

Graphical Screen Design

CRAP

(Contrast, repetition, alignment, proximity)

Grids

An essential tool for graphical design

Other important graphical screen design concepts

Visual consistency

Visual relationships

Visual organization

Legibility and readability

Appropriate imagery

Navigational cues

Familiar idioms

James Tam

The Squint Test

Used to determine what stands out or what elements appear to belong together



James Tam

CRAP: An Important Tool For Graphical Screen Design

Contrast

- Make different things even more different
- Brings out dominant elements & mute lesser elements

Repetition

- Consistency
- Repeat conventions throughout the interface to tie elements together

Alignment

- Visually associate related elements by lining them up

Proximity

- Group related elements
- Separate unrelated elements

James Tam

Contrasting Contrast

Laura Mathews
1993 Santa Rosa
Santa Rosa, California 95403
207.987.1234

Related Skills

Excellent working knowledge of laboratory tests and their application in oncology care through working in a clinical laboratory, monitored while providing patient care. Assisted with basic manual biopsy and aspiration, further practice, puncture, paracentesis, thoracentesis, and intrathecal chemotherapy administration. Promoted self-care skills and education of the client to their disease and particular treatment program.

Extensive experience with at-home care of site and cancer patients, including IV line maintenance, pain management, understanding of medication reimbursement and social service referrals.

Education

1990 Associate in Science Nursing, High Honors
Santa Rosa Junior College, Santa Rosa, California

Experience

1992-present Registered Nurse for Home Health Plus, Visit Division. At-home care of patients with multiple health problems, site, and cancer patients.

1990-present Registered Nurse for Memorial Hospital Oncology Unit, Santa Rosa, California. Managed the care of 4-5 oncology patients. Assisted lead nurse responsibilities. Assisted with new RN orientation. Assisted with procedures, administered chemotherapy, assessed for side effects of chemotherapy and disease process.

1985-1986 Nurse's Aide for Mendocino Coast District Hospital, Fort Bragg, California. Assisted with patient care in Med Surg and Obstetrics settings.

1983-1984 Lab Assistant for Mendocino Coast District Hospital, Fort Bragg, California. Computer skills while inputting data, cultured lab specimens.

Personal Statement

Previous work experience in a fast-paced, high-stress environment has fine-tuned my organizational skills. My experiences have made me comfortable with oncology patients and their families. Superbly value my organizational skills, responses to team and assume responsibilities, and my dedication to my job.

Laura Mathews
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James Tam

Repetition

Mickey Mouse

- Walt Disney Studios
Anaheim, California
58 years old, no children

Employment

- Walt Disney Studios
- Various television studios

Education

- Walt Disney Studios

Favorite Activities

- Driving steamboats
- Roping cattle

Favorite Quote

- Everybody can't be a duck.

James Tam

Alignment

Honor Form

Heresy rheumatic starry offer former's dodder, Violate Huskings, an wart hoppings dam honor form.

Violate lift wetter fodder, oiled former Huskings, hoe batter repetition for bang furry ritch--an furry stretchy. Infect, simple orphan set debt Violate's fodder worse nosing button oiled mouser. Violate, honor udder hen, worsed furry gnats parson--jester putty ladle form gull, sample, morticed, an unaffiliated.

Tarred gull

Wan moaning former Huskings mudst haze dodder setting honor cheer, during nosing.

"Violate" sorted dote former, "Watcher setting dam far? Denture nor yore canned gat ritch setting darn during nosing? Germ pup offer debt cheer?"

"Am tarred, Fodder," resplendent Violate warily.

"Watcher tarred far?" aster stretchy former, hoe dint half mush symphony further gull.

Feeder pegs

"Are badger dint doe mush woke disk moaning! Ditcher curry dose buckles fuller slob darn tutor peg-pan an feeder pegs?"

"Yap, Fodder. Are letter pegs."



"Ditcher mail-car caws an swoop offer caw staple?" "Oll curse, Fodder. Are mukt offer caws an swapped offer staple, letter checkings, an clammed upper lader inner checking-horse toe gadder

Honor Form

Heresy rheumatic starry offer former's dodder, Violate Huskings, an wart hoppings dam honor form.

Violate lift wetter fodder, oiled former Huskings, hoe batter repetition for bang furry ritch--an furry stretchy. Infect, simple orphan set debt Violate's fodder worse nosing button oiled mouser. Violate, honor udder hen, worsed furry gnats parson--jester putty ladle form gull, sample, morticed, an unaffiliated.

