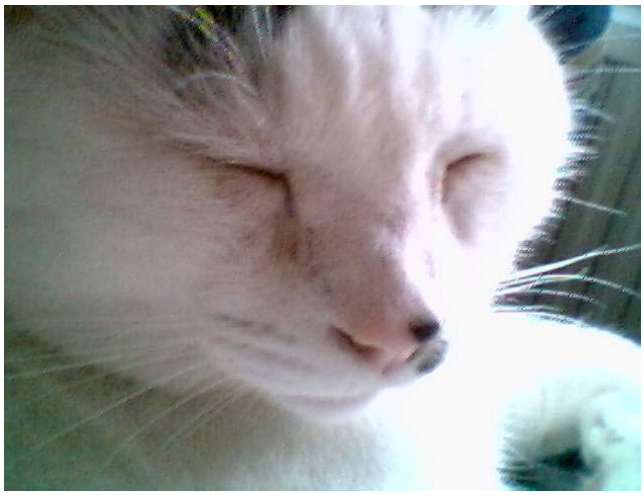
Graphical Screen Design

CRAP
(Contrast, repetition, alignment, proximity)
Grids
An essential tool for graphical design
Other important graphical screen design concepts
Visual consistency
Visual organization
Appropriate imagery
Familiar idioms
Visual relationships
Legibility and readability
Navigational cues
General design principles for displaying information
Gestalt Laws
Visual and spoken language
Image-based recognition

The Squint Test

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



CRAP: An Important Tool For Graphical Screen Design

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

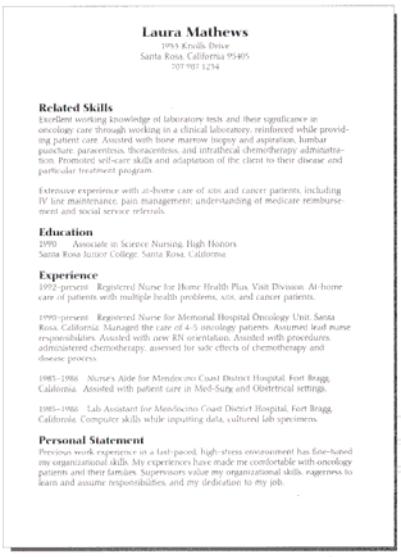
Repetition
- Consistency
- Repeat conventions throughout the interface to tie elements together

Alignment
- Visually associate related elements by lining them up

Proximity
- Group related elements
- Separate unrelated elements

James Tam

Contrasting Contrast



Laura Mathews

1953 Knolls Drive
Santa Rosa, California 95405
707 987 1254

Related Skills

Excellent working knowledge of laboratory tests and their significance in oncology care through working in a clinical laboratory, reinforced while providing patient care. Assisted with bone marrow biopsy and aspiration, lumbar puncture, paracentesis, thoracentesis, and intrathecal chemotherapy administration. Promoted self-care skills and adaptation of the client to their disease and particular treatment program.

Extensive experience with at-home care of sons and cancer patients, including IV line maintenance, pain management; understanding of medicare 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, stds, and cancer patients.

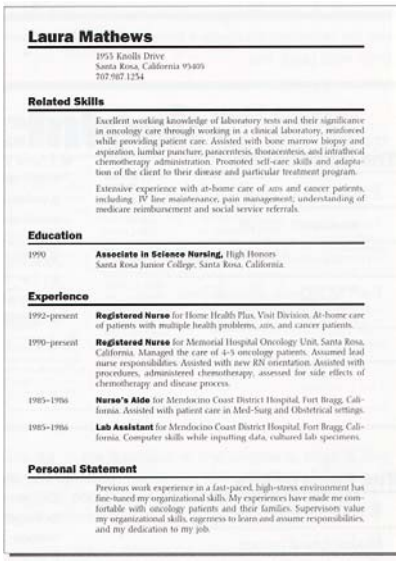
1990–present Registered Nurse for Memorial Hospital Oncology Unit, Santa Rosa, California. Managed the care of 4–5 oncology patients. Assumed lead nurse responsibilities. Assisted with new RN orientation. Assisted with procedures, administered chemotherapy, assessed for side effects of chemotherapy and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

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

1985–1986 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. Supervisors value my organizational skills, eagerness to learn and assume responsibilities, and my dedication to my job.



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From "The Non-Designers Design book by Robin Williams

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.

From "The Non-Designers Design book by Robin Williams

James Tam

Alignment

Honor Form

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

Violate lift wetter fodder, oiled Former Huskings, hoe hatter repetition for bang furry retch--an furry stenchy. Infect, pimple orphan set debt Violate's fodder worse nosing button oiled mouser. Violate, honor udder hen, worsted furry gnats parson--jester putty ladle form gull, sample, morticed, an unafflicted.

Tarred gull

Wan moaning Former Huskings nudist haze dodder setting honor cheer, during nosing.

"Violate!" sorted dole former, "Watcher setting darn fur? Denture nor yore canned gat retch setting darn during nosing? Germ pup otter debt cheer!"

"Arm tarred, Fodder." resplendent Violate warily.

"Watcher tarred fur?" aster stenchy former, hoe dint half mush symphony further gull.

Feeder pegs

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

"Yap, Fodder. Are fetter pegs."

"Ditcher mail-car caws an swoop otter caw staple?" "Off curse, Fodder. Are mulct oiler caws an swapped otter staple, fetter checkings, an clammed upper larder inner checking-horse toe gadder

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From "The Non-Designers Design book by Robin Williams

James Tam

Proximity

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

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

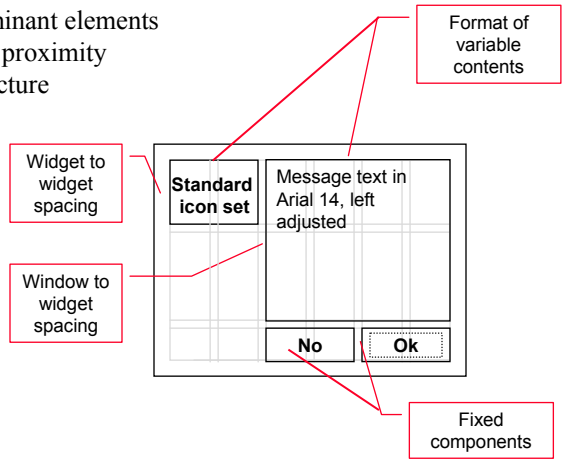
From "The Non-Designers Design book by Robin Williams

Grids

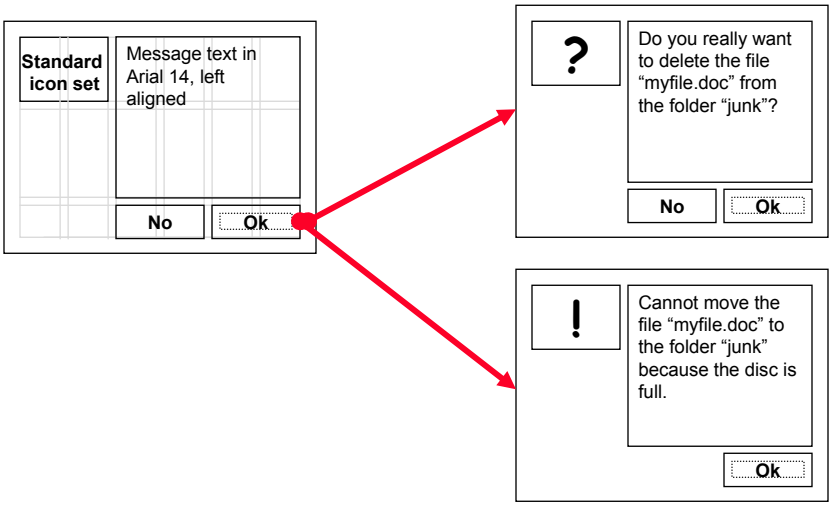
Horizontal and vertical lines to locate window components
- Aligns related components

