Screen design and layout
Generic design guidelines

Readings:
Dix et al:
Chapter 5. Section on Screen Design and Layout
Chapter 7. Section 7.5 on Golden Rules and Heuristics (Schneiderman + Norman)
Basic principles at the screen level

- Ask: What is the user doing
- Think: What information is required
- Design: Form follows function
Tools for layout

- grouping of items
- order of items
- decoration - fonts, boxes etc.
- alignment of items
- white space between items

Key issue: combining structure and style
grouping and structure

logically together ⇒ physically together

**Billing details:**
- Name
- Address: …
- Credit card no

**Delivery details:**
- Name
- Address: …
- Delivery time

**Order details:**

<table>
<thead>
<tr>
<th>item</th>
<th>quantity</th>
<th>cost/item</th>
<th>cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>size 10 screws (boxes)</td>
<td>7</td>
<td>3.71</td>
<td>25.97</td>
</tr>
<tr>
<td>......</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
### Grouping for data comparison

<table>
<thead>
<tr>
<th></th>
<th>Cost Actual</th>
<th>Cost Predicted</th>
<th>Output Actual</th>
<th>Output Predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>947</td>
<td>901</td>
<td></td>
<td>83</td>
<td>82</td>
</tr>
<tr>
<td>721</td>
<td>777</td>
<td></td>
<td>57</td>
<td>54</td>
</tr>
<tr>
<td>475</td>
<td>471</td>
<td></td>
<td>91</td>
<td>95</td>
</tr>
</tbody>
</table>
Order of groups and items

- Group data by the natural sequence of use (from task analysis, HTA)
- **Flow of control** – how users progress through a screen when doing their work
- Flow of control means that the focus of activity moves across a screen or page while the user performs a certain task.
- Flow of control is important for
  - (1) efficiency in performing a task
  - (2) transparency and understandability of a screen or page.
A “natural” flow of control

- cultural constraints
- for Western cultures the natural flow is from left to right and from top to bottom

Which flow of control is correct?
Layout Hierarchy

- use boxes to group logical items
- use fonts for emphasize groupings, headings
- but not too many!!
Containers and non-containers

- Screen or page elements can either be **containers** or **non-containers**.
- Containers can contain other elements; non-containers cannot.

! Too much nesting can visually overload a page

From Gerd Waloszek, http://www.sapdesignguild.org/community/design/
A simple application pattern

Area on the left: overview list (affords for selecting a certain item)

The selected item is displayed in the upper right area: it may contain other sub-items (nesting)

Details of the selected item (or its sub-items) can be inspected in the lower right area.

From Gerd Waloszek, http://www.sapdesignguild.org/community/design/
A real-world web application

From Gerd Waloszek, http://www.sapdesignguild.org/community/design/
Decoration: changing the look but not the concept
Decoration: changing the look but not the concept

From Gerd Waloszek, http://www.sapdesignguild.org/community/design/
Decoration: changing the look but not the concept
Simplicity

- “Perfection is achieved not when there is nothing more to add, but when there is nothing left to take away” (Antoine de St-Exupery)
- “Simplicity does not mean the absence of any decor...It only means that the decor should be belong intimately to the design proper, and that anything foreign to it should be taken away”
- “Keep it simple, stupid” (KISS)
Techniques for simplicity: reduction

- Remove inessential elements
- Decide what essentially needs to be conveyed by design
- Examine every element (label, control, color, line width) to decide whether it serves an essential purpose
- Remove it if it is not essential

from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Techniques for simplicity: regularity

- Use a regular pattern in your screen layout
  - Use same font, color, line width, dimensions, orientation for items at an equal hierarchical level.
- Limit inessential variation among elements

Why?
- irregularities in your design will be magnified in the user’s eyes and assigned meaning and significance.

from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Techniques for simplicity: double-duty

- Combine elements and make them serve multiple roles in the design
- Example: scroll bar thumb
  - affords for dragging
  - indicates the position of the scroll window relative to the entire document
  - indicates the fraction of the document displayed in the scroll window.

from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
White space

- Essential role in screen layout
- Real estate issue vs insufficient white space
- Use margins to draw eye around design
- Integrate figure and ground
  - Object should be scaled proportionally to its background
- Don’t crowd controls together
  - Crowding creates spatial tension and inhibits scanning

from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Crowded dialog

Source: Mullet & Sano, p. 110

from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
**Goals:**
- Articulate: who users are and their key tasks

**Methods:**
- Task centered system design
- Participatory design
- User-centered design

**Evaluate:**
- Task centered system design
- Participatory design
- User-centered design

**Brainstorm designs:**
- Psychology of everyday things
- User involvement
- Representation & metaphors

**Participatory interaction:**
- Task scenario walk-through

**Graphical screen design:**
- Interface guidelines
- Style guides

**Usability testing:**
- Heuristic evaluation

**Products:**
- User and task descriptions
- Throw-away paper prototypes
- Testable prototypes
- Completed designs

**Fields testing:**
- Alpha/beta systems or complete specification

From Dr. Greenberg Lecture Notes, University of Calgary
Design guidelines

- Readings: Dix 7.5
Heuristics=usability guidelines

- Plenty to choose from
  - Nielsen’s 10 principles
  - Norman’s rules from Design of Everyday Things
  - Schneiderman’s eight golden rules
  - Mac, Windows guidelines