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James Tam

Proximity

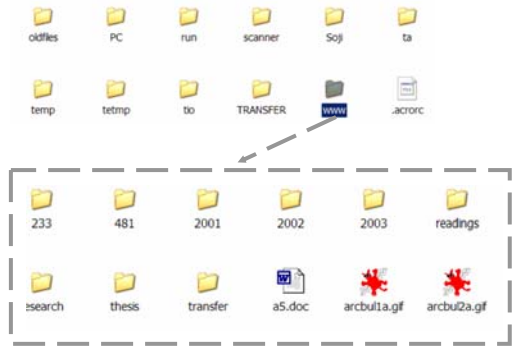
<p>CD ROMs CD ROMs Children's CDs Educational CDs Entertainment CDs Laser discs Educational Early learning Language arts Science Math Teacher Tools Books Teacher tools Videos Hardware & Accessories Cables Input devices Mass storage Memory Modems Printers & supplies Video and sound</p>	<p>CD ROMs</p> <hr/> <p>CD ROMs Children's CDs Educational CDs Entertainment CDs Laser discs</p> <p>Educational</p> <hr/> <p>Early learning Language arts Science Math</p> <p>Teacher Tools</p> <hr/> <p>Books Teacher tools Videos</p> <p>Hardware & Accessories</p> <hr/> <p>Cables Input devices Mass storage Memory Modems Printers & supplies Video and sound</p>
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James Tam

Graphical Design

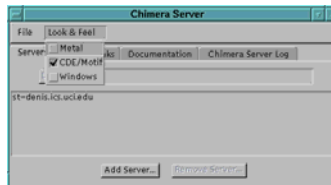
Must account for:

- A comprehensible mental image
 - Metaphor (known <-> unknown)
- Appropriate organization of data, functions, tasks and roles
 - Cognitive model (how do I think it works)



Graphical Design (2)

- Quality appearance characteristics
 - The “look”
- Effective interaction sequencing
 - The “feel”



James Tam

Components of Visible Language

Layout

- Formats, proportions, and grids

scarves: 10.75
hats: 5.43

Typography

- Typefaces and typesetting

bold serif fixed
italic sans-serif variable

Imagery

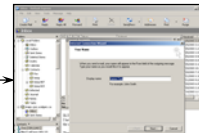
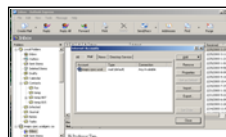
- Signs, icons, symbols; concrete to abstract



BOOZE!

Sequencing

- How the interface unfolds



James Tam

Components Of Visible Language (2)

Visual identity

- Unique appearance



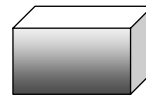
Animation

- Dynamics of display



Color and Texture

- Convey complex information and pictorial reality



James Tam

Grids

Horizontal and vertical lines to locate window components

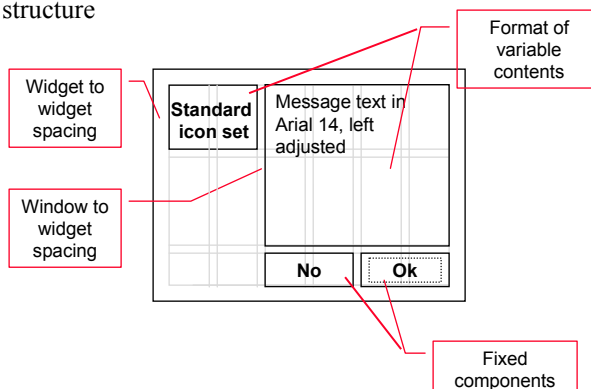
- Aligns related components

Organization

- Contrast to bring out dominant elements
- Grouping of elements by proximity
- Show organizational structure
- Alignment

