A woman in a white shirt and dark pants is standing and pointing at a whiteboard in a modern meeting room. Three other people (two men and one woman) are seated around a large wooden conference table, looking towards the whiteboard. The room has large windows, modern lighting, and a whiteboard with some faint diagrams.

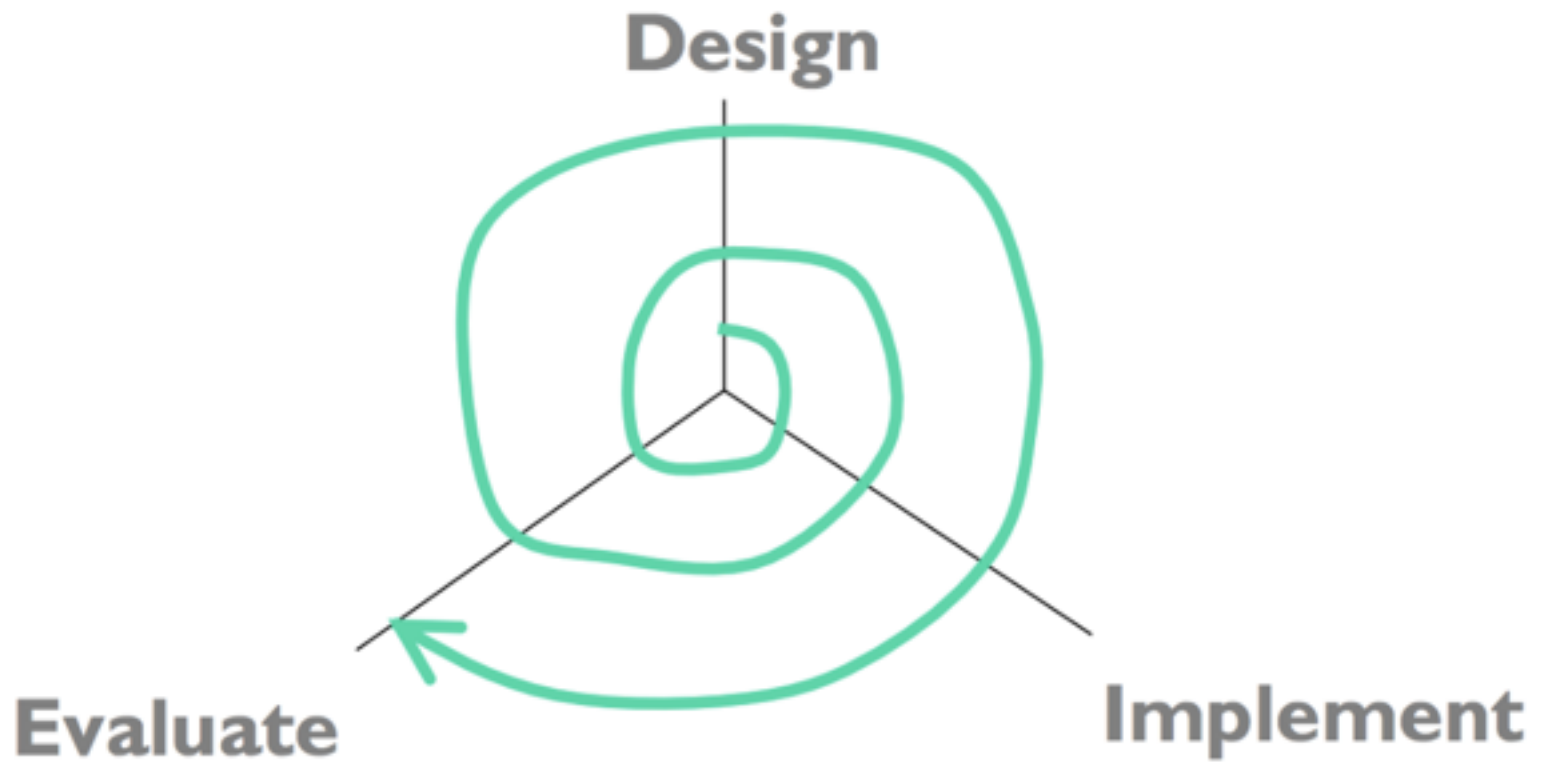
MIT GSL 2018

week 4 | Wednesday

User Interfaces II

User Centered Design

