real world
2. Consistency and Standards
3. Help and Documentation
4. User Control and Freedom
5. Visibility of System Status
6. Flexibility and Efficiency
7. Error Prevention
8. Recognition, not Recall
9. Error Reporting, Diagnosis, Recovery
10. Aesthetic and Minimalist Design
Match the Real World

The problem is your modem can't interface with your ISP because your RJ11 cable needs upgrading.

Will it cost much?

That depends on whether you know I just said "you need a longer phone cord."
Match the Real World

- Examples
  - Desktop
  - Trashcan
- Dangers of metaphors
  - Often hard for designers to find
  - Deceptive
  - Constraining
  - Breaking the metaphor
- Use of a metaphor doesn’t excuse other bad design decisions
Direct Manipulation

- User interacts with visual representation of data objects
  - Continuous visual representation
  - Physical actions or labeled button presses
  - Rapid, incremental, reversible, immediately visible effects
- Examples
  - Files and folders on a desktop
  - Scrollbar
  - Dragging to resize a rectangle
  - Selecting text
- Visual representation and physical interaction are important
Affordances
of direct manipulation

- Perceived and actual properties of a thing that determine how the thing could be used
  - *Chair* is for sitting
  - *Knob* is for turning
  - *Button* is for pushing
  - *Listbox* is for selection
  - *Scrollbar* is for continuous scrolling or panning
- Perceived vs. actual
Natural Mapping

- Physical arrangement of controls should match arrangement of function
- Best mapping is direct, but natural mappings don’t have to be direct
  - Light switches
  - Stove burners
  - Turn signals
  - Audio mixer
Feedback / Responsiveness

- Actions should have immediate, visible effects
  - Push buttons
  - Scrollbars
  - Drag & drop
- Kinds of feedback
  - Visual
  - Audio
  - Haptic (conveyed by sense of touch)
Consistency and Standards

Guidelines for Mac, Windows, Gnome, KDE, Android, iOS...

UI and writing!
Help and Documentation
User Control and Freedom
Visibility of System Status
Flexibility and Efficiency
Error Prevention
Recognition, not Recall
Error Reporting, Diagnosis, Recovery

Microsoft Office 2000 Installation: Fatal Error

Installation ended prematurely because of an error.

RealPlayer

Unable to contact Technical Support for further information.

More information is available at the RealNetworks Technical Support Website.
Aesthetic and Minimalist Design
Microsoft designs the iPod package
User Interface Testing

• How do you know you did everything well?
• Only way: Have real users test it!
Email "A Tale of Two Cities"

This task was performed using Suse 9.3 in a Portable Lab on the GNOME desktop. The test was administered in English. The following is a description of the task:

Your friend Arthur loves "A Tale of Two Cities". Please email the electronic book to him. His email address is arthur@example.com.
Issues Encountered

• Mail Client is referred to as “Evolution” (not “Mail” or similar)
• “Send/Receive” Button does not compose mail (but syncs with server)
• Attachment list hidden by default
• 20% of users failed to send mail
• Average *successful* time was 4:23 minutes
Typically, when project managers observe their design undergoing a usability test, their initial reaction is:

*Where did you find such stupid users?*
Eye tracking
GUI Hall of Shame

[Image of a software options window]

[Image of a software options window]

http://homepage.mac.com/bradster/iarchitect/
Tabs
Rewind
In Microsoft Assistant Killed in Denver, it was reported that Microsoft program managers demonstrated a technique to kill the assistant to a crowd attending a development conference.
Options

Effects

- [ ] Strikethrough
- [ ] Double strikethrough
- [ ] Superscript
- [ ] Subscript
- [ ] Shadow
- [ ] Outline
- [ ] Emboss
- [ ] Engrave
- [ ] Small caps
- [ ] All caps
- [ ] Hidden
Puzzle

Printing of "KDE Print System" on printer "grad-3" was aborted.

You may want to find out why.
503 Polite People

There has been an error transferring your mail. I said:

MAIL FROM:<mmccclinc@vt.edu>

and then the SMTP server said:

503 Polite people say HELO first
Type “Mismatch”
Summary

Nielsen’s Principles

1. Match the real world
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