STEVENS
INSTITUTE of TECHNOLOGY
THE INNOVATION UNIVERSITY®

SSW 322: Software Engineering Design VI

Introduction to UX/UCD Design
2020 Spring

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Office Hour: Monday/Wednesday 2 to 4 pm
Software Engineering
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Today's Topics

- User Experience (UX) Design
  - Principles
- User Centered Design
  - Processes
- Paper prototyping
- Usability Testing

Acknowledgements

- NN/g Nielsen Norman Group https://www.nngroup.com/articles/recognition-and-recall/
- https://wiki.jasig.org/download/attachments/8096535/JASIG+UCamp+UCD+Introduction+-+Fall+07.ppt
- https://www.slideshare.net/hursman/user-centered-design-overview/
- Systems Analysis and Design in a Changing World, 7th Edition

Components of the user interface

Application—Functions, organization, screen content, advertisements, distractions, links, views, complexities

Equipment—Screen, keyboard, mouse, keypad, printed forms, documents, reports, webcam, desk, chair, light

Screen elements—Windows, screens, menus, buttons, pictures, animations, fonts, sounds, colors

Mobile equipment—Touch screen, screen size, brightness, resolution, hotspots, connections, response times

Smartphones and small mobile devices

Challenges

Small screen size, small keyboards and touch screens, limited network capacity, app design guidelines and toolkits

Smartphones and small mobile devices

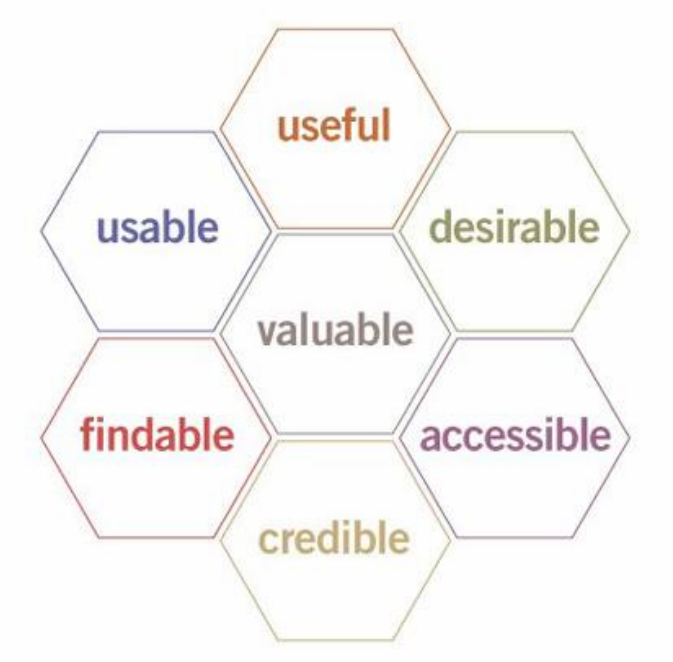
- Layout and formatting
  - Rotating view, resizing, visible navigation, scrolling
- Data entry and user actions
  - Fat finger and accidental touches
- Navigation and visibility
  - Show site map
  - Use action bar
  - Visual clues
  - Back button

UI for Tablets

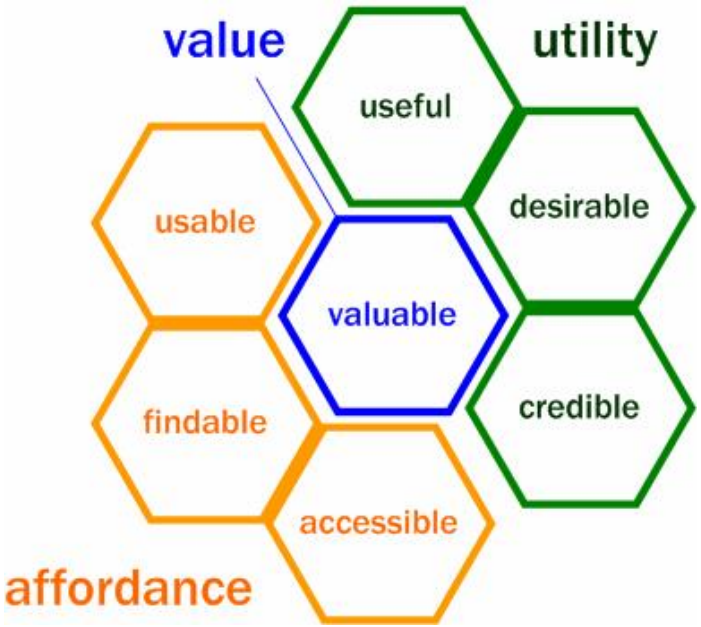
Like smartphones, except more real estate to display

What is user experience (UX)?

User Experience is the sum experience of a user interacting with a product.



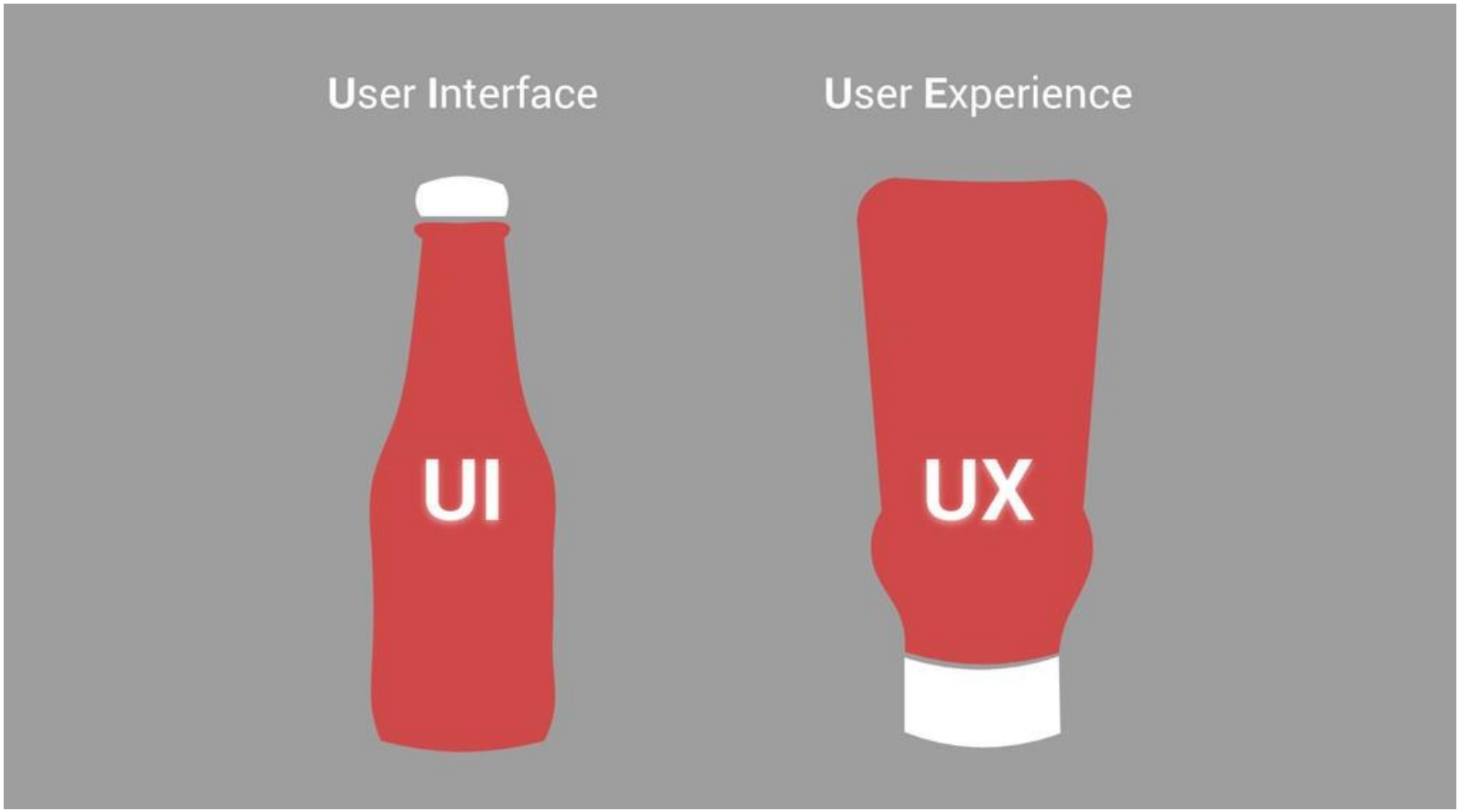
- Peter Morville



- James Melzer

What is UX design?