Spiral Model



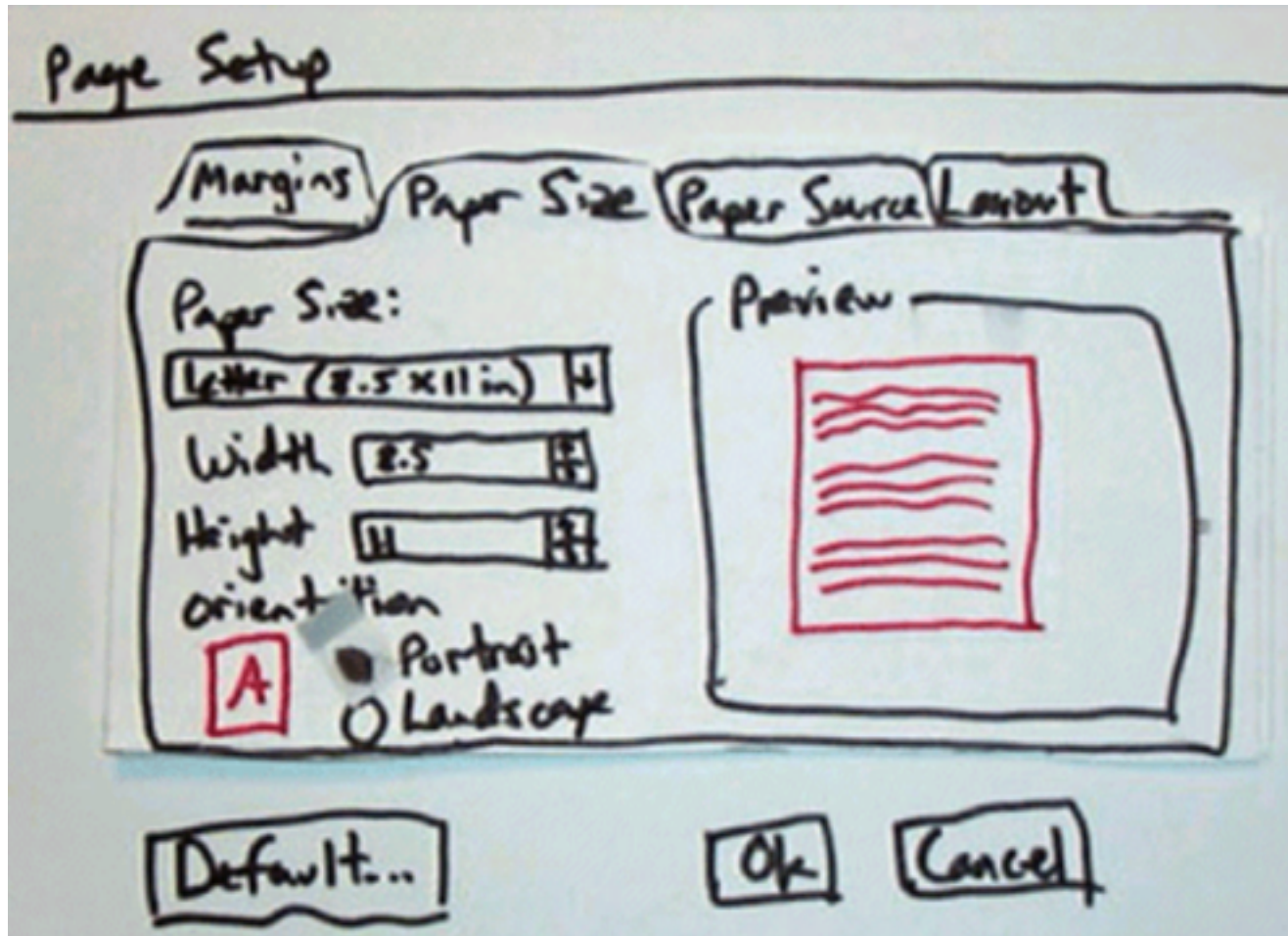
Prototyping

- Producing cheaper, less accurate renditions of your target interface
- Essential in spiral design process, useful in later iterations as well
- Why?
 - Get feedback earlier, cheaper
 - Experiment with alternatives
 - Easier to change or throw away
- Fidelity – how similar it is to the final product
 - Low fidelity: omits details
 - High fidelity: more like finished product

