

Graphical Screen Design

CRAP – contrast, repetition, alignment, proximity

Grids are an essential tool for graphical design

Other visual design concepts

consistency

relationships

organization

legibility and readability

navigational cues

appropriate imagery

familiar idioms

Major sources: Designing Visual Interfaces, Mullet & Sano, Prentice Hall / Robin Williams Non-Designers Design Book, Peachpit Press

Slide deck by Saul Greenberg. Permission is granted to use this for non-commercial purposes as long as general credit to Saul Greenberg is clearly maintained.

Warning: some material in this deck is used from other sources without permission. Credit to the original source is given if it is known.

CRAP

Contrast

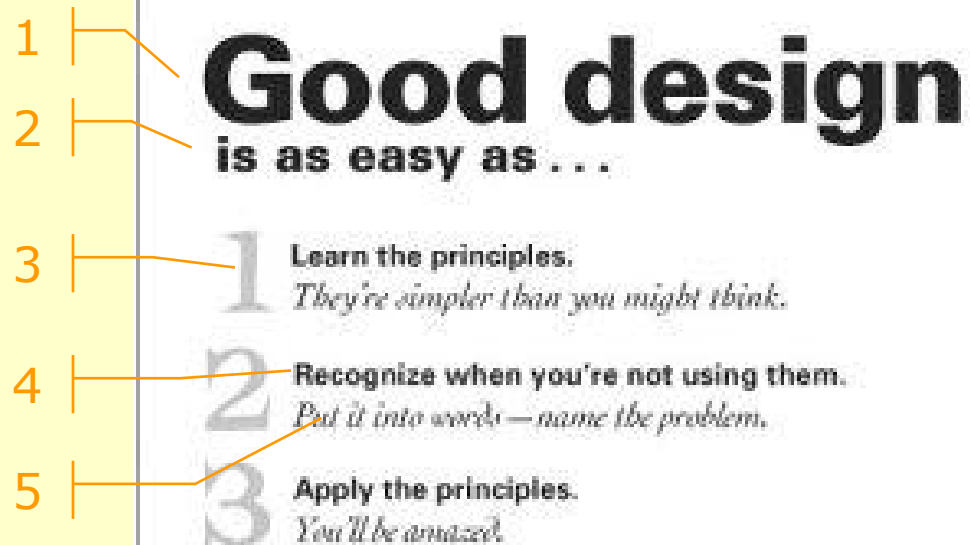
- make different things different
- brings out dominant elements
- mutes lesser elements
- creates dynamism