- The aim of design is to create good user experiences.



https://www.sitepoint.com/ui-vs-ux-what-is-the-difference/

Metaphors of human computer interaction

Direct manipulation metaphor

metaphor in which objects on a display are manipulated to look like physical objects (pictures) or graphic symbols that represent them (icons)

Desktop metaphor

metaphor in which the visual display is organized into distinct regions, with a large empty workspace in the middle and a collection of tool icons around the perimeter

Document metaphor

metaphor in which data is visually represented as paper pages or forms

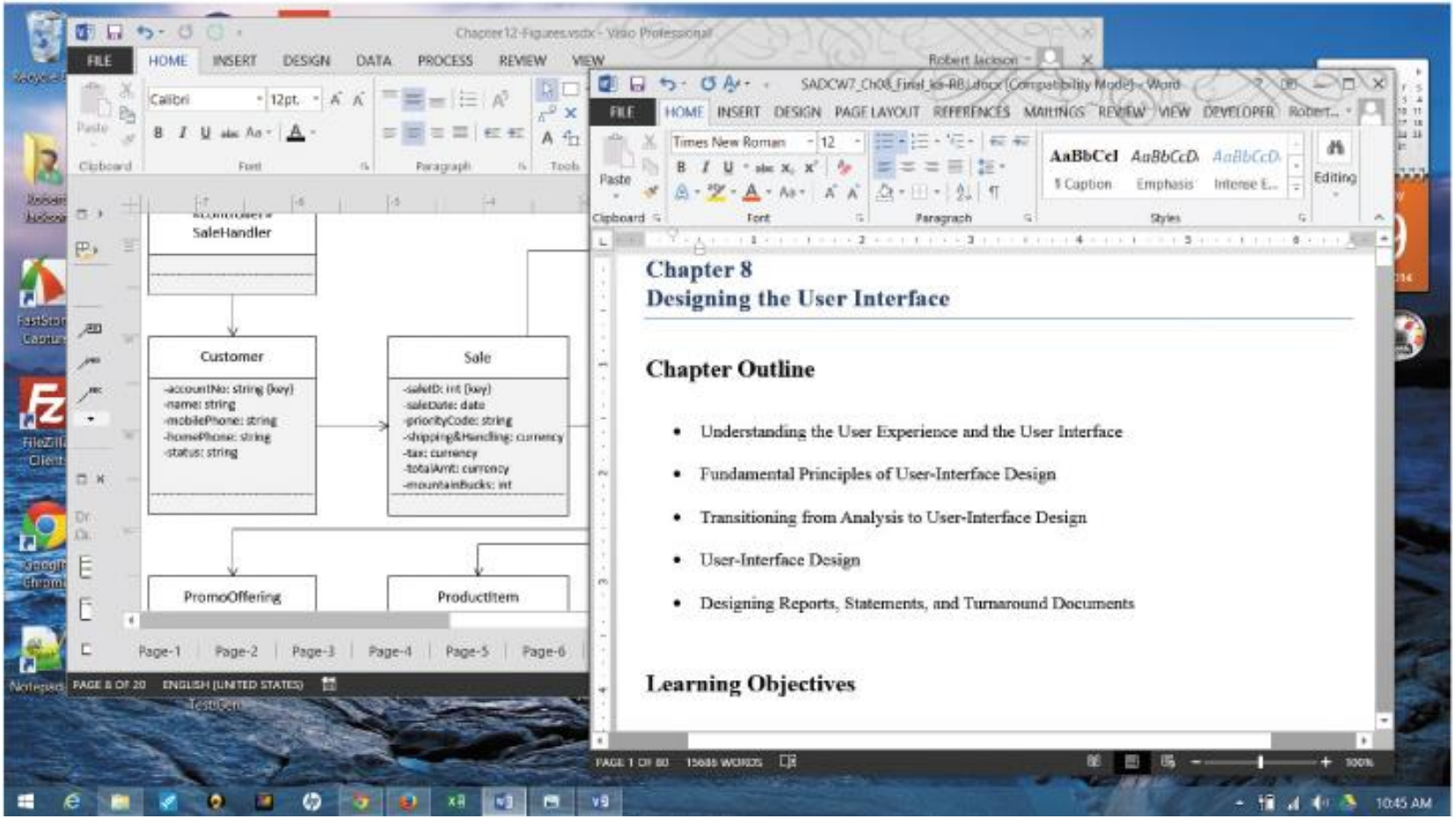
Dialog metaphor

metaphor in which user and computer accomplish a task by engaging in a conversation or dialog via text, voice, or tools such as labeled buttons

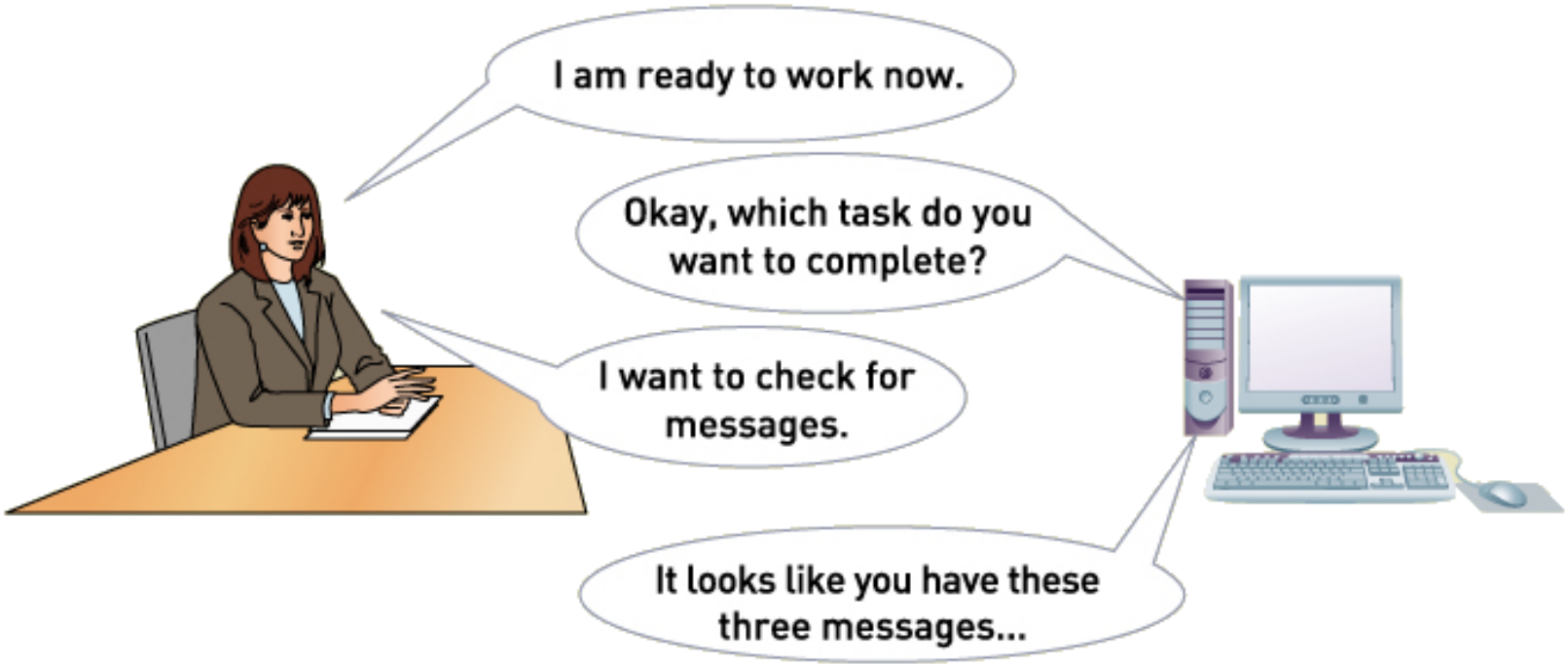
Metaphor Details

Metaphor	Description	Example
Direct manipulation	Manipulating objects on a display that look like physical objects (pictures) or that represent them (icons)	The user drags a folder icon to an image of a recycle bin or trash can to delete a collection of files.
Desktop	Organizing visual display into distinct regions, with a large empty workspace in the middle and a collection of tool icons around the perimeter	At computer startup, a Windows user sees a desktop, with icons for a clock, calendar, notepad, inbox and sticky notes (the computer interface version of a physical Post-It note).
Document	Visually representing the data in files as paper pages or forms; these pages can be linked together by references (hyperlinks)	The user fills in a form field for a product he or she owns, and the manufacturer's Web site finds and displays the product's manual as an Adobe Acrobat file, which contains a hyperlinked table of contents and embedded links to related documents.
Dialog	The user and computer accomplishing a task by engaging in a conversation or dialog by using text, voice, or tools, such as labeled buttons	The user clicks a button labeled "troubleshoot" because the printer isn't working. The computer prints questions on the display, and the user responds by typing answers or selecting responses from a printed list.

