Get Paper and Drawing Implements ready – you will use them in class today.

CS1320
Creating Modern Web and Mobile Applications

Lecture 25

Human Computer Interaction I

HCI = User Friendly

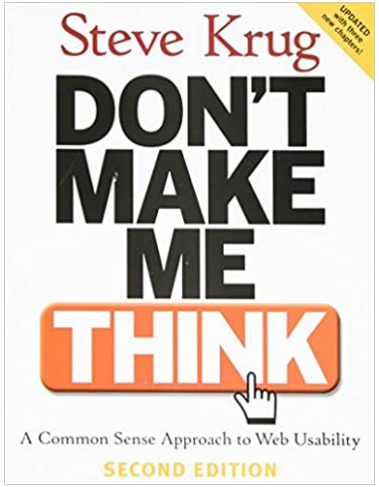
- Everyone says this is what is needed
  - But do you understand what is user-friendly and what is not
  - It is what we use to determine if we like a web or mobile app
  - It is the goal of human-computer interaction

What Does “User Friendly” Mean

- Easy to use
  - For whom
- Nice to look at
  - For whom
- Other Criteria
  - Resilient to mistakes
  - Easy to learn
  - Easy to understand
  - Does what the user expects

PUT THE USER FIRST

- This is the Basic Principle
  - The app is written for the user
- Problems
  - Easy to say
  - Difficult to do
  - Even when you are the user
  - Especially when you are the user
- Don’t Make Me Think

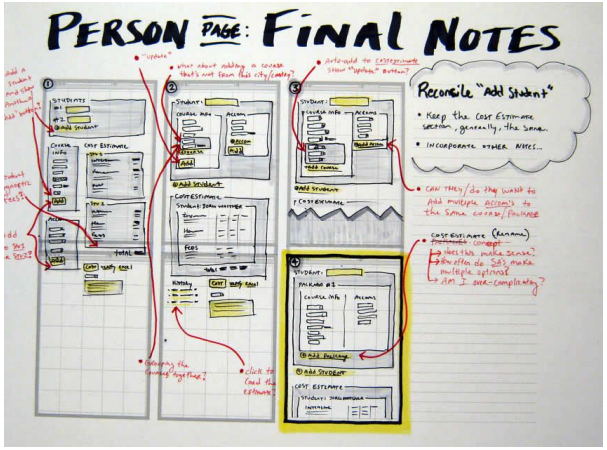


How to Put The User First

- Principles
  - Learnability, flexibility, robustness
- Listen to users throughout the process
  - **UI design is an iterative process**
  - Should be centered around the user
  - The implementer is a poor example of a user
  - What did you learn talking to users?
- Work in terms of realistic scenarios
  - Covering the major uses of your application

Designing a User Interface

- Sketch out what the UI looks like
- Sketch out transitions
- Details aren't important at first
  - E.g. colors, images, fonts, …
  - But note any ideas you might have
  - Interactions and understanding are important
- Getting feedback is important
  - Early feedback to avoid unnecessary work
  - Early feedback to give direction

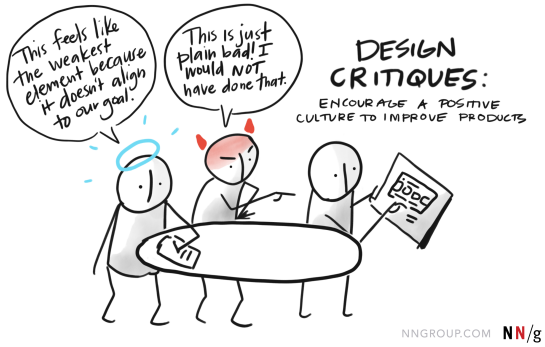


Designing and CRITs

- Sketch a quick design (5-10 minutes)
  - Sketch should show overview and ideas, not details
  - Enough to give someone a feel of how it would work
- Get Feedback – CRITs (5-10 minutes)
  - Feedback should be detailed and informative
  - Feedback should be helpful
  - Feedback should be criticism (but NOT PERSONAL)
    - Don't feel bad because of it – it will help in the end
  - Like a code review – the purpose is to find problems
- Design Courses can be run this way

