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SOFTWARE ENGINEERING

CS 487

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Computer Science

Lesson Overview

- User-Centered Design
- Reading
  - Ch. 23 – Project Planning
- Objectives
  - Explore the user-centered design process
  - Discuss UCD as a means of achieving measurably better HCI
  - Examine the relationship between UCD and situational awareness (SA)

Week 14
User-Centered Design

HCI and UCD

- Human-computer interface
  - The means of interaction for human users
  - Automation would in effect repurpose the HCI as a computer-computer interface
- User-centered design
  - A design methodology which both
    - involves the user in the design process and
    - emphasizes user performance in the evaluation of design

Give the People What They Want?

- The user's opinion is more important than yours
- Appreciate users' capabilities
- Offer help – in many forms
- Strive for quality user experiences
- Involve the user early
- Use what works
- Things can be interpreted differently by different people at different times

The Design Process

- Identify user groups
- Establish requirements for the user experience
- Develop alternative designs
- Create interactive prototypes
- Evaluate with relevant, objective analysis
- Collect feedback and fix it in the next version

Usability Goals

- Effective to use
- Efficient to use
- Safe to use
- Having good utility
- Easy to learn
- Easy to remember how to use

Design Principles

- Make it visible, or not, as needed
- Provide feedback
- Set boundaries (constraints)
- Be consistent
- Provide clues

Evaluation Described

- Evaluation is the process of assessing the goodness/acceptability of a design
- Why
  - Evaluation is critical to achieving user acceptance
  - It is beneficial to get it right the first time
- What
  - Criteria should match the users' needs/interests
  - Easy to learn, fast, satisfying, entertaining, etc.
- Where
  - My place or yours? Control vs. comfort
- When
  - You can evaluate at any point, but should you?
  - Does it meet standards? Does it meet user's needs?

Evaluation Approaches

- Usability testing
  - Quantification of user performance
    - Time to complete, error rates, type/severity of errors, etc.
  - Measure *typical* users' performance on *typical* tasks
  - Controlled by the evaluator
- Field studies
  - See how users act and interact (with each other, a given product, etc.) in their *natural* setting
- Analytical evaluation
  - Heuristic (guidelines and standards) evaluations
  - Walkthroughs of scenarios using prototypes
- Hybrids

Evaluation Methods

- Observation and inquisition
  - Observe users
  - Ask users, ask experts
  - Observation, questionnaires, interviews
- User testing
  - E.g., based on scenarios
- Inspections
  - E.g., based on heuristics
- Modeling
  - To predict and establish benchmarks

Usability Testing

- Testing the product
  - to determine the extent to which it is usable
  - by the intended user population
  - on the tasks for which it was designed
- User testing
  - Measures human performance on specific tasks
  - Logging of keystrokes and mouse movements, video recordings, etc.
- User satisfaction questionnaires / interviews
  - How do you feel?
  - Efficiency and effectiveness

Measuring Usability

- Time
  - Time to complete a defined task
  - After a specified time away from the product
- Number
  - Number and type of errors made per task
  - Number of errors per unit time
  - Number of navigations to help
  - Number of users making a particular error
  - Number of users completing successfully

User-Centered Design

- Decision support
  - Traditionally technology-centered
  - Sensors, reports, gauges, alarms, etc.
- vs. Information overload
  - Bottlenecks
  - 7 +/- 2 chunks
  - Recall time, processing time
- Operator error
  - A causal factor of 60% to 85% of all accidents
- UCD is improving performance and acceptance

UCD and Situation Awareness

- UCD is not
  - Giving users everything they ask for
  - Making decisions for them
  - Doing things for them
- Design principles
  - Organize technology around the user's needs and capabilities
  - And around the way they process information and make decisions
  - Keep the user in control and aware of state
    - thereby reducing anxiety and
    - improving decision-making effectiveness

Design Principles

- Provide support for projection
- Provide support for confirmation
- Remove ambiguity
- Reduce false alarms
- Set trade-offs appropriately
- Use multiple modalities, consistently
- Minimize disruptions
- Support assessment and diagnosis of multiple alarms
- Support global SA

Keep It Simple

- Again, working memory is limited – designing with the limitations in mind is critical
- Less is more (slick, cool, flashy are not)
  - Avoid clutter
  - Avoid unnecessary marks, elements, etc.
  - Avoid scrolling, paging, etc.
  - Every bit of ink (pixel) requires a reason
- Organization is key
  - Group logically and summarize where possible
  - Focus on context
  - Rely on iconic memory where possible