Repetition

Alignment

Proximity



CRAP

Contrast

Repetition

- repeat design throughout the interface
- consistency
- creates unity

Alignment

Proximity



CRAP

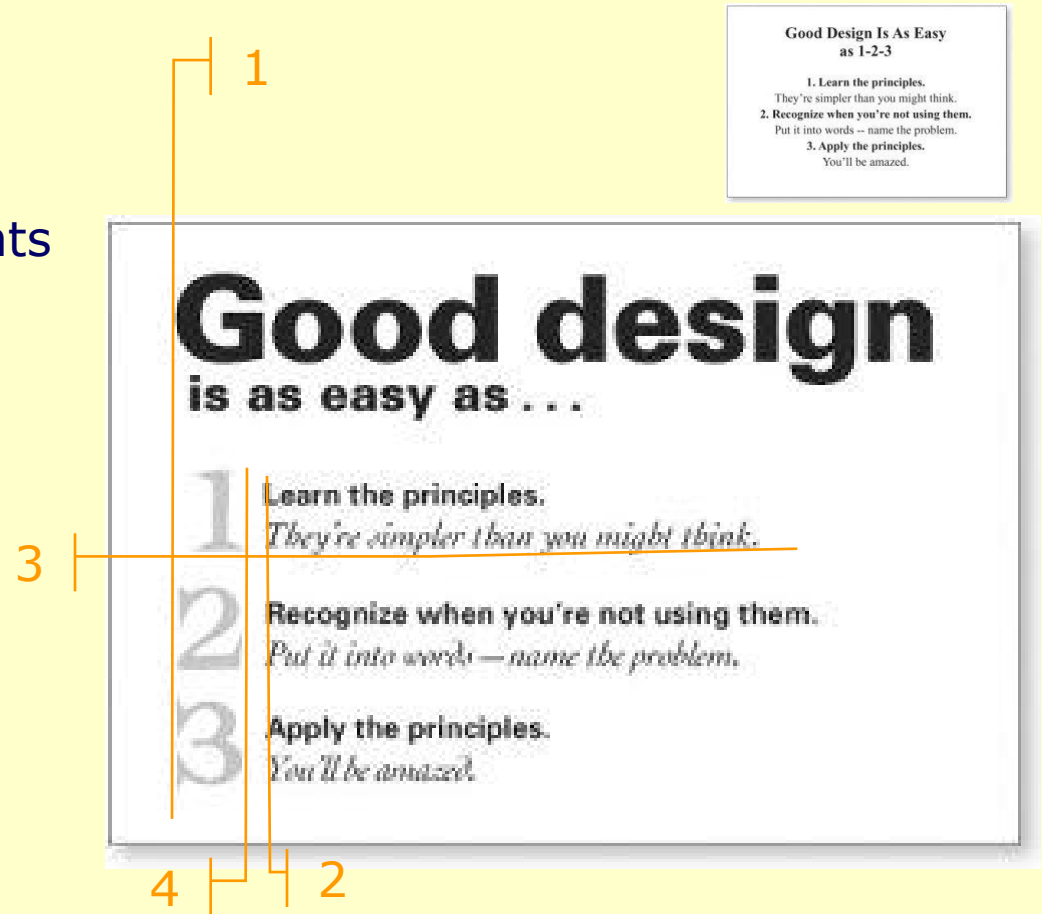
Contrast

Repetition

Alignment

- visually connects elements
- creates a visual flow

Proximity



CRAP

Contrast

Repetition

Alignment

Proximity

- groups related elements
- separates unrelated ones

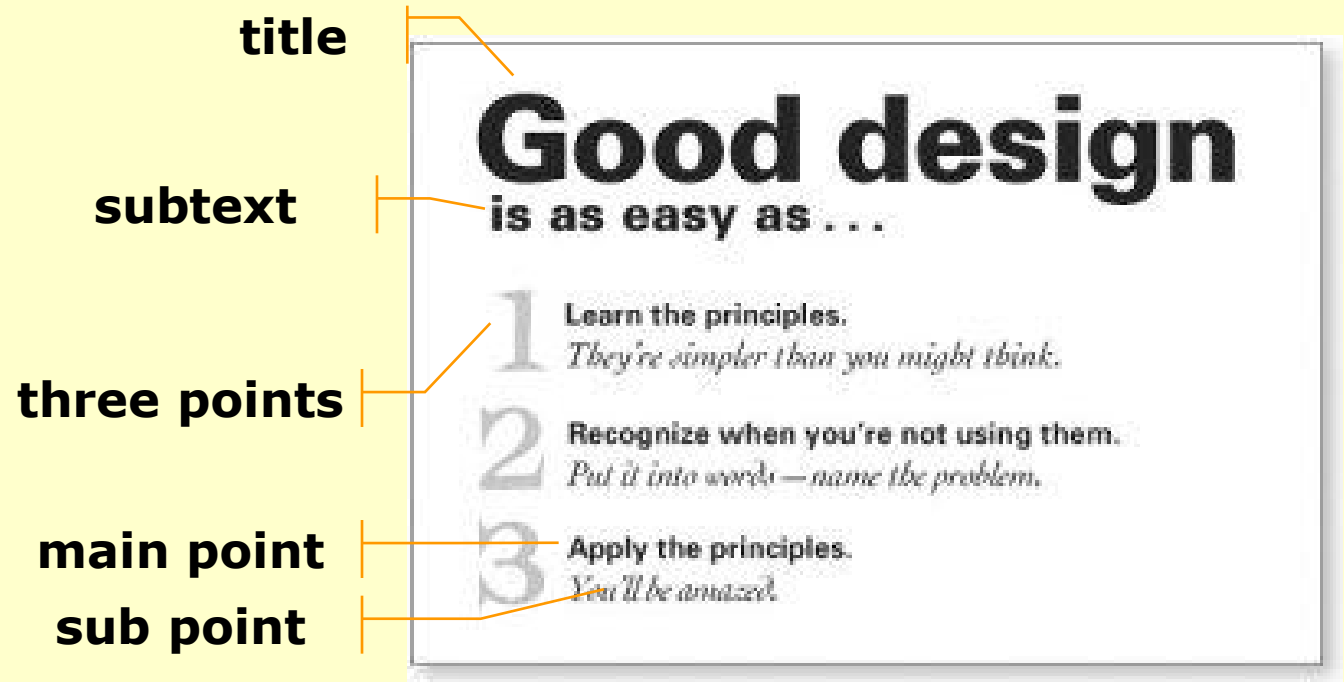
Good Design Is As Easy
as 1-2-3

1. Learn the principles.
They're simpler than you might think.
2. Recognize when you're not using them.
Put it into words -- name the problem.
3. Apply the principles.
You'll be amazed.



Where is a view focused ?

CRAP combines all aspects with the goal to provide guidelines for reading a graphics



CRAP example

World Wide Web Info for Saul Greenberg - Microsoft Internet Explorer

File Edit View Favorites Tools Help

erg\My Documents\My Webs\~saul\hci_topics\powerpoint_presentations2003\graphical_design\version Go

GroupLab
The University of Calgary

[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

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 Inter

Original



[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

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

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

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

Contrast



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



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

Repetition

CRAP summary

C

Contrast

- make different things different
- brings out dominant elements
- mutes lesser elements
- creates dynamism

R

Repetition

- repeat design throughout the interface
- consistency
- creates unity

A

Alignment

- visually connects elements
- creates a visual flow

P

Proximity

- groups related elements
- separates unrelated ones

Contrast using visual weight

Create a point attracting attention and then you guide user's eye on the screen

Example of visual flow:

- image
- heading
- date
- logo
- text



User's view steps from one item to other following weights

Contrast using font

Technique	Example in Context
Font serif/sans serif	We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights...
Size	We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights...
Weight	We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights...
Color	We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights...
Form (italics)	We hold these truths to be self-evident, that all men are created equal, that they are endowed by their <i>Creator</i> with certain unalienable Rights...
D i r e c t i o n	We hold these truths to be self-evident, that all men are created equal, that they are endowed by their C r e a t o r with certain unalienable Rights...

Contrast – serif/sans serif font

A serif is a decorative embellishment on the edge of the letters.

Serif Times New Roman

Baskerville Old Face, Century, Century Schoolbook, Constantia, Garamond, Georgia, Goudy Old Style, Palatino, Times New Roman

A minimalist font--there are no serifs. Sans in French means without.

Sans serif Calibri

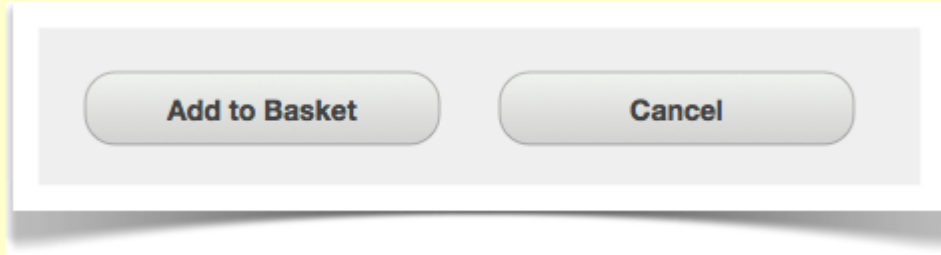
A monoweight font--there are no thick/thin transitions and therefore no stress direction either.

Arial, Bell Gothic, Calibri, Candara, Century Gothic, Corbel, Franklin Gothic, Gill Sans, Lucida Sans, Microsoft Sans Serif, MS Reference Sans Serif, Myria Pro, Tahoma, Trebuchet MS, Tw Cen MT,

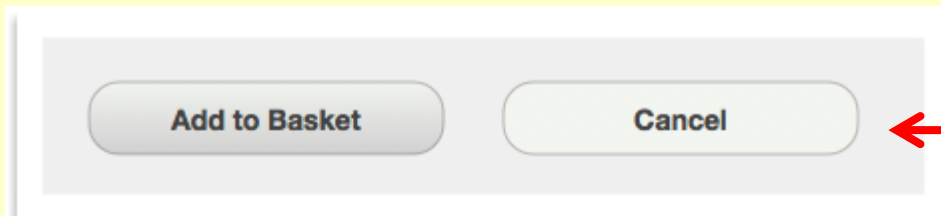
for longer texts, serifs guide reader letter by letter

good choice for on-line texts, serifs may lower readability (blurred pixels)

Contrast – simple modifications



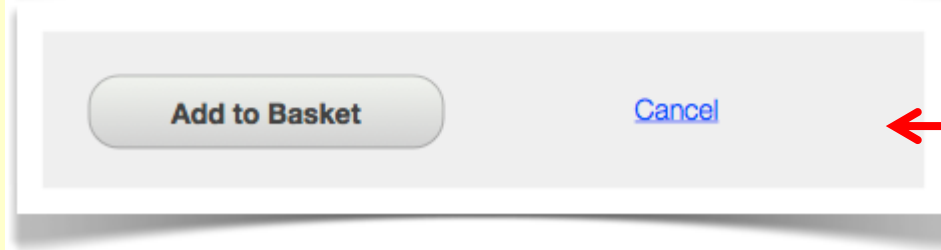
which button is more important ?



no „depth“



„Bold“ canceled



button replaced by link

Repetition unifies design



Color palette unifies design

The screenshot displays the Kuler Adobe website interface. At the top right, the URL kuler.adobe.com is visible. The main area features two image galleries. The top gallery shows a prehistoric painting of a horse with several circular color selection markers overlaid. The bottom gallery shows a photograph of a snow-capped mountain range with similar color selection markers. Below the galleries, a color palette is displayed, consisting of five color swatches: white, a dark blue, a medium blue, a light blue, and a dark brown. The interface includes a sidebar with a 'Barevné ladění' (Color palette) dropdown menu and a 'Barevné' (Color) radio button. The word 'Uložit' (Save) is visible in blue buttons above each gallery.

Text alignment helps to categorize

100 West Union Street 111 Smithfield Road
Athens, Ohio 45701 Cleveland, Ohio 44249
740-589-5555 440-555-5895

Education

Ohio University Athens, Ohio
Bachelor of Business Administration Cumulative GPA: 3.6
Major: Management Information Systems Expected Graduation: June 2008

Work Experience

Appalachian Regional Entrepreneurship Initiative Athens, Ohio
Consultant Aug 2007 - Present
Performed market and industry research
Prepared company and financial analyses
Developed strategic business and market plans for mid-sized companies
Implemented stabilizing and growth strategies with clients
Progressive Auto Insurance Cleveland, Ohio
IT Intern June 2007 - Aug 2007

Completed programming for seven company-wide applications
Assisted with quality and assurance testing
Worked with cross-functional team to design new pricing system

Footlocker Athens, Ohio

Shift Supervisor Jan 2007 - June 2007

Supervised six employees

Responsible for all employee scheduling and opening and closing store

Sales Representative June 2006 - Jan 2007

Assisted customers with purchasing process

Exceeded required sales goals each week

Professional Associations

Beta Gamma Sigma, Business Honors Society Mar 2006 - Present

Beta Alpha Psi, National Fraternity for Financial Information Professionals Sept 2005 - Present

Association for Information Technology Professionals, Vice President Sept 2004 - Present

