

---

# Screen Design

# Guidelines for controls *(Dix et al.)*

---

- Place controls that are functionally related together.
- If controls are *used* sequentially, *organize* them sequentially.
- Make the most frequently-used controls the most accessible.
- Don't place a destructive control next to a frequently used one.

# Issues in screen design

---

1. **Layout:** do you optimize, or let the user customize? How to organize?

# Layout issues

---

Some ways of optimizing layout:

- Layout by function, sequence, or frequency
- Automatic layouts: consistent location, cascading objects, tiling
- Stick to conventions

Or: You can let (make) the user choose.

- 
- Some examples from Saul Greenberg:



[Saul Greenberg](#) [GroupLab](#) [Dept Computer Science](#) [University of Calgary](#)



**Saul Greenberg, Professor**  
Human-Computer Interaction &  
Computer Supported Cooperative Work  
Dept. of Computer Science  
University of Calgary  
Calgary, Alberta  
CANADA T2N 1N4  
Phone: +1 403 220-6087  
Fax: +1 403 284-4707  
Email: [saul@cpsc.ucalgary.ca](mailto:saul@cpsc.ucalgary.ca)

**Research**

[GroupLab project](#) describes research by my group

[Publications](#) by our group; most available in HTML, PDF, and postscript

[Project snapshots](#) describes select projects done in Grouplab

[Grouplab software repository](#)

[Grouplab people](#)

**Graduate Students**

I have a few openings for MSc and PhD students who are interested in Human Computer Interaction and / or Computer Supported Cooperative Work. [Some research and project ideas honors and graduate students](#)

*Courses offered this year*

[CPSC 481](#): Foundations and Principles of Human Computer Interact





[Saul Greenberg](#) [GroupLab](#) [Dept Computer Science](#) [University of Calgary](#)

**Saul Greenberg, Professor**  
Human-Computer Interaction &  
Computer Supported Cooperative Work

Dept. of Computer Science  
University of Calgary  
Calgary, Alberta  
CANADA T2N 1N4



Phone: +1 403 220-6087  
Fax: +1 403 284-4707  
Email: [saul@cpsc.ucalgary.ca](mailto:saul@cpsc.ucalgary.ca)

**Research**

[GroupLab project](#) describes research by my group  
[Publications](#) by our group; most available in HTML, PDF, and postscript  
[Project snapshots](#) describes select projects done in Grouplab  
[Grouplab software repository](#)  
[Grouplab people](#)

**Graduate Students**

I have a few openings for MSc and PhD students who are interested in Human Computer Interaction and / or Computer Supported Cooperative Work. [Some research and project ideas honors and graduate students](#)

*Courses offered this year*

[CPSC 481](#): Foundations and Principles of Human Computer Interaction  
[CPSC 581](#): Human Computer Interaction II: Interaction Design  
[CPSC 601.13](#): Computer Supported Cooperative Work

**Proximity**

[Saul Greenberg](#) [GroupLab](#) [Dept Computer Science](#) [University of Calgary](#)



**Saul Greenberg, Professor**  
Human-Computer Interaction &  
Computer Supported Cooperative Work

Dept. of Computer Science  
University of Calgary  
Calgary, Alberta  
CANADA T2N 1N4



Phone: +1 403 220-6087  
Fax: +1 403 284-4707  
Email: [saul@cpsc.ucalgary.ca](mailto:saul@cpsc.ucalgary.ca)

**Research** [GroupLab project](#) describes research by my group  
[Publications](#) by our group; most available in HTML, PDF, and postscript  
[Project snapshots](#) describes select projects done in Grouplab  
[Grouplab software repository](#)  
[Grouplab people](#)

**Graduate Students** I have a few openings for MSc and PhD students who are interested in Human Computer Interaction and / or Computer Supported Cooperative Work. [Some research and project ideas honors and graduate students](#)

**Courses offered this year**  
[CPSC 481](#): Foundations and Principles of Human Computer Interaction  
[CPSC 581](#): Human Computer Interaction II: Interaction Design  
[CPSC 601.13](#): Computer Supported Cooperative Work

**Previous Years:**  
[CPSC 681](#): Research Methodologies in Human Computer Interaction  
[CPSC 699](#): Research Methodology for Computer Science (old!)  
[CPSC 601.48](#): Special Topics: Heuristic Evaluation

**Alignment**





[Saul Greenberg](#) [GroupLab](#) [Dept Computer Science](#) [University of Calgary](#)

# Saul Greenberg Professor

Human-Computer Interaction &  
Computer Supported Cooperative Work



Dept. of Computer Science  
University of Calgary  
Calgary, Alberta  
CANADA T2N 1N4  
Phone: +1 403 220-6087  
Fax: +1 403 284-4707  
Email: [saul@cpsc.ucalgary.ca](mailto:saul@cpsc.ucalgary.ca)

## Graduate Students

**Research Ideas.** I have a few openings for MSc and PhD students who are interested in Human Computer Interaction and / or Computer Supported Cooperative Work.

## *Courses offered this year*

- CPSC 481:** Foundations and Principles of Human Computer Interaction
- CPSC 581:** Human Computer Interaction II: Interaction Design
- CPSC 601.13:** Computer Supported Cooperative Work

## *Previous Years*

- CPSC 681:** Research Methodologies in Human Computer Interaction
- CPSC 699:** Research Methodology for Computer Science (old!)
- CPSC 601.48:** Special Topics: Heuristic Evaluation
- CPSC 601.56:** Advanced Topics in HCI: Media Spaces and Casual Interaction
- SENG 609.05:** Graphical User Interfaces: Design and Usability
- SENG 609.06:** Special Topics in Human Computer Interaction
- Ego alert:** My entry on U Calgary's 'Great Teachers" Web Site

## Administration

**Ethics Committee** for research with human subjects; I am the chair





Saul Greenberg [GroupLab](#) [Dept Computer Science](#) [University of Calgary](#)

# Saul Greenberg Professor

Human-Computer Interaction &  
Computer Supported Cooperative Work



Dept. of Computer Science  
University of Calgary  
Calgary, Alberta  
CANADA T2N 1N4

Phone: +1 403 220-6087  
Fax: +1 403 284-4707  
Email: [saul@cpsc.ucalgary.ca](mailto:saul@cpsc.ucalgary.ca)

**Graduate Students** [Research Ideas](#) I have a few openings for MSc and PhD students who are interested in Human Computer Interaction and / or Computer Supported Cooperative Work.