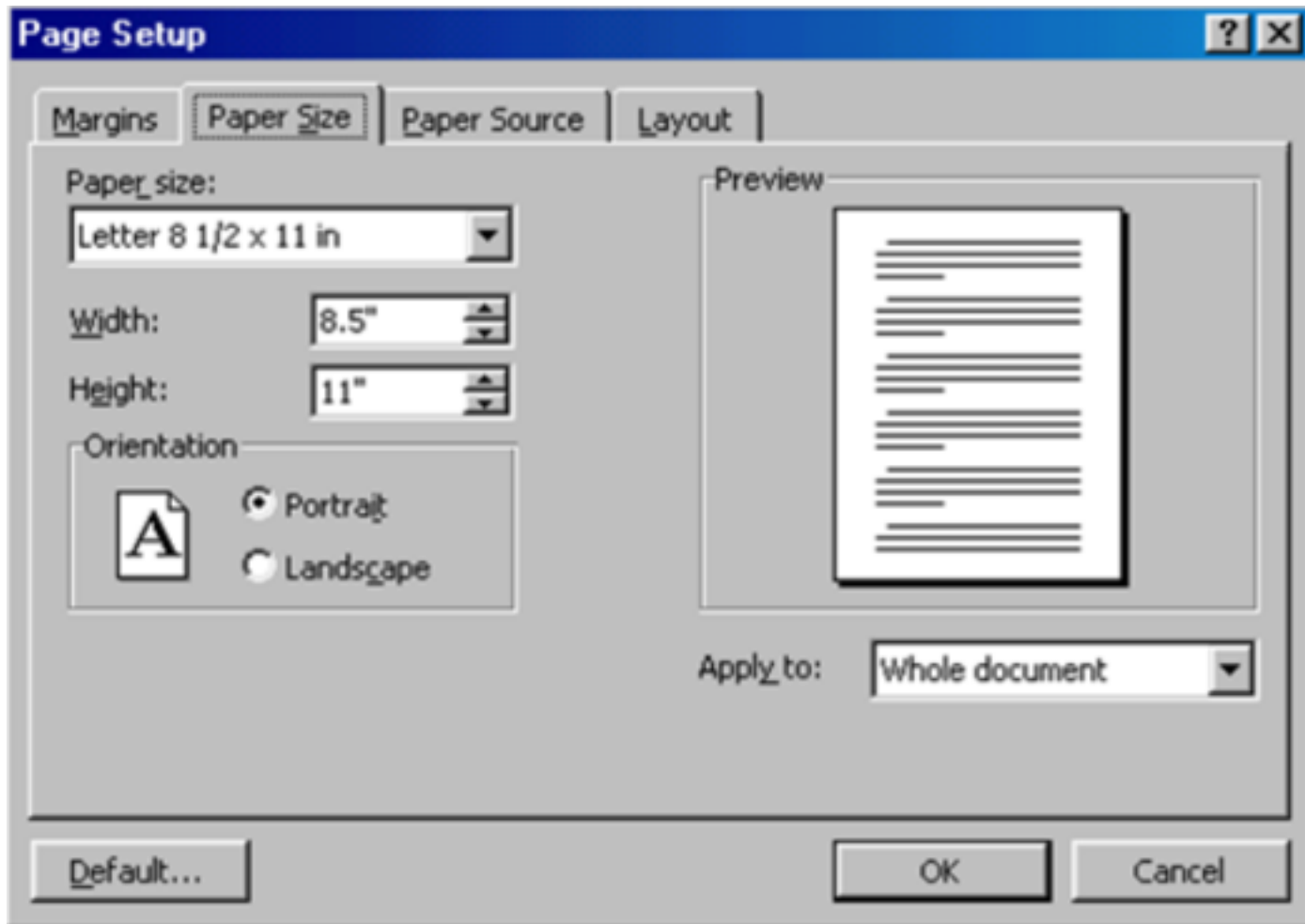
Prototyping

- Breath: % of features covered. Depth required for degree of functionality implemented
- Look: Appearance, graphic design
 - Sketchy, hand-drawn
- Feel: input method
 - Pointing and writing feels very different from mouse and keyboard