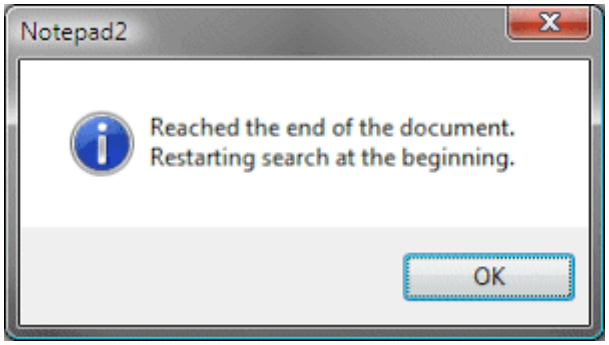
Direct manipulation, desktop, and document metaphors on one screen



Dialog Metaphor

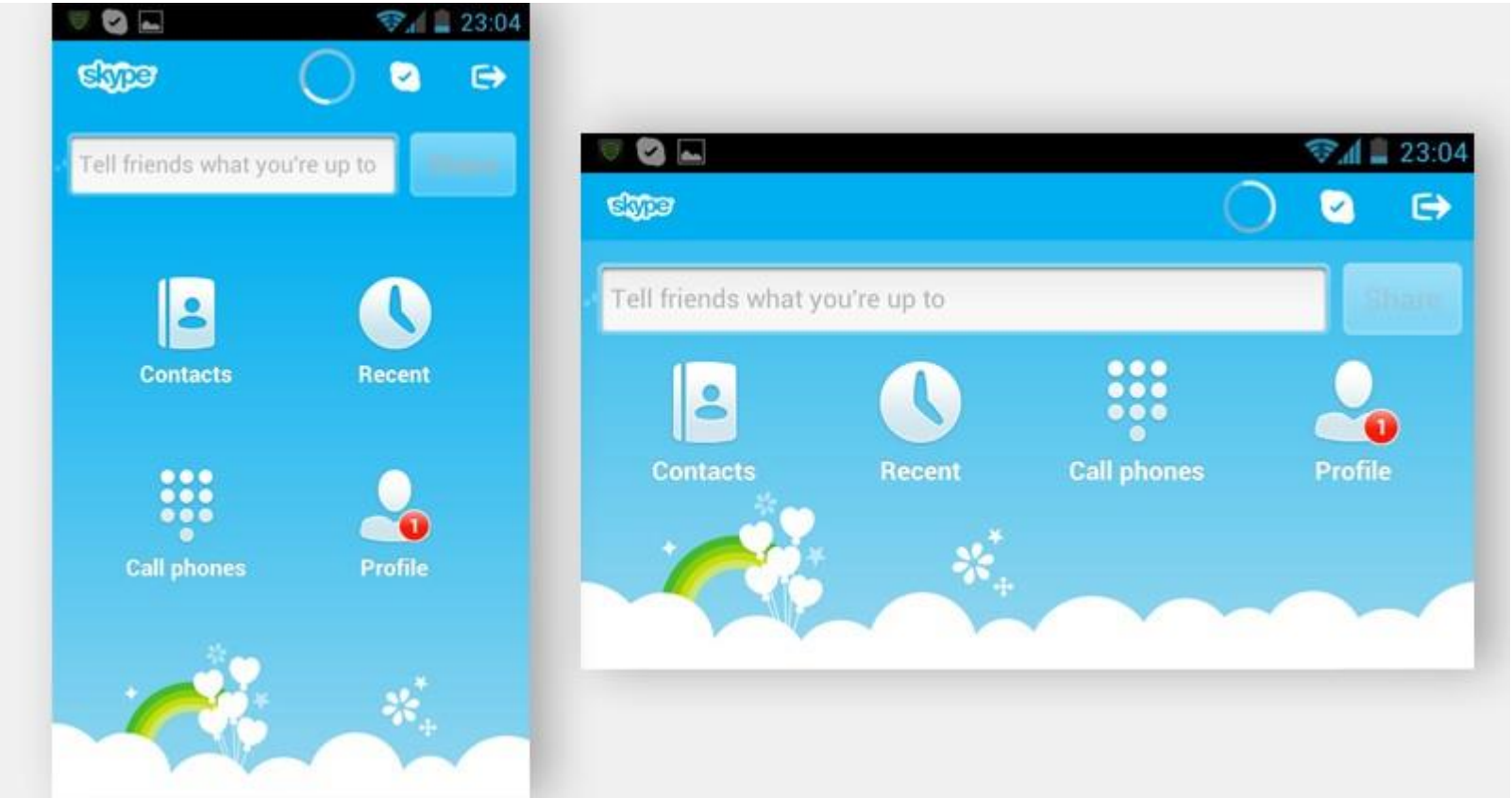


Dialog Metaphor



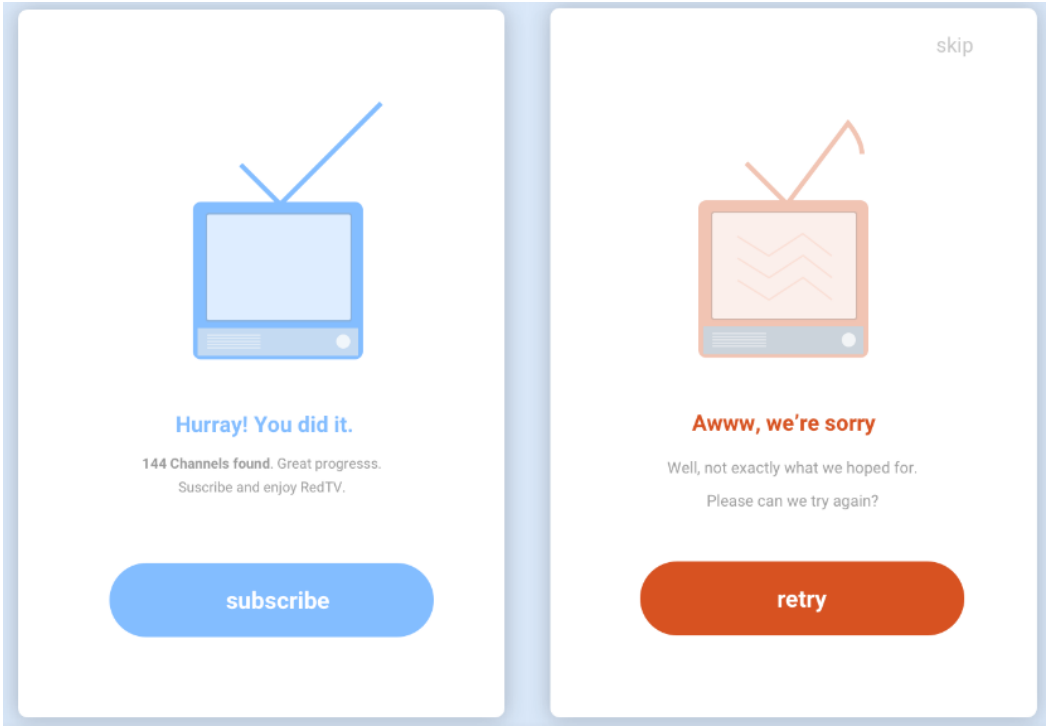
Principles of UX design

Affordance – the appearance of the object suggests its function



Principles of UX design

- Visible with Feedback
- Both visible on the display and provides a response to a user action (feedback)