In-Class Exercise

- Do a design and upload it
  - Go to http://bdognom-v2.cs.brown.edu:5002
  - Sign in with your Brown ID (no password needed)
  - Choose the first design lesson
  - Raise your hand (zoom-wise) when you are done
  - Finish within 10 minutes (including uploading)



In-Class Exercise

- Now you should provide CRITs on someone's design
  - Be helpful, not personal
  - Be critical, but constructively
- Choose the second lesson
  - You will be given a random design and asked to critique it
  - Raise your hand (zoom-wise) when you are done
  - Finish within 10 minutes
  - If you finish early, you can restart the lesson to get another design
  - When you are done you can view the critique on your design

Design is an Iterative Process

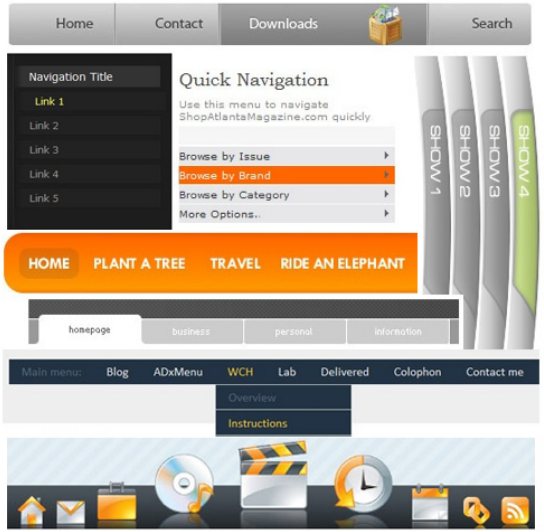
- Design – Crits – Redesign – Crits – Redesign …
  - Crits aren't a substitute for real users
  - Design – User Testing – Redesign - …
- You will have a chance to redo your design
- Real users can provide feedback as well
  - Get early feedback for your ideas from the user community
  - Based on sketches
- We will cover actual testing with real users
  - As part of the testing lectures
  - You need a prototype system to do that right

HCI In Web & Mobile Applications

- Look and feel of the pages (Visual)
  - Is it pleasant
  - Does the user focus on the appropriate things
- How the user interacts with the pages (Interactive)
  - Is interaction easy and natural
  - Effort minimization
  - Is interaction safe
- How the user interacts with the Site (Navigation)

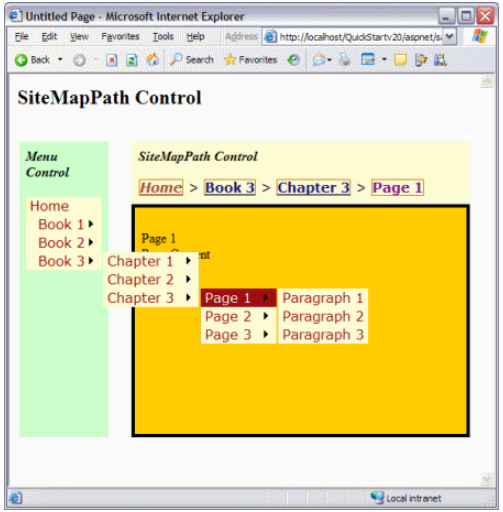
Web Site & Mobile Navigation

- Navigation is essential to web & mobile applications
  - It can make or break your application
- Many types of navigation are possible
  - Link to new page
  - Form submission to new page
  - JavaScript-created new page (using AJAX)
  - Frames (iframes) within a page
  - Forward and Back browser buttons
  - Links within a page
  - Shift/Control click on a link
  - Swiping

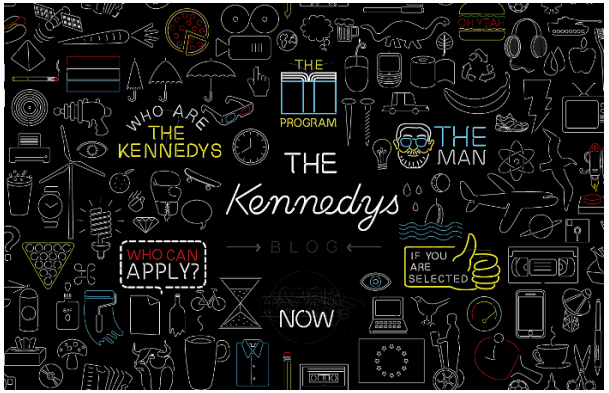


Understanding User Navigation

- How the user will navigate your site
  - For specific tasks
  - For specific pages
  - Based on scenarios
- What is the navigation model provided
  - Where can one go from a page
  - How can one get to a page
  - How are links dependent on history
  - How does this fit with the browser's capabilities
- This is a central part of application design



