

# Capabilities of Human Beings

Sameer Kharel

(Chapter 2: McCracken and Wolfe –  
Capabilities of Human Beings)

# Overview

In this lecture you will learn about:

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

# Definitions

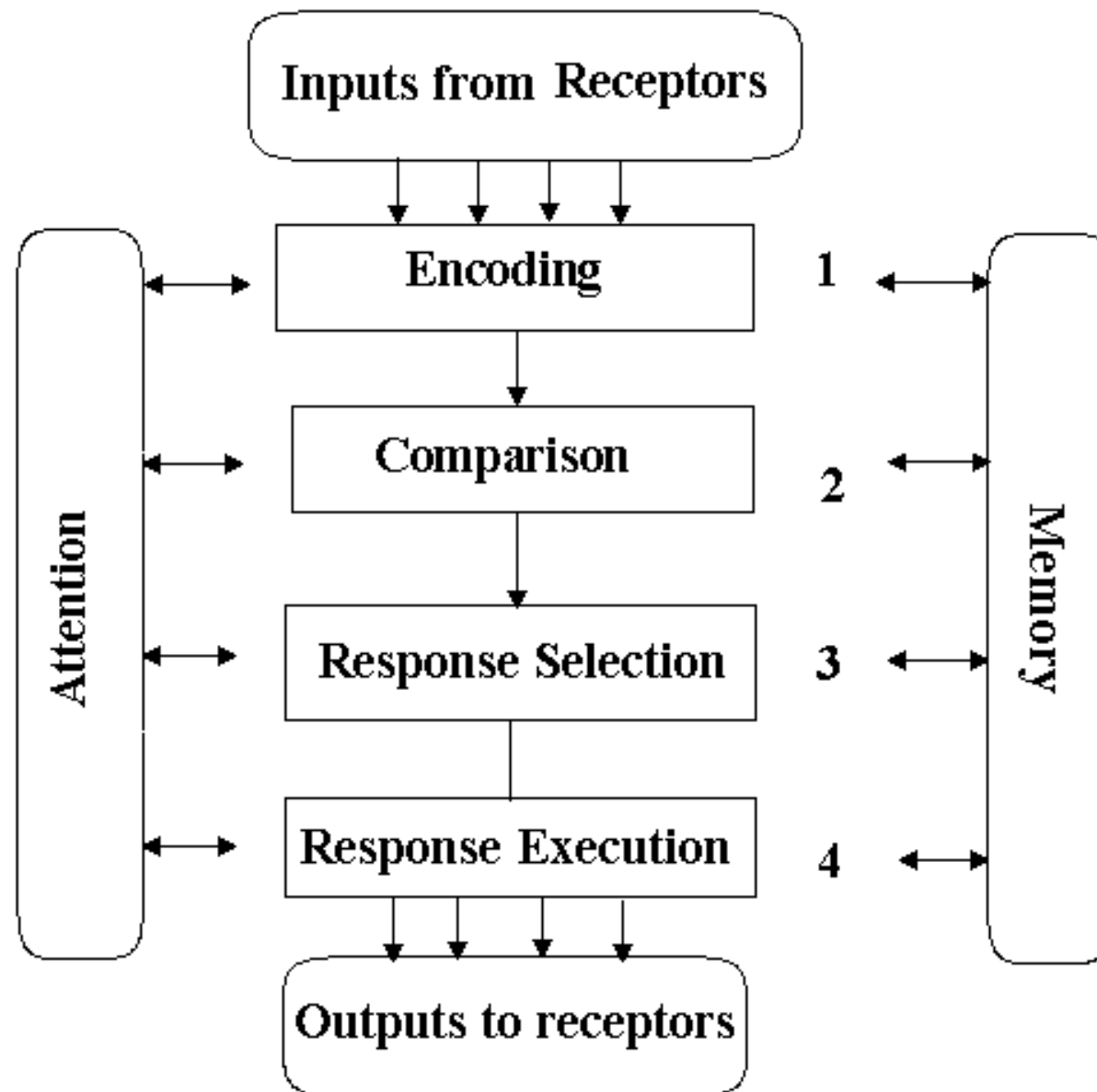
- *Cognitive psychology*: the study of how people perceive, learn, and remember
- *Cognition*: the act or process of knowing
- The issue: confronted with a new experience (or website) how does a user draw on past experience to make sense of it?
- Example: underlined blue text is understood to be a link

# 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

# 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



# Four stage model of information processing

- Encoding - information from environment into some internal representation
- Comparison - internal representation with previous memorised representations
- Selection - decision on appropriate response to encoded stimulus
- Execution - organisation of response into action

# Sensory Memory and Perception

- Separate memory buffers associated with encoding stage
  - iconic memory stores visual images (persists approx 0.2 seconds)
  - echoic memory stores auditory images (persists approx 2.0 seconds)
- Conscious data transfer rate is slow
  - (reading rate in range of 300 words/minute)
- Subconscious transfer much faster



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

- How many links are there on top menu of amazon.com?
- Who cares?
- Moral: People filter out irrelevant factors and save only the important ones
- What are the current news item on the KU Website
- Moral: just because the information is there, doesn't mean people attend to it

# 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

Example of context: What do you see?