**Courses offered this year**  
[CPSC 481](#) Foundations and Principles of Human Computer Interaction  
[CPSC 581](#) Human Computer Interaction II: Interaction Design  
[CPSC 601.13](#) Computer Supported Cooperative Work

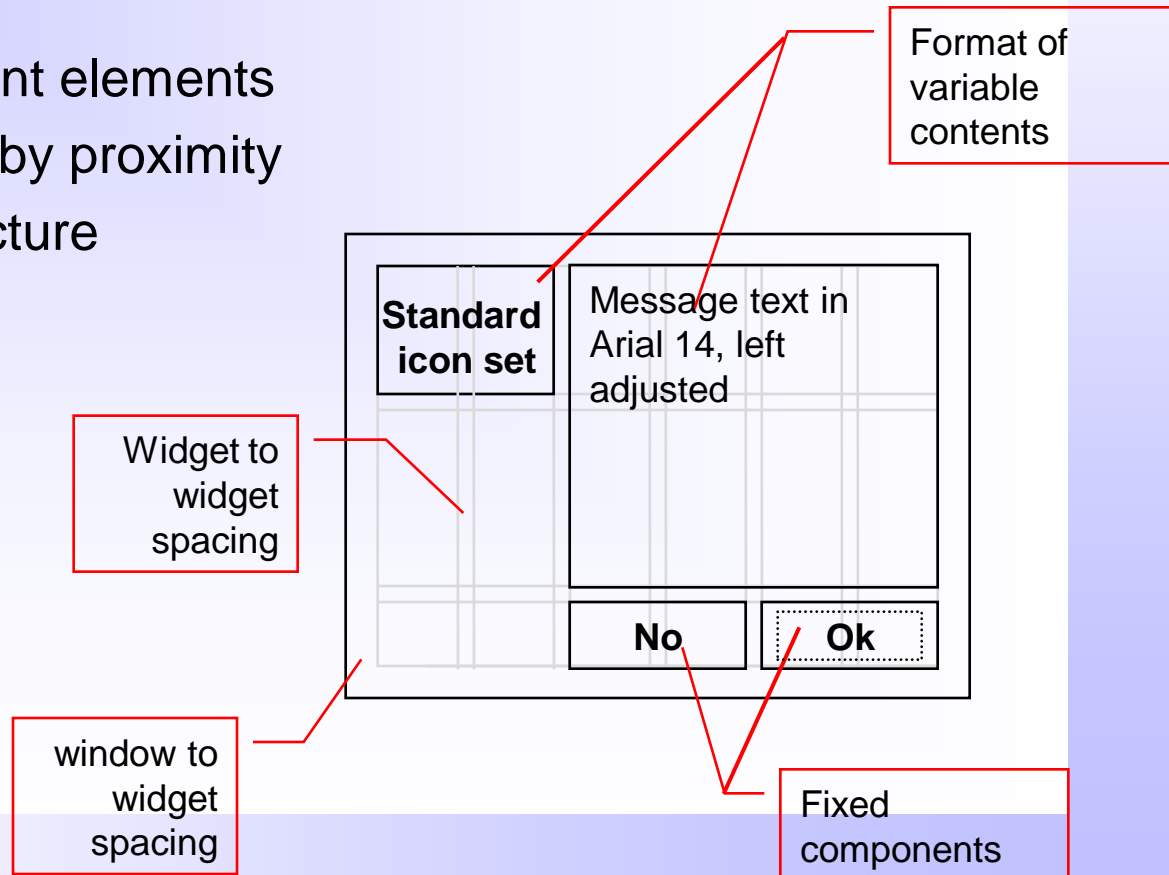
**Previous Years**  
[CPSC 681](#) Research Methodologies in Human Computer Interaction  
[CPSC 699](#) Research Methodology for Computer Science (old!)  
[CPSC 601.48](#) Special Topics: Heuristic Evaluation  
[CPSC 601.56](#) Advanced Topics in HCI: Media Spaces and Casual Interaction  
[SENG 609.05](#) Graphical User Interfaces: Design and Usability  
[SENG 609.06](#) Special Topics in Human Computer Interaction  
[Ego alert](#) My entry on U Calgary's 'Great Teachers' Web Site

**Administration** [Ethics Committee](#) for research with human subject

# Repetition

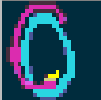
# Grids

- Horizontal and vertical lines to locate window components
  - aligns related components
- Organization
  - contrast for dominant elements
  - element groupings by proximity
  - organizational structure
  - alignment
- Consistency
  - location
  - format
  - element repetition
  - organization



No regard for  
order and  
organization

**Advanced FAX Settings** [X]

 **Aptiva Communication Center**

**Speaker setting**

On     On until connect     Off

**Wait**    **seconds for connection**

**Retry after**    **seconds**    **Number of retries**

**Resolution**

Fine     Standard

**Maximum transmit rate:**

**Paper size:**

**Use custom editor:**

Haphazard layout

**xbugtool 2.0 Beta 2** Server: elmer-bb.Corp

Load ▾ Store Submit ▾ View Print ▾ Reset ▾ Props Gen. Help ▾

Bug Id: \_\_\_\_\_ Cc: \_\_\_\_\_ Mode: Edit Create Update lists

Category ▾ \_\_\_\_\_ Priority: 

1	2	3	4	5
---	---	---	---	---

Subcategory... \_\_\_\_\_ Severity: 

1	2	3	4	5
---	---	---	---	---

Resp Mgr... \_\_\_\_\_ Bug/Rfe: 

bug	rfe
-----	-----

State ▾ \_\_\_\_\_ Responsible Engineer: \_\_\_\_\_

Synopsis is: \_\_\_\_\_

Keywords: \_\_\_\_\_

Description Work around Suggested fix Comments Public summary

State triggers:

- Evaluation
- Commit to fix in rel. \_\_\_\_\_
- Fixed in releases... \_\_\_\_\_
- Integrated in releases... \_\_\_\_\_
- Verified in releases... \_\_\_\_\_
- Closed because ▾
- Incomplete because ▾

Root cause... \_\_\_\_\_

Fix affects docs ▾

Duplicate of: \_\_\_\_\_ Interest list: \_\_\_\_\_

Patch id: \_\_\_\_\_ See also (bugids): \_\_\_\_\_

History:

Submitter : \_\_\_\_\_ Date: \_\_\_\_\_

Generic SVR4 problem?: 

no	yes
----	-----

Dispatch operator : \_\_\_\_\_ Date: \_\_\_\_\_

Evaluator : \_\_\_\_\_ Date: \_\_\_\_\_

Commit operator : \_\_\_\_\_ Date: \_\_\_\_\_

Fix operator : \_\_\_\_\_ Date: \_\_\_\_\_

# Repairing the layout

**Bugtool**

Report ▾ View ▾ Props ▾ Help ▾ Mode: Create Edit

Bug ID: ▾ \_\_\_\_\_ Type: Bug RFE

Category: ▾ XView Priority: 1 2 3 4 5

Subcategory: ▾ library Severity: 1 2 3 4 5

Release: ▾ 1.0

Status: ▾ Submitted

Synopsis: \_\_\_\_\_

Keywords: \_\_\_\_\_

Pub Summary: \_\_\_\_\_

See also: \_\_\_\_\_

Interest List: \_\_\_\_\_

Description	Work Around	Suggested Fix	Comments	Evaluation
+				

Root Cause: ▾ documentation-confusing

Same as: \_\_\_\_\_

Resp Mgr: ▾ none Hook 1: \_\_\_\_\_

Resp Engr: ▾ none Hook 2: \_\_\_\_\_

Flags:  Fix Affects Documentation  
 Generic SVR4 Problem

# Issues in screen design

---

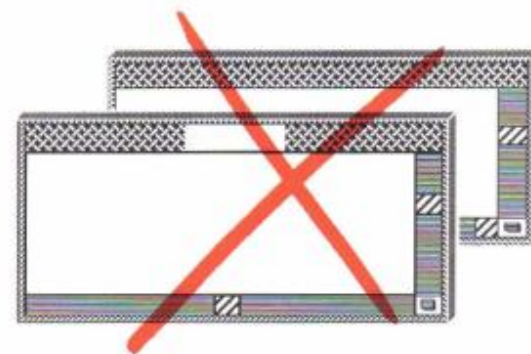
1. **Layout:** do you optimize, or let the user customize? How to organize?
2. **How will you manage screen clutter and increase signal-to-noise?**

*Edward Tufte on Screen design*

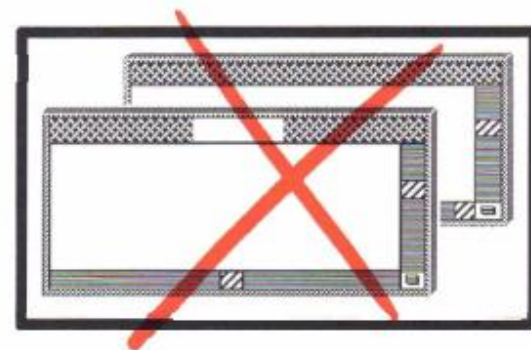
# Edward Tufte on visual clutter

“Various elements collected together on the screen can create all sorts of incidental patterns simply by their combined presence. In these screen sketches, visual clutter results from prison grids of window frames, empty paths, and rectangles and blocks... Note also the effect of dark overscan borders, provoking vivid but content-free shapes around screen images.”

*Tufte, E. (1989). Visual Design of the User Interface. IBM:Armonk NY, p. 8*



For example, various elements collected together on the screen can create all sorts of incidental patterns simply by their combined presence. In these screen sketches, visual clutter results from prison grids of window frames, empty paths, and rectangles and blocks... Note also the effect of dark overscan borders, provoking vivid but content-free shapes around screen images.

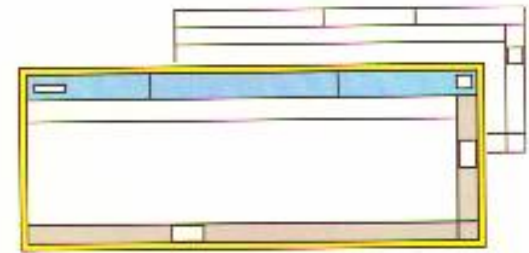




# A better design:

“Here is a before/after redesign that seeks to reduce... noise. Above is a sketch of a conventional screen, with strong grid frames marching around everywhere, doing little to show data. What we seek is a more modest visual means, appropriate to the elementary task of delineating a window. Below, a de-gridded design, simple and elegant, which uses color to define edges.”

*Tufte, E. (1989). Visual Design of the User Interface. IBM:Armonk NY, p. 9*



Here is a before/after redesign that seeks to reduce... noise. Above is a sketch of a conventional screen, with strong grid frames marching around everywhere, doing little to show data. What we seek is a more modest visual means, appropriate to the elementary task of delineating a window. Below, a de-gridded design, simple and elegant, which uses color to define edges. By reducing contrast between figure and ground, lighter colors (embossed by dark lines) will calm down background shapes.



# Screen elements interact.

---

The whole is not the sum of the parts!!

Consider the whole screen,  
not just the individual elements.

Review Gestalt principles: Proximity,  
similarity, good continuation, closure

# Good designs:

---

pay attention to layout, color, typography, icons, graphics, and coherence.

do not consist of superficial cosmetic matters or simply decorative touches.