Look & Feel



Look & Feel



Paper Prototype

- Interactive paper mockup
 - Sketches of screen appearance
 - Paper pieces show windows, menus, dialog boxes
- Interaction is natural
 - Pointing with a finger = mouse click
 - Writing = typing
- A person simulates the computer's operation
 - Putting down & picking up pieces
 - Writing responses on the “screen”

Paper Prototypes

- Describing effects that to show on paper
- Low fidelity in look & feel
- High fidelity in depth (person simulates the backend)

Why Paper Prototypes?

- Faster to build
 - Sketching is faster than programming
- Easier to change
 - Easy to make changes between user tests, or even during a user test
- Focuses attention on big picture
 - Designer doesn't waste time on details
- Only preschool skills required

Good Paper Prototypes Tips

- Make it larger than life
- Make it monochrome
- Replace tricky visual feedback with audible descriptions
 - Tooltips, drag & drop, animation, progress bar
- Keep pieces organized
 - Use folders & open envelopes

Testing a Paper Prototypes

- Role for design team
 - Computer
 - Simulates prototype
 - Doesn't give any feedback that the computer wouldn't
 - Facilitator
 - Presents interface and tasks to the user
 - Encourages user to “think aloud” by asking questions

Testing a Paper Prototypes

- Role for design team
 - Facilitator
 - Keeps user test from getting off track
 - Observer
 - Keeps mouth shut, sits on hands if necessary
 - Takes copious notes

What you can learn from Paper Prototype

- Conceptual model - Do users understand it?
- Functionality - Does it do what's needed? Missing features?
- Navigation & task flow
 - Can users find their way around?
 - Are information preconditions met?
- Terminology – Do users understand labels?
- Screen contents - What needs to go on the screen

What you can't learn from Paper Prototype

- Look: color, font, whitespace etc
- Feel: efficiency issues
- Response time
- Are small changes noticed?
- Exploration vs deliberation
 - User are more deliberate with a paper prototype; they don't explore or trash as much

Computer Prototypes

Computer Prototype

- Interactive software simulation
- High-fidelity in look & feel
- Low – fidelity in depth
 - Paper prototype had a human simulating the backend; computer prototype doesn't
 - Computer prototype may be horizontal covers most features, but no backend

What you can learn Computer Prototypes

- Everything you learn from paper prototype plus:
- Screen layout
 - Is it clear, overwhelming, distracting, complicated?
 - Can users find important elements?
- Colors, fonts, icons, other elements
 - Well-chosen?
- Interactive feedback
- Efficiency issues – Controls big enough? Too close together? Scrolling list is too long?