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

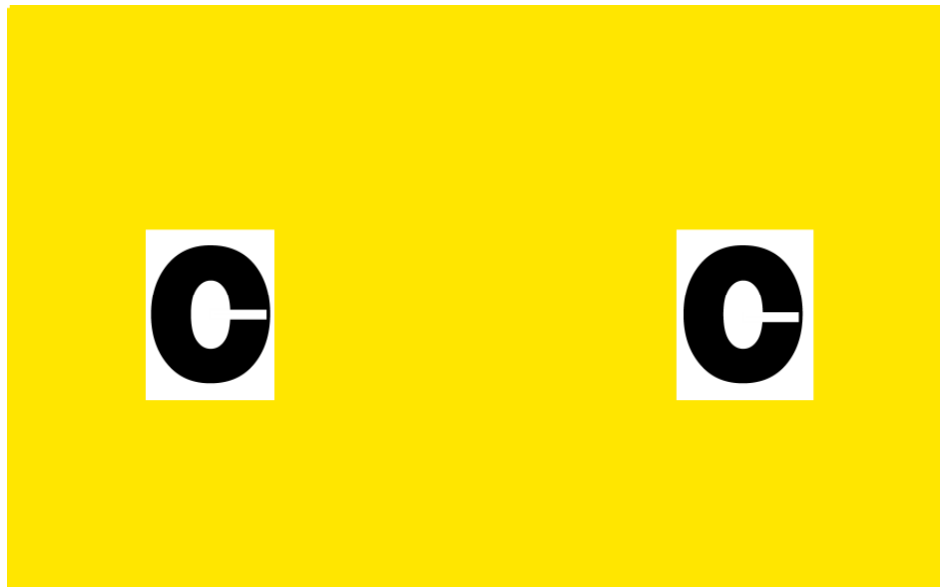
- It's blurry and too contrasty, of course, but more:
- You had no idea what to expect, because there was no context
- Now that you do have a context, you will have little difficulty recognizing it the next time

Example of context: What do you see?



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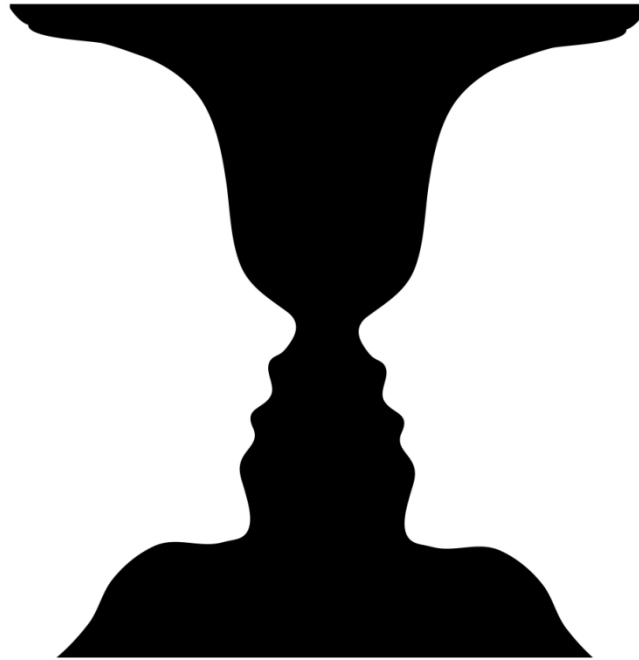
Another example of context: are these  
letters the same?



Well, yes, but now in context:

**top ace**

# Figure and ground: What do you see?



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# 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

# Four Gestalt Psychology Principle

1. Proximity
2. Similarity
3. Common Fate
4. Closure

# Principle 1: Proximity

- Our eyes/brain logically group together visual elements that are “proximate” (close) to one another.
- Given the following image, do you see
  - Six squares?
  - Three groups of two squares?



- More will answer “Three groups of two squares”

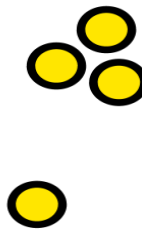
# Proximity Example

- Items close together appear to have a relationship
- Distance implies no relationship

Time:

Time:

# Proximity



# Proximity to Create Structure

Name

Addr1

Addr2

City

State

Phone

Fax

Name	<input type="text"/>
Addr1	<input type="text"/>
Addr2	<input type="text"/>
City	<input type="text"/>
State	<input type="text"/>
Phone	<input type="text"/>
Fax	<input type="text"/>

Name

Addr1

Addr2

City

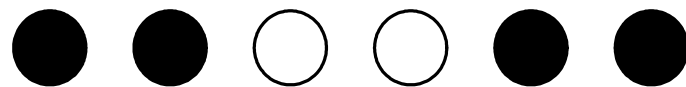
State

Phone

Fax

# Principle 2: Similarity

- Our eyes/brain logically group together visual elements that are similar to one another.
- Given the following image, do you see
  - Six circles
  - Three groups of two circles



- More will answer “Three groups of two circles”

# Similarity Example

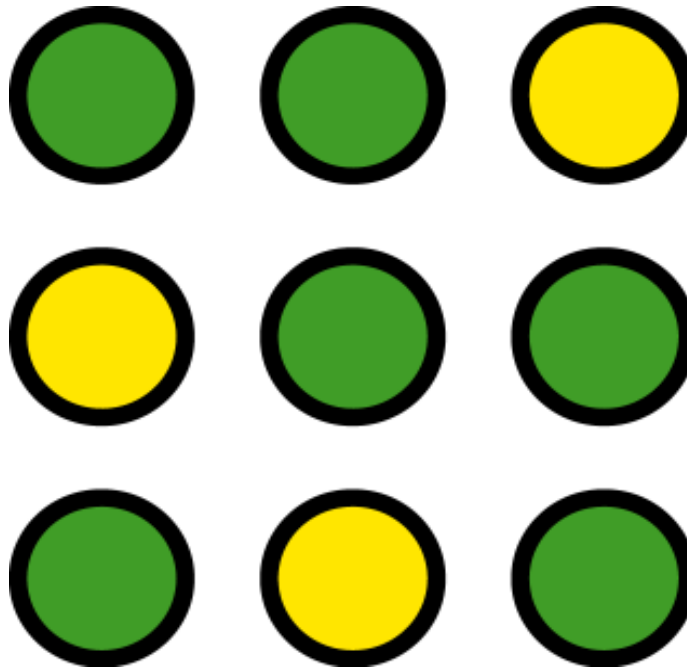
- Given the following image, do you see
  - Six letter 'A's?
  - Three groups of two 'A's?