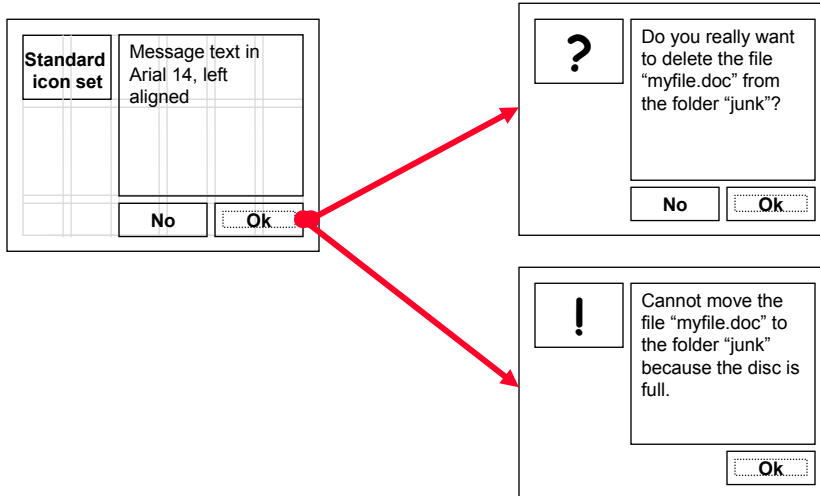
Consistency

- Location
- Format
- Repetition
- Organization



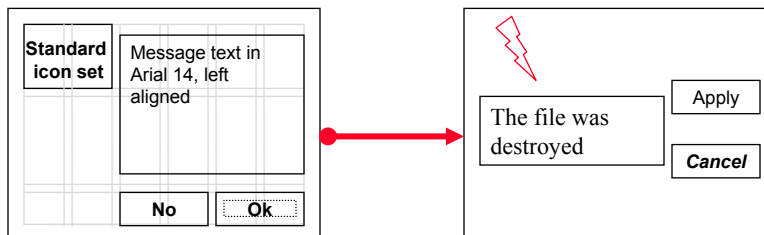
James Tam

Uses A Grid: Consistent



James Tam

No Grid: Inconsistent



James Tam

Another Grid Example

Two-level Hierarchy

- indentation
- contrast

Logic of organizational flow

Alignment connects visual elements in a sequence

Grouping by white space

James Tam

Visual Consistency: Internal Consistency

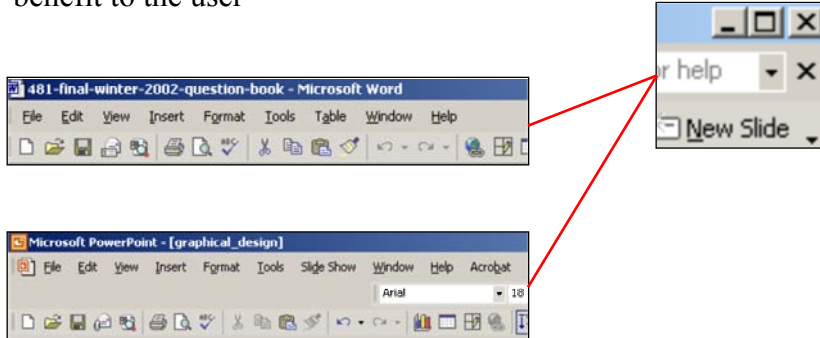
- Unless there is a compelling reason all elements of the same program follow the same rules and conventions
- Application specific grids can be used to enforce this

Doh!

James Tam

Visual Consistency: External Consistency

- Follow interface and platform style conventions
- Use grids that are platform (e.g., Windows) and widget (e.g., Java Swing) specific
- Deviate from these conventions only when there is a clear benefit to the user



James Tam

External Consistency Violated

The screenshot displays a web interface for 'LIGANDFIT', a cancer research project. The interface is divided into several sections:

- Primary Task Information:** Displays the project name 'LIGANDFIT', the phase 'CANCER RESEARCH PROJECT, PHASE II', and a description: 'LigandFit helps scientists to characterize therapeutic targets and identify and assess drug candidates by performing automated docking of flexible ligands to a protein's binding site.' It also shows 'Task CPU Time: 3 hrs 7 mins 27 secs' and a 'Task Execution Progress' bar at 57%.
- Member Information:** Shows the member's name 'JimmyT', 'Total Points: 889891', and 'Total CPU Time: 5 years: 132 days: 15 h: 25 m: 23 s'. A link 'View your scores and rewards' is provided.
- Device Information:** Shows 'Overall Performance' with a score of 100, comparing the user's device to a 'High-end Desktop System'. Other metrics include Processor, Memory (185), and Network. A link 'View your device list' is provided.

The interface includes a 'Learn about this Project' link and a footer with the 'UNITED DEVICES™' logo and the text 'The UD agent © United Devices: www.ud.com'. A status bar at the bottom indicates 'Primary task is executing...' with several icons.

The UD agent © United Devices: www.ud.com

James Tam

A Tool For Ensuring Consistency: Mumble Text



James Tam

Structure Is Difficult To Ascertain

sometimes be more a nuisance than a benefit. This was found to be the case in my own investigation of potential change display mechanisms summarized in Chapter 5 and published as Tam, McCaffrey, Maurer, and Greenberg (2000). During this study, many test participants expressed a desire for useful abstractions that combine rudimentary change information into one higher-level conceptual change. For example, one participant noted while watching the animated replay of a class name being shown "...I don't need to see each and every character being typed just to see a name change!" Of course, care must be taken to make these abstractions understandable, e.g., by using already familiar representations or notations. This minimizes the cost of acquiring information while maximizing its benefits due to the added structure and organization.

Based upon my previous findings (to be discussed in Chapter 5), I add a third dimension, *persistence*, to Gutwin's classification. Persistence refers to how long the information is displayed (Figure 4.1 side pane). The display of information is *permanent* if it is always visible and *passing* if it only appears for a certain period. We noticed how study participants frequently complained when important information disappeared off the screen. Conversely, they also indicated that screen clutter might occur with the mechanisms that constantly displayed all changes. Thus, there's a need to classify change information according to how long it should stay visible.

With permanent persistence, the effort needed to find changes i.e., the acquisition cost is low because the information is always there. Ideally, a person merely has to shift their gaze over to see the information. Because people can become accustomed to the occurrence of workspace events, they can also ignore things that do not interest them and pay closer attention to things that are of interest (Gutwin 1997).

With passing persistence, information about changes is presented only for a limited duration. This is useful when the information applies only to a specific portion of the project (artifact or group of artifacts) being viewed, or when the change information otherwise becomes irrelevant.

