

User-Centered Website Development: A Human-Computer Interaction Approach



Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

2. Capabilities of Human Beings

In this chapter you will learn about:

- Human senses, perception, memory, and interruptions
- Mental models, metaphors, and perceived affordance
- Some design guidelines based on these topics

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Definitions

- *Cognitive psychology*:
 - the study of how people perceive, learn, and remember
- *Cognition*:
 - the act or process of knowing
- The issue:
 - confronted with a new experience (or website) how does a user draw on past experience to make sense of it?
- Example:
 - underlined blue text is understood to be a link

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Why do we care?

- Because when people try to understand something, they use a combination of
 - What their senses are telling them
 - The past experience they bring to the situation
 - Their expectations

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Senses

- Senses (sight, hearing, smell, taste, touch) provide data about what is happening around us
- We are visual beings ("See what I mean?")
- Designing good Web materials requires knowledge about how people perceive

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Constructivism

- Our brains do not create pixel-by-pixel images
- Our minds *construct* models that summarize what comes from our senses
- These models are what we perceive
- When we see something, we don't remember all the details, only those that have meaning for us

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Example: familiar objects that we see, but don't store in detail

- How many links are there on top menu of amazon.com?
- What are the colors on your favorite cereal box?
- How many lines are there in the IBM logo?
- Who cares?
- Moral: People filter out irrelevant factors and save only the important ones


Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Context

- Context plays a major role in what people see in an image
- Mind set: factors that we know and bring to a situation
- Mind set can have a profound effect on the usability of a web site

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Example of context: What do you see?



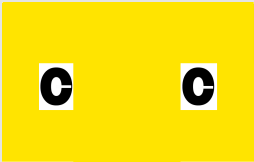
Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Why couldn't you see the cow's face at first?

- It's blurry and too contrasty, of course, but more:
- You had no idea what to expect, because there was no context
- Now that you do have a context, you will have little difficulty recognizing it the next time

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Another example of context: are these letters the same?



Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Well, yes, but now in context:



Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Exercise applying this idea

- Keep a diary of the number of times you couldn't "see" something that was in front of you, because you expected it to look different:
 - The teabags that were in the "wrong" box
 - The sugar container that was right *there*—but you were looking for small packets of sugar
 - A book that you remembered as having a blue cover, but it's really green
 - The button you couldn't "see" because it was flashing, and your mind set is that anything flashing is an advertisement


Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Figure and ground

- Images are partitioned into
 - Figure (foreground) and
 - Ground (background)
- Sometimes figure and ground are ambiguous

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Figure and ground: What do you see?



Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Gestalt psychology

- "Gestalt" is German for "shape," but as the term is used in psychology it implies the idea of *perception in context*
- We don't see things in isolation, but as parts of a whole

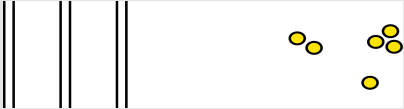
Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Five principles of Gestalt psychology

- We organize things into meaningful units using
 - Proximity: we group by distance or location
 - Similarity: we group by type
 - Symmetry: we group by meaning
 - Continuity: we group by flow of lines (alignment)
 - Closure: we perceive shapes that are not (completely) there

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Proximity



Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Example: a page that can be improved . .

The screenshot shows a Microsoft Internet Explorer window with the title "Bad Proximity - Microsoft Internet Explorer". The address bar is empty. The main content area features a large photograph of a mountain landscape with a rainbow. To the left of the image is a vertical blue sidebar containing a list of links: "Breaking News", "Camcorders", "Contacts", "Digital Cameras", "DVD Players", "Free Releases", "Games", "Subscribe", "VCRs", and "Webmaster".

Chapter 2: Capabilities

By using proximity to group related things

The screenshot shows a Microsoft Internet Explorer window with the title "Better Proximity - Microsoft Internet Explorer". The layout is identical to the previous slide, but the links in the blue sidebar are now grouped into three categories: "Breaking News", "Free Releases", and "Reviews" at the top; "Camcorders", "Digital Cameras", "DVD Players", and "VCRs" in the middle; and "Contacts", "Subscribe", and "Webmaster" at the bottom.

Chapter 2: Capabilities

Similarity

A 3x3 grid of nine circles. The top row contains two green circles followed by one yellow circle. The middle row contains one yellow circle followed by two green circles. The bottom row contains two green circles followed by one yellow circle.

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Example: can you use similarity to improve this page?

The screenshot shows a Microsoft Internet Explorer window with the title "Bad Similarity - Microsoft Internet Explorer". The page has a navigation bar with four buttons: "About Us", "Browse", "Shop", and "Check Out". The "About Us" button is significantly larger than the other three. Below the navigation bar is the heading "CDs 4 U".

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Sure: make the buttons the same size:

The screenshot shows a Microsoft Internet Explorer window with the title "Better Similarity - Microsoft Internet Explorer". The layout is identical to the previous slide, but the four navigation buttons ("About Us", "Browse", "Shop", and "Check Out") are now all the same size.