AA<sub>A</sub>AA

- More will answer “Three groups of two 'A's”



# Similarity



# Principle 3: Common Fate

- Our eyes/brain associate elements that are similar to one another (not same as similarity for grouping).
- What associations do you see here?



Lines are not vertically aligned  
=> do not have common fate  
=> do not seem grouped together

Lines are vertically aligned  
=> do have common fate  
=> do seem grouped together

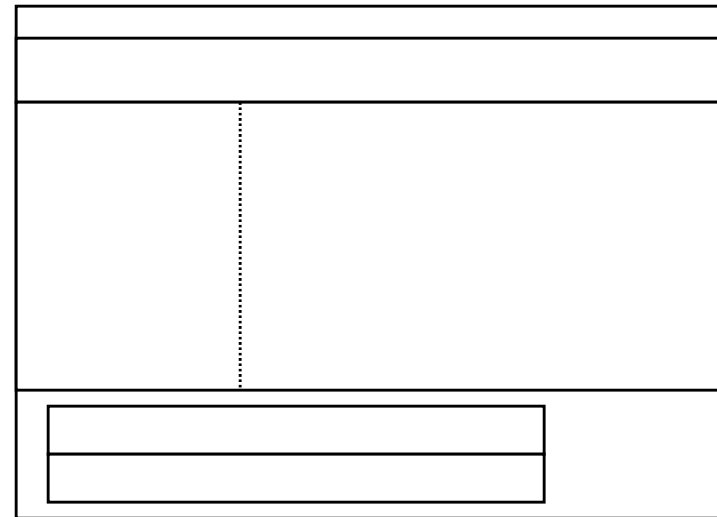
# Grids Provide Structure Using Common Fate

- Grids are (hidden) horizontal and vertical lines
  - They help place graphic elements
- Alignment to same grid line creates logical grouping
  - Common fate
- Grids avoid disconcerting irregularities
  - That attract the eye

# Grids Provide Structure Using Common Fate

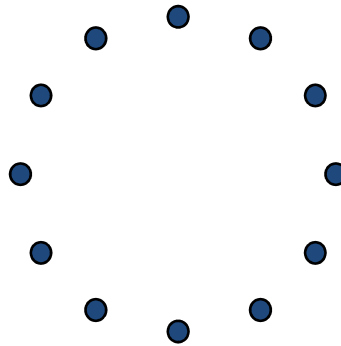
- Grids are (hidden) horizontal and vertical lines
  - They help place graphic elements
- Alignment to same grid line creates logical grouping
  - Common fate
- Grids avoid disconcerting irregularities
  - That attract the eye

# Grid Example



# Principle 4: Closure

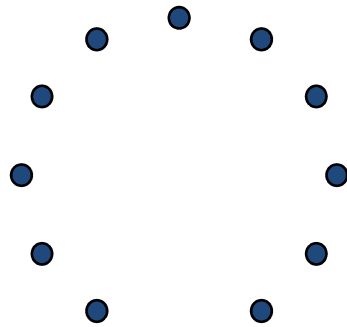
- Our eyes/brain logically group together visual elements that approximate a closed shape, to form that closed shape
- Given the following image, do you see
  - Twelve dots?
  - A circle?



- More will answer “A circle”

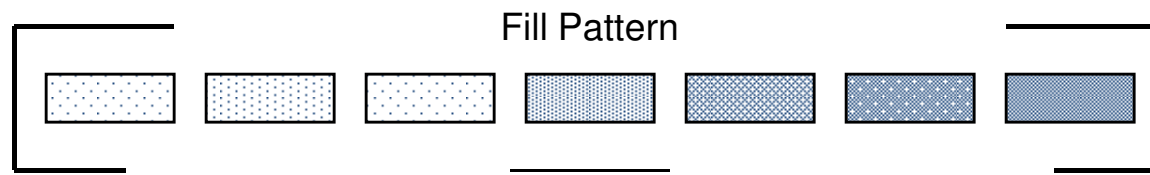
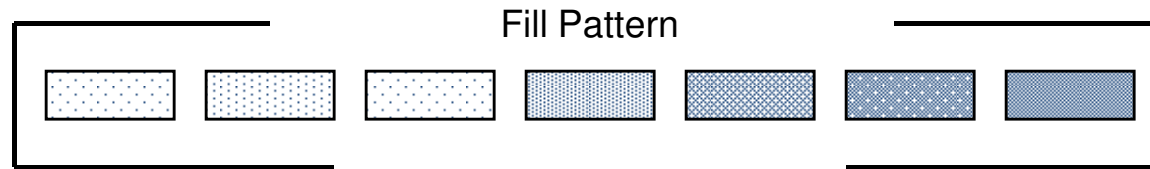
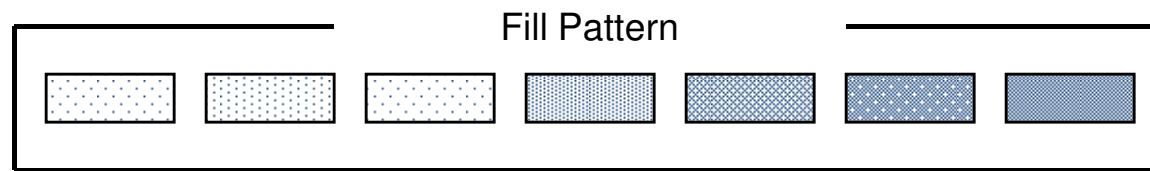
# Closure Example

- Given the following image, do you see
  - Eleven dots?
  - A circle?