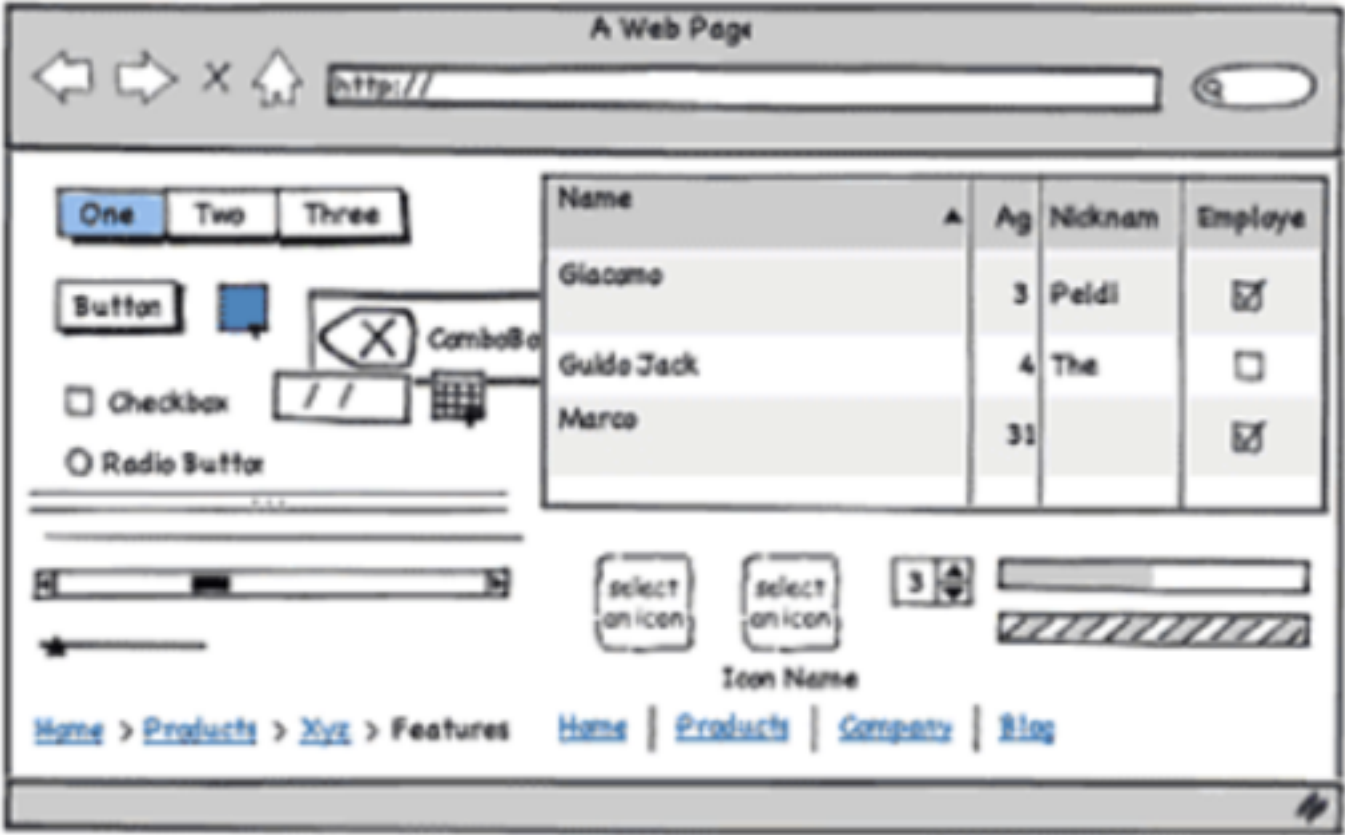
Why Use Prototype Tools

- Faster than coding
- No debugging
- Easier to change or throw away
- Don't let your UI toolkit do your graphic design

Computer Prototyping Techniques

- Storyboard
 - Sequence of painted screenshots
 - Sometimes connected by hyperlinks
- Form builder
 - Real windows assembled from a palette of widgets (buttons, text fields, labels)
- Wizard of Oz
 - Computer frontend, human backend

Storyboarding



Storyboarding

- Pros

- You can draw anything

- Cons

- No text entry
- Widgets aren't active
- Hunt for the hotspot

User Testing

Types of User Tests

- Formative evaluation
 - Find problems for next iteration of design
 - Evaluates prototype or implementation, in lab, on chosen tasks
 - Qualitative observations (usability problems)
- Field study
 - Find problems in context
 - Evaluates working implementation, in real context, on real tasks
 - Mostly qualitative observations

Types of User Tests

- Controlled experiment
 - Tests a hypothesis (e.g., interface X is faster than interface Y)
 - Evaluates working implementation, in controlled lab environment, on chosen tasks
 - Mostly quantitative observations (time, error rate, satisfaction)

Basic Principles (Belmont Report)

- Respect for persons
 - voluntary participation, informed consent
 - protection of vulnerable populations (children, prisoners, people with disabilities, esp. cognitive)
- Beneficence
 - do no harm; risks vs. benefits: risks to subjects should be commensurate with benefits of the work to the subjects or society
- Justice - fair selection of subjects

Pressures on a User

- Performance anxiety
- Feel of an intelligence test
- Comparing self with other subjects
- Feeling stupid in front of observers
- Competing with other subjects

Avoiding errors

- Different things should act differently but similar things should...?
- Separate dangerous functions from frequently used commands
- Safety from Mode Errors
 - Eliminate modes
 - Increase visibility of mode
 - Disjoint action sets in different modes
- Confirmation Dialogs! – use sparingly!!