Omicron Delta Kappa, Leadership Honors Society Nov 2004 - Present

Honors and Awards

Copeland Scholar/Ohio Business Fellow, competitive scholarship programs Sept 2004 - Present

Provost Scholarship Sept 2004 - Sept 2005

Dean's List Fall 2004 - Present

Computer Skills

Microsoft Word, Excel, Access and Visio, Blackboard, Photoshop, Snagit

Class experience: Visual Web Developer, C#, HTML, SharePoint

Joseph Bobcat

jbobcat@ohio.edu

100 West Union Street
111 Smithfield Road
Athens, Ohio 45701
Cleveland, Ohio 44249
740-589-5555

Education

Ohio University; Athens, Ohio
Bachelor of Business Administration
Cumulative GPA: 3.6
Major: Management Information Systems
Expected Graduation: June 2008

Work Experience

Appalachian Regional Entrepreneurship Initiative; Athens, Ohio
Consultant, Aug 2007 - Present

- Performed market and industry research
- Prepared company and financial analyses
- Developed strategic business and market plans for mid-sized companies
- Implemented stabilizing and growth strategies with clients

Progressive Auto Insurance; Cleveland, Ohio

IT Intern, June 2007 - Aug 2007

- Completed programming for seven company-wide applications
- Assisted with quality and assurance testing
- Worked with cross-functional team to design new pricing system

Footlocker; Athens, Ohio

Shift Supervisor, Jan 2007 - June 2007

- Supervised six employees
 - Responsible for all employee scheduling and opening and closing store
- Sales Representative, June 2006 - Jan 2007
- Assisted customers with purchasing process
 - Exceeded required sales goals each week

Professional Associations

Beta Gamma Sigma, Business Honors Society, Mar 2006 - Present

Beta Alpha Psi, National Fraternity for Financial Information Professionals, Sept 2005 - Present

Association for Information Technology Professionals, Vice President, Sept 2004 - Present

Omicron Delta Kappa, Leadership Honors Society, Nov 2004 - Present

Honors and Awards

Copeland Scholar/Ohio Business Fellow, competitive scholarship programs; Sept 2004 - Present

Provost Scholarship; Sept 2004 - Sept 2005

Dean's List Fall; 2004 - Present

Computer Skills

Microsoft Word, Excel, Access and Visio, Blackboard, Photoshop, Snagit

Class experience: Visual Web Developer, C#, HTML, SharePoint

Proximity and alignment

Appliances
Audio,TV & Home Theatre
Blu-ray
Camera & Photo
Computers & Office
DVD
Electronics
Garden & Outdoors
Home & Garden
Houseware & Furnishings
iPod, MP3 & Accessories
Kitchen & Dining
Lighting
MP3 Downloads
Music
Music, DVD & Games
Office Products & Supplies
PC & Video Games
PCs & Laptops
Peripherals & Accessories
Sat Nav, Phones & PDA
Software

alphabetic list

Music, DVD & Games

Music
MP3 Downloads
DVD
Blu-ray
PC & Video Games

Electronics

Camera & Photo
Audio,TV & Home Theatre
iPod, MP3 & Accessories
Sat Nav, Phones & PDA

Computers & Office

PCs & Laptops
Peripherals & Accessories
Software
Office Products & Supplies

Home & Garden

Kitchen & Dining
Appliances
Houseware & Furnishings
Lighting
Garden & Outdoors

groups with heading

Alignment – grid analysis

The original design of the TSA Secure Flight registration form is shown with a grid overlay. The grid consists of vertical lines that do not align with the form's fields, creating a fragmented and inconsistent layout. The form includes fields for: Traveler # 1 - Adult, First Name, Last Name, Gender, Date of Birth (DD/MM/YYYY), Email address, Phone number (US: 000 000 0000), Password (with a strength indicator), TSA Secure Flight Program Information, Optional TSA items, Passport Number, Expiry Date (DD/MM/YYYY), Passport Issuing Country, Citizenship, Address Number, and Known Traveler Number. A checkbox for 'Enter Frequent Flyer information' is also present.

original design

The revised design of the TSA Secure Flight registration form is shown with a grid overlay. The grid lines are perfectly aligned with the form's fields, creating a clean and consistent layout. The form includes the same fields as the original design: Traveler # 1 - Adult, First Name, Last Name, Gender, Date of Birth (DD/MM/YYYY), Email address, Phone number (US: 000 000 0000), Password (with a strength indicator), TSA Secure Flight Program Information, Optional TSA items, Passport Number, Expiry Date (DD/MM/YYYY), Passport Issuing Country, Citizenship, Address Number, and Known Traveler Number. A checkbox for 'Enter Frequent Flyer information' is also present.

revised design

Grids

Horizontal and vertical lines to locate window components

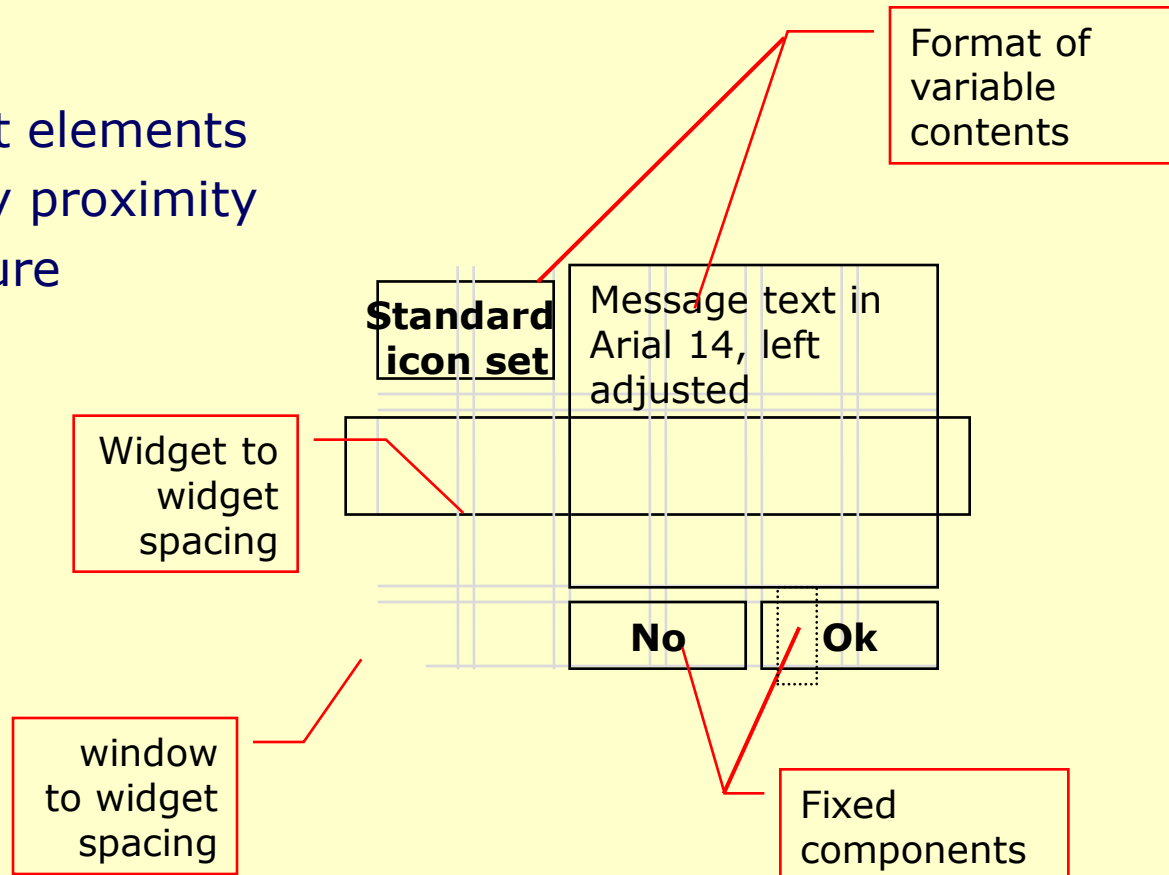
- aligns related components

Organization

- contrast for dominant elements
- element groupings by proximity
- organizational structure
- alignment

