



Human Factors / User Interface Design Guidelines

For more info
see CS 465

How would you interact with this?

First Launch Date: 09/09/97 Set Date

First Launch Time: 19:17 Set Time

How about this?



Design Terminology: Affordances

- An affordance is a relation between an object/environment and an organism that **affords** the opportunity for that organism to perform an action.
- For example, a knob affords twisting, and perhaps pushing, while a cord affords pulling.
- An affordance enables the possibility of some action.

Design Terminology: Signifiers

- A "signifier" is some sort of indicator, some signal in the physical or social world that can be interpreted meaningfully

User Experience design in a nutshell

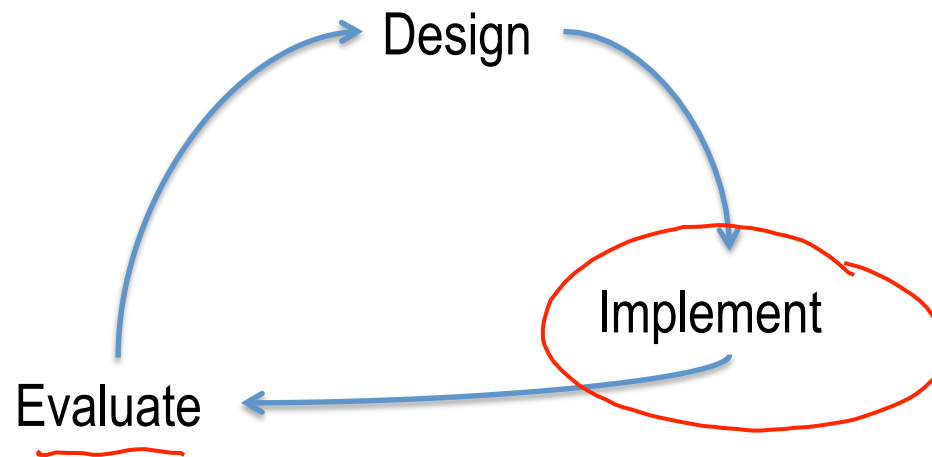
1. Provide the affordances desired by users
2. Organize those affordances appropriately
 - “Information Architecture”
3. Make your affordances obvious through correct use of signifiers

Sounds pretty easy...

User Experience Design is Hard

- Most users are not like you
- Users can't always tell you what they want
- But, they can sure tell you what is wrong.
 - Consistent problems are the system's fault

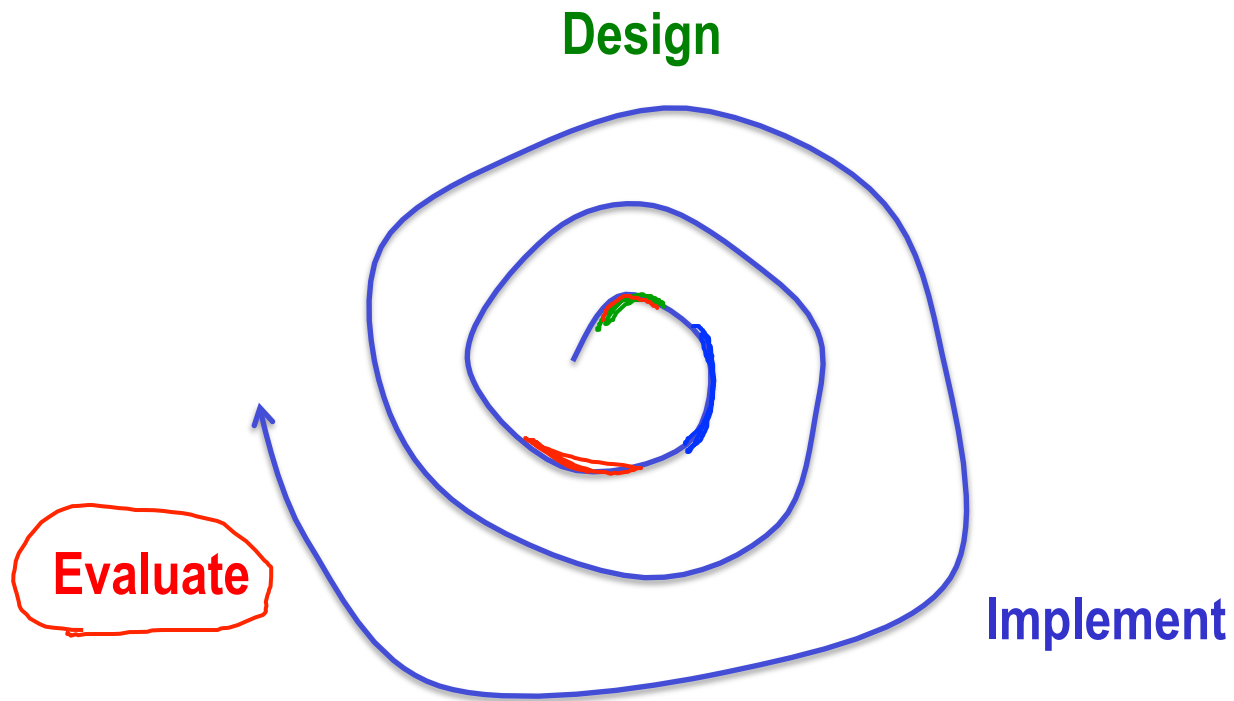
You won't get it right the first time: UX Design is an Iterative Process