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Anything else?

The screenshot shows a Microsoft Internet Explorer window with the title "Bad Similarity - Microsoft Internet Explorer". The page content is mostly blank, with only the navigation bar and the heading "CDs 4 U" visible from the previous slide.

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Sure: use the same font everywhere:

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Symmetry: we use our experience and expectations to make groups of things

We see two triangles. We see three groups of paired square brackets.

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Continuity: flow, or alignment

We see curves AB and CD, not AC and DB, not AD and BC. We see two rows of circles, not two L-shaped groups.

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Use alignment (one form of continuity) to improve this page

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

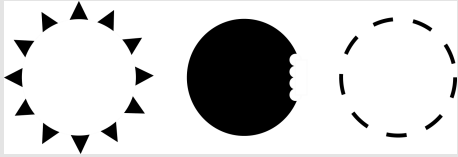
Sure: the lines on the previous slide show how to use horizontal alignment

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

But why stop? Left-align both columns to get vertical alignment also

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Closure: we mentally "fill in the blanks"

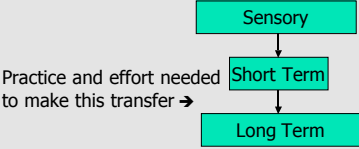


All are seen as circles

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

2.4 Memory

- Hierarchical Model



Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

"The Magic Number 7, Plus or Minus 2"

George Miller, 1956

- Value of " chunking"
 - 2125685382 vs. 212DanHome
 - 10 chunks vs. 3 (assuming 212 is familiar)
- Can you remember:
 - Vsdfnjejn7dknsdnd33s

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

How many chunks in . . .

- www.bestbookbuys.com
- 20? Not really:
 - www.
 - best
 - book
 - buys
 - .com

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Recognition vs. Recall

- Why is a multiple choice easier than an essay test?
 - Multiple choice: you can recognize the answer
 - Essay: you must recall the answer
- A computer with a GUI allows us to recognize commands on a menu, instead of remembering them as in DOS and UNIX

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

Memory aids

- Post-It® notes
- In Windows
 - ctrl- N (new)
 - ctrl- C (copy)
 - ctrl- S (save)
- Favorites List and bookmarks to store URLs
- Hyperlinks—if their wording indicates the content of the target page. ("Click here" is not a memory aid.)

Chapter 2: Capabilities of Human Beings Copyright © 2004 by Prentice Hall

2.5 Interruptions

- Focusing attention and handling interruptions are related to memory
- In website design you need to give cues or memory aids for resuming tasks:
 - Back button
 - Followed links change color
 - When filling in forms, blank boxes show where to pick up the job

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Interruptions, continued

- How fast must a system respond before the user's attention is diverted? (Robert Miller, 1968)
- Response time User reaction
 - < 0.1 second Seems instantaneous
 - < 1 sec Notices delay, but does not lose thought
 - > 10 sec Switches to another task

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall



2.6 Mental Models

- How do people use knowledge to understand or make predictions about new situations?
- People build mental models
- For example, a car: put gas in, turn key, and it runs. (Not exactly a car mechanic's model!)
- Can't ignore user's mental model
- And how do we know **what** the users' mental models are?
Through user testing.

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

2.7 Metaphors

- Way to relate a difficult or more abstract concept to a familiar one
 - Open file 
 - Save file 

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

Metaphors have problems



- Disadvantage:
 - metaphor may not be widely known or correctly understood
- The mailbox icon meant nothing outside rural United States until explained.
And it's backwards: we put the flag up *to tell the mailman* that we have put mail in the box *to be picked up*.

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall

2.8 Affordance

- Affordance:
"The functions or services that an interface provides"
 - A door **affords** entry to a room
 - A radio button **affords** a 1-of-many choice
 - On a door, a handle **affords** pulling;
a crash bar **affords** pushing

Chapter 2: Capabilities of Human Beings

Copyright © 2004 by Prentice Hall



Perceived affordance

- We want affordance to be **visible** and **obvious** to the user
 - The Up and Down lights on an elevator door should have arrows, or they should be placed vertically so that the top one means Up
 - On a car, turning the steering wheel to the left makes the car go left



Example of perceived affordance



Top switch controls top lights

By convention, with a light switch “up” is “on”



2.9 Design Guidelines for the Web

- Lessen burden on user’s memory:
 - Use recognition instead of recall
 - Help users chunk information
 - Require as little short-term memory as possible
- Consider user’s mental models
- Provide visual clues and memory aids
- Provide feedback: let users know their input was received



Summary

In this chapter you learned that

- **Sight** is the most important sense—on the Web and in general
- We construct **mental models**; we don’t store bitmaps
- **Context** and **expectations** influence what we see
- Five principles of **Gestalt** psychology: proximity, similarity, symmetry, continuity, closure
- **Metaphors** are tricky
- **Chunking** helps memory
- Perceived **affordance** depends on users’ backgrounds, mental models, and expectations