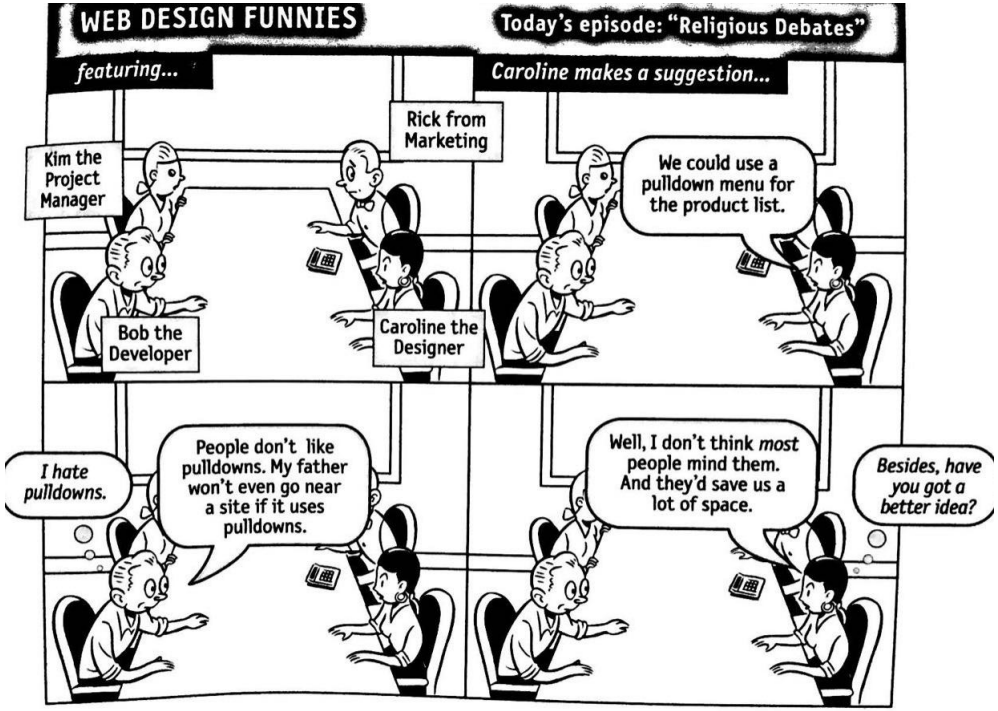
Navigation is Integral

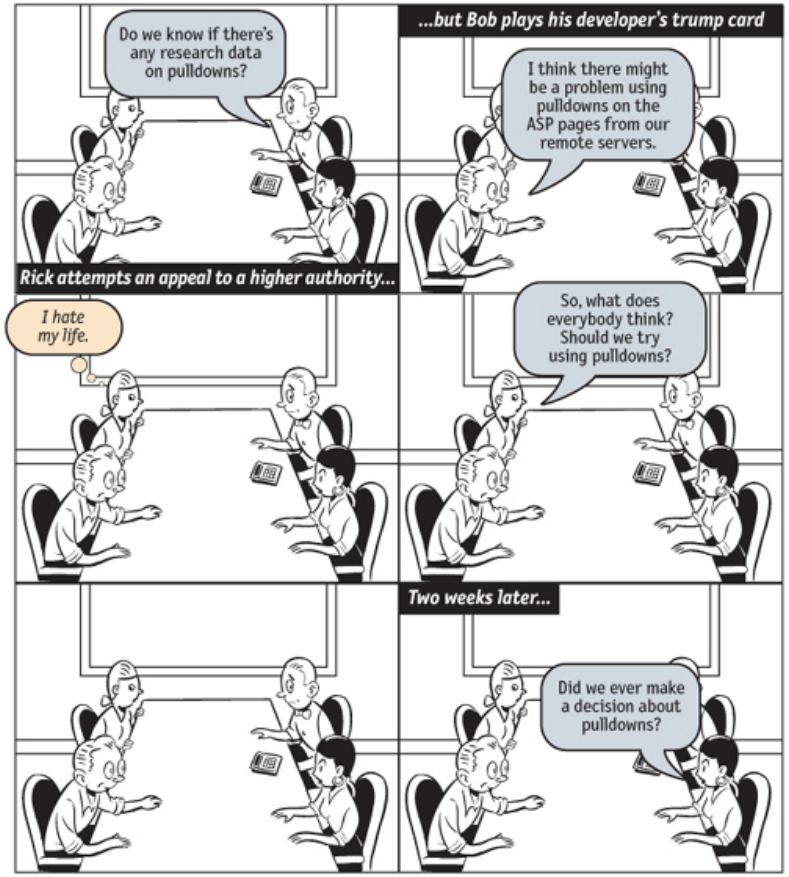


- It controls how the app or site is used
- It controls what the user can / can't do
- It ensures that the prerequisites for a page are satisfied
  - Before the page is used
- It ensures that users access your app in a logical way
- It directly affects user satisfaction
- It can easily introduce errors
  - Either actual ones
  - Or ones based on incorrect user expectations

Navigation Link Strategies

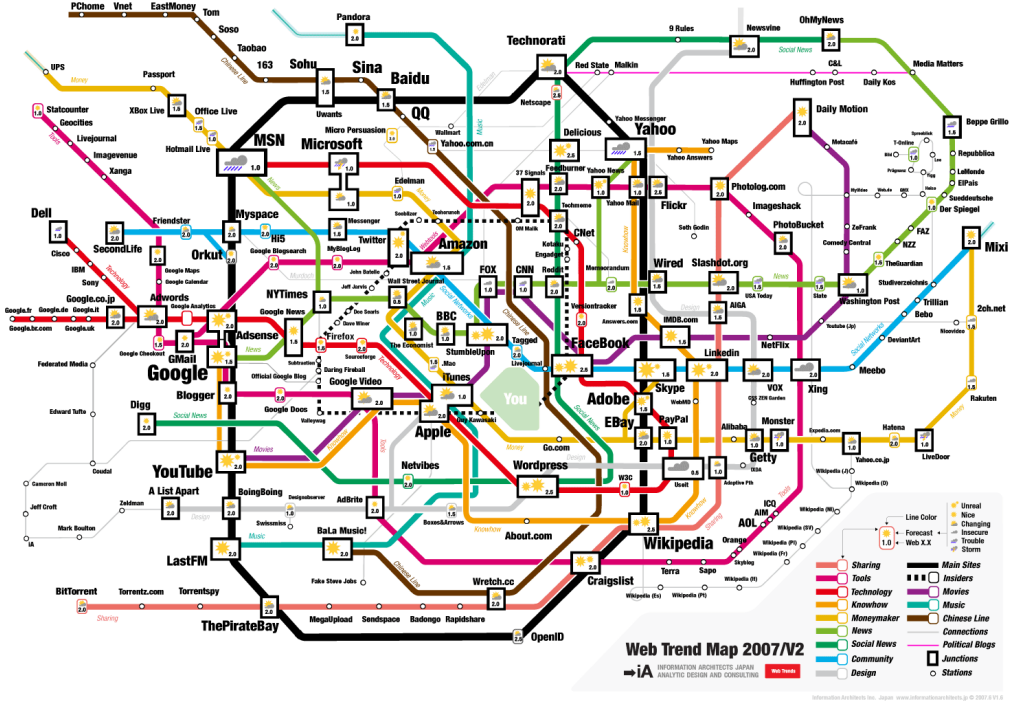
- Different navigation strategies
  - All options and sub-options on the left
  - Options link to another page with sub-options
  - Options on top with pull-down menus
  - Options on left with roll-over menus
  - Options on the left as a tree, one node expanded at a time
  - Options on left as a tree, user-defined expand/contract
  - Hamburger menus
  - …
- Which works best?


WEB DESIGN FUNNIES
Today's episode: "Religious Debates"
featuring...
Caroline makes a suggestion...
Kim the Project Manager
Rick from Marketing
Bob the Developer
Caroline the Designer
We could use a pulldown menu for the product list.
I hate pulldowns.
People don't like pulldowns. My father won't even go near a site if it uses pulldowns.
Well, I don't think most people mind them. And they'd save us a lot of space.
Besides, have you got a better idea?