- 
- Bad examples:

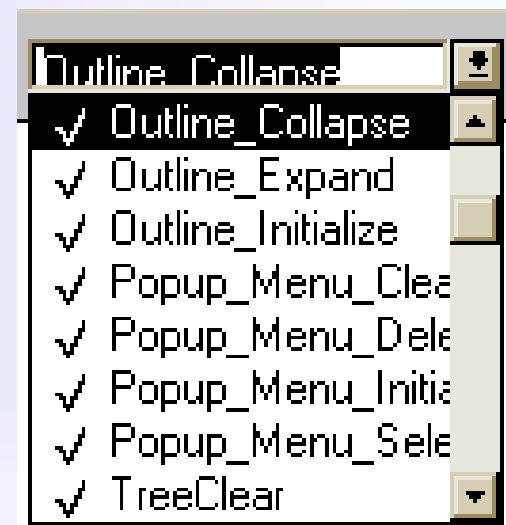
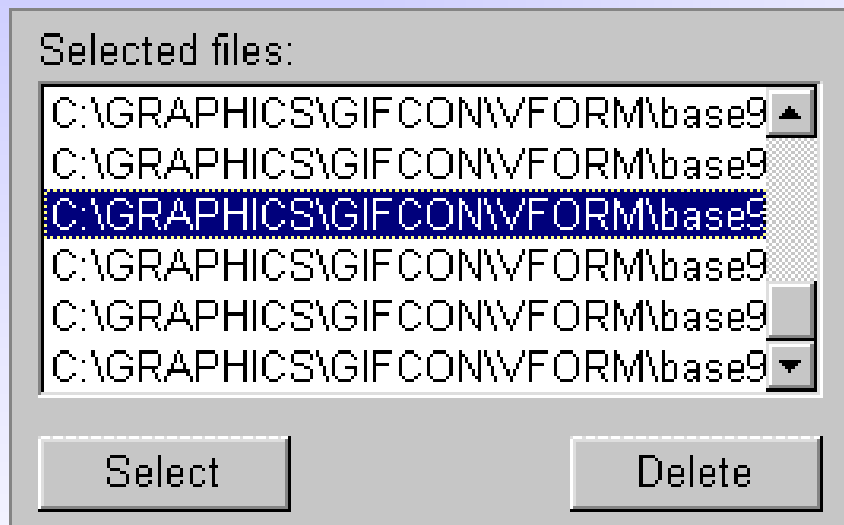


Here, 3-D elements are used both functionally (good!) and decoratively (bad!).

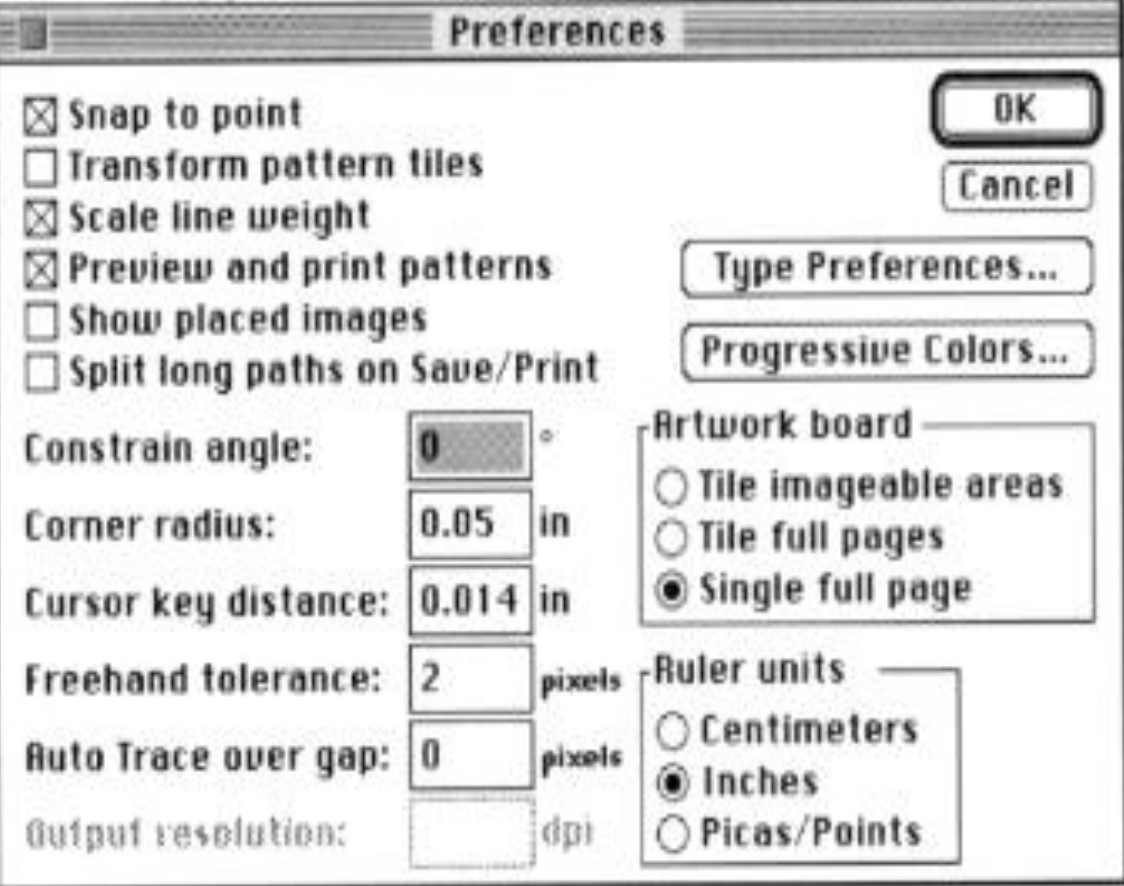
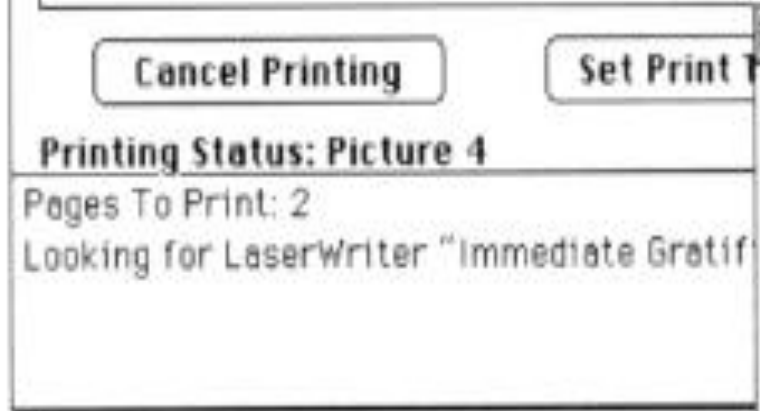
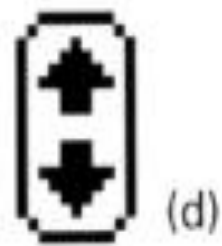
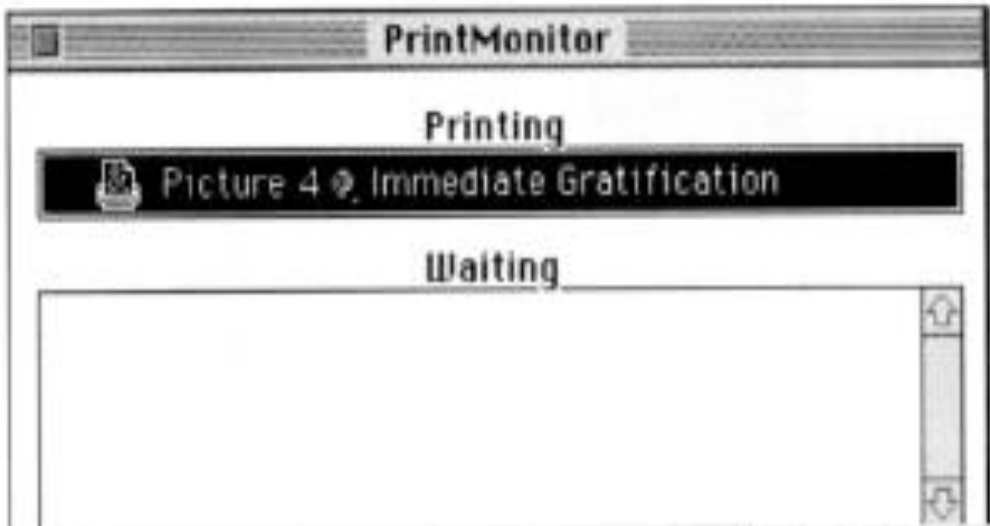
This makes the window too cluttered (and suggests an affordance where there shouldn't be one).