Treat the User with Respect

- Time – Don't waste it
- Make user feel comfortable
- Informed consent – Tell the user honestly what you are looking for from them
- Privacy – Preserve user's privacy
- Control – the user should be able to stop at any time

User Testing

- Be prepared before the testing
- Make the user feel comfortable and able to take breaks during the testing
- After test
 - Inform the user how they have helped you
 - Answer any questions you couldn't answer before the testing
 - Don't publish user identifying information
 - Don't show video or audio without user's consent

Formative Evaluation

- Find some users
 - Should be representative of the target user class, based on user analysis
- Give each user some tasks
 - Should be representative of important tasks, based on task analysis
- Watch user do the tasks
- Roles
 - User – think out loud
 - Facilitator – brief users, provides tasks, controls sessions, coaches users
 - Observers – Be quiet and take notes

Heuristic Evaluation

Usability Guidelines

- Heuristics
- Nielsen's 10 principles
- Norman's rules from Design of Everyday Things
- Tognazzini's 16 principles
-
- Helps designers choose design alternatives
- Help evaluators find problems in interface

Nielsen Heuristics

- Match the real world (L)
- Consistency & standards (L)
- Help & documentation (L)
- User control and freedom (S)
- Visibility of system status (S)
- Flexibility & efficiency (E)
- Error prevention (S)
- Recognition, not recall (S)
- Error reporting, diagnosis, and recovery (S)
- Aesthetic & minimalist design

Heuristic Evaluation

- Performed by an expert
- Steps
 - Inspect UI thoroughly
 - Compare UI against heuristics
 - List usability problems
 - Explain & justify each problem with heuristics

How to: Heuristic Evaluation

- Justify every problem with a heuristic
 - “Too many choices on home page (Aesthetic & minimalist Design)”
 - Can’t just say “I don’t like the colors”
- List every problem
 - Even if an interface element has multiple problems
- Go through the interface at least twice
 - Once to get the feel of the system
 - Again to focus on particular interface elements


Example

Shopping Cart Contents

Welcome, Ben Bitdiddle.

You have 2 item(s) in your shopping cart.
To remove an item, check "Remove" box & click "Recalculate".
Shipping Calculator below.

There is a problem with your order.

Product	Description	Quantity	UnitPrice	ExtPrice
	323022 Pinnacle Clean Plus Version 4.0 Retail *** (Free 2nd Day)*** <input type="checkbox"/> Remove	<input type="text" value="1"/>	\$61.00	\$61.00
	80098-21 Corsair VS1GBKIT400 1GB Kit DDR400 PC3200 Value Select Memory Retail (out of stock) <input type="button" value="Remove Hardware"/>	<input type="text" value="1"/>	\$179.00	\$179.00

Subtotal: \$240.00

For more information about tax, please [click here](#).

Shipping Promotion details. Please read.

Note: Discount will be applied during check out

Coupon Code:

Ship to Zip Code:

Have not made up your mind? Save all the items in your shopping cart!

Cart Title:

Return to old shopping cart:

Cart Name:

Example

- Shopping cart icon is not balanced with its background whitespace (graphic design)
- Good: user is greeted by name (feedback)
- Red is used both for help messages and for error messages (consistency, match real world)
- “There is a problem with your order”, but no explanation or suggestions for resolution (error reporting)

Example

- ExtPrice and UnitPrice are strange labels (match real world)
- Remove Hardware button inconsistent with Remove checkbox (consistency)
- “Click here” is unnecessary (simplicity)
- No “Continue shopping” button (user control & freedom)
- Recalculate is very close to Clear Cart (error prevention)