Do we know if there's any research data on pulldowns?
...but Bob plays his developer's trump card
I think there might be a problem using pulldowns on the ASP pages from our remote servers.
Rick attempts an appeal to a higher authority...
I hate my life.
So, what does everybody think? Should we try using pulldowns?
Two weeks later...
Did we ever make a decision about pulldowns?

Other Navigation Methods

- Filtering
- Search
- Site map
- A-Z index
- Image maps

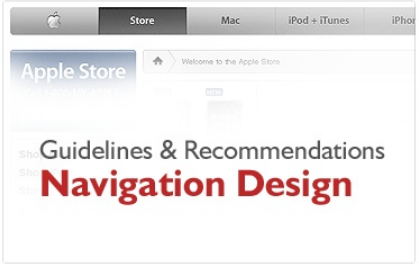


Designing For Navigation

- User interface design criteria
  - Common sense (do what is logical or expected)
  - Consistency
  - Minimize the possibility for errors
  - Keep the user informed (bread crumbs)
- Don't make me think
  - Navigation should be obvious
  - Clicking on an object should do the logical thing
- Don't make me work
  - Minimize the amount of navigation needed
  - Make common operations simple

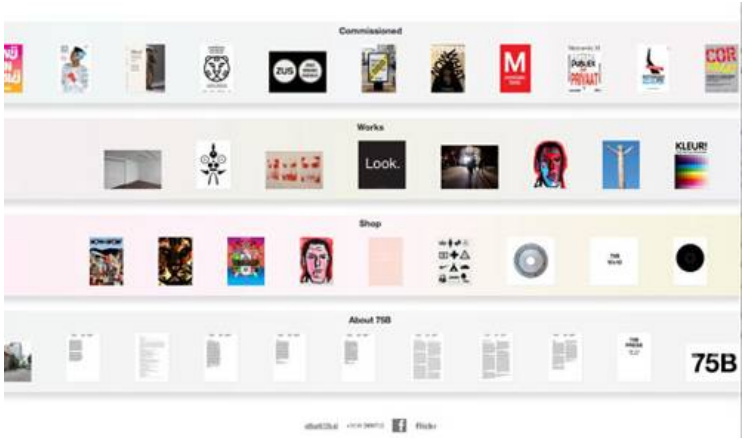
Other Navigation Guidelines

- Do not create or direct the user to pages with no navigational options
- Clearly differentiate navigational elements from one another
- Group and place them in a consistent and easy to find place on each page
- On long pages, provide a 'list of contents' with links that take users to the corresponding content
- Provide feedback to let users know where they are (breadcrumbs)
- Ensure that tab labels are clearly descriptive
- Ensure tabs are located at the top of the page and look clickable
- Do not require users to scroll purely navigational pages
- Use site maps where there are many pages
- Provide 'glosses' to help users select correct links
- Do not expect users to use breadcrumbs effectively

