(A brief introduction to) User Centered Design and the User Interface

Marshini Chetty
Dangerous Drop-Downs? Bad UI Design Caused 😱 Hawaii’s False Missile Alert

And how it could have been avoided

We’re all aware of the false alarm people in Hawaii saw on Saturday the 13th of January:

![Emergency Alert Image]
BMD False Alarm

Amber Alert (CAE) - Kauai County Only

Amber Alert (CAE) Statewide

1. TEST Message

**PACOM (CDW) - STATE ONLY**

Tsunami Warning (CEM) - STATE ONLY

**DRILL - PACOM (CDW) - STATE ONLY**

Landslide - Hana Road Closure

Amber Alert DEMO TEST

High Surf Warning North Shores

"PACOM (CDW)-STATE ONLY" and "DRILL - PACOM (CDW) - STATE ONLY" are the options used to trigger the real and test alerts.
Missile Alert Sent

“You have sent a real missile alert to the entire state of Hawaii”
2010 World Cup not for all Africans

Some worry that Fifa has done little to benefit ordinary South African fans snap up 100,000 World Cup tickets

Many South Africans had complained the original process, by which tickets were sold through Fifa's website or in a complicated ballot at a local bank branch, excluded people without web access, credit cards or the disposable income to pay months in advance.

Initially, ticket sales were available only online.
How Lousy Cockpit Design Crashed An Airbus, Killing 228 People

New evidence shows that a lack of pilot feedback from the cockpit controls led to the crash of Air France Flight 447. What led to such a design disaster?

Dudes, we know this is an A380. Shutterstock has its limitations.

BY MARK WILSON  4 MINUTE READ

On June 1, 2009, Air France Flight 447 crashed into the ocean on its way back from Rio de Janeiro. 216 passengers and 12 crew died on impact. This month, the official investigation is likely to conclude with “human error” as the culprit—pilots making mistakes that forced the plane to crash. But evidence unearthed by The Telegraph tells a different story, that the pilots of the Airbus A330-200, and everyone else on the plane, were really victims of bad design.

Dominated by computers, And it’s not just one single component that could have avoided the tragedy. Multiple
INTRODUCTIONS: WHO AM I?
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**Research Field:**
Human Computer Interaction (HCI)

**Areas of Interest:**
Ubiquitous Computing
Usable Privacy and Security
Information and Communication Technology for Development (ICTD)

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Where I am from

[Map of Africa with an arrow pointing to South Africa]
Try to get people to actually start using your app early on.

There's nothing that can replace real-world, user feedback.

Often, your friends will help you find bugs or give ideas on what is missing.
User-Centered Design Process

DESIGN → PROTOTYPE → EVALUATE → DESIGN
User Centered Design

- Systematic way to identify and consider relevant human factors in your design
  - Helps get us started with a proven track
  - Prevents “designers block”
  - Helps us communicate to others
  - Helps reduce the number of decisions made out of the blue
  - Helps focus design activities
  - Helps document and defend decisions that may be reviewed later
  - Forces us to iterate
  - Helps us keep the user first
What Do We Design?

• Artifact view
  – Object, device or system that is designed

• Holistic view
  – The interaction, flow + user experience is designed
  – Think in terms of users goals
    • Artifacts have no goals
    • People have goals!
    • Keep users in center in beginning, middle, and end
Phases of Design Thinking

Gather Inspiration
Inspire new thinking by discovering what people really need

Generate Ideas
Push past obvious solutions to get to breakthrough ideas

Make Ideas Tangible
Build rough prototypes to learn how to make ideas better

Share the Story
Craft a human story to inspire others toward action
Empathize
Define
Ideate
Prototype
Test
• Have to understand context of the design and user needs

• Goals
  – Learn about stakeholders
  – Discover user goals and needs
  – How is it done now?
  – What is desired?
  – What else has been tried?
• Methods
  – User Surveys
  – Interviews
  – Focus groups
  – Competitive analysis
  – Contextual inquiry
  – Design ethnography
  – User Logs
• Ideate = Brainstorming/generating ideas
• Goal
  – Increase chance of success by considering huge volume of ideas in systematic way
  – Avoid going with the first idea you get
  – Get the design right instead of the right design!
Brainstorming + Sketching

1. Thomson family gather around.
2. System suggests flotilla.
3. System shows descriptions.
4. Further details?
   System asks for details.
5. Summary printed.
• Hard to evaluate something that does not exist
• Hard for users to react to abstract concepts
• Prototype brings subtleties and nuances to light
• Begin to wrestle with technical constraints
Prototype