Organizes the display:
- Contrast to bring out dominant elements
- Grouping of elements by proximity
- Show organizational structure
- Alignment

Provides consistency
- Location
- Format
- Repetition
- Organization

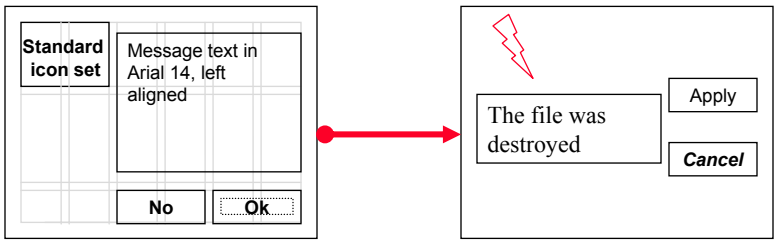


Using A Gird: Consistent



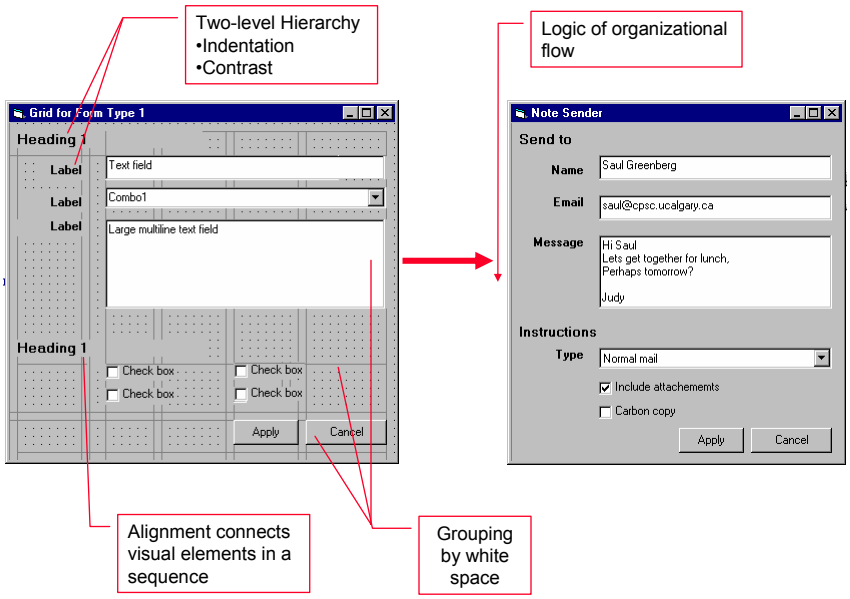
James Tam

No Grid: Inconsistent



James Tam

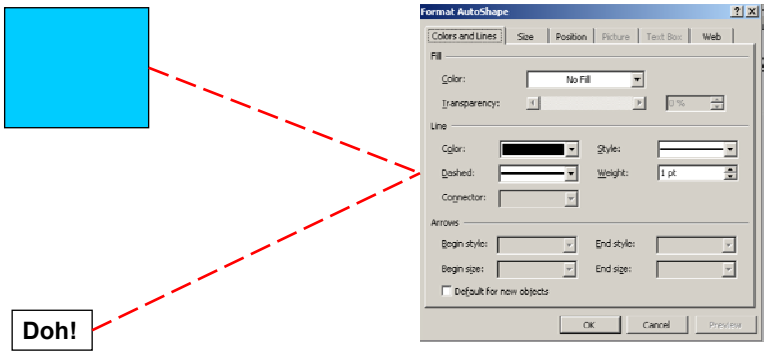
Another Grid Example



James Tam

Visual Consistency: Internal Consistency

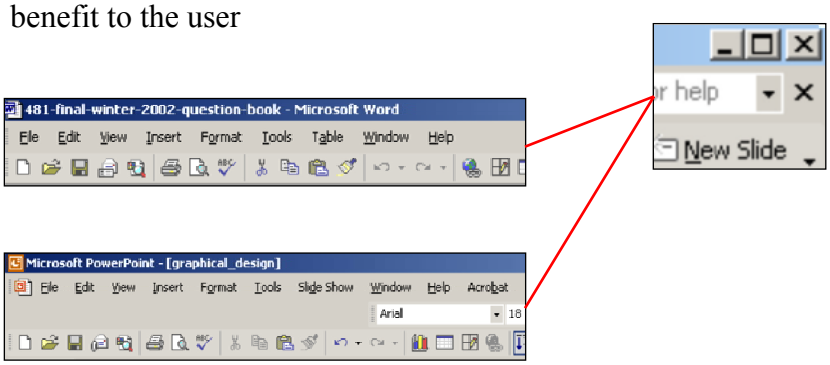
- Unless there is a compelling reason all elements of the same program follow the same rules and conventions
- Application specific grids can be used to enforce this



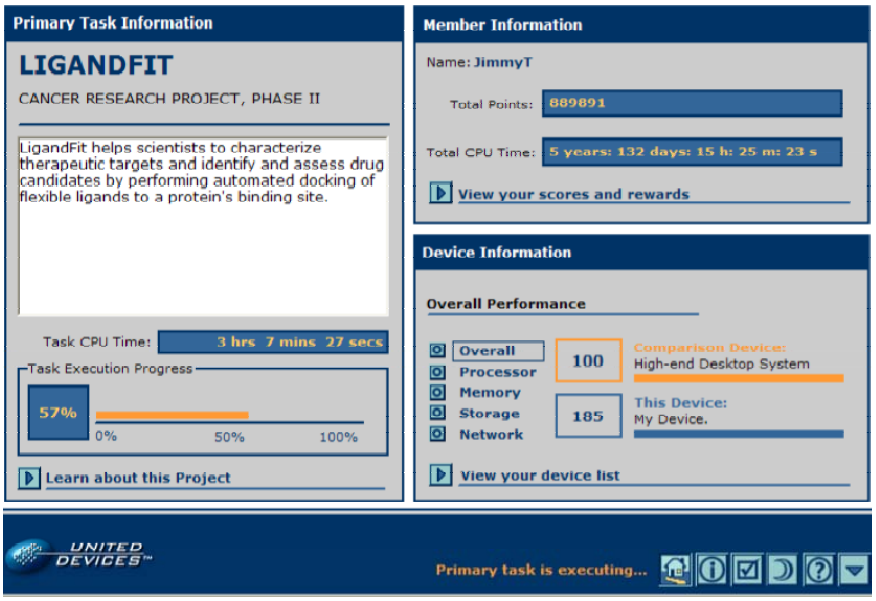
James Tam

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

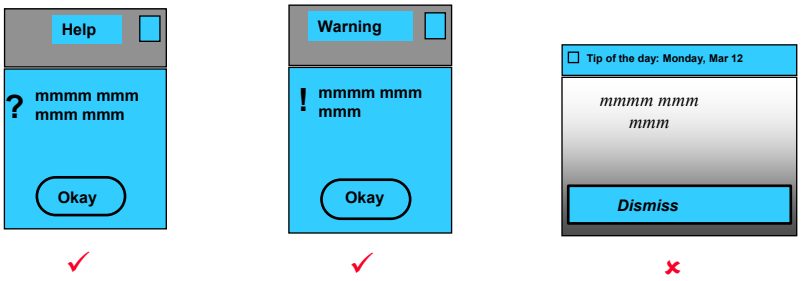


External Consistency Violated



The UD agent © United Devices: http://www.grid.org/projects/cancer/

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. This is quite an important point for us. 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