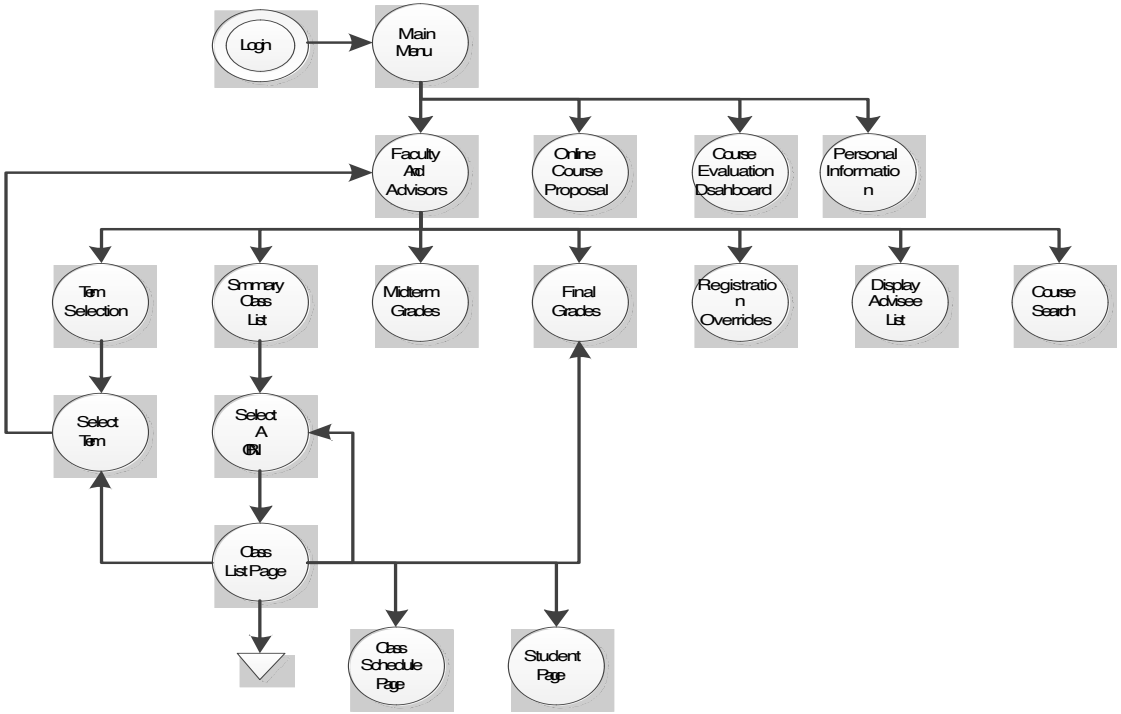


To Design, One Must Represent: Navigation

- How might you describe navigation
  - For a typical web site
  - For your project?
- Typically done as a graph
  - Nodes = pages
  - Links = navigations between pages
    - Labeled with what link does what
- Complications
  - Multiple ways of getting to a page
  - Might go back to referring page
  - Links might be conditional

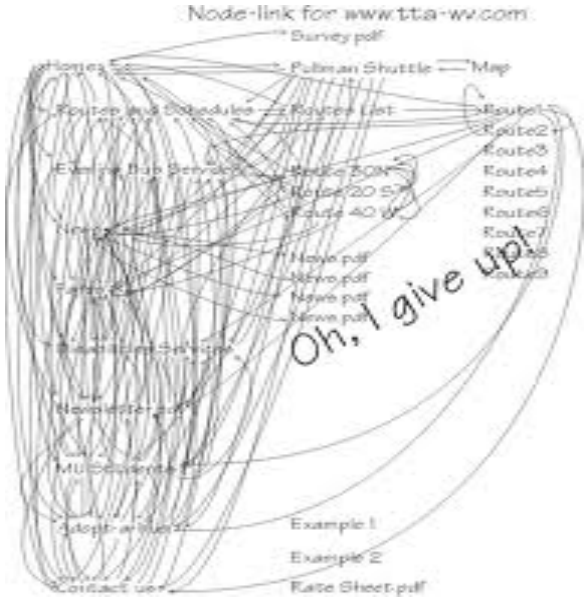


Navigation Example



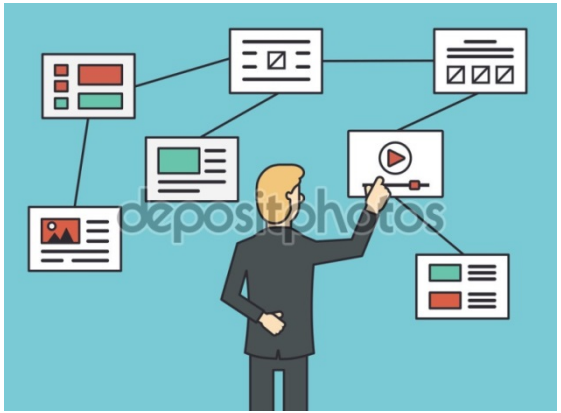
Representing Navigation

- How complex is the resultant diagram?
  - Is it something you can or want to draw
  - How do you represent user actions (back/forward)
  - How do you represent possible concurrency
- What are the alternatives
  - Draw diagrams for common uses of the application
  - Should have a set of graphs covering all navigations
    - This will tell you what to do in managing links
    - And what links need to be available on each page
  - Represent the graph in another form
    - List of links for each page
    - Harder to get an overview
  - Simplified FSA notations (e.g. StateCharts)