# Avoid uninformative elements

---



*How do you chose when you can't even discriminate the choices from each other?*



(b)

**Sort**

First Sort	Second Sort	Third Sort
Sort By: Start Time	Sort By: No Sort	Sort By: No Sort
<input checked="" type="radio"/> Ascending <input type="radio"/> Descending	<input type="radio"/> Ascending <input type="radio"/> Descending	<input type="radio"/> Ascending <input type="radio"/> Descending
		Cancel OK

**Footnote**

Maximum Height Per Column: 54.0 pc

Numbering Style:  Numeric (4)  Custom: \*†‡

Number Format:

In Main Text:	In Footnote:
Position: Superscript	Position: Baseline
Prefix:	Prefix:
Suffix:	Suffix: .\t

Set Cancel Help

(a)



# Issues in screen (& menu) design

---

1. **Layout:** do you optimize, or let the user customize? How to organize?
2. How will you manage **screen clutter** and increase signal-to-noise?
3. **Should you represent all options at once, or limit options depending on the context?**

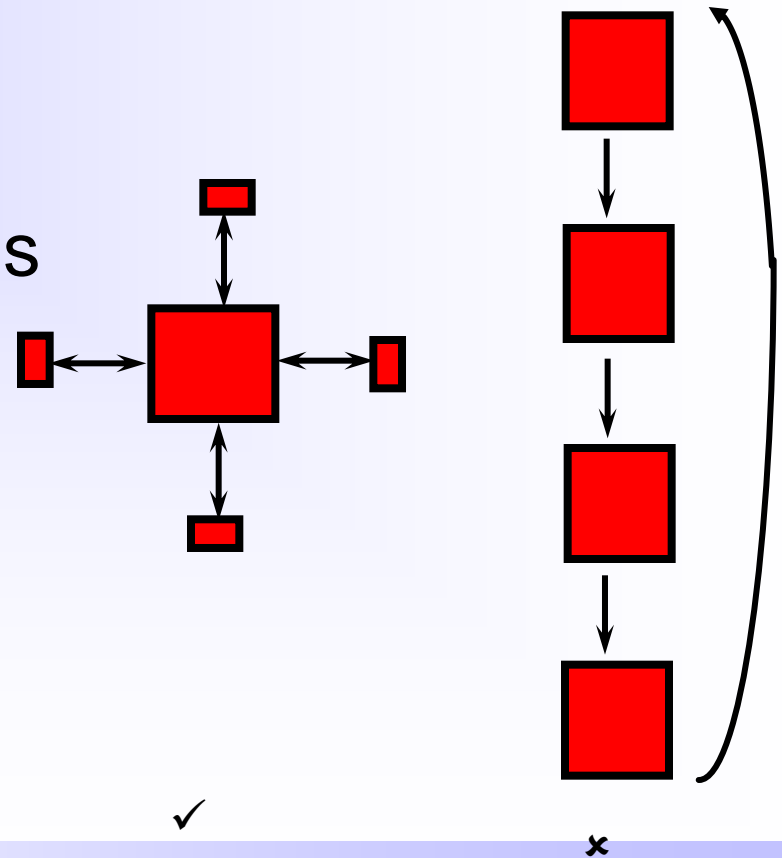
# How much info to provide: Tradeoff

---

**Breadth v. depth** - trade off searching v. selecting

## ■ how can window navigation be reduced?

- avoid long paths
- avoid deep hierarchies
- But: avoid information overload



# Issues in screen design

---

1. **Layout**: do you optimize, or let the user customize? How to organize?
2. How will you manage **screen clutter** and increase signal-to-noise?
3. Should you represent all **options** at once, or limit options depending on the context?
4. **How will you get the user's attention?**