Structure Is Difficult To Ascertain: Don't Impose An Explicit Structure

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James Tam

Structure Is Implied With White Space

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James Tam

Relationships Between Screen Elements

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

No structure

Mmmm:
Mmmm:
Mmmm:
Mmmm:
Mmmm:

✗

Explicit structure

Mmmm:
Mmmm:

Mmmm:
Mmmm:
Mmmm:

✗

Implicit structure

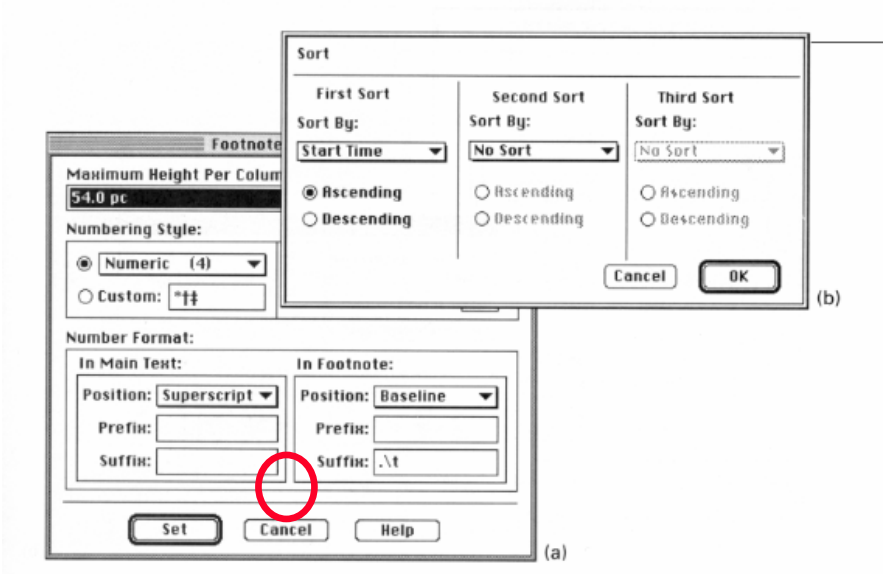
Mmmm:
Mmmm:

Mmmm:
Mmmm:
Mmmm:

✓

James Tam

Examples Of Explicit Structure



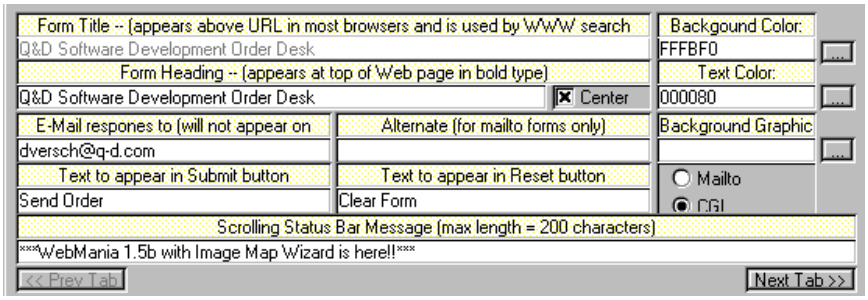
Using explicit structure as a crutch from Mullet & Sano page 31

James Tam

An Example Of Poor Presentation

- Problems:
  - What Are The Input Fields?
  - What Is Output Only?

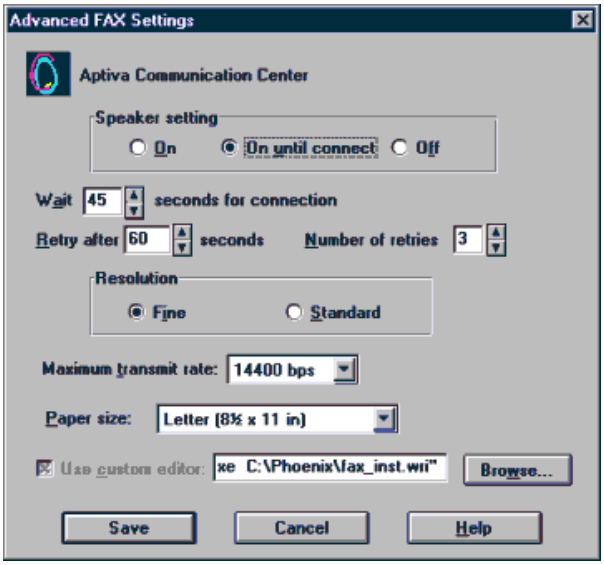
- Causes:
  - Bad alignment
  - Poor choice of colors to distinguish labels from editable fields



Webforms

James Tam

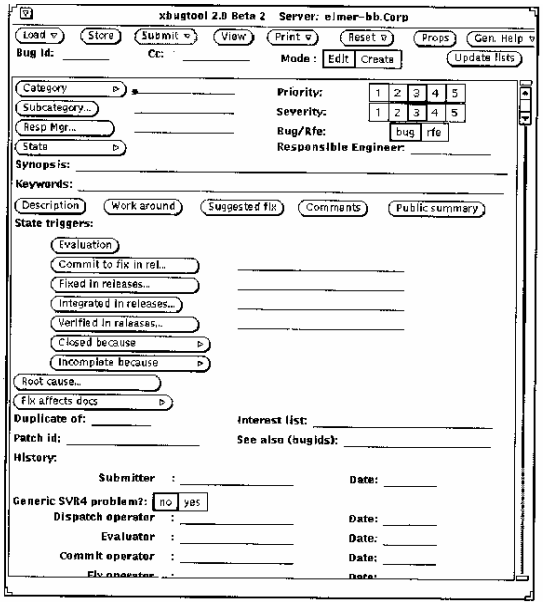
Another Example: No Regard For Order And Organization



IBM's *Aptiva Communication Center*

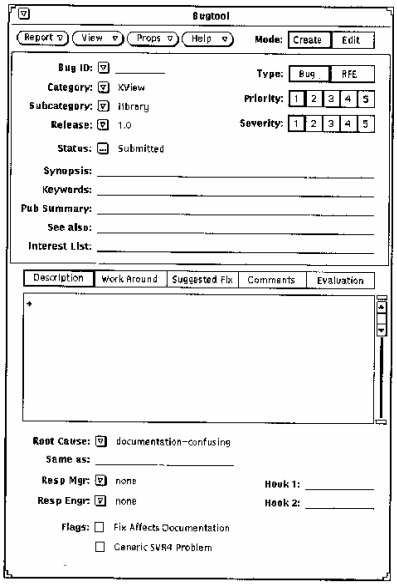
James Tam

Yet Another Example: A Haphazard Layout



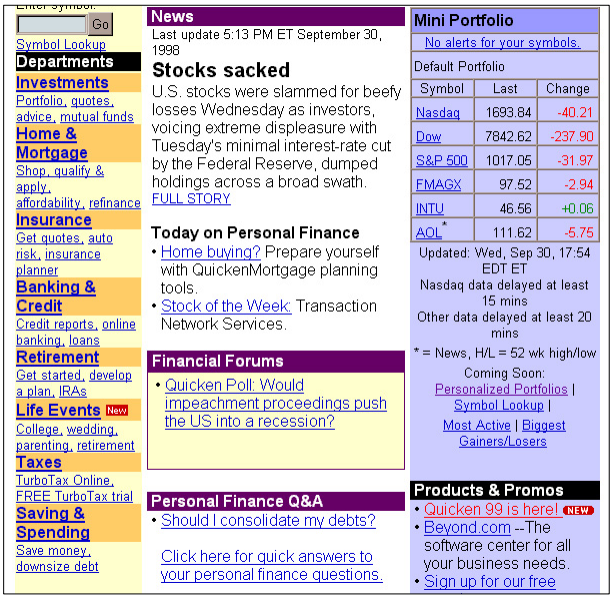
Haphazard layout from Mullet & Sano page 105