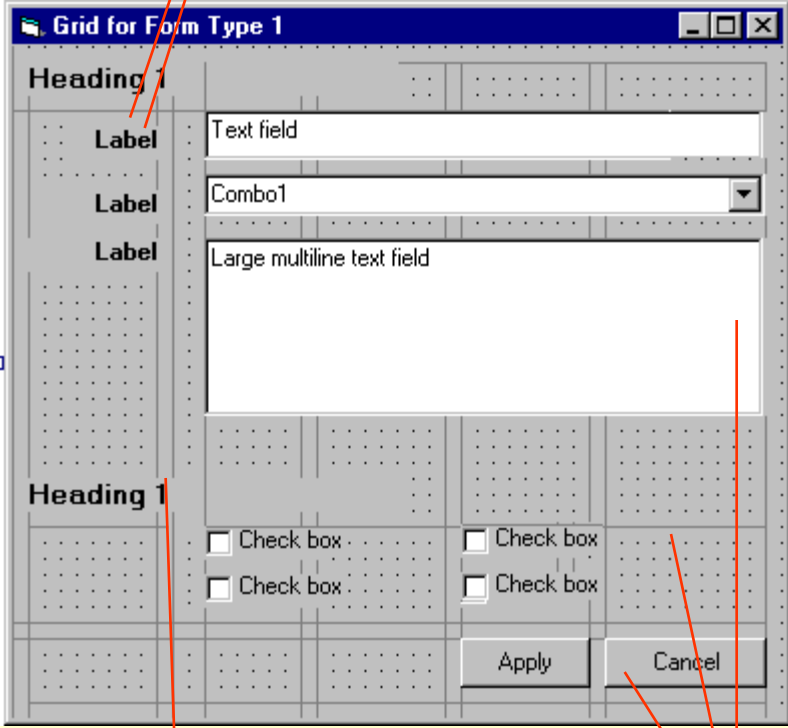
Consistency

- location
- format
- element repetition
- organization



Two-level Hierarchy
• indentation
• contrast

Logic of organizational flow



A wireframe diagram of a form titled "Grid for Form Type 1". It features a grid layout with two main sections, each starting with a "Heading 1". The first section contains three rows: "Label" followed by a "Text field", "Label" followed by a "Combo1" dropdown, and "Label" followed by a "Large multiline text field". The second section contains four rows of "Check box" elements, followed by "Apply" and "Cancel" buttons. Red lines connect callout boxes to specific elements: one points to the "Text field" label, another to the "Text field" itself, and a third to the "Apply" button.



A screenshot of a "Note Sender" application window. It is organized into sections: "Send to" with "Name" (Saul Greenberg) and "Email" (saul@cpsc.ucalgary.ca) fields; "Message" with a text area containing "Hi Saul", "Lets get together for lunch, Perhaps tomorrow?", and "Judy"; and "Instructions" with a "Type" dropdown (Normal mail), "Include attachments" (checked), and "Carbon copy" (unchecked) options. "Apply" and "Cancel" buttons are at the bottom right. A red arrow points from the wireframe to this application.

Alignment connects visual elements in a sequence

Grouping by white space

Repetition brings visual consistency

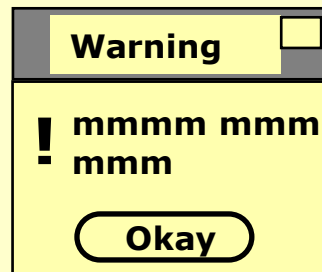
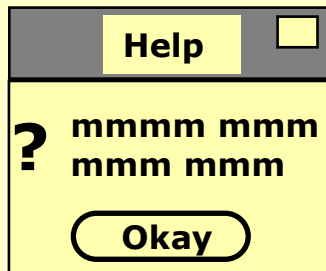
internal consistency

- elements follow same conventions and rules
- set of application-specific grids enforce this

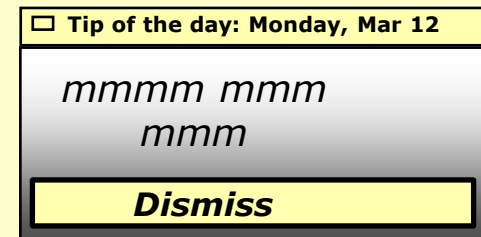
external consistency

- follow platform and interface style conventions
- use platform and widget-specific grids

deviate only when it provides a clear benefit to user



✓



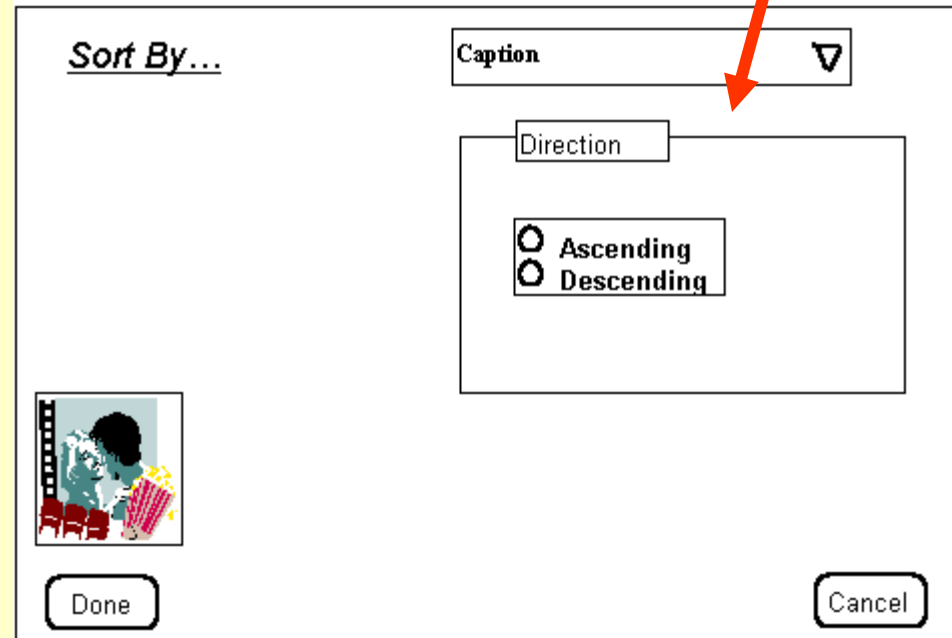
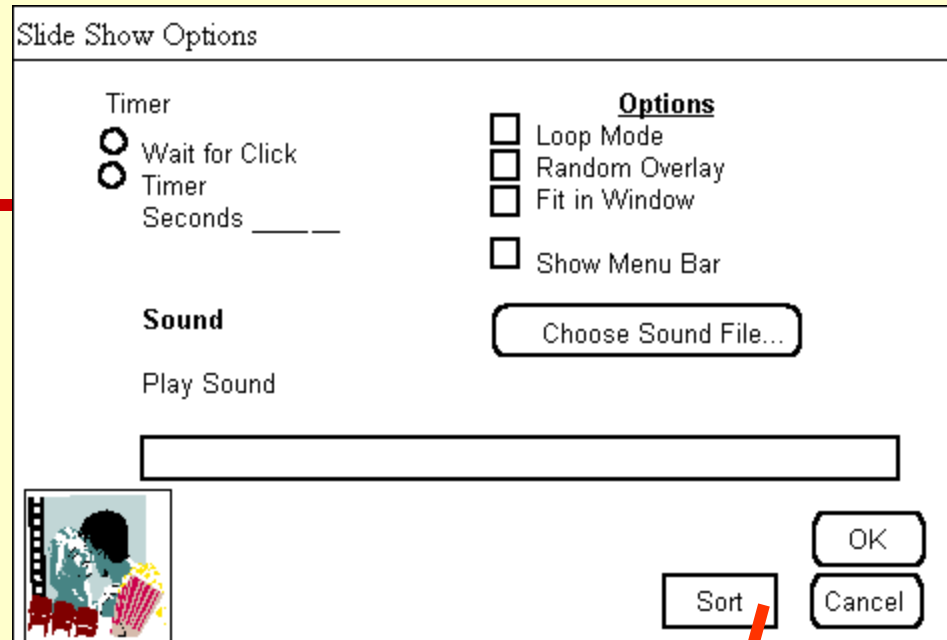
x