- **Iteration can be costly**
 - Might have to re-write a lot of your code

Spiral Model of Design

- Use throwaway prototypes and cheap evaluation early in the cycle.



Usability

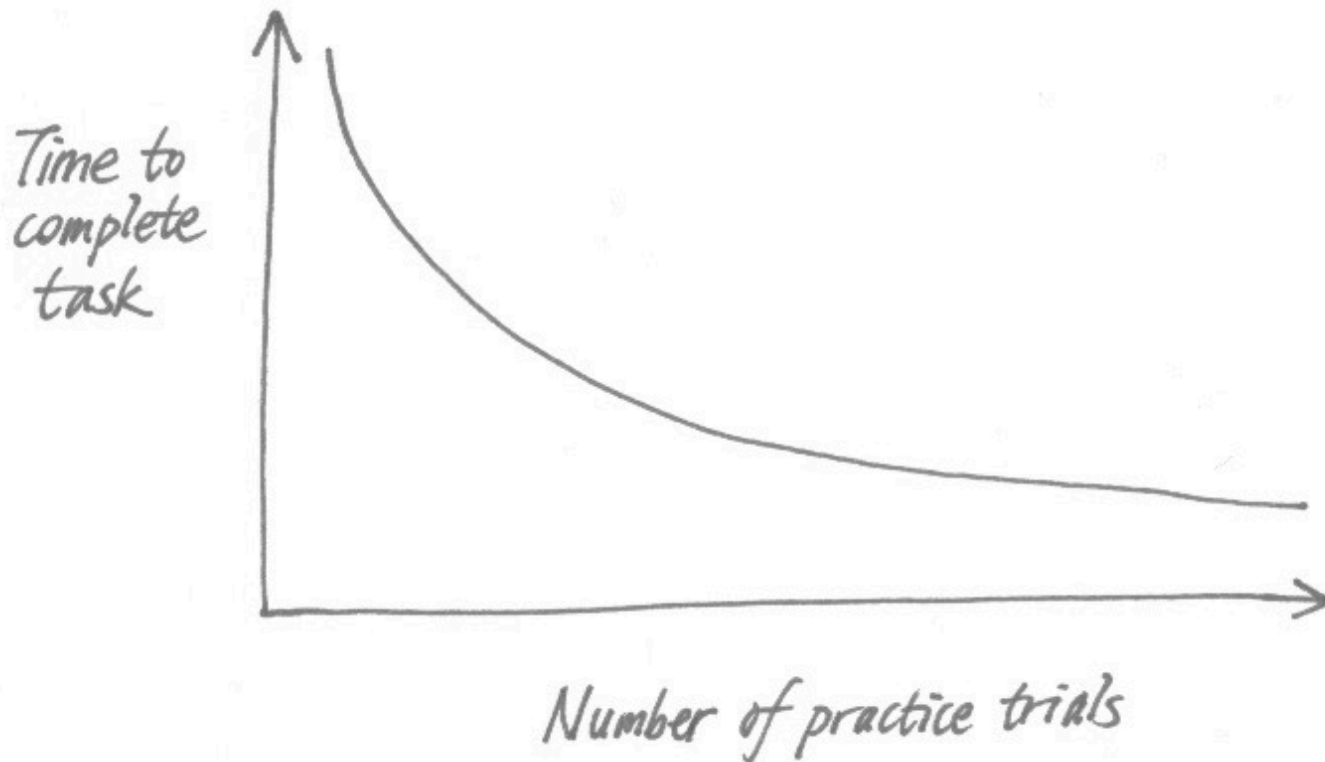
- How well users can use the system.
- **Dimensions of Usability:**
 - Learnability: Easy to learn? *← novice*
 - Visibility: Is the state of the system clear?
 - Efficiency: Once learned, is it fast to use? *← expert*
 - Errors: are errors few and recoverable?
 - Satisfaction: is it enjoyable to use?
- **Design Principles guide building usable systems**
 - Guided by findings in Ergonomics / Human Factors