# Getting a user's attention

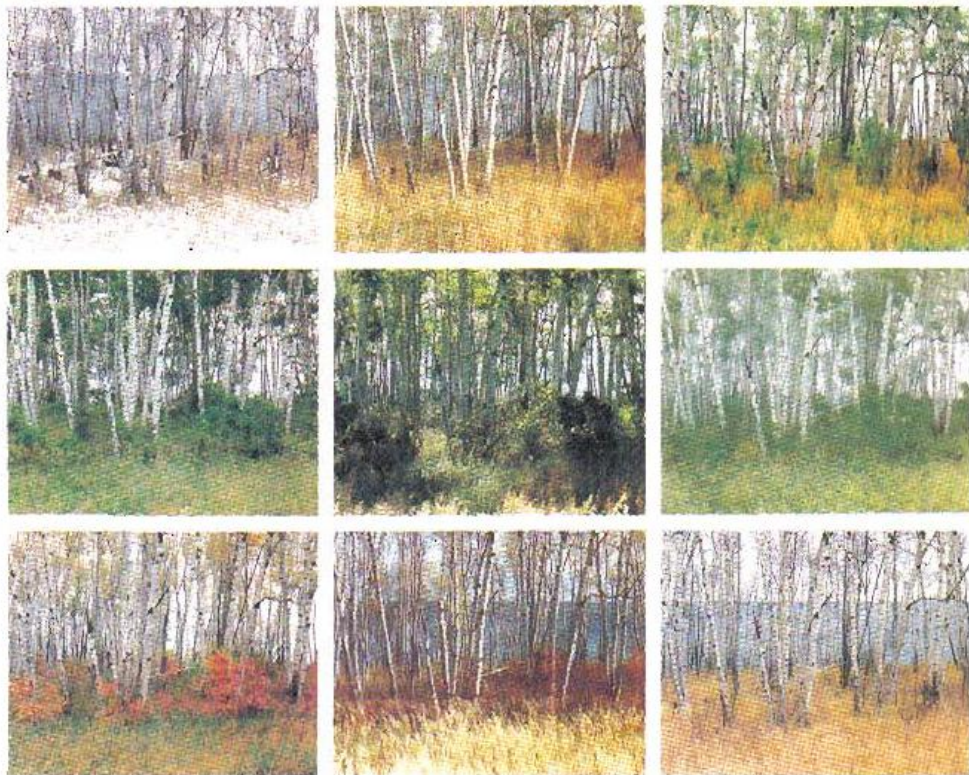
---

- Make it pop out
- Make it darker
- Make it move
- Make it flash
- Make it larger
- Place it where the user is looking
- Use sound
- Use color

# Using color on the screen *(Tufte)*

---

- use color to enhance information
- avoid strong colors that can produce after-images
- when choosing colors, look at maps or nature for inspiration



# Getting a user's attention

---

*A caveat:*

“when *every* function on the user interface receives special visual emphasis, then *nothing* at all has gained emphasis - only visual noise has increased, as stronger and stronger elements compete with each other.”

- *Tufte (1989). Visual Design of the User Interface, IBM, Armonk, NY, p. 7*

- 
- To get a user's attention, use a modality that isn't currently being used for the primary task, if possible (Baddeley's theory of working memory)
  - But use interruptions sparingly. One study showed workers are interrupted every 11 minutes, then take 25 minutes to return to the previous task!

*(NYTimes Sunday Magazine, "Meet the Life Hackers" by Clive Thompson, 10/16/2005)*



# More issues in screen design

---

- How to represent **states, modes, or contexts**?
- How to use **animation**?
- How to represent **transitions** between contexts? (*the “where am I” problem*)
- How to represent dynamic information?
- How to incorporate **conventions**?
- What kind of **representations** to use?

# Legibility and readability

---

- typesetting
  - point size
  - word and line spacing
  - line length
  - indentation
  - color
  - font

# Legibility and readability

---

- Characters, symbols, graphical elements should be easily noticeable and distinguishable

Text set in  
Helvetica (sans-serif)

Text set in  
Times Roman (serif)

TEXT SET IN  
CAPITOLS

Text set in  
Braggadocio

Text set in  
Courier

# Which is easiest to read?

---

What is the time?

What is the time?

What is the time?

What is the time?

What is the time?

*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.*

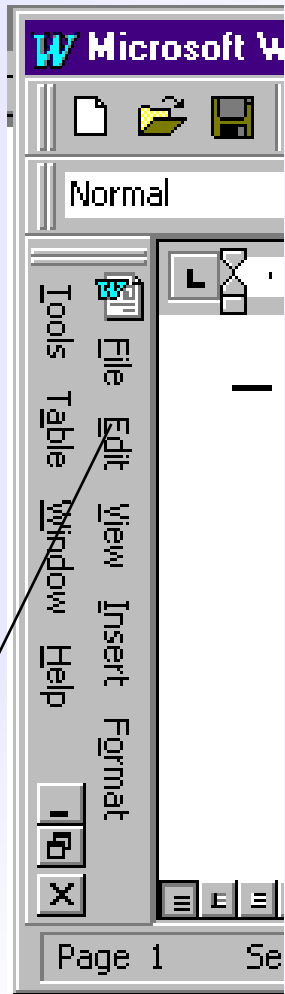
*To start the demonstration, click the "OK" button at the bottom of the screen.*