Scale up low ➔ high fidelity

• Low fidelity
  – Quick, cheap, dirty
  – Sketches, paper, cardboard

• Medium fidelity
  – Slower, more expensive
  – Powerpoint, interactive mockups

• High fidelity
  – Slowest, most expensive
  – Full interface
Scale up low ⇒ high fidelity

- Low fidelity + Medium fidelity
  - Build fast
  - Don’t over-engineer
  - Don’t become attached to it
  - Build multiple at the same time
• Many types of evaluation
  – Prototype walkthroughs
  – Think-Alouds
  – Wizard of Oz
  – Performance comparisons
  – Usability tests
  – Field deployments
  – A/B testing

• Use evaluation method based on level of implementation and goals
• Evaluation drives iteration
  – Problems in usefulness or appropriateness
    • Return to investigation phase
  – Problems in conceptual model and how users understand the system
    • Return to ideation phase
  – Problems in user performance
    • Return to the prototyping phase
Going from a functional prototype to a **release candidate**
Avoid crucial errors

• NOT just applying checklists and guidelines
  – These can help, but UCD is a whole philosophy
• NOT using oneself as the model user
  – Know your real users; recognize variation in humans
• NOT just common sense
  – E.g. World Cup Soccer 2010
Know the User

• Physical abilities
• Cognitive abilities
• Personality differences
• Skill differences
• Cultural diversity
• Motivation
• Special needs
In Class Activity (10 minutes)

• You have to design the ideal student backpack
  1. Spend 1-2 minutes coming up with top three requirements that you believe a backpack should have
  2. Now, turn to the neighbor on your left, ask them the top three things **THEY** want in a backpack (2 minutes)
  3. Tell **THEM** the top three things you want in a backpack (2 minutes)

• Quick discussion (5 minutes)
  – Was it easy to come up with (1)?
  – Did your list in (1) match up with (2) or (3)?
Summarizing User Centered Design

• Systems must be designed for the user
• Recognize individual differences
• Recognize design influences human behavior and well-being
• Recognize that people, technologies, and their interfaces do not exist in isolation
• Emphasize empirical data & evaluation
From UCD to User Interface

• Most systems have a user
• Good UI critical for usability and adoption
• Designing for users is important and difficult
• Easier for novices to learn (don’t have to read the manual)
• Easier for experts to do what they need to do
• Leads to better user experience
  – Pleasure, satisfaction, productivity
  – Reduce errors
What is the User Interface?

• Bridges world of human action and computer action

How do I work this? What can I do?

What just happened? Is this what I wanted?
General Architecture for UI

- Consider screen based interaction that’s 2D
- UI takes input from user
- App processes input and creates output
- UI delivers output to user
Text box
- Accepts unicode text strings
- Responds to keystrokes and symbols

• Text = sequence of characters -> translated into keywords -> fed into search engine
• Implicit inputs e.g. personalization settings, sensed location etc.
Input

• Any data that user provides to the computer
  – E.g. keystrokes, mouse positions, mouse clicks, taps
  – lower level inputs e.g. clicks, taps, text strings, gestures

• UI accepts range of inputs
• Inputs have structure
• UI helps users provide inputs into structures
Outputs
• Have structure
• In this case, calculation + ranked search results
UI Functions

• Takes input -> output
• Uses state to represent information about application
  – E.g. in digital clock
  – Current time, alarm time, boolean alarm on
• Respond to input by executing event handlers
Basic UI Architecture

• UI defines inputs, outputs and event handlers to modify state
• Take input and perform operation on state and provide feedback on state
• e.g. Press snooze on clock
  – provides input to event handler
  – disables sound for set period of time
• Event-based programming
• Typical architecture is model-view-controller
Gulf of Execution

• Gap between what person wants to do with interface and what inputs are possible to provide
• How to translate goal into input to get towards goal

RANGE OF POSSIBLE ACTIONS

disclosures in gear review
Gulf of Evaluation

- Gap between output and feedback interface provides and person’s ability to relate that output to their goal
UI needs Affordances

• Perceptual cues that action is possible
  – E.g. blinking cursor in text box
tap the digits!
3:26
show time  set time
Wrapping it all up

• User centered design is an iterative process
• Get feedback early and often!
• You are *not* your user!
• Programming the user interface is about mediating communication between user and the computer
Further Reading

• Want to know more about user-centered design?
  – Take COS 436 in the Fall

• Want to know more about the UI/model-view-controller architecture for UIs
  – Read Andy Ko’s online textbook (It’s free 😊)
  – https://faculty.washington.edu/ajko/books/uist/index.html

• More on prototyping UIs
  – Read Sketching the User Interface by Bill Buxton
  – Or see free online workbook
  – http://sketchbook.cpsc.ucalgary.ca/

• More on design and affordances
  – Read Design of Everyday Things by Don Norman
Questions?

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