Grid design

Graphical redesign

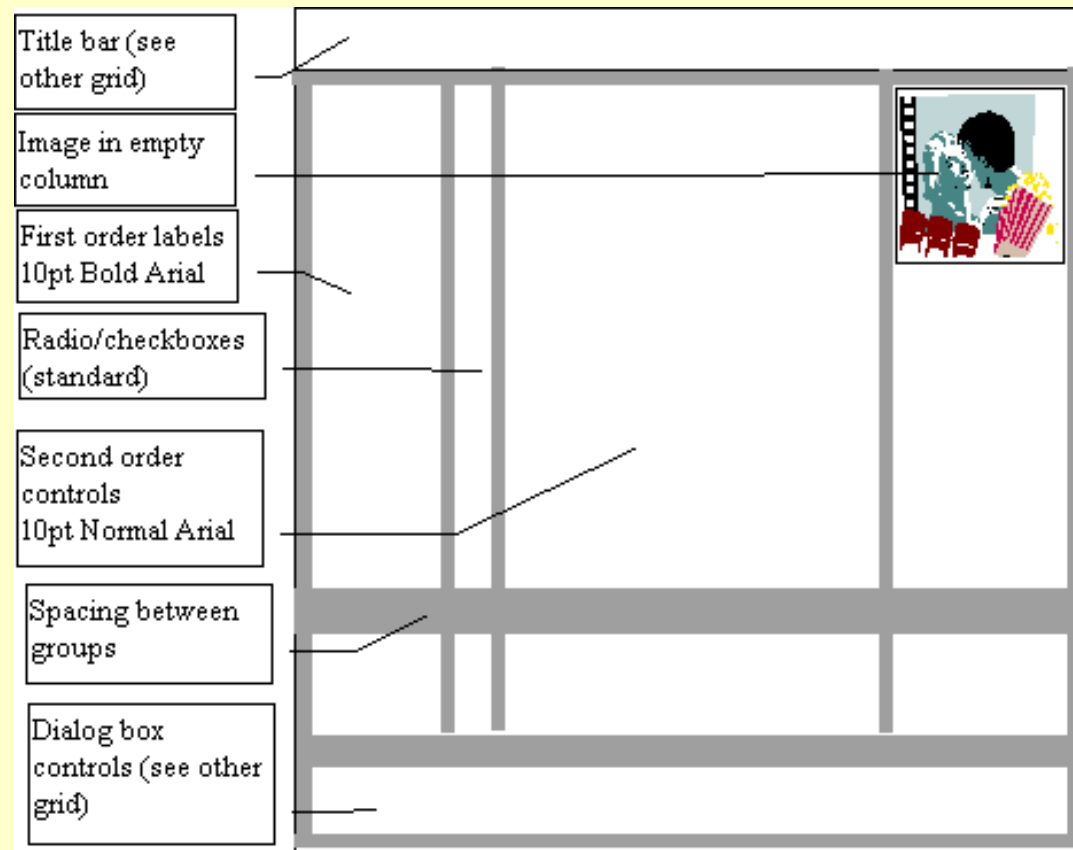
Create a grid emphasizing:

- visual consistency
- relationships between screen elements
- navigational cues
- economy
- legibility and readability
- imagery



Constructing a grid – an easy (amateurish) approach

1. Maintain consistency with GUI style
 - locate standard components - title bar, window controls, ...
2. Decide navigational layout + white space + legibility + typography
 - annotated grid shows location of generic components
 - these generic components may have their own grids.



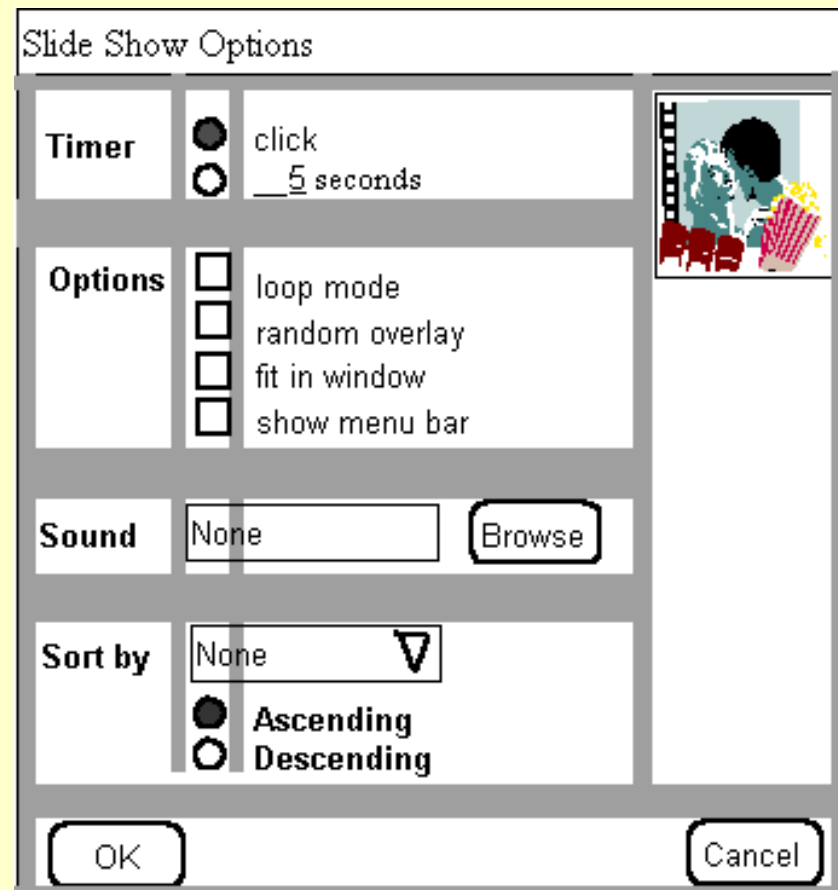
Using the grid

3. Determine relationships, navigational structure

- map navigational structure onto the grid

4. Economize

- collapse two windows into one
- trim sound dialog



Using the grid

5. Evaluate by displaying actual examples
6. Economize further
 - decide which we prefer


Slide Show Options

Timer click
 __5 seconds

Options loop mode
 random overlay
 fit in window
 show menu bar

Sound

Sort by ▾
 Ascending
 Descending



Slide Show Options

Timer click
 __5 seconds

Options loop mode
 random overlay
 fit in window
 show menu bar

Sound

Sort by ▾
 Ascending
 Descending

VS

Relate related screen elements

proximal clusters
alignment
white (negative) space
explicit structure

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

x

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

?