Example

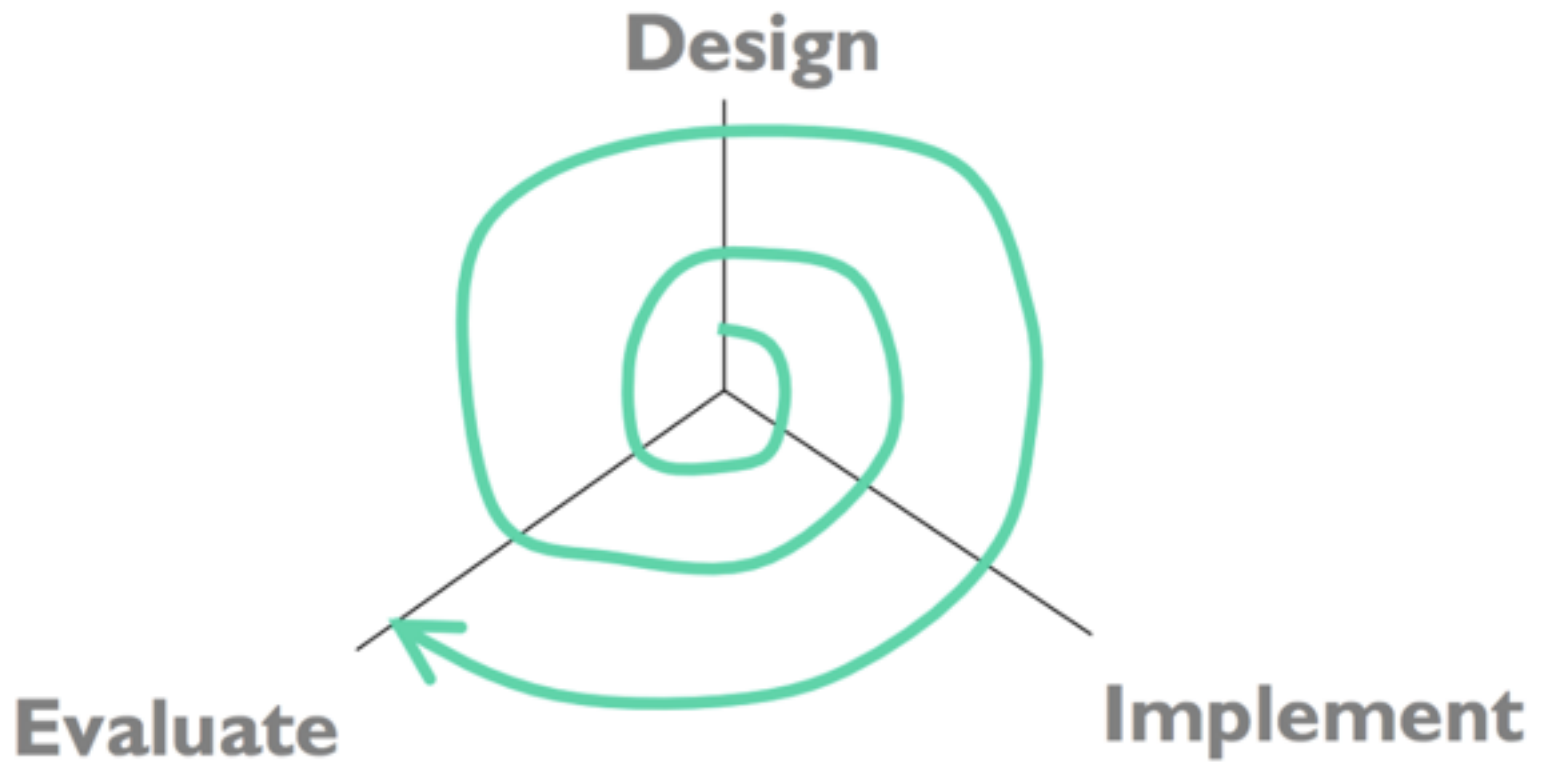
- “Check Out” button doesn’t look like other buttons (consistency, both internal & external)
- Uses “Cart Title” and “Cart Name” for the same concept (consistency)
- Must recall and type in cart title to load (recognition not recall, error prevention, efficiency)

Heuristic Evaluation ≠ User Testing

- Evaluator is not the user either
- Analogy: code inspection vs. testing
- HE finds problems that UT often misses
 - Inconsistent fonts
 - Fitts's Law problems
- But UT is the gold standard for usability

User Centered Design

Spiral Model



Now that we are all experts, lets prototype!