Ergonomics / Human Factors

- the scientific discipline concerned with the understanding of interactions among humans and other elements of a system
- applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance
- Characterizes the capabilities and limitations of humans

Human Factors: Power Law of Practice

- The log time to complete a task decreases linearly with of # practice trials.



Usability

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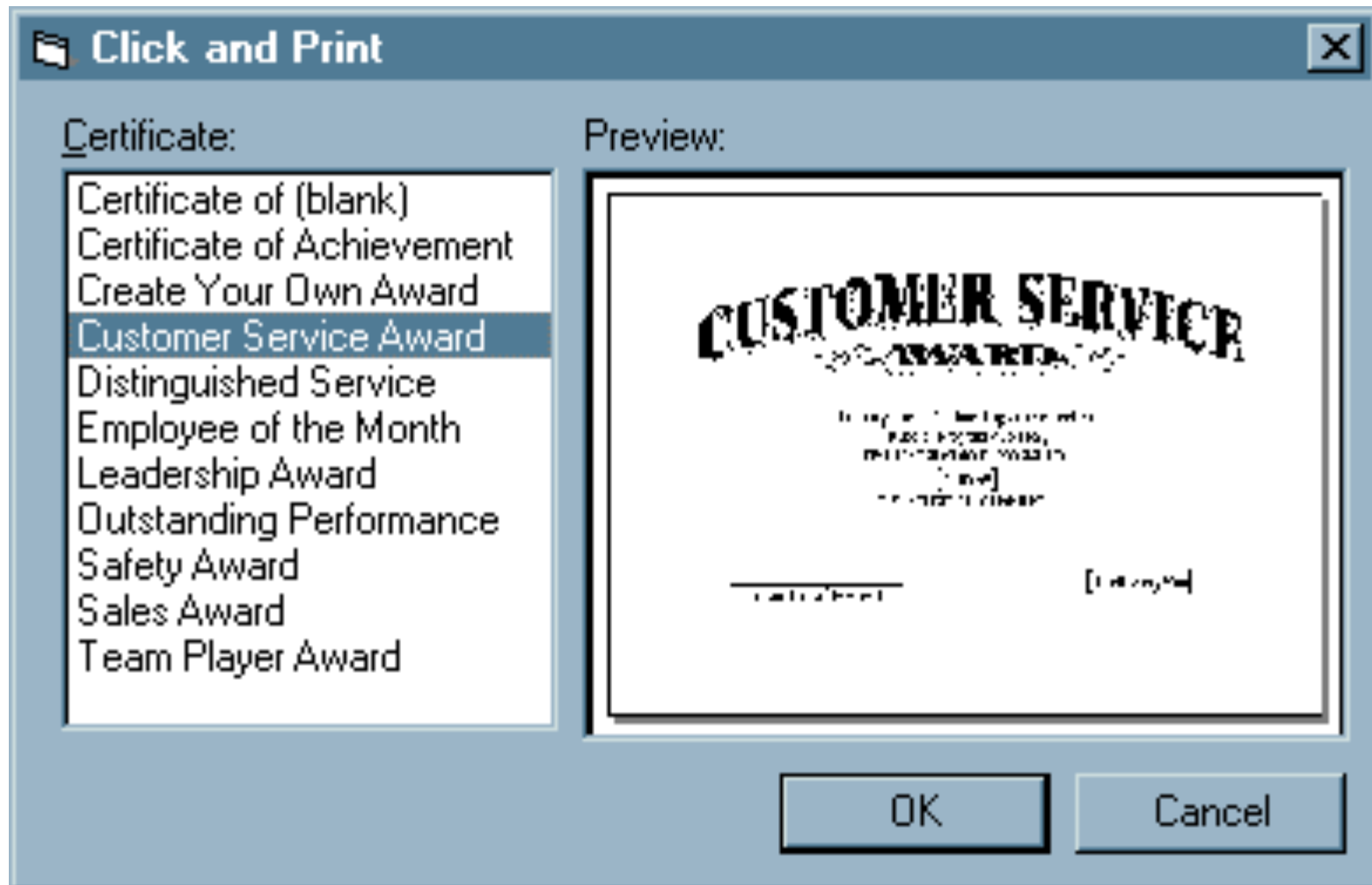
What is wrong with this?