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

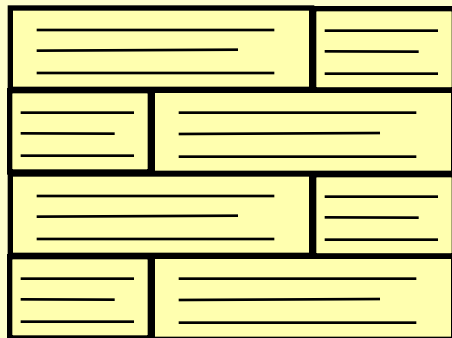
✓

Guide focus using navigational cues

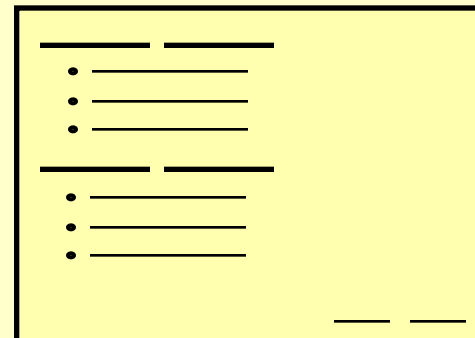
provide initial focus

direct attention as appropriate to important 2ndary, or peripheral items as appropriate

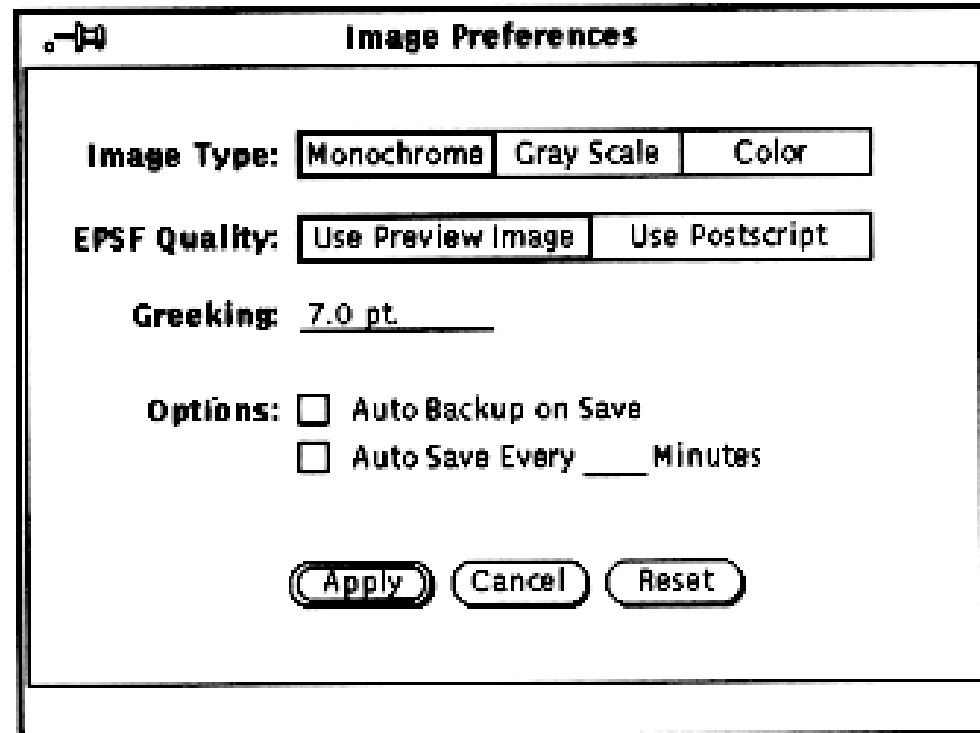
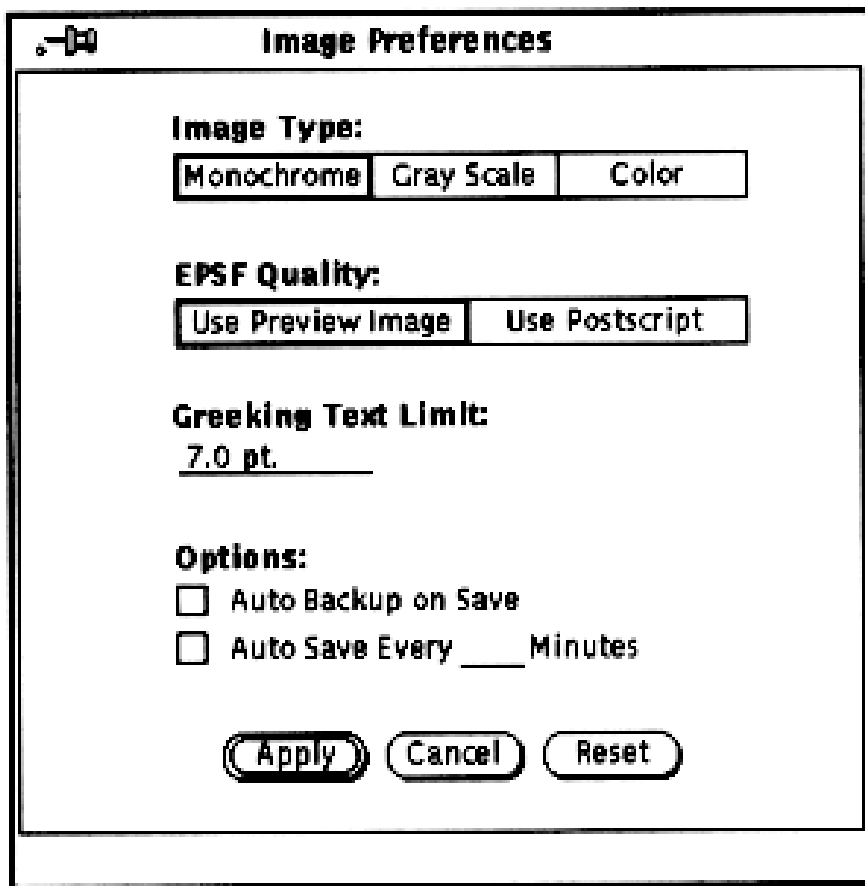
order should follow a user's conceptual model of sequences



x



✓



The importance of negative space and alignment

Economy of visual elements

minimize number of controls

include only those that are necessary

- eliminate, or relegate others to secondary windows

minimize clutter

- so the information is not hidden

A diagram of a cluttered form layout. It consists of two main sections, each with a title and two columns of input fields. The top section is titled **MMMM** and contains four rows of 'xxx: _____' followed by two rows of rounded rectangular buttons. The bottom section is titled **NNNN** and contains two rows of 'xxx: _____' followed by one row of three rounded rectangular buttons. The two sections overlap, with the top section partially covering the bottom section.

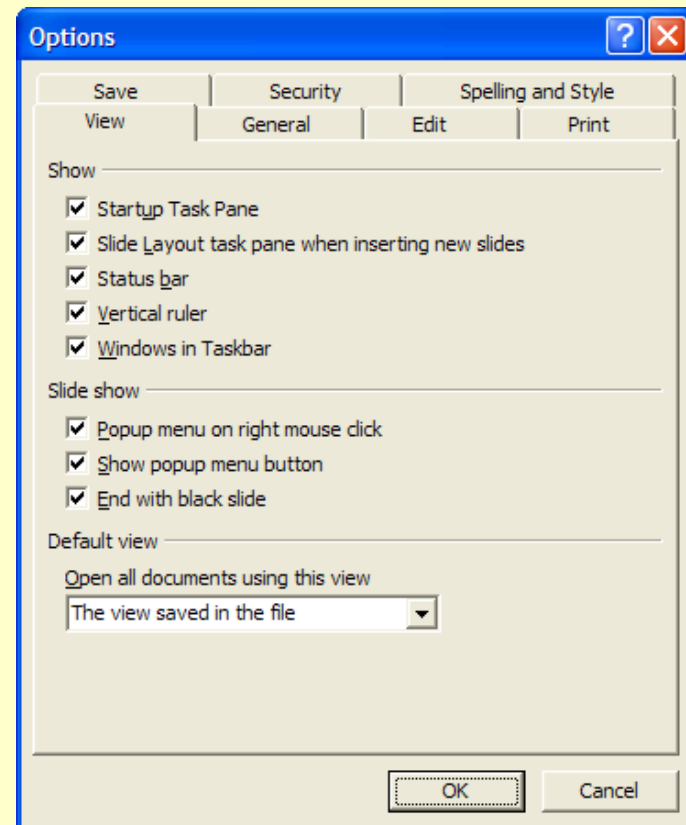
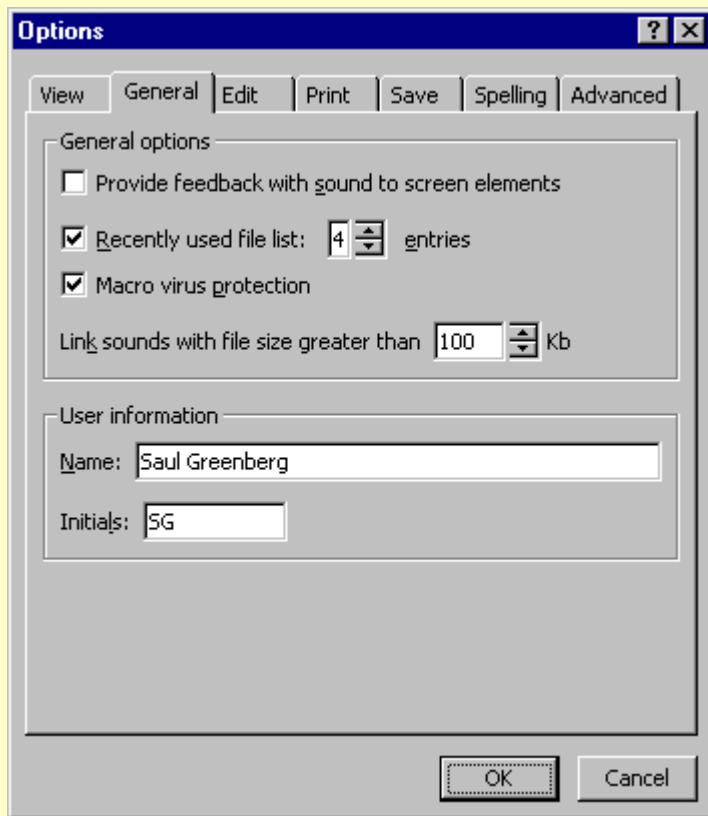
x