Repairing A Haphazard Layout



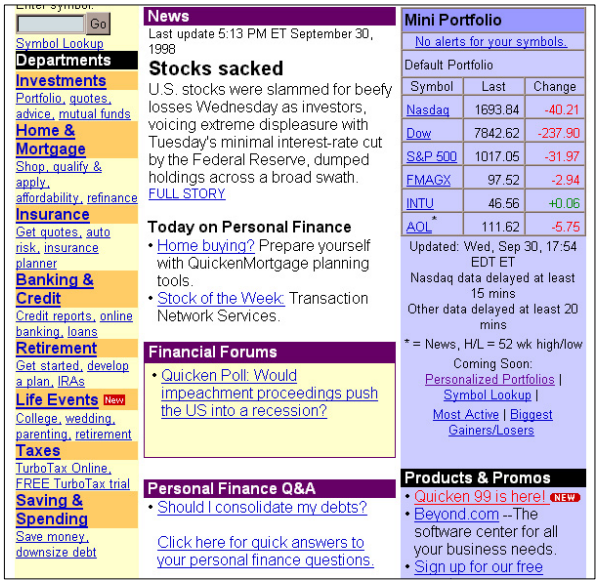
Repairing a haphazard layout from Mullet &Sano page 105

Spatial Tension



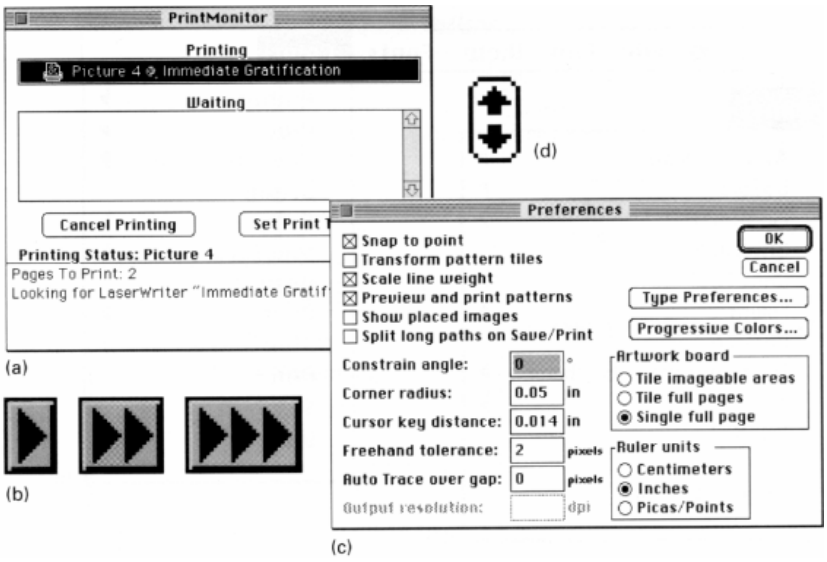
The web site for Quicken: Web Centers/Personal Finance link

Spatial Tension



The layout is so cramped that finding information is difficult

More Examples Of Spatial Tension

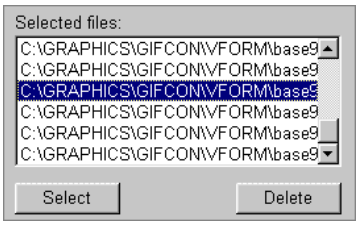


Spatial Tension from Mullet & Sano page 72

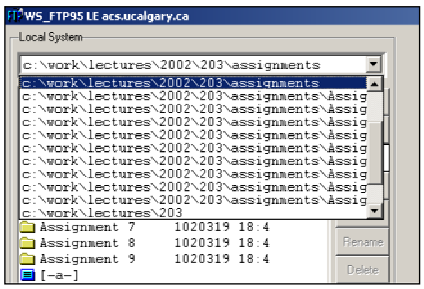
James Tam

Determining Relationships Between Screen Elements

- How do you chose when you cannot discriminate screen elements from each other?



GIF Construction Set

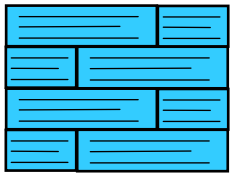


WS-FTP

James Tam

Navigational Cues

- Provide initial focus
- Direct attention to important, secondary, or peripheral items as appropriate
- Assist in navigation through material



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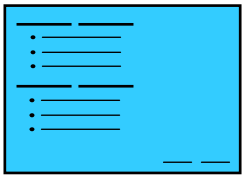

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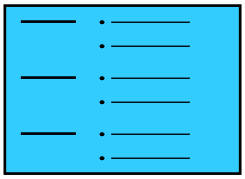
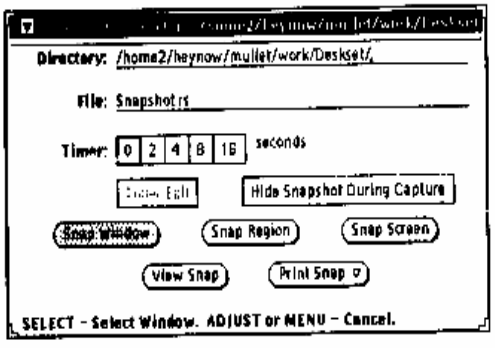
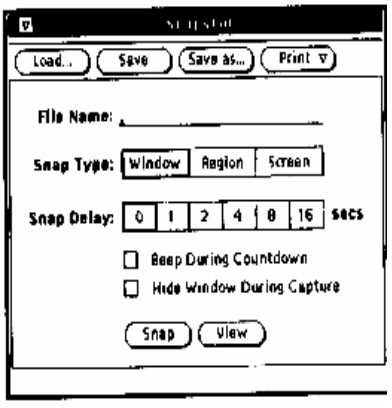