Principles of UX design

- Consistency
  - Across platforms
  - Within a suite of applications
  - Within an application

iPod Touch

iPhone

iPad

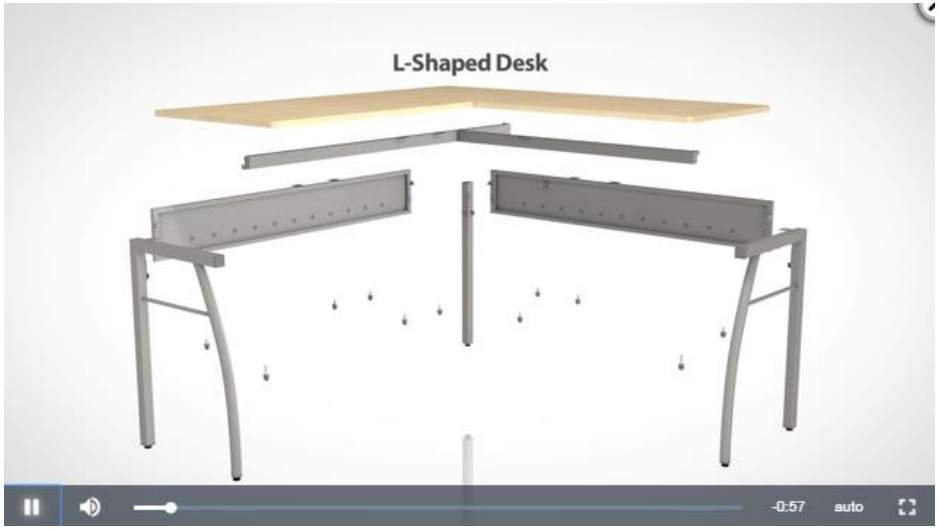
Principle of UX design

- Continuity
  - Consistency across releases over time

- Windows 7
- Windows 8
- Windows 10

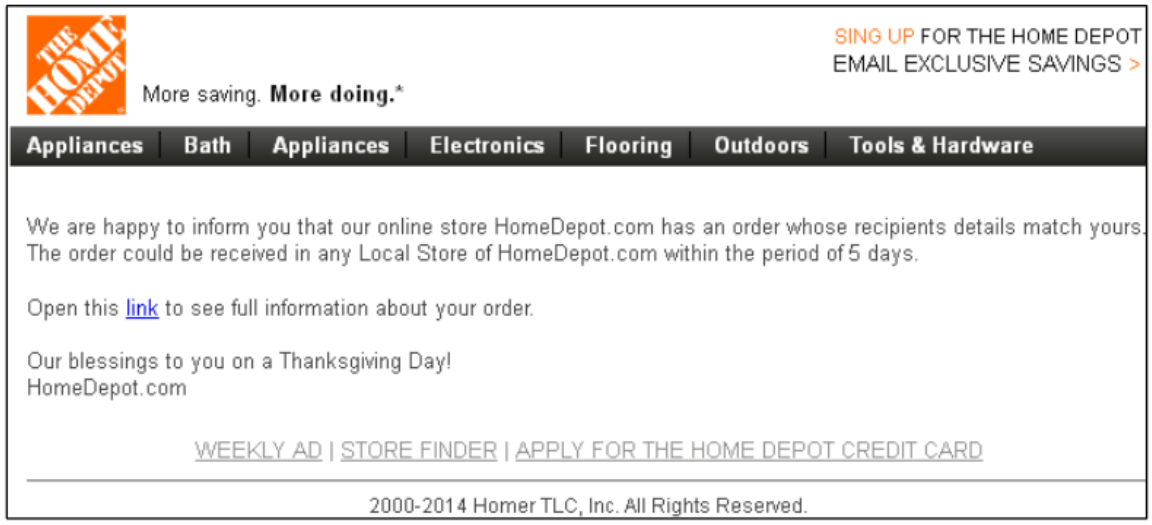
Principle of UX design

- Discoverability
  - To help users discover “hidden” features or objects
  - Active discovery – mouse hovers, pop-ups, tool tips



Principle of UX design

- Closure
  - Closure on Dialogues – End of a series of actions
  - Protect user's work – at end and for partially complete work
  - Provide undo to reverse actions



Principle of UX design

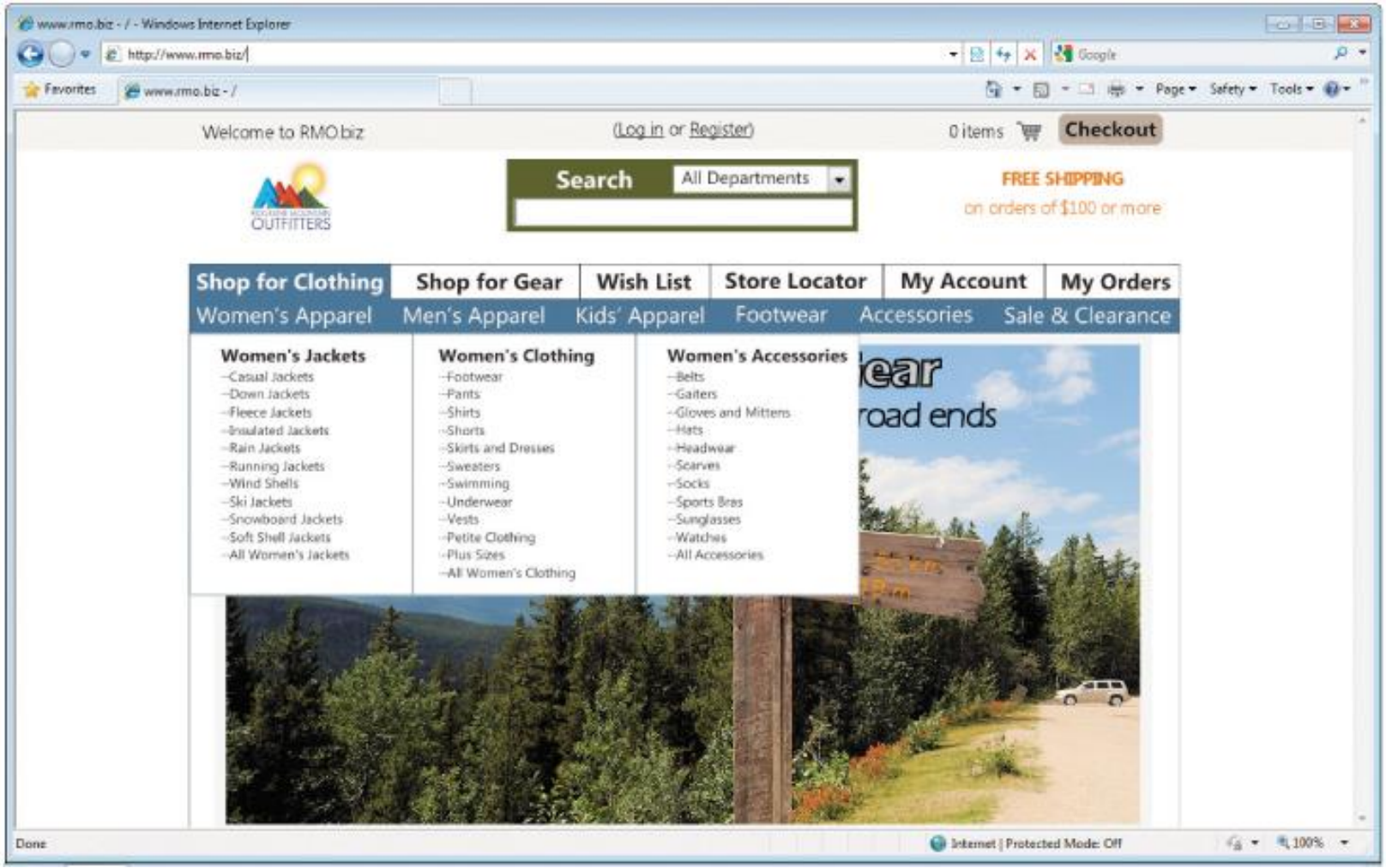
- Readability and navigation

  Readable text for all users (type, size, color)

Principle of UX design

- Readability and Navigation (cont)
  - Clear navigation
  - Reverse navigation – a way out – breadcrumbs navigation
- Usability and Efficiency
  - Shortcut keys for experienced users
  - Meaningful error messages
  - Simplicity – KISS (Keep it Simple, Stupid)