- More will answer “A circle” - despite the missing dot

# Closure Example – Each Palette Has Progressively Less Closure - and Works





# Contd...



## LOOK IN IDE

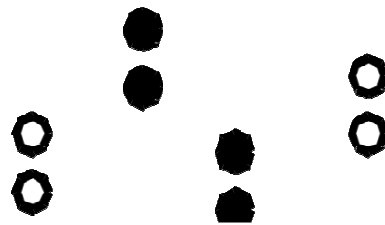
This example likely requires too much effort to allow closure to occur and the message may be lost.

## LOOK INSIDE

This example makes it easy for closure to occur. Therefore the message is clear.

# Combining Gestalt Principles

- Several Principles can be combined
  - Proximity reinforces similarity



- Proximity reinforces closure



- Proximity opposes closure



# Use Visual Structure to Reinforce Logical Structure

- Proximity reinforces alphabetization

ATE  
BAT  
BIT  
CAT  
DOG  
EAT  
FAR  
FAT

GET  
GOT  
HAT  
HIT  
HOT  
LAP  
MAP  
PAT

ATE BAT BIT CAT DOG EAT  
FAR FAT GET GOT HAT HIT  
HOT LAP MAP PAT

# Combining Principles – Web Example

Grouping defined by background (common fate) and by box (closure)

Grouping defined by background (common fate)

Grid (common fate)

The screenshot shows the Delta website interface. The top navigation bar includes links for HOME, TRAVEL, SKYMILES®, PROGRAMS & SERVICES, INSIDE DELTA, and CUSTOMER CARE. The main content area is divided into several sections:

- SkyMiles log in:** A section on the left with input fields for SkyMiles number and PIN, a 'Start in:' dropdown menu set to 'Home', and a 'Remember my SkyMiles number:' checkbox with 'Yes' and 'No' options. A 'GO' button is present.
- Round-Trip Reservations:** A central section with a yellow background. It includes a 'leaving from' field, a 'Select departure date and time' dropdown menu (set to Jan 11, 10 AM), a 'Going to' field, a 'Select return date and time' dropdown menu (set to Jan 11, 10 AM), and a 'Passengers and preferred cabin' section with a dropdown menu set to 'Coach (Restricted)'. A 'GO' button is at the bottom right.
- Customer Advisory:** A section on the right with a red header. It contains text about flight delays and cancellations, dated Thursday, January 11, 2001.
- Arrival / Departure Info:** A section at the bottom with a yellow background. It includes a 'Flight number' input field, radio buttons for 'Yesterday', 'Today' (selected), and 'Tomorrow', and a 'GO' button.

Annotations highlight grouping principles:

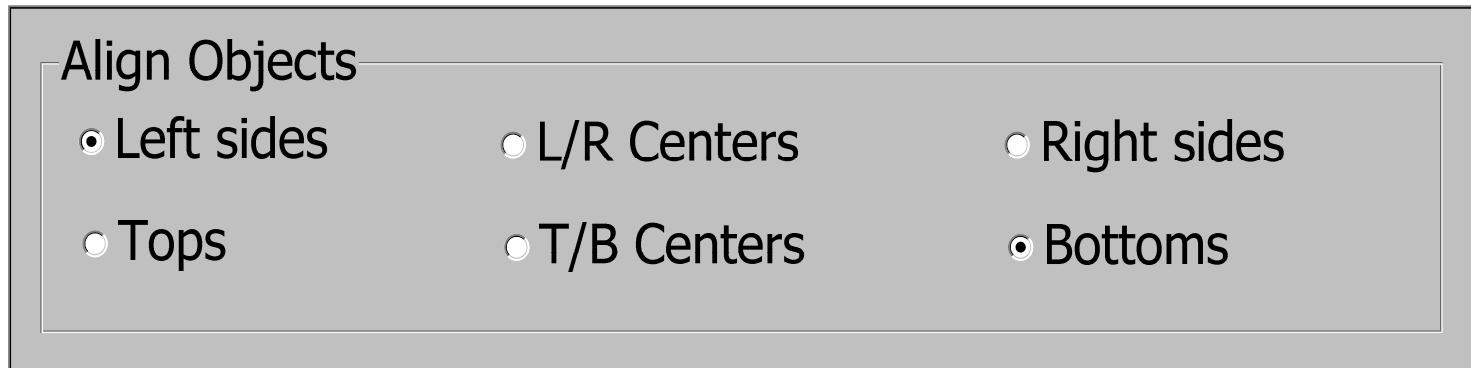
- A blue box points to the SkyMiles log in section, stating: "Grouping defined by background (common fate) and by box (closure)".
- A blue box points to the Round-Trip Reservations section, stating: "Grouping defined by background (common fate)".
- A blue box points to the Arrival / Departure Info section, stating: "Grid (common fate)".