The matrix in Figure 4.1 suggests that these dimensions can be combined, giving eight possibilities. For example, a literal, situated and passing display of changes is depicted in Figure 4.2a. The figure shows an animation of a changed circle (by using a 'replay' technique) where the circle literally retraces the path that it took as it was moved. It is situated because the animation occurs in the same place that the change actually happened. The persistence is 'passing' because once an animation has replayed a change, the information is gone. Figure 4.2b shows two other examples within a concept map editor. The first illustrates the symbolic, situated and permanent octant, where color value (shades of gray) is used to indicate changed 'Jim' and 'Jack' nodes. Thus, it is symbolic because changes are mapped to a gray scale value, situated because the shading is applied directly to the node that was changed, and permanent because the color values are always on. Figure 4.2b also portrays an example of the symbolic, separate, and passing octant, where a person can raise a node's change details in a pop-up as a text description by mousing-over the node. Thus it is somewhat separate as the information appears outside the changed node, it is symbolic as it uses the text to describe the changes, and passing because the pop-up disappears when the person moves the mouse off the node (not quite on the node).

In summary, these three dimensions provide the designer with a means of classifying change information. I now turn to other display issues, where we need to represent the change information in an easily understood and readily accessible fashion.

James Tam

An Implicit Structure Is Imposed

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Structure Is Implied With White Space

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Relationships Between Screen Elements

- Using white space (negative proximity) vs. forcing an explicit onscreen structure (e.g., the use of bounding boxes)

Mmmm: <input type="text"/>	Mmmm: <input type="text"/>	Mmmm: <input type="text"/>
Mmmm: <input type="text"/>	Mmmm: <input type="text"/>	Mmmm: <input type="text"/>
Mmmm: <input type="text"/>	Mmmm: <input type="text"/>	Mmmm: <input type="text"/>
Mmmm: <input type="text"/>	Mmmm: <input type="text"/>	Mmmm: <input type="text"/>
Mmmm: <input type="text"/>	Mmmm: <input type="text"/>	Mmmm: <input type="text"/>

xx✓

James Tam

Explicit Structure

The image shows two overlapping dialog boxes from Microsoft Word. The background dialog box is the 'Footnote' dialog, with the 'Numbering Style' set to 'Numeric (4)'. The foreground dialog box is the 'Sort' dialog, which is divided into three columns: 'First Sort', 'Second Sort', and 'Third Sort'. Each column has a 'Sort By' dropdown menu and radio buttons for 'Ascending' and 'Descending'. The 'First Sort' dropdown is set to 'Start Time', and the 'Ascending' radio button is selected. The 'Second Sort' and 'Third Sort' dropdowns are set to 'No Sort'. The 'Sort' dialog has 'Cancel' and 'OK' buttons. The 'Footnote' dialog has 'Set', 'Cancel', and 'Help' buttons. A red circle highlights the 'Set' button in the 'Footnote' dialog.

Using explicit structure as a crutch from Mullet & Sano page 31

James Tam

What Are The Input Fields? What Is Output Only?

- Bad alignment
- Poor choice of colors to distinguish labels from editable fields

Form Title -- (appears above URL in most browsers and is used by WWW 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 <input checked="" type="checkbox"/> Center		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!****		
<< Prev Tab		Next Tab >>

Webforms

James Tam

No Regard For Order And Organization

Advanced FAX Settings

Aptiva Communication Center

Speaker setting

On On until connect Off

Wait 45 seconds for connection

Retry after 60 seconds Number of retries 3

Resolution

Fine Standard

Maximum transmit rate: 14400 bps

Paper size: Letter (8½ x 11 in)

Use custom editor: xe C:\Phoenix\Fax_inst.wri Browse...