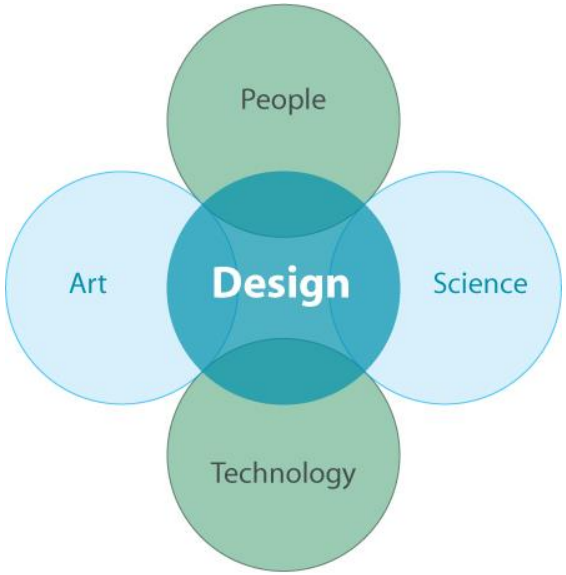
RMO Homepage-- clean and simple



Example of a bad website

What is user-centered design (UCD)?

- The user is put in the center of the design
- Melds technology and humanity

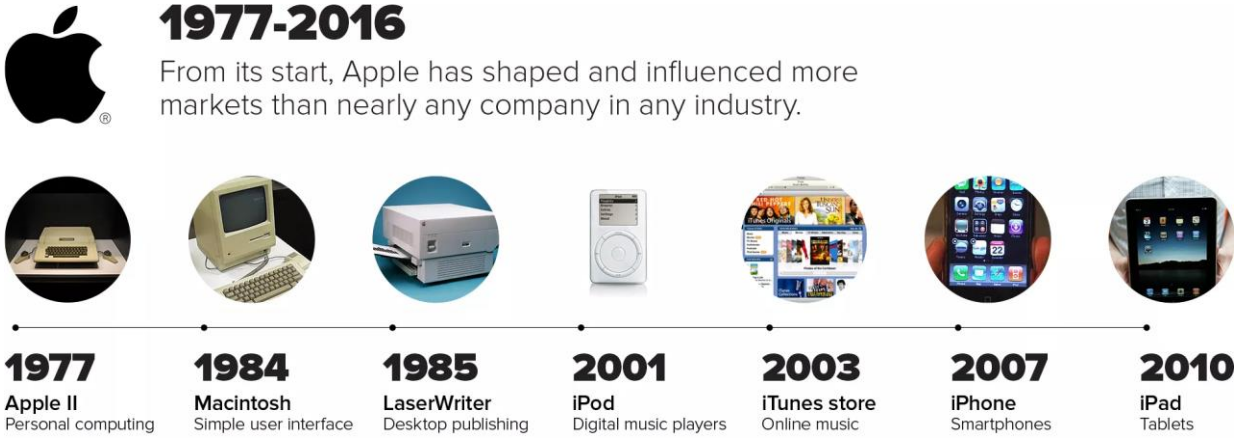


Why UCD/UX?

- Increased customer satisfaction
- Increased user productivity/efficiency/accuracy
- Increased service/site usage and adoption
- Decreased support and training costs
- Reduced development time and costs
  - Create only the features users need
- Reduced maintenance costs
  - Do it right the first time

Why UCD/UX?

- If you're running a business, someone's overall experience with your product or service could very well make the difference between whether they will buy, or more importantly, whether they will come back to buy again or look elsewhere next time.



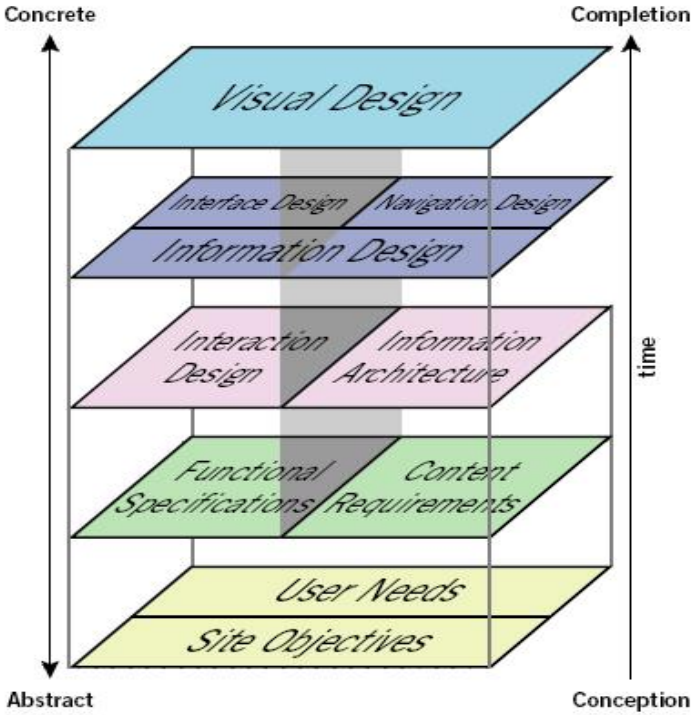
User Experience (Not Technology) Is The Secret To Apple's Success.

http://www.uxteam.com/blog/user-experience-innovation-not-technology-is-the-secret-to-apples-success/

Watch: https://www.youtube.com/watch?v=hb4AzF6wEoc

What do designers do?

- User Research
- Usability Analysis
- Information Architecture
- Interaction Design
- User Interface Design
- Visual/Graphic Design



What is the UCD process?

1. User Needs Assessment
2. Competitive/Comparative Analysis
3. Heuristic Evaluation
4. Personas
5. Goals, Tasks & Scenarios
6. Design Concepts
7. Usability Testing

1. User Needs Assessment

- Surveys
- Interviews
- Focus groups
- Advanced observation techniques
  - Field studies
  - Contextual inquiries
  - Ethnography

2. Competitive/Comparative Analysis

- Try using similar services or products in order to find out:
  - Current trends in the marketplace
  - What expectations your users will have
  - What *to* do, what *not* to do
  - Interface conventions
  - “Must have” standard features

3. Heuristic Evaluation

- Evaluate an existing interface (or new interface concept) based on set of usability criteria
- Mostly used to highlight usability problems and deficiencies
- May or may not propose usability solutions
- Identified problem areas are addressed by subsequent design work
- Normally done with expert evaluators, but it can be a valuable tool for anyone
- One detailed checklist: http://www.stcsig.org/usability/topics/articles/he-checklist.html

4. Personas

- Models of “archetypical” users collected from user research
- Each persona is a description of one particular “typical” user of your system
- Personas may be combined if they have the same (or sometimes overlapping) goals
- Be specific, make them real
  - Pictures, posters
  - Include details about their life—humanize them
- Places the focus on specific users rather than on "everyone”
- Helps avoid “the elastic user”

4. Sample Persona

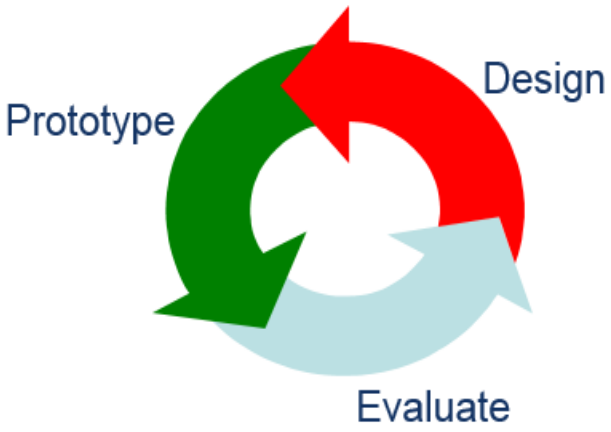
- Edward (Eddie) Calhoun
  - 35 years old
  - IT Person, Computational Physics Department
  - Came to UC Berkeley for his master's degree in CP, graduated in June of 2005.
  - Hired to continue working as an IT person for the CP department, where he had done some work as a student.
  - Is very good with computers (even builds his own PCs), but they aren’t his whole life
  - Fell in love with Angie while a student, they are busy planning a wedding for June of 2007.