www.delta.com

Document: Done Sameer Kharel

# Grouping: Poor Dialogue Box Design

- Logical structure hard to understand – proximity problem



# Which is the Logical Structure?

Align Objects

<input type="radio"/> Left sides	<input type="radio"/> L/R Centers	<input type="radio"/> Right sides
<input type="radio"/> Tops	<input type="radio"/> T/B Centers	<input type="radio"/> Bottoms

Align Objects

<input type="radio"/> Left sides	<input type="radio"/> L/R Centers	<input type="radio"/> Right sides
<input type="radio"/> Tops	<input type="radio"/> T/B Centers	<input type="radio"/> Bottoms

# Combine Similarity + Common Fate => Stronger Typographical Hierarchy

This is a level 1 heading

This is a level 2 heading

This is another level 2 heading

This is a level 3 heading

Yet another level 3 heading

Back up to level 2

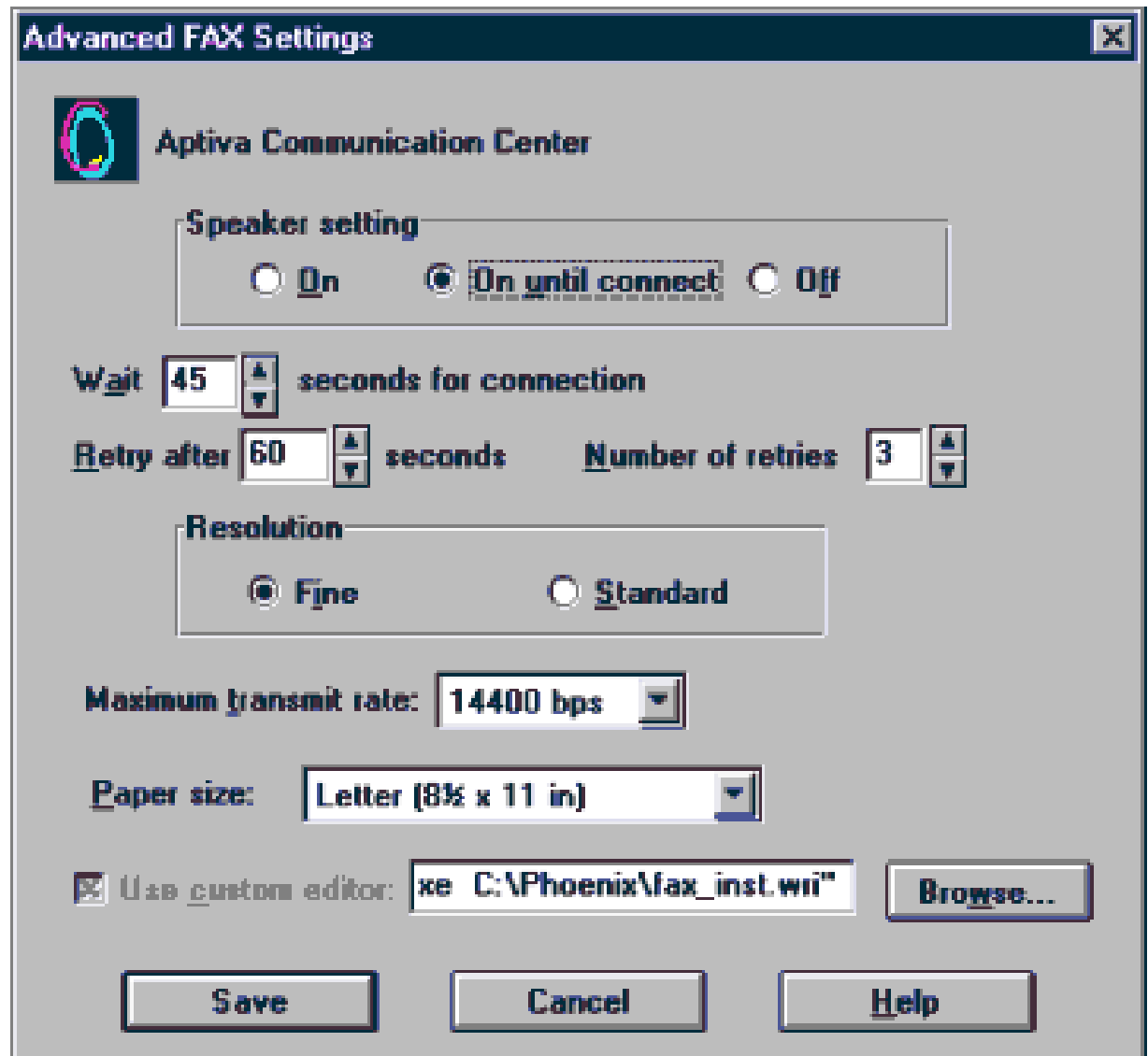
Down to level 3

Still at level 3

Back to level 1

# Bad

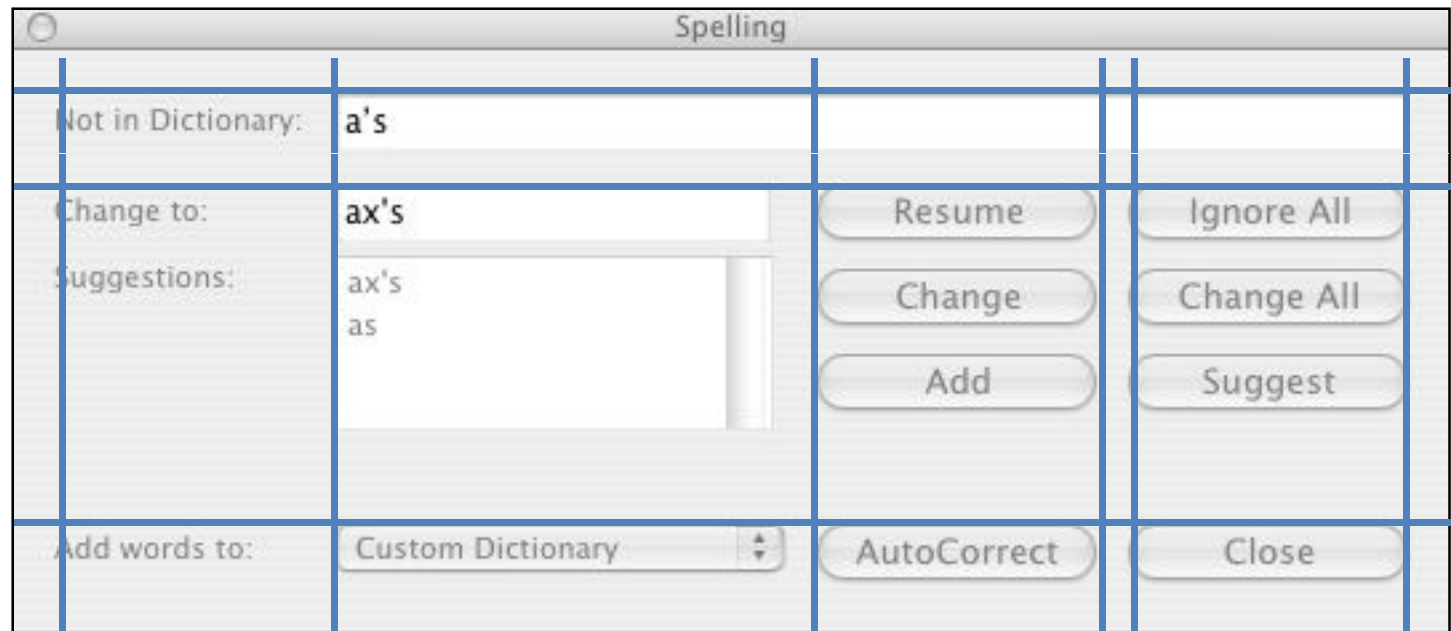
- No gridding
- Inconsistent use of visual cues for grouping
- Inconsistent space between label and data





# A Well-Designed Dialogue Box

Strong grid structure  
(common fate)

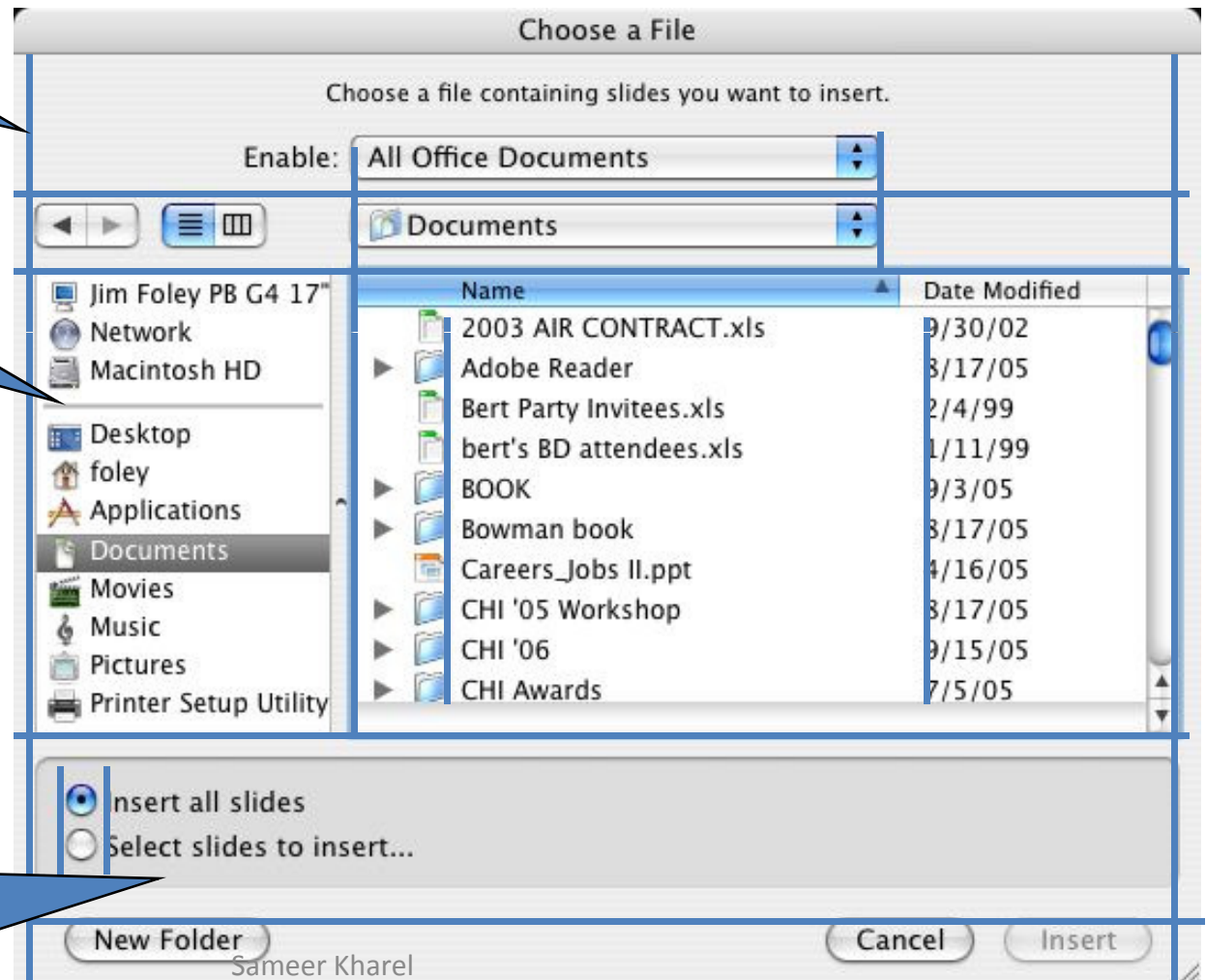


# Another Well-Designed Dialogue Box

Strong grid structure  
(common fate)