A diagram of a clean form layout. It features a primary window titled **MMMM** containing three rows of 'xxx: _____' and two rounded rectangular buttons. A secondary window titled **NNNN** is positioned behind it, partially overlapping the top of the primary window. This design separates the two sections, preventing clutter and ensuring information is not hidden.

✓

Tabs

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



Imagery

Signs, icons, symbols

- right choice within spectrum from concrete to abstract

Icon design is **very hard**

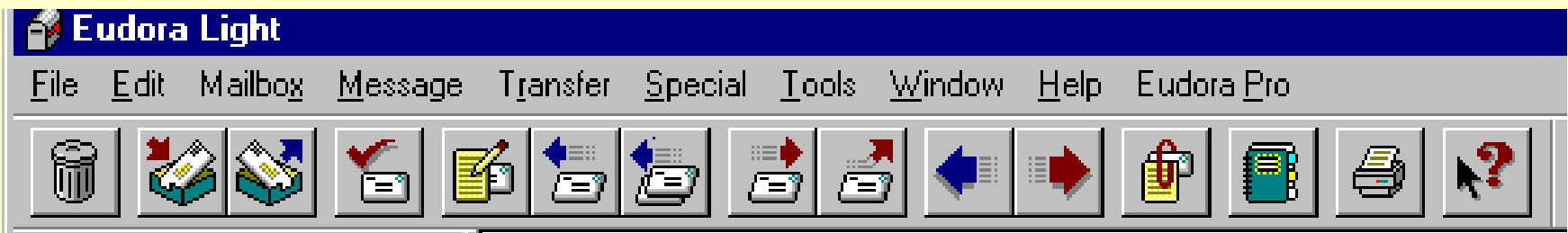
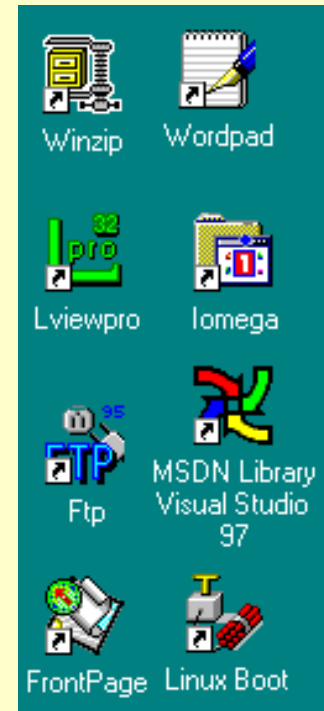
- except for most familiar, always label them

Image position and type should be related

- image "family"

Consistent and relevant image use

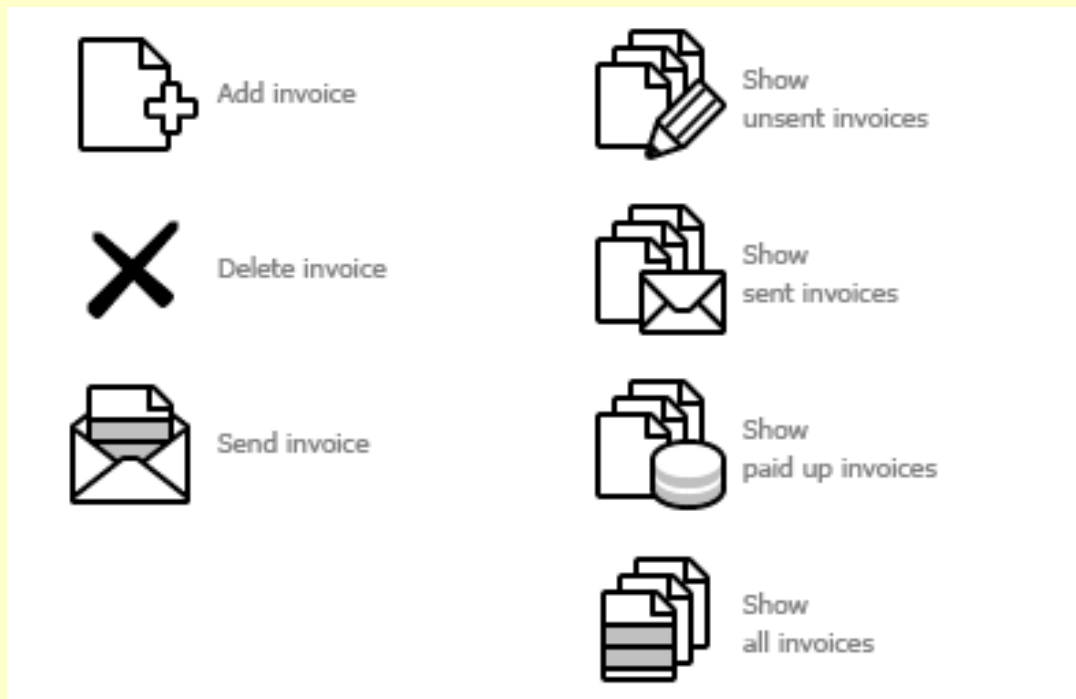
- identifies situations, offerings...



Icons easy ? Not at all !