✓

James Tam

Re-Factoring An Interface

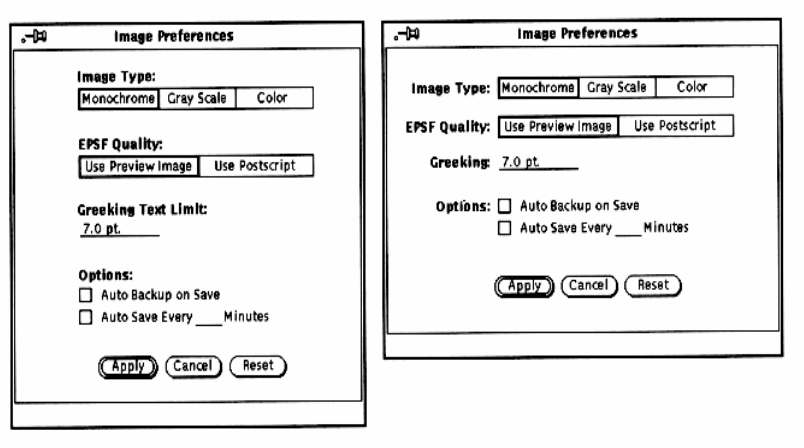




Redesigning a layout using alignment and factoring from Mullet & Sano Page 119

James Tam

The Importance Of Negative (White) Space

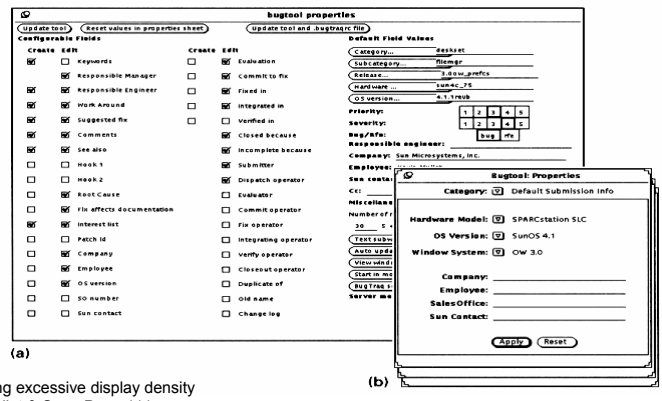


The importance of negative space from Mullet & Sano page 129

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

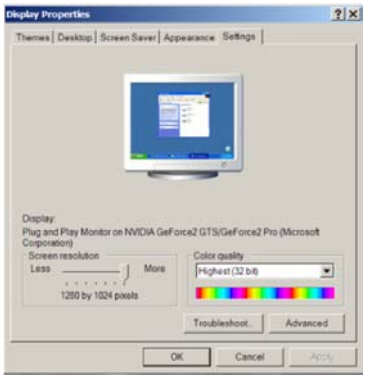
James Tam

Economy Of Visual Elements (Using Tabs)

Excellent means for factoring related items

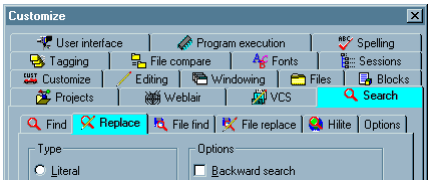
Economy Of Visual Elements (Using Tabs)

Excellent means for factoring related items



Windows display properties tab

But it can be overdone

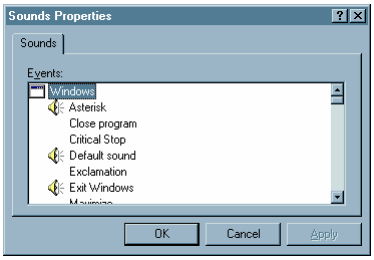


MultiEdit 8.0

Website: Ottawa-Carleton Real Estate Board

Economy Of Visual Elements (Using Tabs): 2

The unnecessary use of a tab



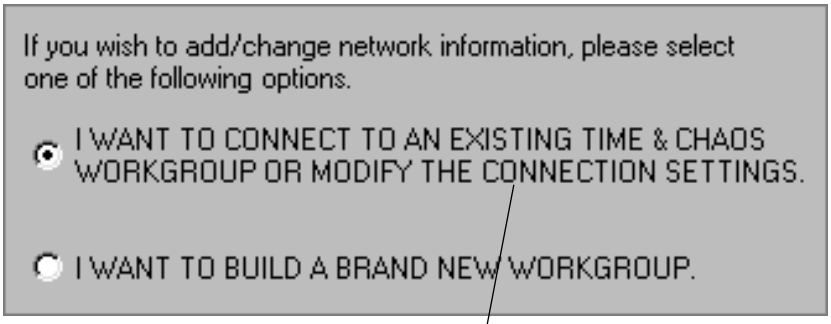
Microsoft Windows

Legibility And Readability: The Effect Of Font Choice

Whenever your local SMS Administrator sends you an actual software Package, the SMS Package Command Manager will appear (usually at network logon 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 "CLICK HERE" button at the bottom of the screen.

Legibility And Readability: The Effect Of Capitalization

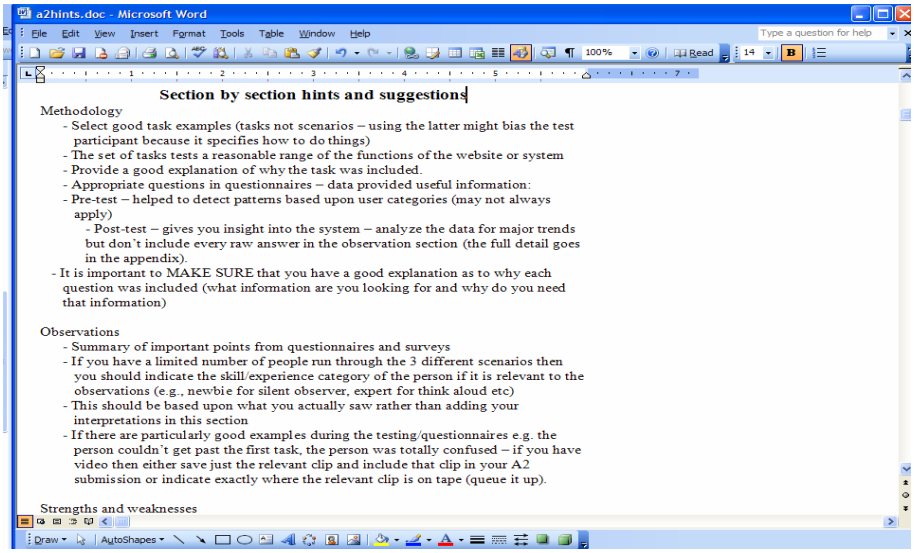


These choices must be really important, or are they?

Legibility And Readability: The Effect Of 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

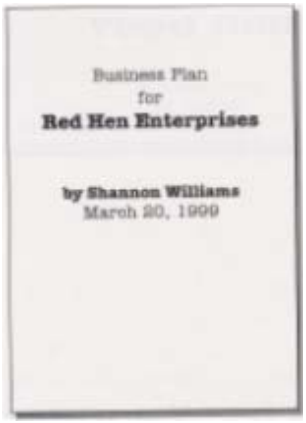
Use Capitalization Sparingly

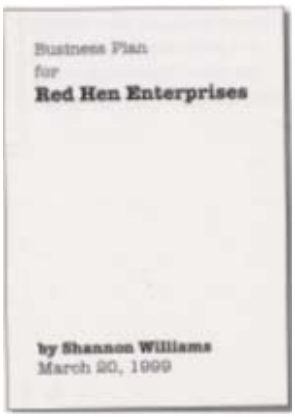


James Tam

Legibility And Readability: Center Alignment

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





From the Non-Designer's Design Book page 30

James Tam

Legibility And Readability: Center Alignment

•Overuse of centering can make it harder to determine the structure of onscreen elements.

```
while ((reRun == 'y') || (reRun == 'e'))
                {
            if (reRun != 'e')
                b.scan();
            b.display();
            generation += 1;
        System.out.println("\t\tGeneration: " + generation);
    System.out.print("Do you wish to play another generation (y/n): ");
            reRun = (char) Console.in.readChar();
            Console.in.readLine();
            if (reRun == 'e')
                b.edit();
                }
```


Legibility And Readability: Center Alignment

•**It can be useful for providing additional contrast**

- e.g., titles vs. the body of the text.

Some Potential Research Topics

HCI and expert systems: Scope -Masters or Doctorate level projects

There has been little research conducted into determining what is usable for software used by expert users. Most of the work in the area of Human-Computer interaction is more applicable to high level interfaces such as GUI's than they are for low level interfaces such as a Unix command line. Research in this area would involve studying these types of users and their tasks in order to come up with a set of usability heuristics that can guide future designers of these systems as well be used as an evaluation tool for existing systems.