5. Goals, Tasks and Scenarios

- Goals: what the user wants to do, but not how the user achieves them
- Tasks:
  - Describe the steps necessary to achieve the goals
  - Can vary with the available technology
  - Are broken down into steps for task analysis, and are recombined into sequence of steps for scenario development
  - Designers can reorganize, combine, or remove tasks currently performed to help users achieve their goals more efficiently
- Scenarios:
  - Written description of a persona achieving a goal through a set of tasks in a specific context
  - Should start technology-neutral and become more specific as the design progresses

6. Design Concepts

- Start rough
- Explore!
- Use personas to keep the users in view
- Use scenarios to inform the design
- Get frequent feedback
- Note user conventions
- Make design artifacts public
- May be expressed in a prototype for usability testing



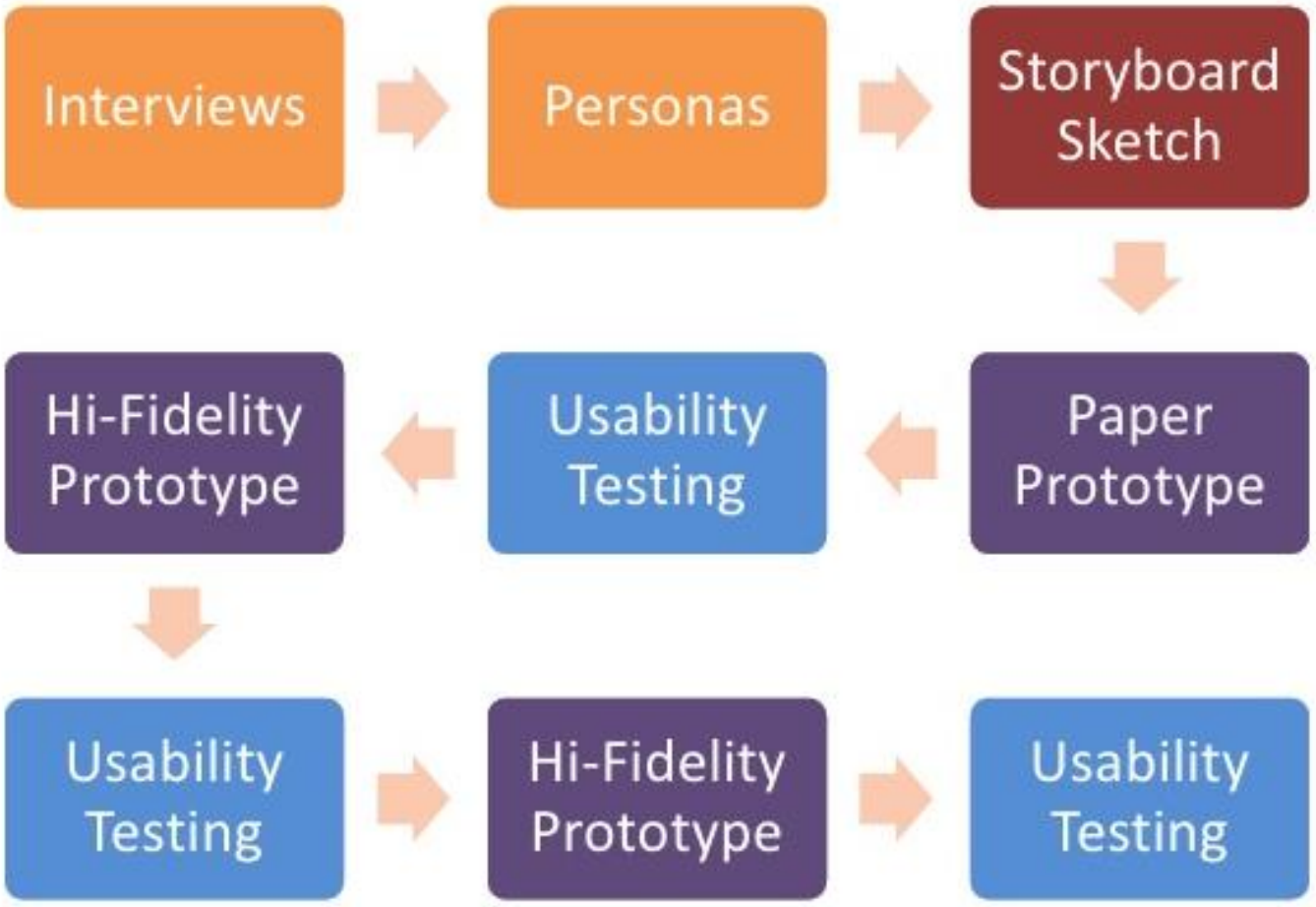
7. Usability Testing

- Let users validate or invalidate the design
- Ask the user to complete selected typical tasks (from scenarios) and think aloud while they do it
- Test early in the process
- Can test with 3-5 users (or less!)
- “Formal” testing
- Measures “success”
  - Set success criteria prior to testing (best done at the project outset)
  - Compare to baseline if you have one
  - Have usability problems revealed in the heuristic evaluation been addressed?

7. Usability Testing

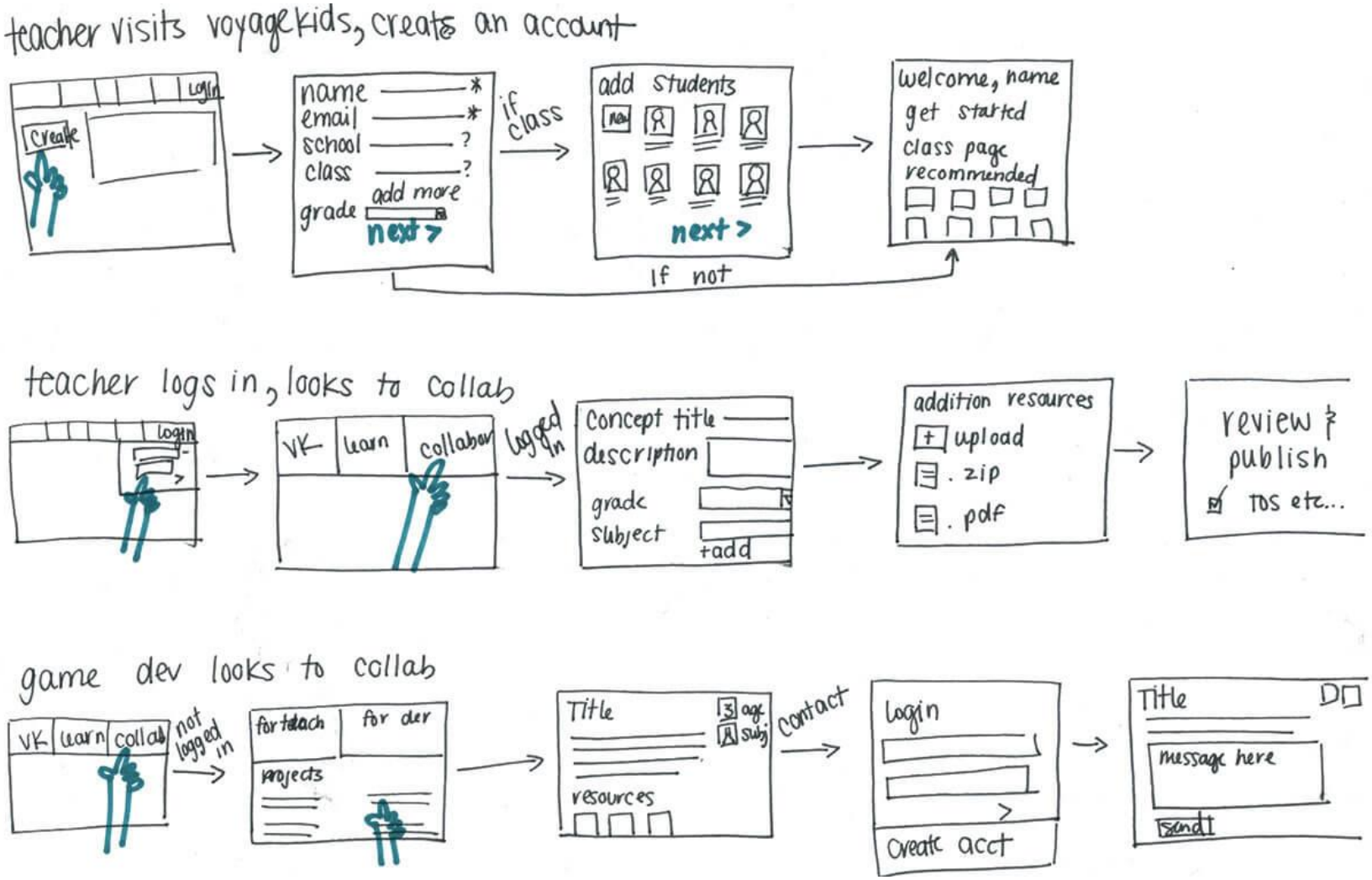
- Define what is to be tested
- Select users based on personas
- Administer the tests
- Analyze the data
- Document the findings in a brief
- Share the findings with the development team
- Determine what design changes will be made based on test results