Horizontal line uses closure  
to create two groups and  
counter proximity

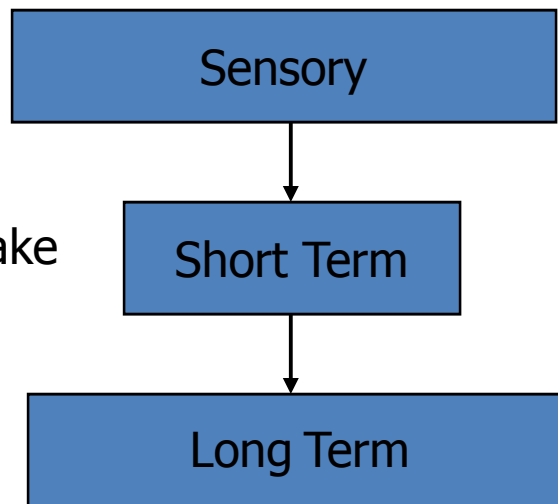
Box surrounding related  
Items (closure)  
Different background color  
(common fate)



# Memory

- Hierarchical Model

Practice and effort needed to make  
this transfer ➡



# “The Magic Number 7, Plus or Minus 2”

- ‘chunk’ – meaningful item of information
- We can hold 7 + or – 2 ‘chunks’ of information in short term memory
- What constitutes a chunk varies by individual (and their level of expertise) and context
- Think of looking up a phone number, closing the phone and then dialling
  - 009468484950 vs 009 46 8 484950
  - 132781243 vs 1 3 27 81 243

# Recognition vs. recall

- Why is a multiple choice test 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

# Design Implications

- support user by reducing demands on working memory
- do not require user to remember temporary operating states and labels
- help the user remember how far the task they have progressed
- help the user remember what the system expects them to do next
- leads to the important principle of visibility of current state and feedback about current action

# Data entered to define a query...

The screenshot shows the British Airways website interface. At the top, there's a navigation bar with links like Home, Contact Us, Site Index, and Privacy and Legal. A dropdown menu for 'Country of Residence' is set to 'United Kingdom'. Below this, a 'Welcome to ba.com' banner is visible. On the left, a sidebar contains links for Executive Club, My BA, Travel booking, Offers and destinations, Traveller's information, and Inside BA. The main content area features several sections: 'Latest flight news', 'Hotels Cars Holidays', 'Manage my booking', 'Your questions', and 'Executive Club'. The central 'Book return flights' section contains the following form fields:

- Book one-way and multi-city** (link)
- Tips for finding low fares** (link)
- Leaving From (city or airport)**: London (All)
- Going To (city or airport)**: stockholm
- Adults (12+ yrs)**: 1
- Children (2-11 yrs)**: 0
- Infants (<2 yrs)**: 0
- Departing On**: 28 Nov +/- 7 days
- Returning On**: 5 Dec +/- 7 days
- Flight class**: Economy (lowest price)
- Get flights** (button)

On the right side, there's a 'click here for details' button with a globe icon, a 'For the latest special offers' section, and a 'Site highlights' list including: Latest flight news, New US travel rules, Celebrate Concorde, Press and media, Arrivals and departures, Online Check-in, Timetables, Traveller's advice, Sign up for offers, Hotels and sightseeing, Car rental, and a partially visible 'Ticket and Self' link.

# ...reproduced on next page

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites History Print Mail News RSS Feeds

Address [http://www.britishairways.com/travel/fx/public/en\\_gb?eId=111011&timestamp=1114122311](http://www.britishairways.com/travel/fx/public/en_gb?eId=111011&timestamp=1114122311) Go Links »

**BRITISH AIRWAYS** Home | Contact Us | Site Index | Privacy and Legal Country of Residence:

**ba.com**

1 Dates 2 Flights 3 Price 4 Passengers 5 Payment 6 Confirmation

### Choose Your Departure Date

Select your date below and click the 'Continue' button

- Prices show the lowest **adult fare** for your outbound journey on a one-way basis and **must be sold as a return fare**. Fares **exclude taxes, fees and charges of approximately £30.10**.
- The total, inclusive price of your journey will be shown once you have selected your outbound and return flights.

Price guide: **Lowest**    **Higher**

November						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
				21 £75	22 £75	23 £90
24 £60	25 £60	26 £44	27 £44	28 £60	29 £60	30 £44

December						
Mon	Tue	Wed	Thu	Fri	Sat	Sun

**Passengers :**  
1 Adult, 0 Children, 0 Infants

**Cabin :**  
Economy (Traveller)

**Departing :**  
**From :** Heathrow (London)  
**To :** Arlanda (Stockholm)  
**Date Range :** Fri 21 Nov 2003 to Fri 5 Dec 2003

**Returning :**  
**From :** Arlanda (Stockholm)  
**To :** Heathrow (London)  
**Date Range :** Fri 28 Nov 2003 to Fri 12 Dec 2003

Internet



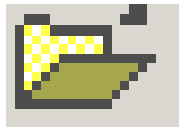
# Mental Models

- How do people use knowledge to understand or make predictions about new situations?
- People build mental models
- Think of how many windows there are in the house or flat you currently live in
- How do you arrive at the answer?
- Is the answer a fact about your house you have previously learnt?