- Help designers choose design alternatives
- Help evaluators find problems in interfaces ("heuristic evaluation")

from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Guidelines from earlier lectures

- User-centred design
  - Know your users
  - Understand their task
- Fitz’s Law
  - Tiny controls are hard to hit
  - Screen edges are precious
- Colour guidelines
  - Don’t depend solely on colour cues (colour blindness)
  - Avoid red on blue text (chromatic aberration)
- Memory: use chunking to simplify information presentation
  - Minimize working memory
  - Recognition rather than recall
- Schneiderman’s principles in direct manipulation

Adapted from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Schneiderman’s eight golden rules

1. Strive for consistency
   - Consistent sequences of actions should be required in similar situations;
   - identical terminology should be used in prompts,
Schneiderman’s eight golden rules

- Kinds of consistency: internal, external, metaphorical

Adapted from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Schneiderman’s eight golden rules

2. **Enable frequent users to use shortcuts.**
   - Shortcuts should be easy to learn (keyboard accelerators, command abbreviations, bookmarks, history)
   - Hall of Shame example: Explorer (Windows 95)
Schneiderman’s eight golden rules

3. Offer informative feedback for every user action

- Keep user informed of system state:
  - Cursor change
  - Selection highlight
  - Status bar
  - Don’t overdo it...

- Response time:
  - $<0.1$ s: seems instantaneous
  - $0.1 - 1$ s: user notices, but no feedback is needed
  - $1-5$ s: display busy cursor
  - $>1-5$ s: display progress bar

Adapted from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Schneiderman’s eight golden rules

4. **Design dialogs to yield closure**

Sequences of actions should be organized into groups with a beginning, middle, and end.

- **Ex:** Select “Open” on file menu. (beginning)
  - Complete dialog box. (middle)
  - Press “Open” button. (end)

The informative feedback at the completion of a group of actions gives the operators the satisfaction of accomplishment, a sense of relief, the signal to drop contingency plans and options from their minds.

- It is also an indication that the way is clear to prepare for the next group of actions.
Schneiderman’s eight golden rules

5. Error prevention and handling

- Selection is less error-prone than typing
- But don’t overdo it...

- Disable illegal commands (gray-out)
- Keep dangerous commands away from common ones

Adapted from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Schneiderman eight golden rules

- Error messages
  - Be precise: restate user’s input
    - Not “cannot open file” but “Cannot open file named paper.doc”
  - Give constructive help
    - Why error occurred and how to fix it
  - Be polite and non-blaming
    - Not fatal error, not illegal
  - Hide technical details until requested

Adapted from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Source: Interface Hall of Shame
Schneiderman’s eight golden rules

6. Permit easy reversal of actions
   - Relieves anxiety
   - Encourages exploration of unfamiliar options
   - Dimensions of reversibility:
     - a single action,
     - a data entry,
     - a complete group of actions.
Schneiderman’s eight golden rules

7. **Support internal locus of control**
   - The user should be in control of the system, which should respond to his actions.
   - Long operations should be cancelable
   - All dialogs should have a cancel button

![Dialog](source: Interface Hall of Shame)
Schneiderman’s eight golden rules

8. **Reduce short-term memory load**
   - Keep displays simple
   - Consolidate multiple-pages display
   - Provide time for learning action sequences
   - Recognition, not recall
     - Use menus, not command languages
     - Use generic commands when possible (Open, Save, Copy, Paste)
     - All needed information should be visible

Adapted from Dr. Miller’s Lecture notes on UI Design and Implementation, MIT 2005.
Schneiderman’s eight golden rules

Source: Interface Hall of Shame
Interface Design and Usability Engineering

Goals:
- Articulate:
  - who users are
  - their key tasks

Methods:
- User and task descriptions
- Brainstorm designs
- Refined designs
- Completed designs

Products:
- Task centered system design
- Participatory design
- User-centered design
- Evaluate tasks
- Psychology of everyday things
- User involvement
- Representation & metaphors
- Participatory interaction
- Task scenario walk-through
- Graphical screen design
- Interface guidelines
- Style guides
- Usability testing
- Heuristic evaluation
- Low fidelity prototyping methods
- High fidelity prototyping methods
- Throw-away paper prototypes
- Testable prototypes
- Alpha/beta systems or complete specification
- Field testing

From Dr. Greenberg Lecture Notes, University of Calgary
Sample questions for graphical design and screen layout

List two techniques for achieving greater simplicity in graphical design:

• *Reduction; regularity; using the same element for multiple purposes*

• Observe carefully the two design alternatives below. Which design scheme is better? Justify your response by using concepts related to graphic design and screen layout.
Sample questions for generic design guidelines

- Define internal, external, and metaphorical consistency. You don’t need to give examples.
- State four out of the eight golden rules from Shneiderman’s heuristics. Their names are enough.
- Long question: analyze a given UI (or a prototype) using generic design guidelines (heuristic rules)