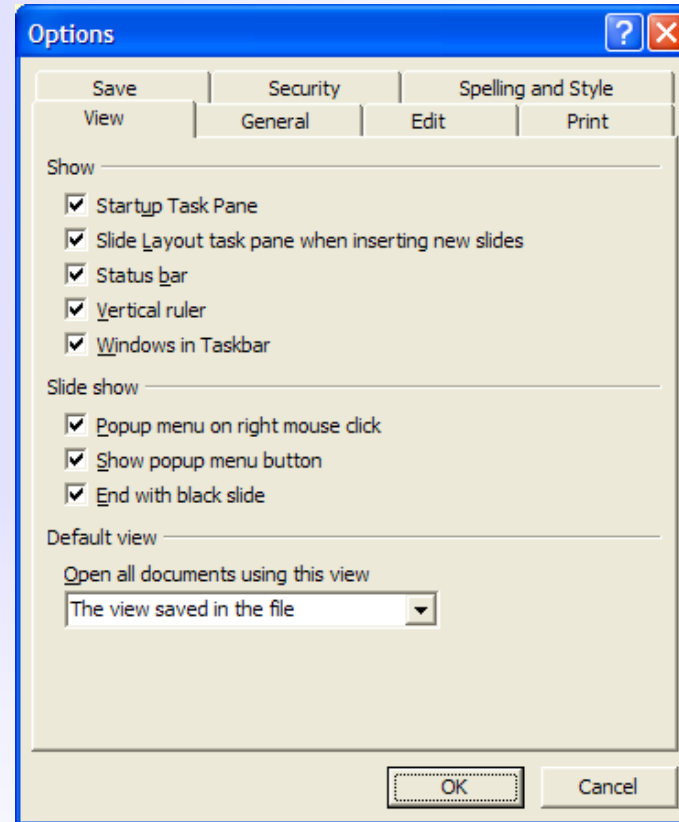
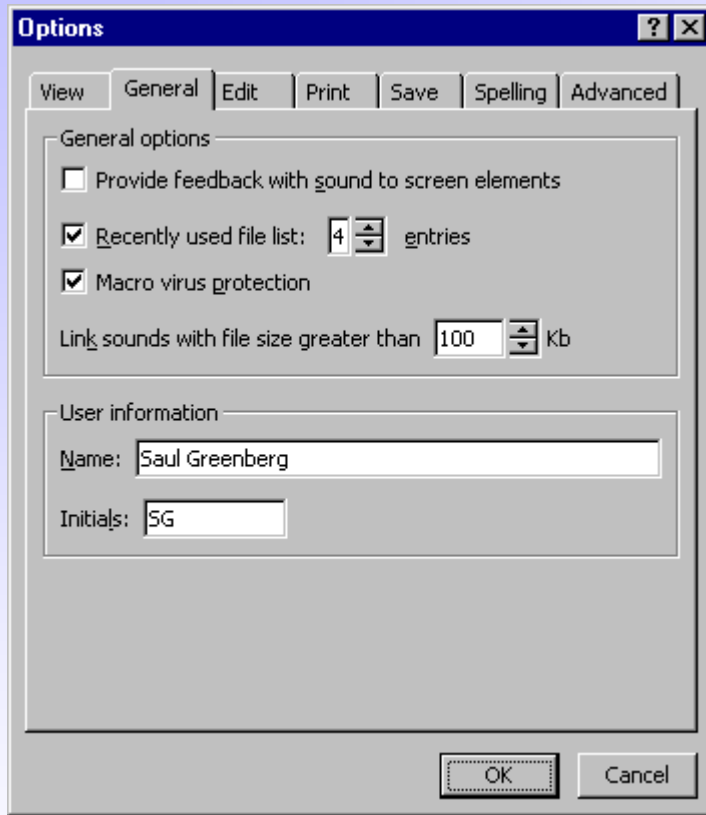
If you wish to add/change network information, please select one of the following options.

- I WANT TO CONNECT TO AN EXISTING TIME & CHAOS WORKGROUP OR MODIFY THE CONNECTION SETTINGS.
- I WANT TO BUILD A BRAND NEW WORKGROUP.

**These choices must be really important, or are they?**

Text orientation  
difficult to read





## ■ Tabs

- excellent means for factoring related items
- but can be overdone



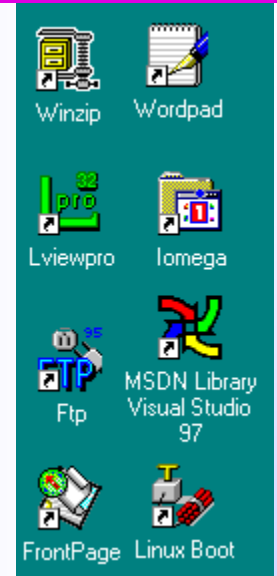
# The power of a (good) representation

---

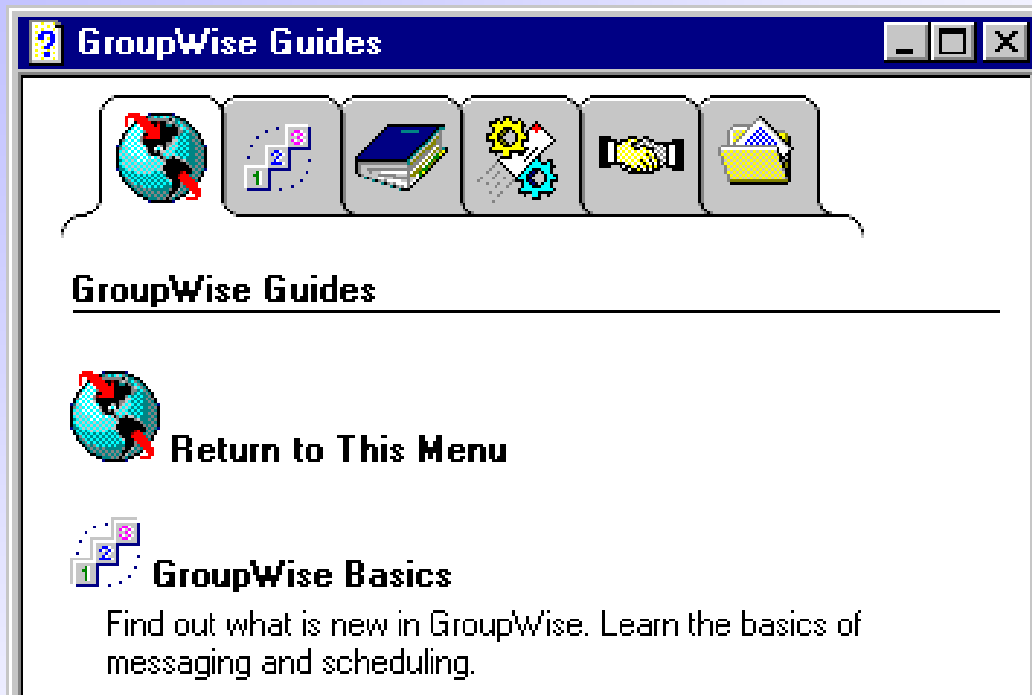
- Important in problem-solving
- Enables the user to make predictions
- Provides a natural constraints and mappings
- May suggest a useful metaphor
- “Graphical” doesn’t mean easy to understand!