Design Principles for Learnability

- **Consistency (in design and metaphors)**
 - Similar looking things act similarly
 - Different looking things act differently
 - In wording, location, color, ordering
- **Use common words not jargon**
- Recognition, not recall
 - Labeled buttons rather than command languages
- **2 kinds of users: Beginners & Experts**

Alternative Design



Visibility

- Avoid affordances w/o signifiers
 - E.g., pop-up menus by clicking on open space
- Avoid hidden modes
- Perceptual Fusion:
 - Stimuli <100ms apart seems fused to humans
 - 10 frames/second appears as moving picture

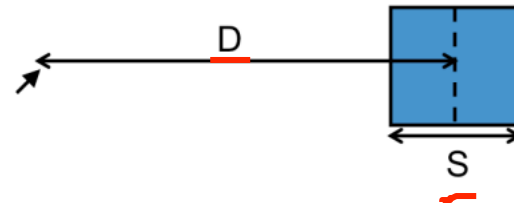
Efficiency: Hand motion tasks

- Moving mouse on screen
- Finger on keyboard/touchscreen
- Hand from keyboard to mouse

- **Fitts's Law**

- Time = a + b*log(D/S)
- log(D/S) = index of difficulty

- Bigger, closer = easier
- For mousing, S is infinite on edge of screen (good!)



Efficiency: Path Steering Tasks

- Fitts's law only for unconstrained movements
- Task much harder if constrained to tunnel



$$T = a + b (D/S)$$

Design for Efficiency

- **Fitt's Law & Steering Law**

- Important targets: big, nearby, or at screen edges
- Avoid steering tasks

- **Provide shortcuts**

- Keyboard accelerators (for expert users)
- Bookmarks
- History

Reminder: Using the internet/citing sources

- It must be publicly available
- It must be a minority (<25%) of the code that you submit
- You must understand what the code does.
- Cite any distinctive or substantial code snippets (e.g., more than 2-3 lines) immediately preceding the code

// code below derived from:

// <https://stackoverflow.com/questions/21626439/how-to-implement-the-java-comparable-interface>

```
public int compareTo(LineItem other) {  
    return Integer.compare(this.position, other.position);  
}
```