Save Cancel Help

IBM's Aptiva Communication Center

James Tam

A Haphazard Layout

Haphazard layout
from Mullet & Sano page 105

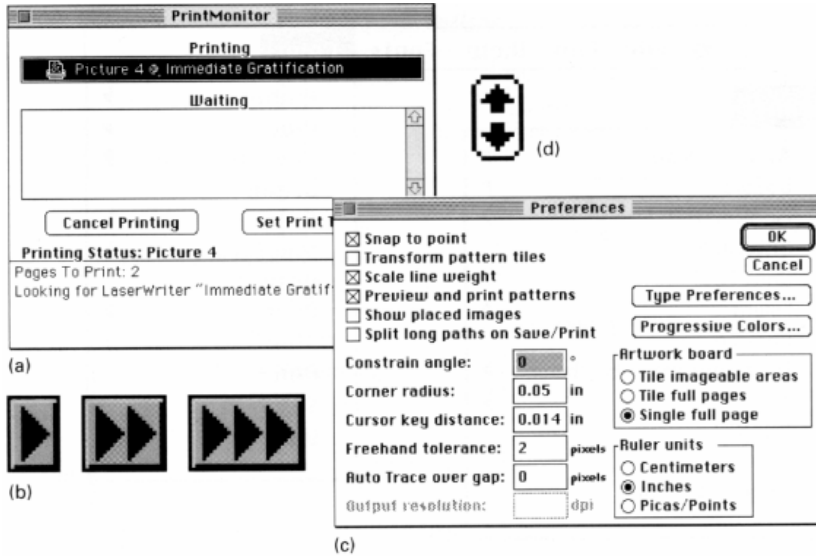
James Tam

Repairing A Haphazard Layout

Repairing a
haphazard layout
from Mullet &
Sano page 105

James Tam

Spatial Tension



Spatial Tension from Mullet & Sano page 72

James Tam

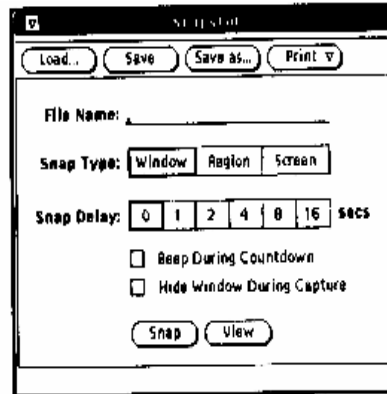
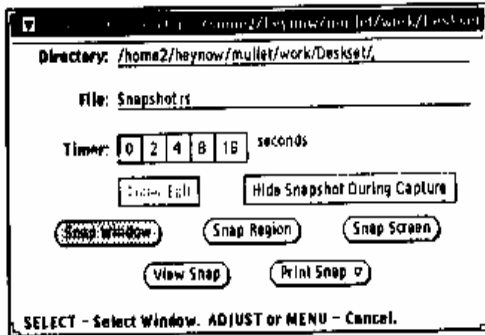
Overuse Of 3D Makes The Layout Look Cluttered



WebForms

James Tam

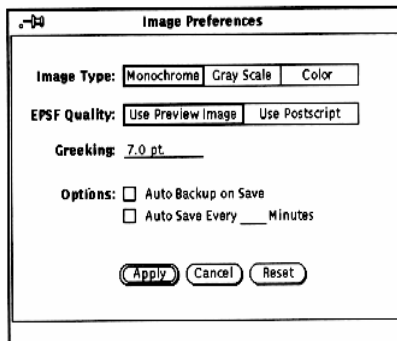
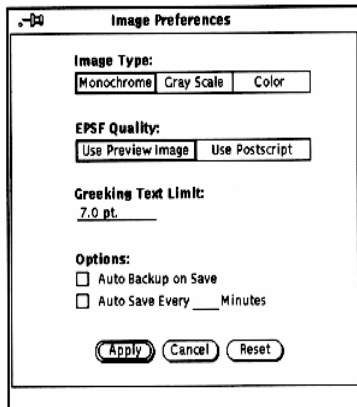
Re-Factoring An Interface



Redesigning a layout using alignment and factoring from Mullet & Sano Page 119

James Tam

The Importance Of Negative (White) Space

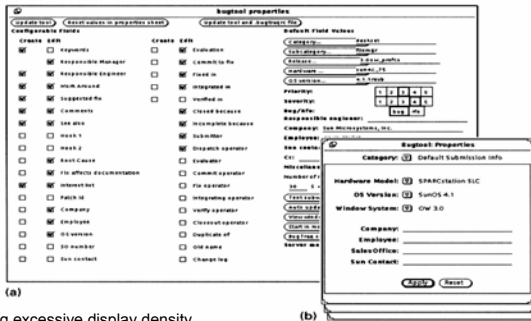


The importance of negative space from Mullet & Sano page 129

James Tam

Economy Of Visual Elements

- Minimize number of controls
- Include only those that are necessary
 - Eliminate, or relegate others to secondary windows
- Minimize clutter
 - So information is not hidden

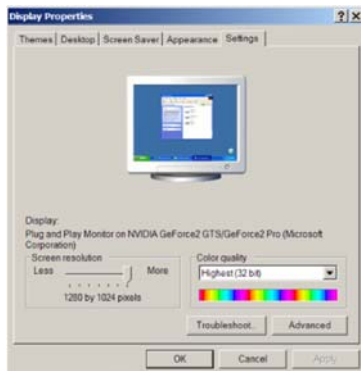


Repairing excessive display density
from Mullet & Sano Page 111

James Tam

Economy Of Visual Elements (Tabs)

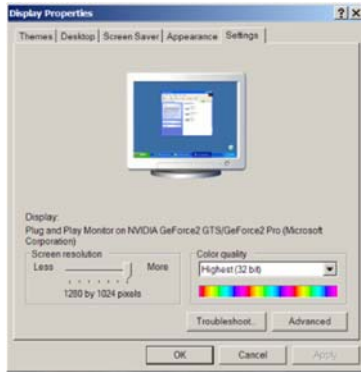
Excellent means for factoring
related items



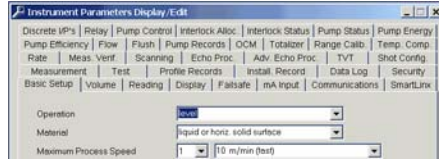
James Tam

Economy Of Visual Elements (Tabs)

Excellent means for factoring related items



But it can be overdone



James Tam

Legibility And Readability: Font Choice

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.

Legibility And Readability: Capitalization

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?

