Information Design

Goal: *identify methods for representing and arranging the objects and actions possible in a system in a way that facilitates perception and understanding*

Information Design

- Define and arrange the visual (and other modality) elements of a user interface
  - Screen layout, icon design, vocabulary selection
  - But also the “big picture” or overall info model
  - Models of perception, psychology guide this
- Engineering an information design
  - Make sure what people see (hear, etc.) makes sense, and helps them to pursue meaningful goals
  - Depends on *what they are doing*, hence the important role of user interaction scenarios
Conceptual Models

- Internal model of how a device will work
- Includes both design model and user’s model
- Informs us of why a design will (or will not) work

Design Model

- The conceptual model of the system to be built, held by the designer based on expected:
  - User goals & intentions
  - User background & experience
  - User limitations (cognitive or system resources)
User’s Model

- Mental model held by the user about the system resulting from:
  - Interpretation of the System Image of the physical implementation
  - Actual goals, experience, limitations

Stages of Action in HCI

- Last month’s budget...?
- System goal
- Action plan
- Execution
- GULF OF EXECUTION
- GULF OF EVALUATION
- Perception
- Making sense
- Interpretation
- focus of information design
- focus of interaction design
Making Sense of an Information Display

**Making Sense**
Income worksheet, Total tax income is being calculated, the wrong multiplier is being used

**Perception**
color, shading, lines characters, squares, spatial organization

**Interpretation**
Excel worksheet, a cell is selected, formula is displayed at top

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**Perception**

- Organize and **encode** sensory data in the mind
  - Lines, shapes, colors are “extracted”
  - Very fast, generally with no conscious thought
  - May be influenced by expectations, “top-down”
- Low-level units then grouped and organized
  - Perceived as rows, columns, grids, figures
  - Seeing the relationships among different elements
- Design goal: make this perceptual process rapid and accurate
Human Vision

- Highest bandwidth sense (100 MB/sec)
- Parallel processing
- Pre-attentive
- Pattern recognition
- Extends memory and cognitive capacity
- People think visually

- Which state has highest income?
- Relationship between income and education?
- Outliers?
Per Capita Income

College Degree %

Napoleon’s March

Chart depicting the successive loss of French Army soldiers during Napoleon’s Russian Campaign (1812–1813).
Gestalt Principles of Perception

Proximity

Similarity

Closure

Area

Symmetry

Continuity

Gestalt in User Interface Design

Try the “squint test”...
What principles are in action?
Tradeoffs: Designing for Perception

- Task-relevant information versus complexity
  - Decompose tasks, link to less critical information

- Offer visual distinctions, but not too many levels
  - Too many variations (e.g., different colors) will make the cues hard to discriminate, slowing perception

Elegant designs exploit position, thematic repetition, low-key color schemes, and white space, instead of lines, boxes, and labels to organize information

Human Limitations for Short-Term Memory

- Miller’s 7 +/- 2 magic number
  - People can recognize 7 +/- 2 chunks of information at a time and hold these chunks in memory for 15-30 seconds

- Chunking
  - Ability to cluster information together
  - Size of chunk depends on knowledge, experience, and familiarity
Chunking Example 1

HEC ATR ANU PTH ETR EET

Chunking Example 2

THE CAT RAN UP THE TREE
Other Chunking Examples

- Image sequences
- Facial recognition
- Word/letter familiarity
- Hierarchies of information
- Others?

Principles of Design

- Provide a good conceptual model
  - How does it work?
  - What does it say to the user? (don’t lie!)
- Leverage gestalt principles of perception
  - Proximity, similarity, closure, area, symmetry, continuity
- Make things visible (leverage affordances)
  - What can user see/feel/grab/push?
  - What does it look like it will do?
How to Lie With Visual Displays

- Only show data ranges that accentuate your argument (chop off bottoms)
- Choose time spans appropriate for you
- Compare logarithmic data on a non-logarithmic graph
- Use multiple dimensions to show one-dimensional data
- Change scale in the middle of your graph

Bottoms Up, Life is Great (?)
Another View

Unemployment Rate

Percent

Good News or Bad News?

Unemployment rate
Seasonally adjusted

Logarithmic Scale

The truth, the whole truth and nothing but the truth

<table>
<thead>
<tr>
<th>Wages</th>
<th>$ per hour</th>
<th>$ per hour, log scale</th>
<th>First years 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boss</td>
<td>0</td>
<td>80</td>
<td>600</td>
</tr>
<tr>
<td>Worker</td>
<td>40</td>
<td>120</td>
<td>500</td>
</tr>
</tbody>
</table>

Dimensional Pictures

E CRESCIVE COW

1860  1936
Changing Scale

How NOT to Lie With Visual Displays

- Show meaningful data ranges
- Choose representative time spans
- Use appropriate scales in displaying information
- Use dimensions in an appropriate manner
- Maintain a common scale throughout your graph

Figure 13: Changing scale in mid-axis to make exponential growth linear (© The Washington Post)