Example UCD process



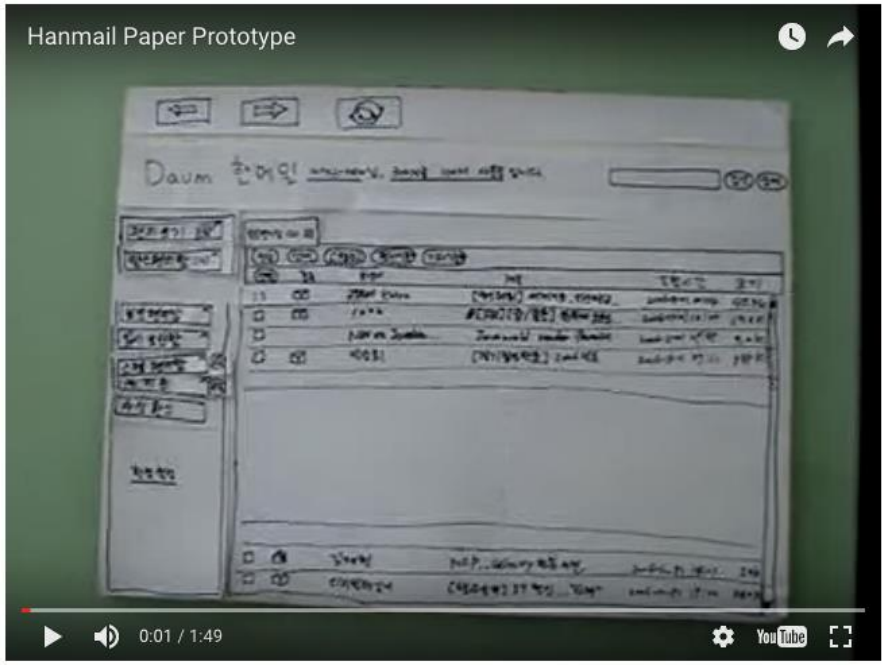
https://www.slideshare.net/hursman/user-centered-design-overview/

Paper Prototyping



Paper Prototyping

Paper Prototyping is a technique that consists of creating ***hand drawings of user interfaces*** in order to enable them to be rapidly designed, simulated and tested.



https://www.youtube.com/watch?v=GrV2SZuRPv0

Why paper prototyping?

Paper prototypes are used:

- **To communicate ideas:** between designers, developers, users and other stakeholders in the first stages of the user-centered design process.
- **As a usability testing technique:** to observe the human interaction with user interfaces even before these interfaces are designed and developed.

Usability testing

- Testing how actual users use a system
- Can be done at almost any stage of UI development
  - Early – use paper and sketches of pages

https://www.youtube.com/watch?v=GrV2SZuRPv0

  - Design – use prototype
  - Production & Testing – use actual pages

https://www.youtube.com/watch?v=BrVnBdW6_rE

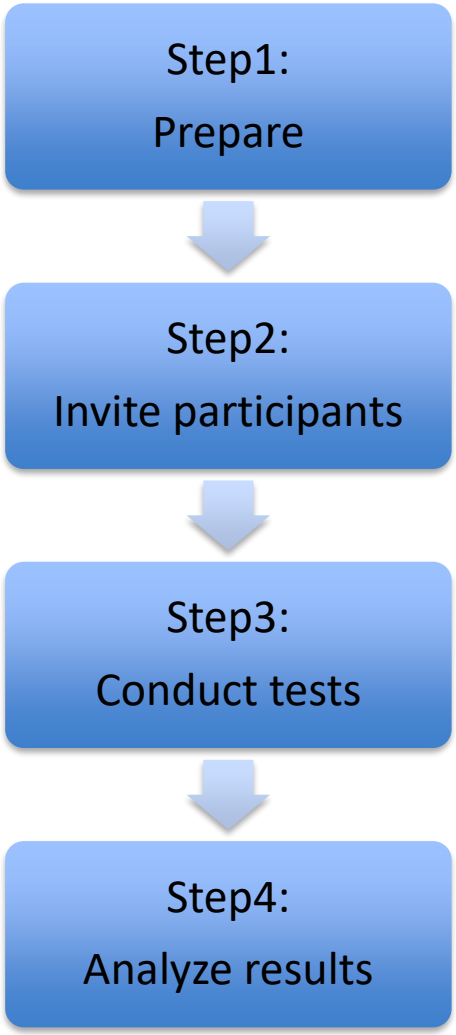
What to test?

- Can the users find what they are looking for?
- Can the users navigate the system easily?
- Does the system do what the users expect it to?
- What is the user's actions and reactions when using a system?

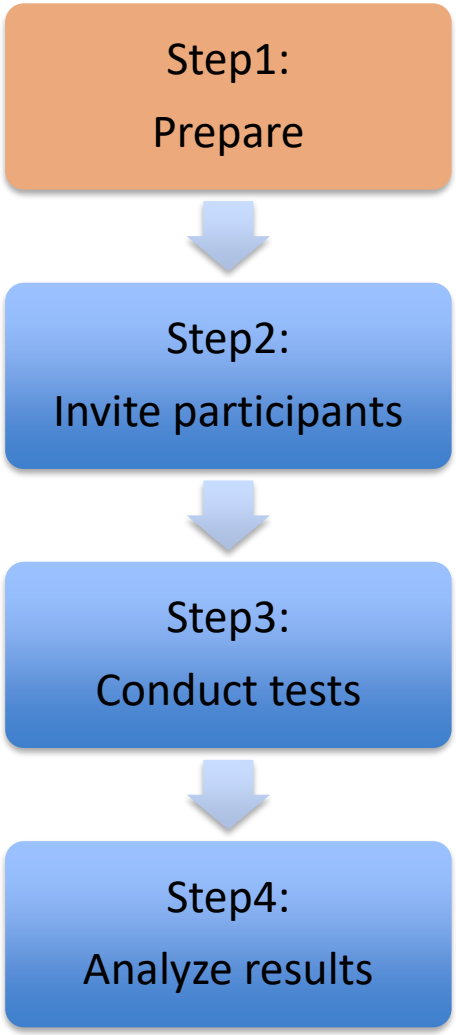
Usability testing metrics

- Task success
- Task time
- Errors
- Efficiency
  - Number of steps required to perform a task
- Satisfaction

Usability Testing Process



Usability Testing Process



- Develop a test plan and prepare a list of questions
- Create a task list:
  - Create a list of tasks that a typical user can complete in an hour
  - Tasks should not be too simple nor too difficult to accomplish (e.g., book a hotel room)
- Formal usability test
  - Audio recording
  - Video recording
  - Eye-movement tracking
  - One-way mirror
  - Application navigation recording (e.g., Morae)
- Usability lab example: https://www.youtube.com/watch?v=ygMZlH9zUwE