Legibility And Readability: Capitalization (2)

THIS IS AN EXAMPLE OF TEXT THAT IS SHOWN ALL IN CAPITAL LETTERS. AS YOU CAN PROBABLY TELL, THE LACK OF VARIATION IN HEIGHT MAKES IT SOMEWHAT MORE DIFFICULT TO READ. THIS WHOLE PARAGRAPH JUST GOES ON AND ON WITHOUT SAYING ANYTHING SIGNIFICANT. THE OTHER SIDE EFFECT OF ALL CAPITALS IS THAT SOME PEOPLE THINK THAT IT IS THE TEXT EQUIVALENT OF SHOUTING AT SOMEONE. ALSO OTHER PEOPLE MAY THINK THAT IT IS MORE SIGNIFICANT BECAUSE IT IS ALL IN CAPITALS. THAT IS PROBABLY WHY SOME PEOPLE DO IT - IN ORDER TO GIVE THE IMPRESSION THAT THEIR MESSAGE IS REALLY IMPORTANT. BUT AS YOU HAVE PROBABLY ASCERTAINED (ASSUMING THAT YOU HAVE EVEN READ THIS FAR) THAT PUTTING TEXT ALL IN CAP'S IS SIMPLY TOO PAINFUL TO READ.

Use Capitalization Sparingly

Proverbs On Individual Differences

You do **NOT** necessarily represent a good representative user of equipment or systems you design

Do not expect others to think and behave as you do, or as you might like them to.



People vary in thought and behaviour just as they do physically

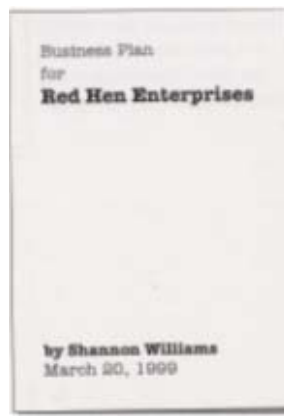


James Tam

James Tam

Center Alignment

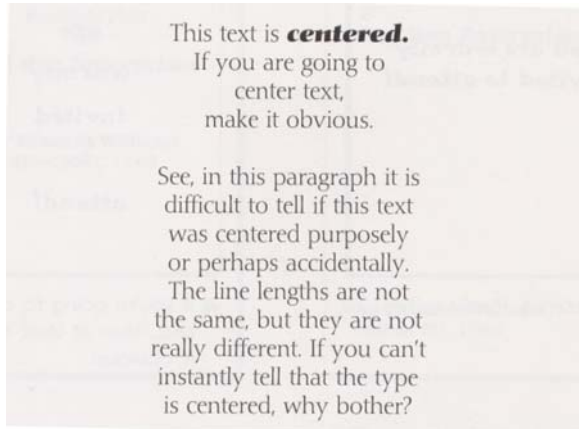
- Some regard it as unprofessional and advocate against it's use.
- It's described as being unprofessional looking and plain.



Center Alignment



- **If you are employing it to provide contrast then make it obvious**



Legibility And Readability

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

Text set in
Helvetica

Text set in
Times Roman



TEXT SET IN
CAPITOLS

Text set in
Braggadocio

Text set in
Courier



Legibility And Readability

Proper use of typography

- 1-2 typographical effects (typeface or typography) - 3 max
 - Font types, normal, italics, bold, underline
- 1-3 fonts sizes max

Large

Medium
Small

Readable

Design components to be
inviting and attractive

Design components to be
inviting and attractive

✓

Large

Medium
Small

Unreadable

Design components to be
inviting and attractive

Design components to be
inviting and *attractive*

✗

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Legibility And Readability

- Typesetting
 - Point size
 - Word and line spacing
 - Line length
 - Indentation
 - Color

Readable

Design components to be
inviting and attractive

Design components to be
inviting and attractive

✓

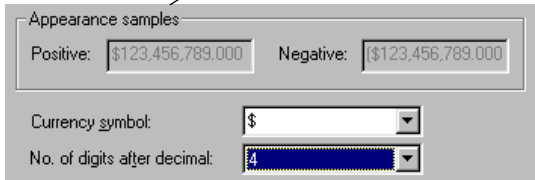
Unreadable: Design components
to be easy to interpret and
understand. Design components to
be inviting and attractive

✗

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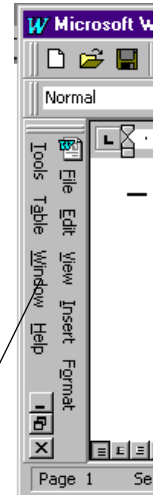
Legibility And Readability

Grayed-out example text hard to read.
Why not make it black?



Regional Preferences applet in Windows95

Text orientation makes it difficult to read



MS-Word James Tam

Imagery

Signs, icons, symbols

- Right choice within spectrum from concrete to abstract

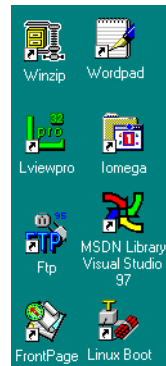


BOOZE!