Using Navigation Diagrams

- For design purposes
  - What links have to be available
  - What should happen if the user clicks here?
  - What are the common navigation paths
    - Based on scenarios
    - Can we simplify these
- For implementation purposes
  - What should happen if the user clicks here
  - What is fixed/variable on each page
  - What should the back/forward button do



Client-Side Navigation

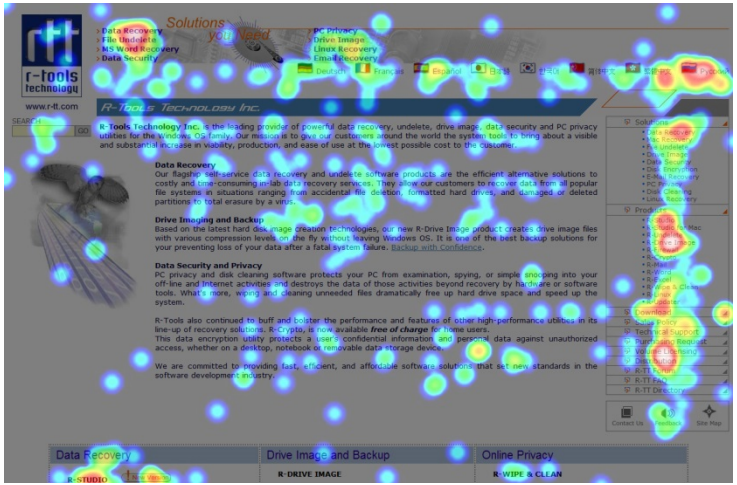
- What does the user see if your app uses AJAX or web sockets?
  - What does forward mean?
  - What does backward mean?
  - What does right-click on a link mean?
- This is a key difficulty with client-side applications
  - Don't meet the user's expectations
  - Don't work well with browsers
  - Encode in the # part of URL
    - Calls to set history, calls to load page

Next Time

- If you are doing this offline
  - Do the design lesson; do the crits lesson
- You should do the crits lesson a second (or third) time
- We will continue design practice
- We will consider design principles

Evaluation of Navigation

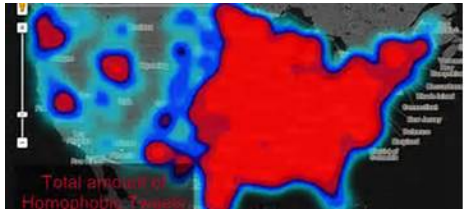
- What does it mean to have good navigation
  - What are the criteria
  - What might you evaluate
- Criteria
  - Performance (time per task)
  - User satisfaction
  - Error rate
- Results
  - Time per task: no significant differences
  - User satisfaction: no significant differences
  - Error rates: some significantly better
    - All options/sub-options on left; drop downs



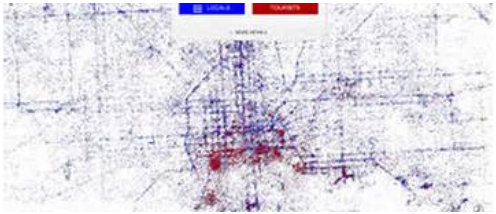
Control Flow History

- Problem: dealing with AJAX, Web Sockets
  - Browser only knows that URL changes
  - Page stays the same however
- What can change in the URL without changing page?
- Encode the control flow in #tag part of the URL
  - Set this on AJAX/Socket based changed
  - Handle this when set by browser

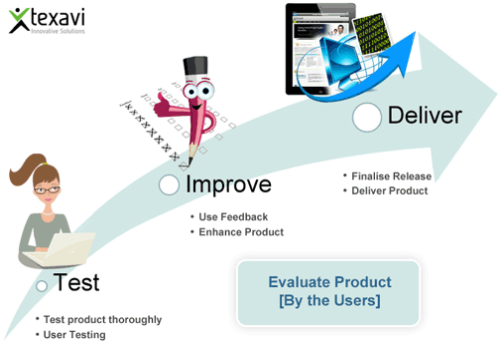
Problem



- Suppose we have data about tweets involving the flu
  - Each has a given geolocation
  - Each has a given time
- How would you display them?
  - What should the display look like
  - What should the interaction look like
  - How would the user get there
- How do you start?