Usability Testing Process

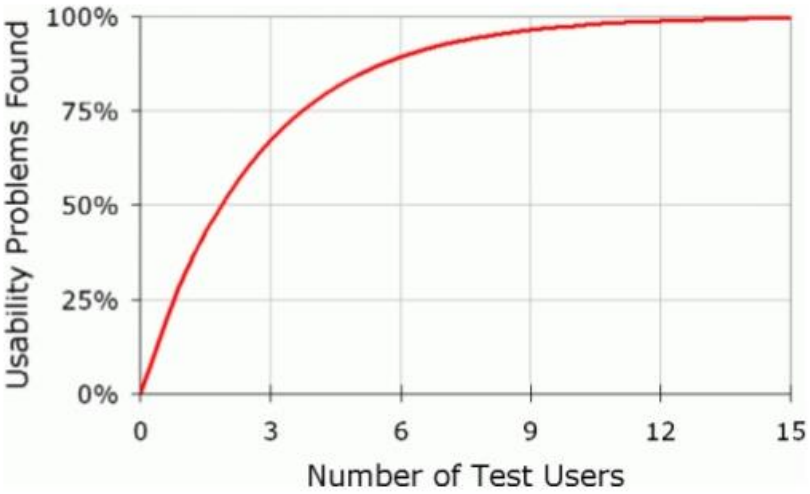
Step1:
Prepare

Step2:
Invite participants

Step3:
Conduct tests

Step4:
Analyze results

- Finding suitable participants outside the development team
- Prior to conducting sessions with participants, test out your test plan beforehand with co-workers or friends that have an acceptable degree of web knowledge
- 6-8 participants per test



Usability Testing Process

Step1:
Prepare

Step2:
Invite participants

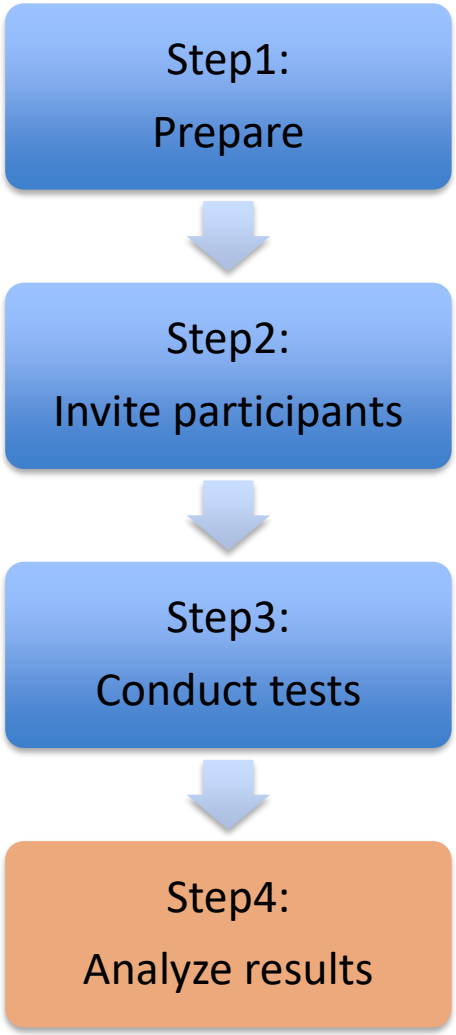
Step3:
Conduct tests

Step4:
Analyze results

- Introduce yourself, explain the process to the user
- Make the participant feel comfortable
- Give one or more tasks to your participant
- Ask your participant to think out loud
- Take notes

Image Source:https://www.linkedin.com/pulse/usability-testing-difficult-very-imortant-inge-nahuis/

Usability Testing Process



- Transfer handwritten notes to computer
- Compile and summarize data
- Write your reports while they are fresh in your mind
- Create a summary
  - Identify difficulties and problem areas
  - Identify why there was difficulty or the source of any problems (specific factors such as navigation, text, graphics, etc.)
  - Identify any specific task-oriented issues

Source:
www.ecs.csun.edu/~rlingard/COMP595VAV/MyUsabilityPresentation.ppt

Roles in usability test

1. Real Users (Usually 5 users)
2. A Facilitator (Usability Professional)
3. A Human Computer (Lead Developer)
4. Observers (Member of the development Team)

1. Real Users

Real Users: The real users of your designed system. Usually 5 users should be able to identify about 85% of all usability problems. These users will interact with a paper version of the user interface that is being tested.

2. Facilitator

- A Facilitator: Usually a usability professional
- His/her role is to **record the issues** raised during the meeting. Where necessary, the facilitator needs to probe into the issues raised so that these are well documented.
- Since the ideas of the people present may be conflicting at times, the facilitator needs to act as a **mediator** between the different parties.

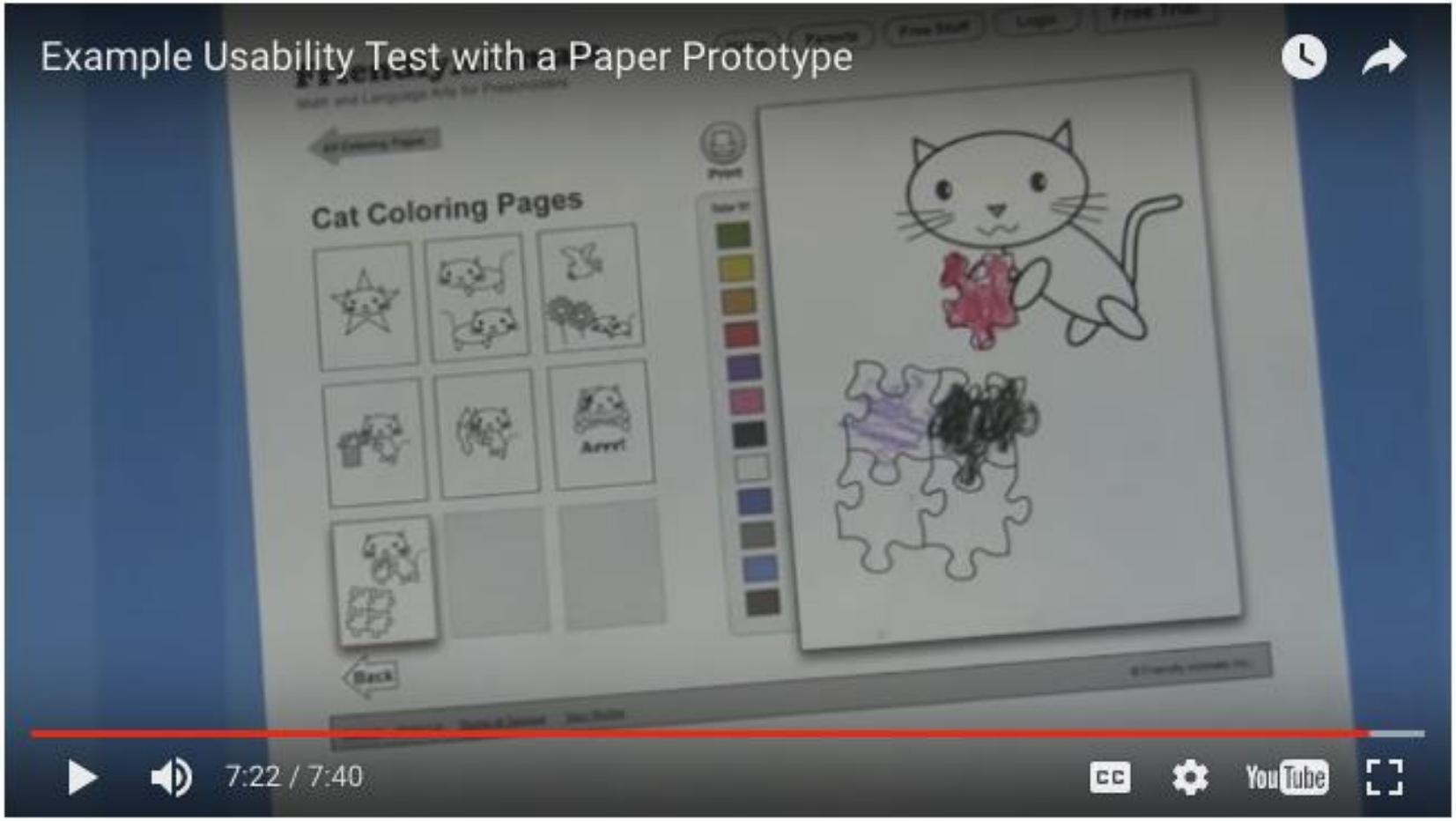
3. Human Computer

- A Human Computer: someone who knows how the system is supposed to work
- This person manipulates the paper prototype so that it can interact with the user as if the system has been implemented.
- The human computer will not explain or give hints to the users about how the interface is supposed to behave.

4. Observer

- Observers: members of the development team.
- Their role to observe and interpret the users' interactions with the paper prototype.

Conduct Usability Test



https://www.youtube.com/watch?v=9wQkLthhHKA


thank you!