Icon design *very* hard

- Except for most familiar, always label them

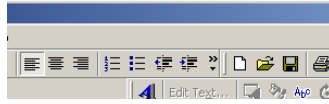


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Imagery (Continued)

Image position and type should be related

- Image “family”



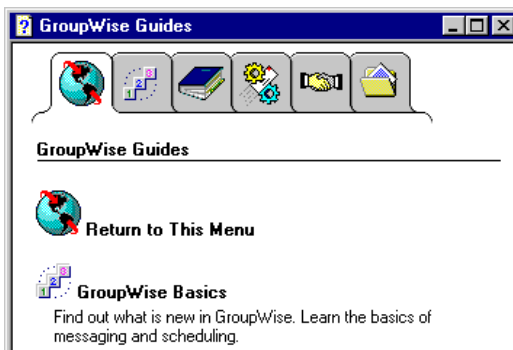
- Don't mix metaphors

Consistent and relevant image use

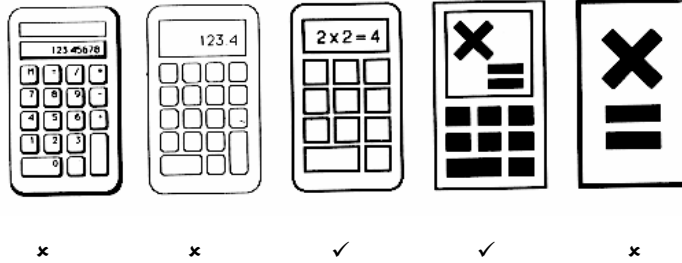
- Not gratuitous
- Identifies situations, offerings...

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Why Icon Design Is Hard: An Example



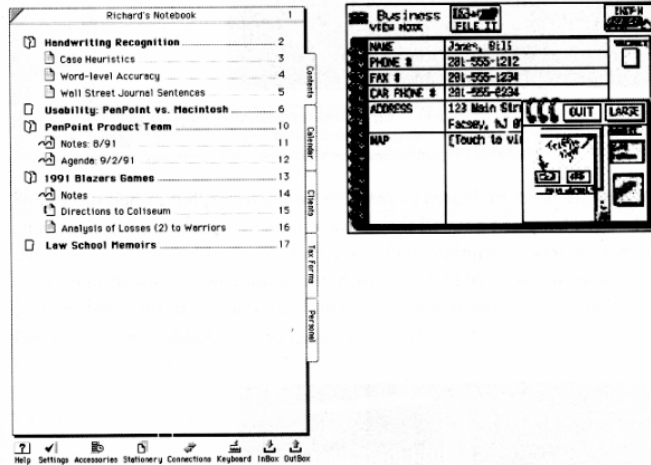
Icon Design: Use The Appropriate Level Of Detail



Choosing levels of abstraction from Mullet & Sano Page 174

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Interface Design: Use An Appropriate Level Of Detail



Refined vs excessive literal metaphors from Mullet & Sano page 25

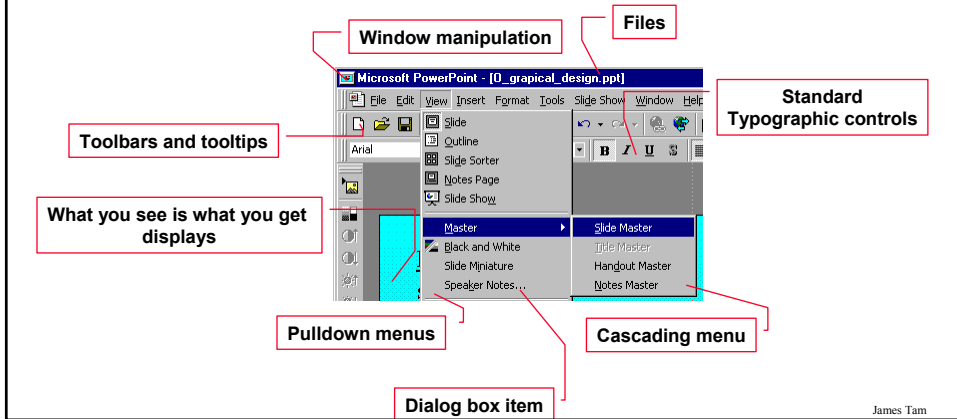
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Idioms

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

Some examples

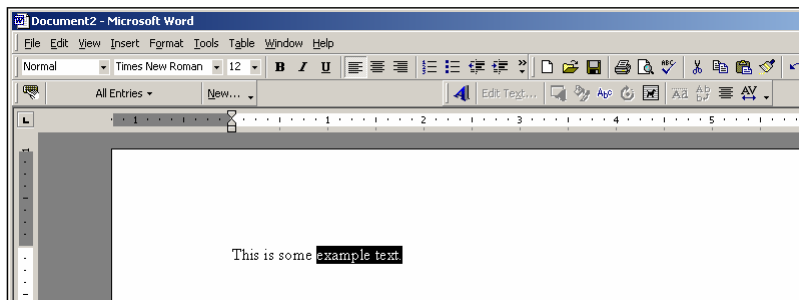


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How To Choose Between Widgets