Educational tools: Scope – undergraduate research project

In order to help undergraduate students grasp some of the more difficult and abstract concepts being taught in class, instructors will sometimes provide visual representations in order to provide a mental model of what the code is actually doing. For example, when first teaching linked lists to students it is common to draw out a picture of a list consisting of nodes and their links. List operations are then demonstrated by redrawing some or all parts of the list manually. A useful learning aid could consist of a system that could demonstrate list operations but do so in an interactive fashion. The student could create some code and see the effects of different list operations in order to better understand the cause-effect relationship between the code and the list.

Gaming projects

•**So it should be used sparingly**

•**It should also be used for a reason rather than as the default**

Legibility And Readability: Center Alignment

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

This text is ***centered.***
If you are going to
center text,
make it obvious.

See, in this paragraph it is
difficult to tell if this text
was centered purposely
or perhaps accidentally.
The line lengths are not
the same, but they are not
really different. If you can't
instantly tell that the type
is centered, why bother?

The Non-Designers Design Book

James Tam

Legibility And Readability: Fonts And Font Effects

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

Text set in Helvetica

Text set in Times Roman

✓

TEXT SET IN CAPITOLS

Text set in Braggadocio

Text set in Courier

✗

James Tam

Legibility And Readability: Fonts And Font Effects (2)

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***

✗

Legibility And Readability: Fonts And Font Effects (3)

- 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

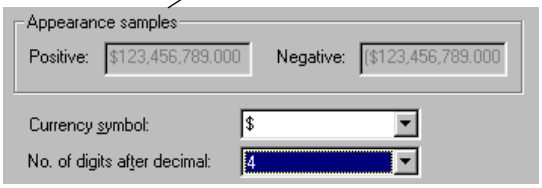
✓

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

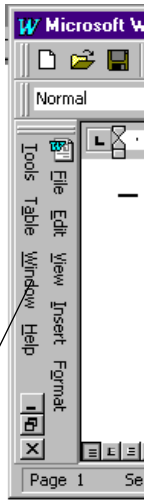
✗

Legibility And Readability: The Effect Of Color And Orientation On Text

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

Using Imagery

Signs, icons, symbols

- Right choice within spectrum from concrete to abstract

Icon design *very* hard

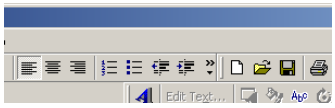
- Except for most familiar, always label them

James Tam

Using Imagery (Continued)

Image position and type should be related

- Image "family"



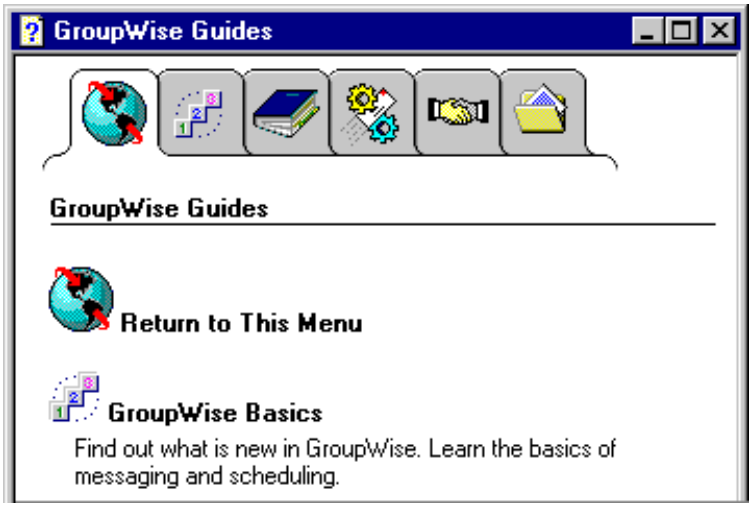
- Don't mix metaphors

Consistent and relevant image use

- Not gratuitous
- Identifies situations, offerings...

James Tam

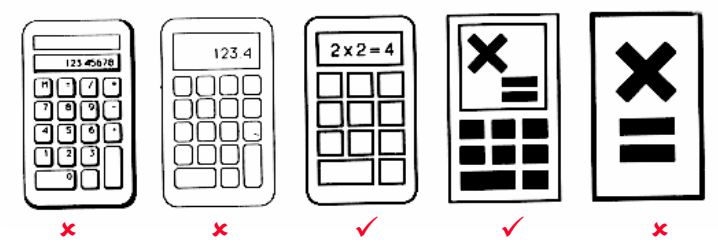
Why Icon Design Is Hard: An Example



Novell GroupWise 5.1

James Tam

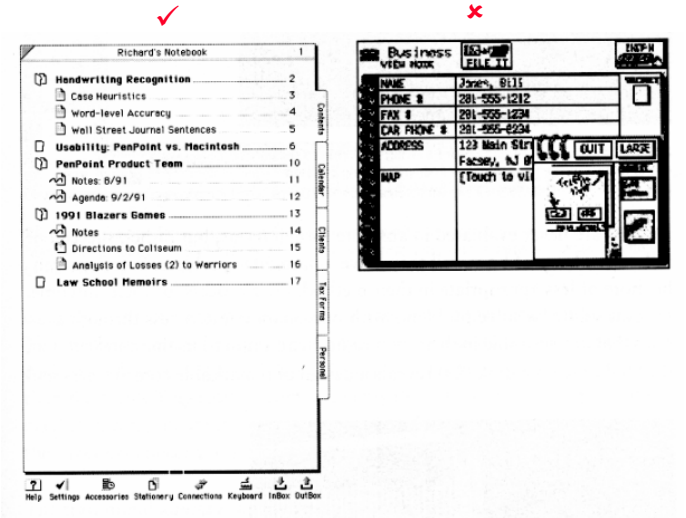
Icon Design: Use The Appropriate Level Of Detail



Choosing levels of abstraction from Mullet & Sano Page 174

James Tam

Interface Design: Use An Appropriate Level Of Detail



Refined vs excessive literal metaphors from Mullet & Sano page 25

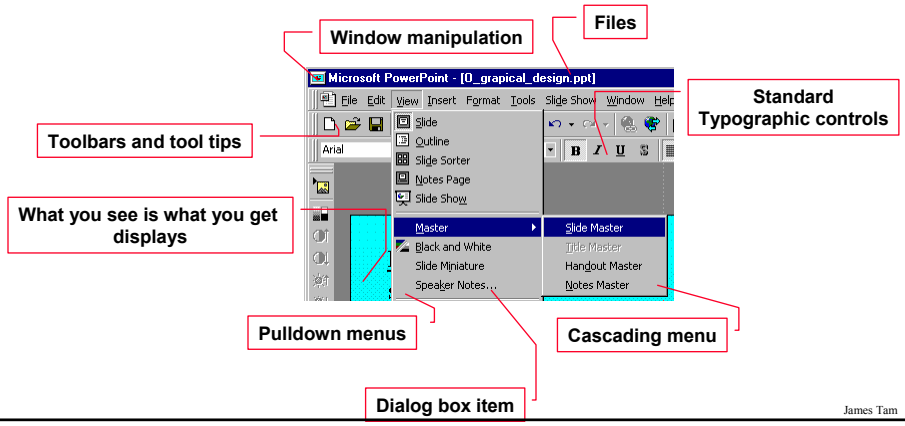
James Tam

Using 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

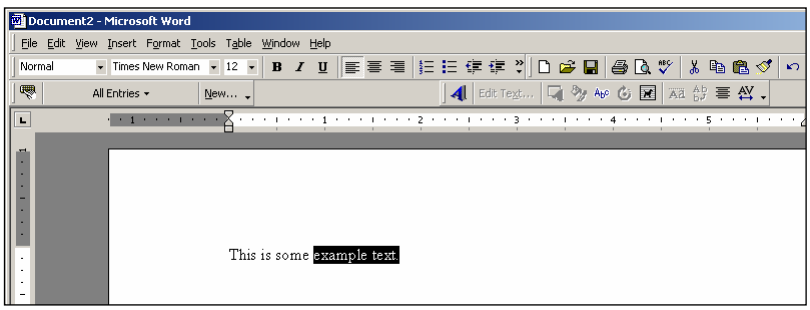


James Tam

General Points To Keep In Mind

1) What components *must* be in the display

- Provide the necessary visual affordances
- Categorizing functions
  - 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