User (Usability) Testing



- Test the effectiveness of the user interface
  - What is liked or disliked (subjective)
  - Speed and ease of use
  - What errors are made (and the error rate)
- How understandable is the interface
  - What instructions/help is required, what is obvious
- Is the content logical and easy to follow
  - Consistency of navigation and presentation
  - Spelling errors, colors and fonts, English
- Universal usability testing
  - Accessibility testing
  - Internationalization testing

Doing Usability Testing

- User studies
  - Watching users use the site (video taping for analysis)
  - Surveys or polls after use
  - Determining what information is needed
- Log studies
  - What are the navigation paths? What are the common operations? How are key pages reached?
  - Detecting errors from the logs
  - Timings
  - Using Google Analytics and similar tools
- Tools and External Sources
  - http://www.youtube.com/watch?v=uLyWxXNDNbI
  - http://www.youtube.com/watch?v=xLIBe6VWmrY

Usability Testing Tools

- UserTesting
  - http://info.usertesting.com/EduDemo.html
- Usage
  - Develop a well-thought out test first
    - What you want the user to do
    - What questions you want to ask
    - What questions you want answered
  - Sign up: https://www.usertesting.com/users/sign_up?client=true
  - Choose ORDER a TEST
  - Select no more than 3 participants
  - Use code U-BU9 in lieu of payment

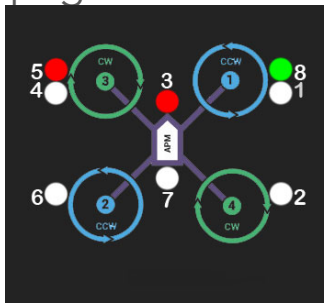
Question

Web site navigation or control flow is not concerned with

A. How users go between pages to accomplish a task
B. The time it takes to complete a multiple-page operation
C. Handling the BACK and FORWARD buttons on a client-heavy application
D. Errors users make in clinking on links on the application's pages
E. Web site navigation is concerned with all the above

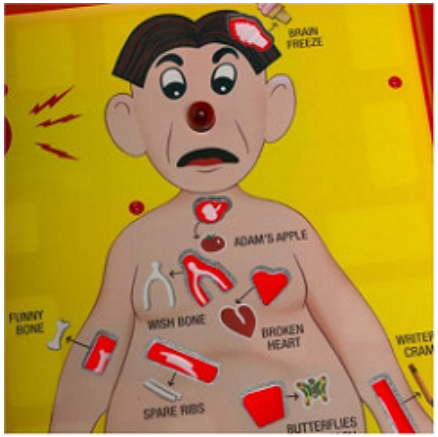
Controlling Navigation

- Control flow is not explicit in HTML or web applications
  - It is implicitly controlled by links
  - Same requests to the server for a particular URL can result in different pages
- Control flow is implicitly controlled by the user
  - Back and forward buttons
  - Multiple copies of a page visible at once
  - Explicit typing of internal URLs
- Client-heavy applications
  - Application has more control, but need to meet expectations
  - Be sure to handle Back and Forward buttons explicitly
  - Need to keep your own history

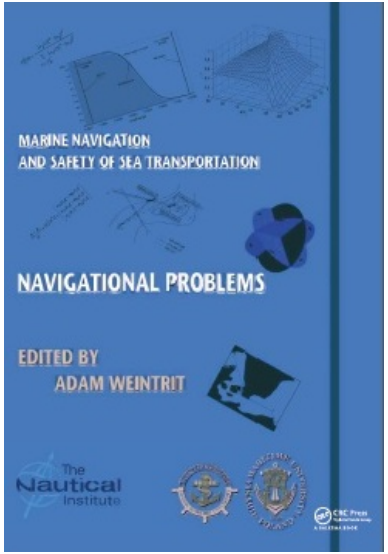


Navigation Problems

- Causes “bugs” in web applications
  - Remember last action, but user clicks on prior page
  - Explicit session id can create security problems
  - Page preconditions might not be met
- Causes user errors or misconceptions
  - Multiple shopping carts



Handling Navigation Problems



- Defensive Programming
  - Each page should check the preconditions
  - Ensure you have the necessary information
- Keep the user informed
  - The page should inform the user what the server thinks
  - Make explicit what will happen on a link
- Keep the client and server in sync
  - Automatically update the shopping cart