1) 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

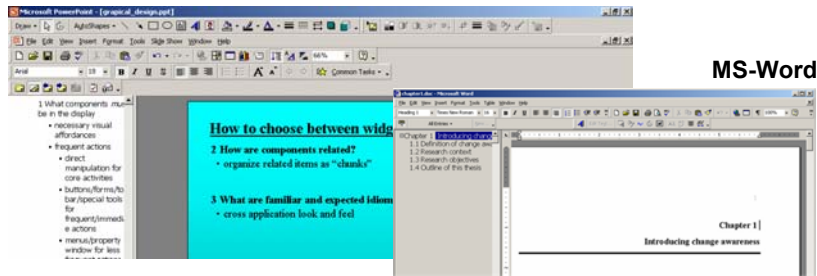


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How To Choose Between Widgets (Continued)

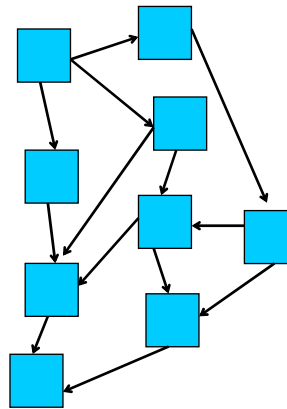
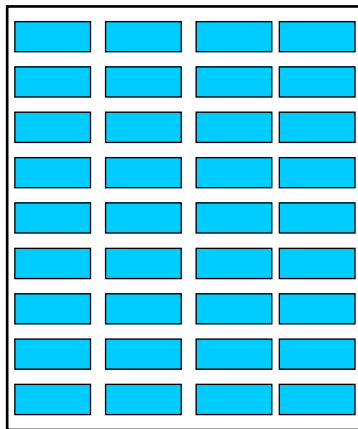
- 2) How are components related?
 - Organize related items as “chunks”
- 3) What are familiar and expected idioms?
 - Cross application look and feel

MS-PowerPoint



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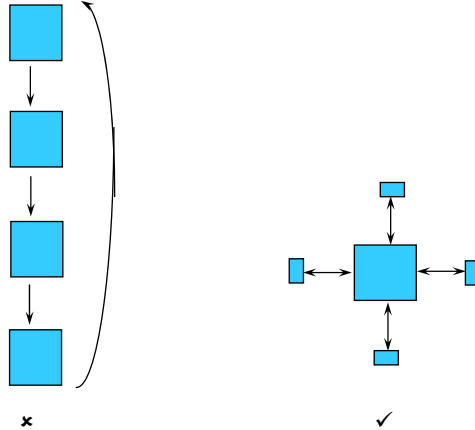
Balance Between Too Many Controls On A Single Screen Vs. Too Many Screens



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Widgets And Complexity

- How can window navigation and clutter be reduced?
 - Avoid long paths
 - Avoid deep hierarchies
 - Re-factor/combine functions



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What You Now Know

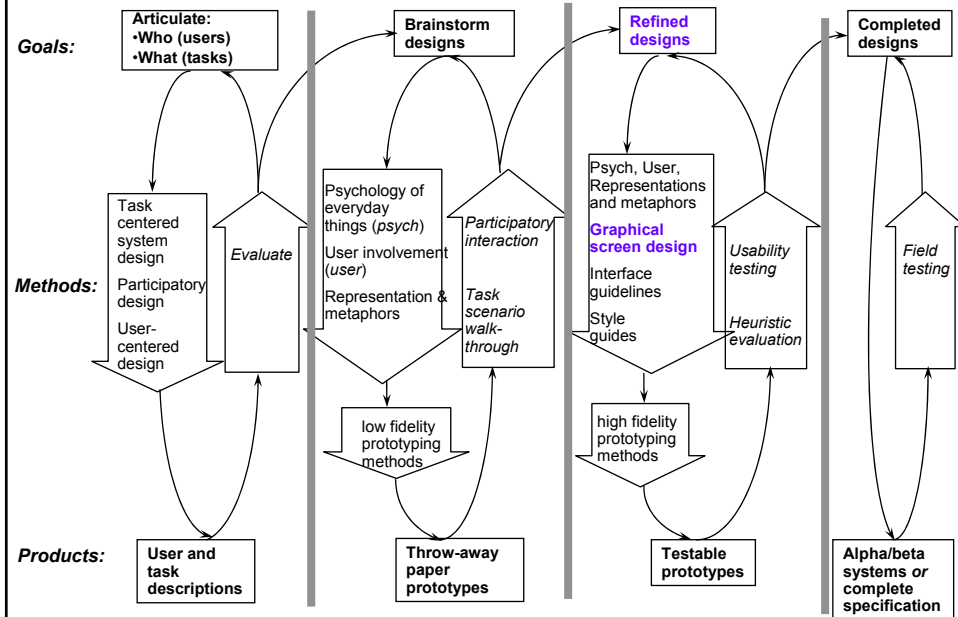
Grids and C.R.A.P. are essential tools for graphical design

Important visual concepts include

- Visual consistency
 - Repetition
- Visual organization
 - Contrast, alignment and navigational cues
- Visual relationships
 - Proximity and white space
- Familiar idioms
- Legibility and readability
 - Typography
- Appropriate imagery

James Tam

Interface Design And Usability Engineering



This diagram is a variation of the one presented by Saul Greenberg

James Tam