Delete All Records



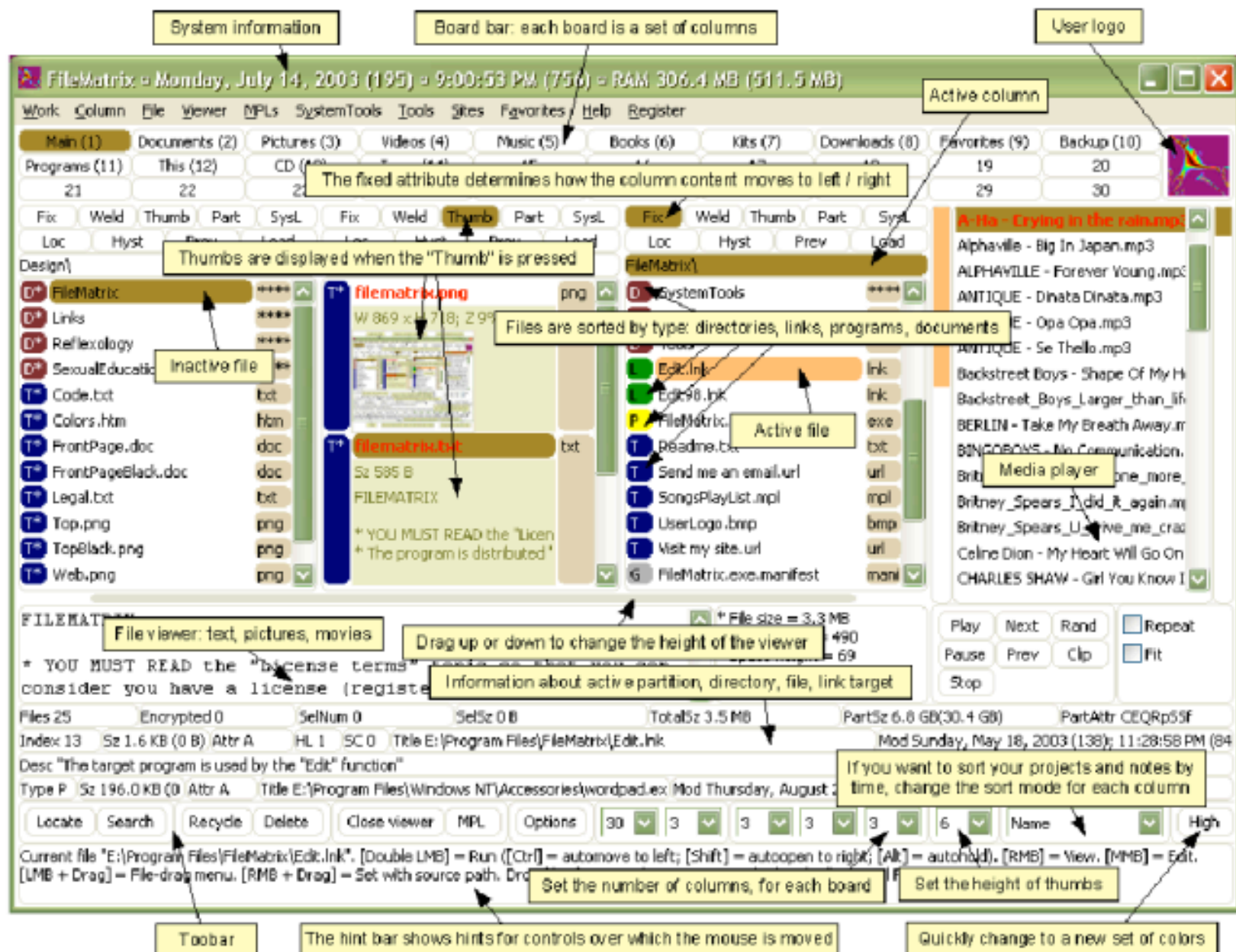
Are you sure you want to delete
all records from the database?

Yes

No

Errors

- Principle: Protect User's Work
- Prevent Errors as much as possible:
 - Selection rather than typing (within reason)
 - Constrain user input
 - Separate risky commands from common ones
- Undo (design pattern)
- Confirmation Dialogs (when appropriate)
- Understandable error messages



Simplicity

- **Less is More**
 - Omit extraneous information, graphics, features
- **Hick's Law:**
 - time to make a decision is proportional to $\log(\# \text{ choices})$

Bing
~~Google~~

Google Search

I'm Feeling Lucky

Whenever your local SMS Administrator sends you an actual software Package, the SMS Package Command Manager will appear (usually at network login time) displaying the available Package(s). The following screenshots display scenes similar to what you will see when you receive an actual SMS Package.

To start the demonstration, click the "CLICK HERE" button at the bottom of the screen.

Form Title -- (appears above URL in most browsers and is used by WWW search)		Background Color:
Q&D Software Development Order Desk		FFFBF0
Form Heading -- (appears at top of Web page in bold type)		Text Color:
Q&D Software Development Order Desk <input checked="" type="checkbox"/> Center		000080
E-Mail responses to (will not appear on)	Alternate (for mailto forms only)	Background Graphic
dversch@q-d.com		
Text to appear in Submit button	Text to appear in Reset button	<input type="radio"/> Mailto
Send Order	Clear Form	<input checked="" type="radio"/> CGI
Scrolling Status Bar Message (max length = 200 characters)		
****WebMania 1.5b with Image Map Wizard is here!****		
<< Prev Tab		Next Tab >>

Simplicity, cont.

- **Good graphic design**
 - Few, well-chosen colors and fonts
 - Group with whitespace
- **Use concise language**
 - Choose labels carefully

How do users hold phones

- <http://www.uxmatters.com/mt/archives/2013/02/how-do-users-really-hold-mobile-devices.php>
- <http://scotthurff.com/posts/how-to-design-for-thumbs-in-the-era-of-huge-screens>