# Imagery

- Signs, icons, symbols
  - Range from concrete to abstract
- Icon design is *very* hard
  - except for most familiar, always label them
- Image position and type should be related
  - image “family”
- Use images consistently



Partial icon family



What do these images mean?  
One of the tabs is a glossary explaining  
these images! which one?

Icons can be just as cryptic as words!

---

Space can be used to represent topic,  
relationships, temporal order, etc. -  
**different views** are possible

# Some links about design:

---

- [GUI examples](#)
- [Tufte on screen design](#)
- Norman: [Three Teapots](#)

# Some references (suggested by Saul Greenberg)

---

**Principles of Effective Visual Communication for GUI design,** p.425-441, In Baecker, R., Grudin, J., Buxton, W., and Greenberg, S., eds (1995). *Readings in Human Computer Interaction: Towards the Year 2000*. Morgan-Kaufmann.

**Designing visual interfaces: Communication oriented techniques.** Mullet, K. and Sano, D. (1995). Sunsoft Press.

**The Non-Designer's Design Book.** Williams, Robin (1994). Peachpit Press Inc.

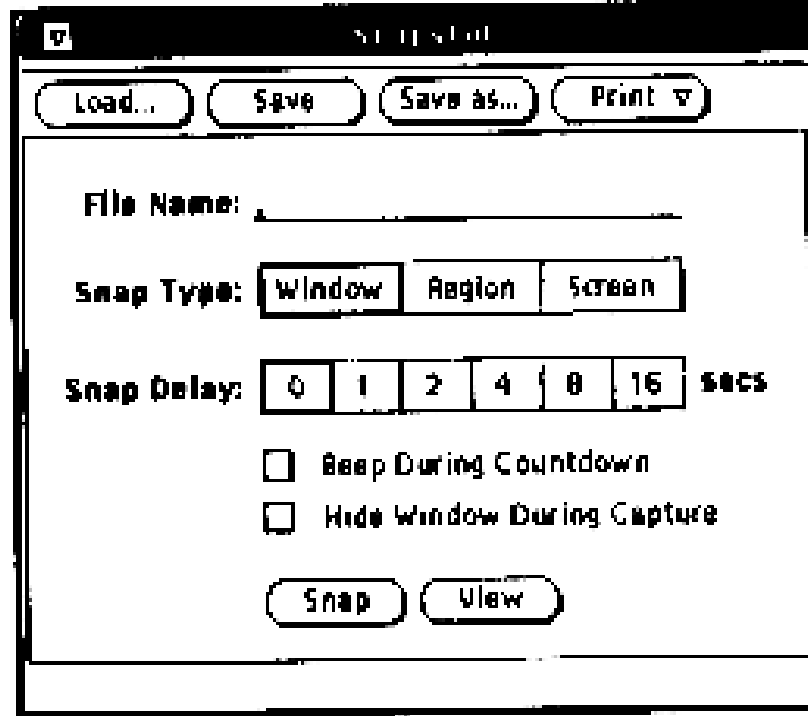
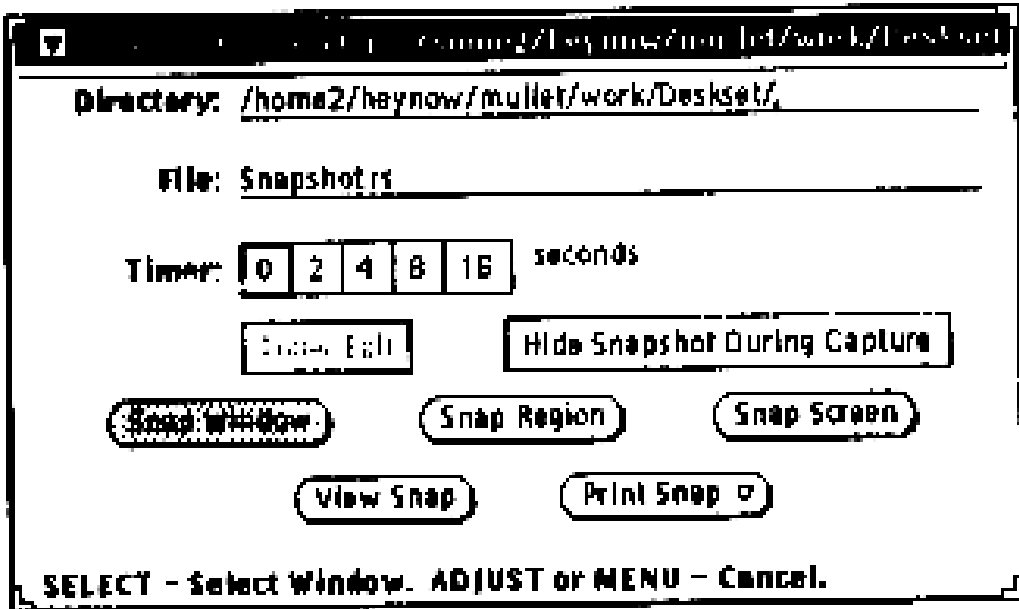
---

A few more examples, time permitting:

Form Title -- (appears above URL in most browsers and is used by W/W/W 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		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!***		
<a href="#">&lt;&lt; Prev Tab</a>		<a href="#">Next Tab &gt;&gt;</a>

- Terrible alignment
  - no flow
- Poor contrast
  - cannot distinguish colored labels from editable fields
- Poor repetition
  - buttons do not look like buttons





Redesigning a layout using alignment and factoring