# Metaphors

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

–Open file



–Save file



# In the shop...

The screenshot shows the Amazon.co.uk website interface. At the top is a Netscape browser window with a toolbar containing icons for Back, Forward, Reload, Home, Search, Netscape, Print, Security, Shop, and Stop. The address bar shows the URL: .amazon.co.uk/exec/obidos/subst/instant-recs/instant-recs-music-main.html/ref=pd\_qp\_h\_3\_1/026-4685024-6751643. Below the browser window is the Amazon.co.uk homepage. The header includes the Amazon logo, navigation links (VIEW BASKET, WISH LIST, YOUR ACCOUNT, HELP), and category tabs (WELCOME, BOOKS, MUSIC, DVD, VIDEO, ELECTRONICS, SOFTWARE, PC & VIDEO GAMES, TOYS & KIDS!, GIFTS). A secondary navigation bar contains links like INTERNATIONAL, HOW TO ORDER, WINE, BBC STORE, and PLAYSTATION 2. A search bar with 'All Products' and a 'GO!' button is present, along with a 'BROWSE' button and a 'Books' dropdown menu. The main content area is titled 'YOUR RECOMMENDATIONS' and features a sidebar with links to Recommendations, Home, Books, Music, DVD, Video, Electronics, Software, and PC & Video Games. The main content area displays a recommendation for 'A Century Ends' by David Gray, including a small album cover, the title, artist name, and a description: 'Usually dispatched within 24 hours Audio CD - Hut / 2 July, 2001'. It also shows the 'Avg Customer Review' as five stars and the 'Our Price' as £7.99, with an 'Add to Basket' button. Below this is an 'Amazon.co.uk Review' section with a paragraph of text. The bottom of the page shows a status bar with 'Document: Done' and the name 'Sameer Kharel'.

Back Forward Reload Home Search Netscape Print Security Shop Stop

Bookmarks Location: .amazon.co.uk/exec/obidos/subst/instant-recs/instant-recs-music-main.html/ref=pd\_qp\_h\_3\_1/026-4685024-6751643 What's Related

Instant Message WebMail Calendar Radio People Yellow Pages Download Customize...

amazon.co.uk™

VIEW BASKET | WISH LIST | YOUR ACCOUNT | HELP

WELCOME BOOKS MUSIC DVD VIDEO ELECTRONICS SOFTWARE PC & VIDEO GAMES TOYS & KIDS! GIFTS

INTERNATIONAL HOW TO ORDER WINE BBC STORE PLAYSTATION 2

QUICKSEARCH All Products GO! BROWSE Books GO!

YOUR RECOMMENDATIONS

Recommendations Home Books Music DVD Video Electronics Software PC & Video Games

amazon.co.uk MUSIC RECOMMENDATIONS

Hello, Howell O. Istance

We think you'll like these items in:

All Categories GO!

1. **A Century Ends**  
~David Gray  
Usually dispatched within 24 hours  
Audio CD - Hut / 2 July, 2001  
[More information](#)

Avg Customer Review: ★★★★★

Our Price: £7.99

Add to Basket

Amazon.co.uk Review

Hardly anybody--with the notable exception of Irish songstress Mary Black, who subsequently turned out a rather splendid cover version of "Shine" some years later--bought A Century Ends,

Rate these items

Document: Done Sameer Kharel

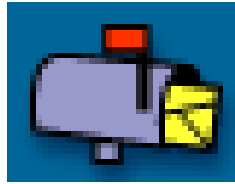
# Look in the basket....

The screenshot shows the Amazon.co.uk website interface. At the top is a Netscape browser window with a toolbar and address bar. The Amazon header includes the logo, navigation links (VIEW BASKET, WISH LIST, YOUR ACCOUNT), and category tabs (WELCOME, BOOKS, MUSIC, DVD, VIDEO, ELECTRONICS, SOFTWARE, PC & VIDEO GAMES, TOYS & KIDS!, GIFTS). Below these are more category-specific links (INTERNATIONAL, HOW TO ORDER, WINE, BBC STORE, PLAYSTATION 2). A search bar with 'All Products' and a 'GO!' button is present, along with a 'BROWSE' dropdown set to 'Books'.

The main content area is titled 'amazon.co.uk SHOPPING BASKET'. It includes a welcome message to 'Howell O. Instance!' and a 'Continue shopping' button. A 'Sign in' link is available to enable 1-Click ordering. The 'Items In Your Shopping Basket' section lists one item: 'David Gray - Live [2000] - VHS Tape'. The item details include a quantity of 1, a list price of £14.99, a current price of £12.99, and a saving of £2.00. A 'Subtotal: £12.99' is displayed. An 'Update' button is provided for changing quantities. At the bottom, a message states 'Items Saved For Later (Items remain for 90 days)'.

Items In Your Shopping Basket	Qty.	
<b>David Gray - Live [2000] - VHS Tape</b> ~ David Gray (Actor) Usually dispatched within 24 hours	1	List Price: £14.99 <b>Our Price: £12.99</b> You Save: £2.00
If you changed any quantities, please press this button to <b>Update</b>		<b>Subtotal: £12.99</b>
Items Saved For Later (Items remain for 90 days)		

# 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*.

# 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

**THANK YOU!!!**