Holistic approach

Make sure that each icon differs from surrounding icons, while still working together as a whole

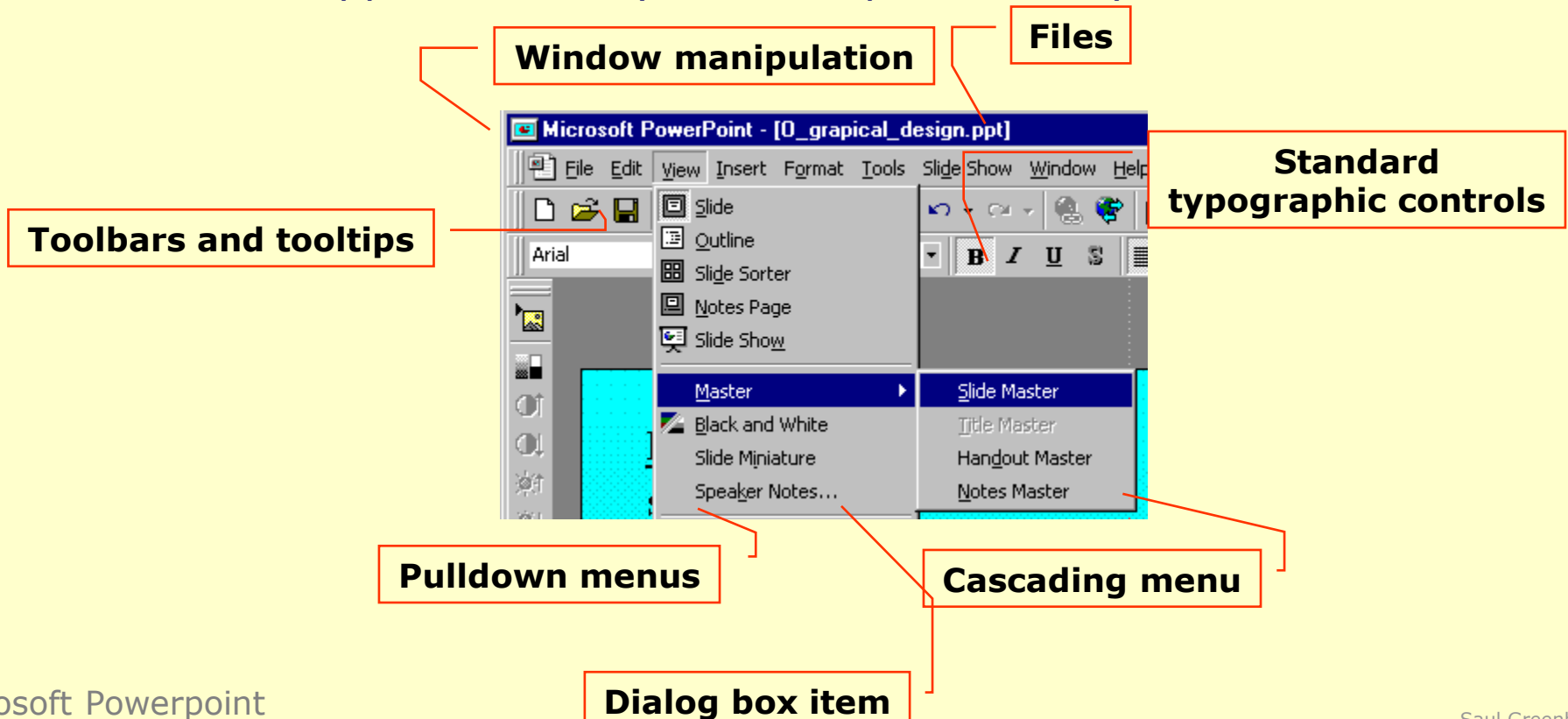


[7 Principles of Effective Icon Design](#)

Idioms

E.g.: Familiar ways of using GUI components

- appropriate for casual to expert users
- builds upon computer literacy
- must be applied carefully in walk up and use systems



How to choose between widgets

What components must be in the display?

- necessary visual affordances
- frequent actions
 - direct manipulation for core activities
 - buttons/forms/toolbar/special tools for frequent/immediate actions
 - menus/property window for less frequent actions
 - secondary windows for rare actions

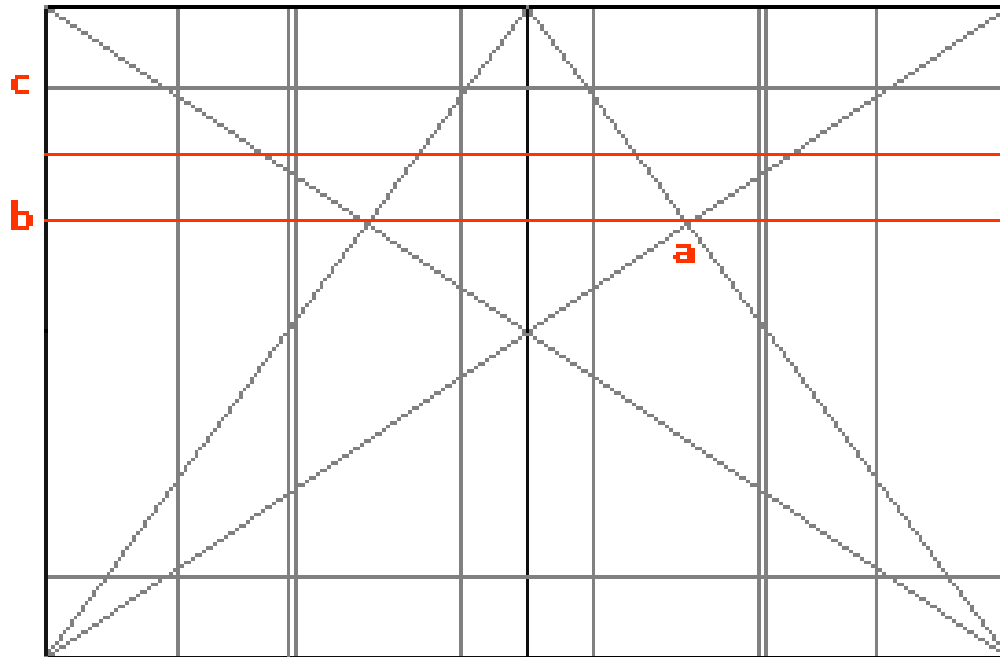
How are components related?

- organize related items as “chunks”

What are familiar and expected idioms?

- cross application look and feel

There is also a professional grid design



A 'hanging line' is then created by drawing a line across from the bisecting lines (a).

Dividing the space between line (b) and the top of our content area (c) gives us our hanging line.

4

Grid design and morning headache

We are not professional typography designers,
at least most of us, ...

So let the professionals to do the job ...

What you now know

CRAP principles

Grids help ... (an essential tool for graphical design)

Other visual concepts include

- visual consistency
 - repetition
- visual organization
 - contrast, alignment and navigational cues
- visual relationships
 - proximity and white space
- familiar idioms (may help or result in negative transfer effect)
- legibility and readability
 - typography
- appropriate imagery

Some reliable guidelines available ?

Jenifer Tidwell

Designing Interfaces: Patterns for Effective Interaction Design

O ' Reilly, 2006

Organizing content

Getting Around

Organizing Page

Doing Things

Showing Complex Data

Getting Input From Users

Builders and Editors

Making It Look Good

Some guidelines on WWW ?

Martijn van Welie, Philips Design

<http://www.welie.com/patterns/>

User needs

- Navigation around
- Basic interactions
- Searching
- Dealing with data
- Personalizing
- Shopping
- Making choices
- Giving input
- Miscellaneous

Application needs

- Drawing attention
- Feedback
- Simplifying interaction

Context of design

- Site types
- Experiences
- Page types

Example of a Welie's pattern

Directory Navigation

Problem: Users need to select an item out of a set

Solution: Sum up level 1 and 2

<u>Business & Economy</u> B2B , Finance , Shopping , Jobs ...	<u>Regional</u> Countries , Regions , US States ...
<u>Computers & Internet</u> Internet , WWW , Software , Games ...	<u>Society & Culture</u> People , Environment , Religion ...
<u>News & Media</u> Newspapers , TV , Radio ...	<u>Education</u> College and University , K-12 ...
<u>Entertainment</u> Movies , Humor , Music ...	<u>Arts & Humanities</u> Photography , History , Literature ...
<u>Recreation & Sports</u> Sports , Travel , Autos , Outdoors ...	<u>Science</u> Animals , Astronomy , Engineering ...
<u>Health</u> Diseases , Drugs , Fitness , Medicine ...	<u>Social Science</u> Languages , Archaeology , Psychology ...
<u>Government</u> Elections , Military , Law , Taxes ...	<u>Reference</u> Phone Numbers , Dictionaries , Quotations ...

Structure of patterns: Use when, How, More Examples

Interface Design and Usability Engineering