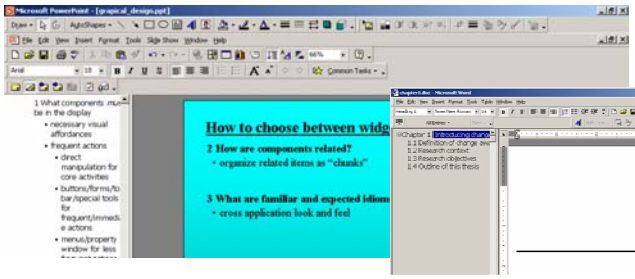
James Tam

General Points To Keep In Mind (2)

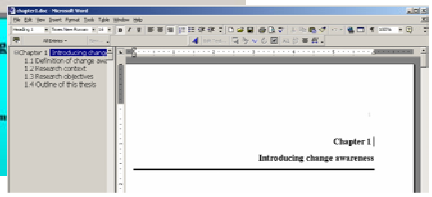
2) How are components related?
- Organize related items as "chunks"

3) What are familiar and expected idioms?
- Cross application look and feel

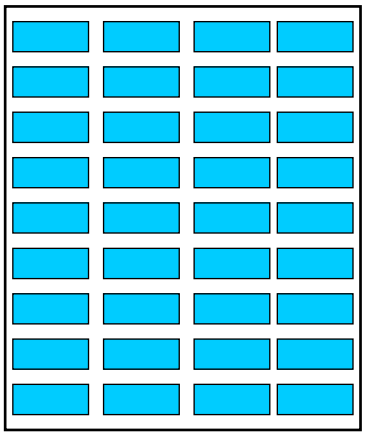
MS-PowerPoint



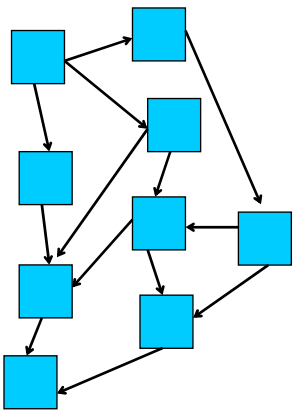
MS-Word



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



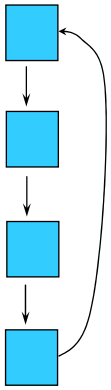
✘



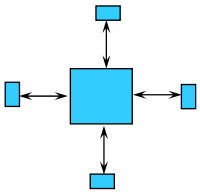
✘

Screen Design And Complexity

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



✗



✓

James Tam

The Gestalt School Of Psychology

Founded in 1912 to investigate the way that people perceive form:

- How do people organize the world into meaningful units and patterns.

James Tam

What Is A Gestalt?

- **Gestalt: is German for 'pattern' or 'configuration'.**
- **Motto of the Gestalt psychologists:**
  - "The whole is more than the sum of it's parts'.
  - What you perceive is greater than what you see.
  - Example one: Motion is perceived from a series of still images

James Tam

What Is A Gestalt? (2)

- Example two: the following is more than just a series of splotches of light and dark (a pattern can be perceived).

James Tam

The Gestalt Laws

They are rules that describe the way that people see patterns in visual displays:

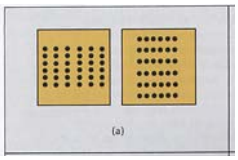
1. Proximity
2. Similarity
3. Continuity
4. Symmetry
5. Closure
6. Relative size
7. Figure and ground

1. Proximity

Things that are near to each other tend to be grouped together.

- Example one:

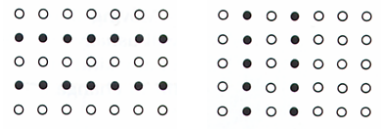
- Example two:



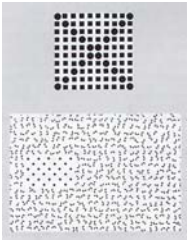
2. Similarity

- **Things that are alike tend to perceived as belonging together.**
- **Similarity can be perceived in many ways:**
  - Color
  - Shape
  - Size
  - Etc.

Example one:



Example two:



James Tam

3. Continuity

- **Lines and patterns tend to be perceived as continuing in time and space.**
  - Example one:

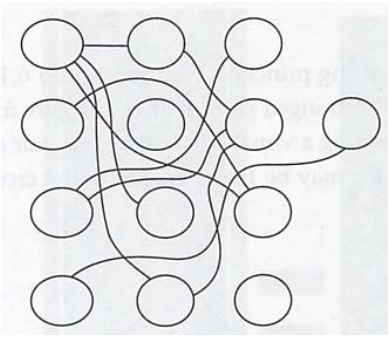
  - Example two:

James Tam

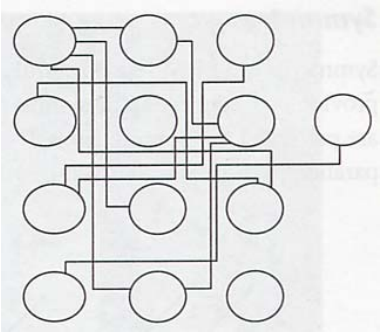
3. Continuity (2)

- **Visual entities (groupings) are more likely to be perceived out of visual elements that are smooth rather than elements with abrupt changes in direction.**

Smooth connections



Abrupt connections

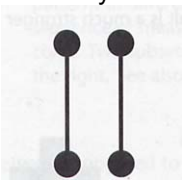


James Tam

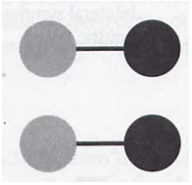
3. Continuity (3)

Connectedness is a stronger grouping principle than:

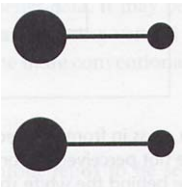
Proximity



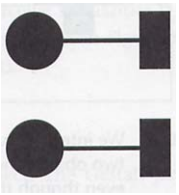
Value



Size



Shape

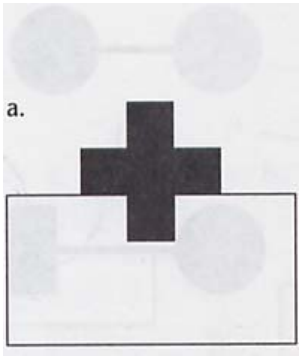


James Tam

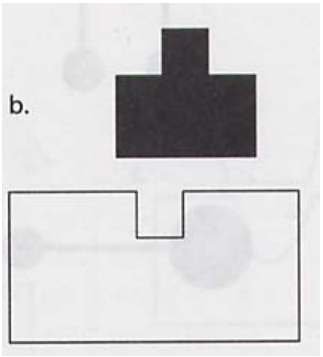
4. Symmetry

People are more likely to perceive a grouping from something that's symmetrical than something that is not.

Image: perceived as a cross in front of a rectangle (more symmetric)



Rather than perceiving it as a less symmetrical image.

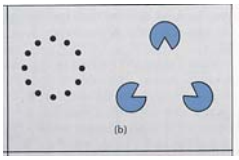


James Tam

5. Closure

- **The human brain tends to fill in gaps in order to perceive complete forms. (Handy when the 'image' is less than perfect).**
  - Example one:

  - Example two:

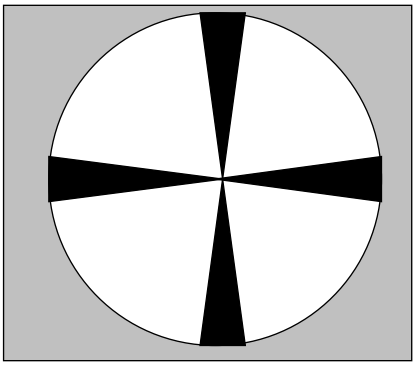


James Tam

6. Relative Size

Smaller components are more likely to be perceived as objects than larger ones.

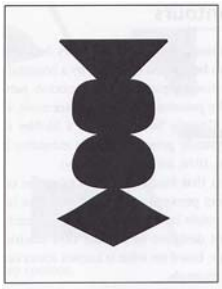
- Example:



7. Figure And Ground

- **A figure: something that is perceived to be in the foreground.**
- **Ground: what lies behind the figure.**

Example one: figure-ground is clear



Example two: cues for figure vs. ground are balanced

Image-Based Object-Recognition

People have a powerful ability to recognize images that they have previously seen.

- e.g., Standing et. al. (1970)[1] had over a 90% accuracy rate with test subjects recognizing whether or not they had previously seen an image (out of 2560 viewed over several days)

Recognition: Viewing 'mug shots'

Recall: Trying to reconstruct a crime scene without visual aids

1 Standing, L., Conezio, I., and Haber, R.N. (1970) Perception and memory for pictures: single trial learning of 2560 visual stimuli. Psychonomic Science 19: 73 – 74).

James Tam

Images Vs. Words

- **Static images vs. words**
- **Animated images vs. words**

James Tam

Static Images Vs. Words

- **An image is not always better than 1000 words!**
- **Consider the follow instructions that may be given to a mailroom clerk:**

Original instructions:

Take a letter from the top of the tray

Put a stamp on it.

Put the letter in the 'Out' tray

Continue until all the letters have stamps on them.

Static Images Vs. Words (2)

Compare the natural language form vs. pseudo code

Original instructions:

Take a letter from the top of the tray

Put a stamp on it.

Put the letter in the 'Out' tray

Continue until all the letters have stamps on them.

Pseudo code:

```
Repeat
    Get a line of text from the input file
    Change all the lowercase characters
    to upper case
    Write the line to an output file
Until (there is no more input);
```

Static Images Vs. Words (2)

Compare the language form vs. pseudo code

Original instructions:

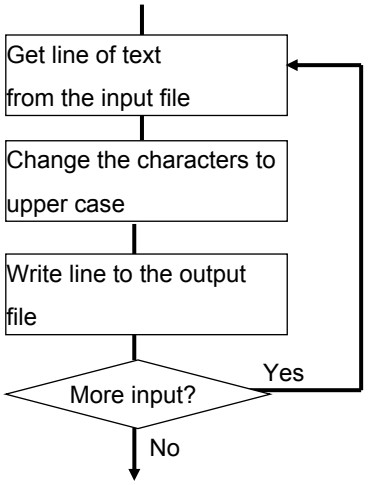
Take a letter from the top of the tray

Put a stamp on it.

Put the letter in the 'Out' tray

Continue until all the letters have stamps on them.

Flowchart:



Static Images Vs. Words (3)

However images are better than text for showing structural relations.

Text

Jane is Jim's boss.

Jim is Joe's boss.

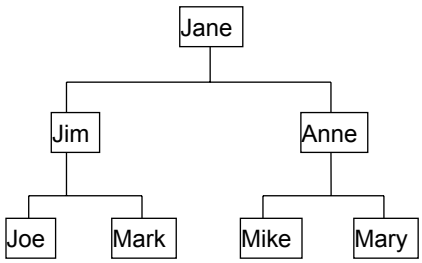
Anne works for Jane.

Mark works for Jim

Anne is Mary's boss.

Anne is Mike's boss.

Structure diagram



Static Images Vs. Works (4)

Generally images should when:

- Structural information must be shown (links between entities or groups of entities).
- A great deal of information needs to be remembered (images are more easily recalled than text except for abstract images e.g., when the concept being represented is new and must be represented abstractly by an image and out of context).

Generally text or the spoken language should be used when:

- Abstract concepts must be portrayed e.g., freedom, efficiency.
- The information is complex, procedural or non-spatial.

Animated Images Vs. Words

Generally animated images should be used when:

- A cause-effect relation must be expressed
- When a structure is being transformed (e.g., the motion of a hinge) – but complex interactions may not be s correctly.
- A sequence of data movements (e.g., sorting algorithms)

Generally text or the spoken language should be used when:

- In general natural language is so widespread, elaborate and complete that written or spoken language should be used unless there is a compelling reason (above) to do otherwise.

What You Now Know

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

Important visual concepts include

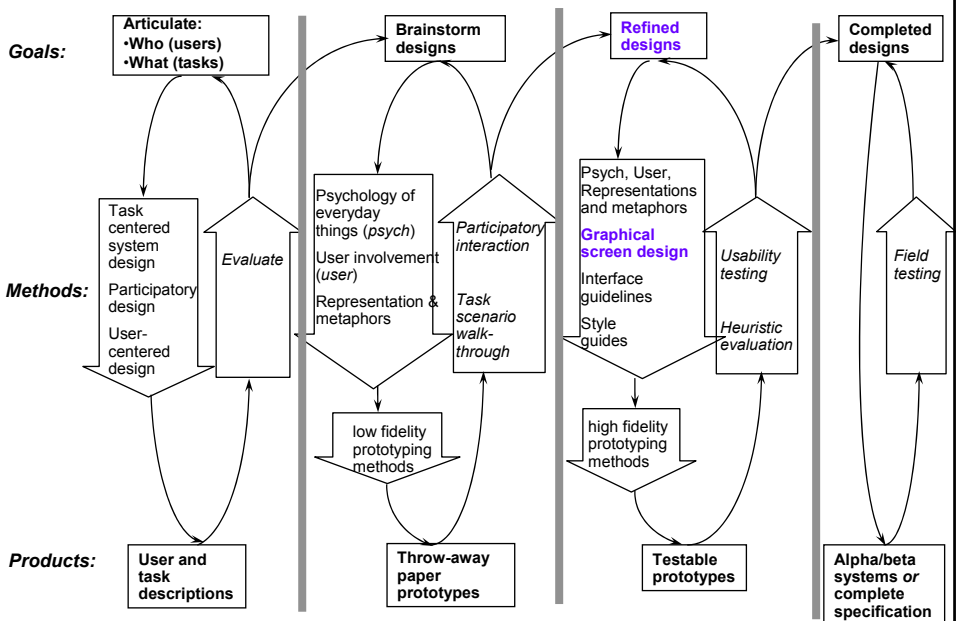
- Visual consistency
  - Repetition
- Visual organization
  - Contrast, alignment and navigational cues
- Visual relationships
  - Proximity and white space
- Familiar idioms
- Legibility and readability
  - Typography
- Appropriate imagery

General design principles for displaying information

- Gestalt Laws
- Visual and spoken language
- Image-based recognition

James Tam

Interface Design And Usability Engineering



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

James Tam