

Graphical Screen Design

CRAP (contrast, repetition, alignment, proximity)

Grids are 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

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
- Mutes lesser elements

Repetition

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

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 nursing history and registration, further patient, procedure, chemotherapy, and intravenous administration. Promoted self-care skills and adaptation of the client to their disease and particular treatment program.

Extensive experience with at-home care of onc 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, acute and chronic 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.

1980-1984 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. Supervisors value my organizational skills, eagerness to learn and assume responsibility, and my dedication to my job.

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 nursing history and registration, further patient, procedure, chemotherapy, and intravenous administration. Promoted self-care skills and adaptation of the client to their disease and particular treatment program.

Extensive experience with at-home care of acute 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, acute and chronic 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.

1980-1984 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. Supervisors value my organizational skills, eagerness to learn and assume responsibility, and my dedication to my job.

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 dole former, "Watches setting dam far? Denture nor yore canned gat ritch setting darn during nosing? Germ pup offer debt cheer?"

"Am tarred, Fodder," resplendent Violate warily.

"Watches 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 ladder 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.

Tarred gull

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

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

"Am tarred, Fodder," resplendent Violate warily.

"Watches 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 ladder inner checking-horse toe gadder offer aches, an wen darn tutor vestibale guarding two peck offer bops

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

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)
- 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

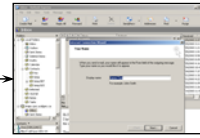
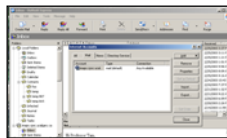
- Signs, icons, symbols; concrete to abstract



BOOZE!

Sequencing

- How the interface unfolds

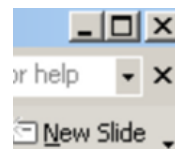


James Tam

Components Of Visible Language (2)

Visual identity

- Unique appearance



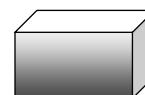
Animation

- Dynamics of display



Color and Texture

- Convey complex information and pictorial reality



James Tam

Grids

Horizontal and vertical lines to locate window components

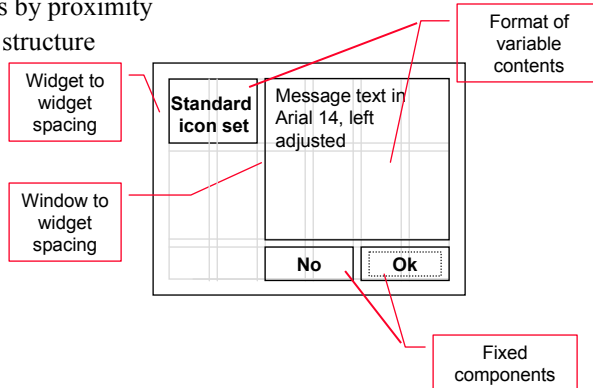
- Aligns related components

Organization

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

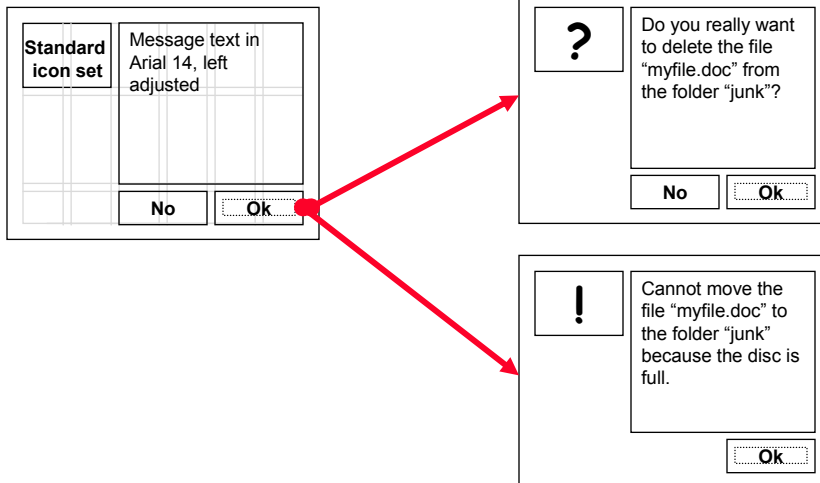
Consistency

- Location
- Format
- Repetition
- Organization



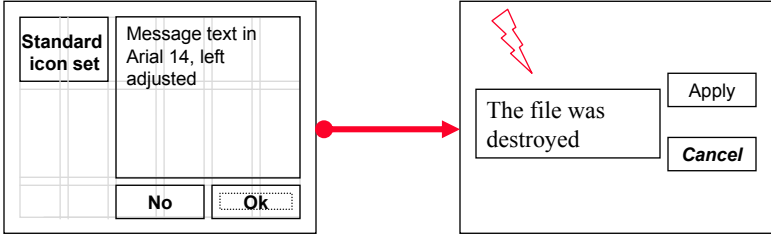
James Tam

Uses A Grid: Consistent



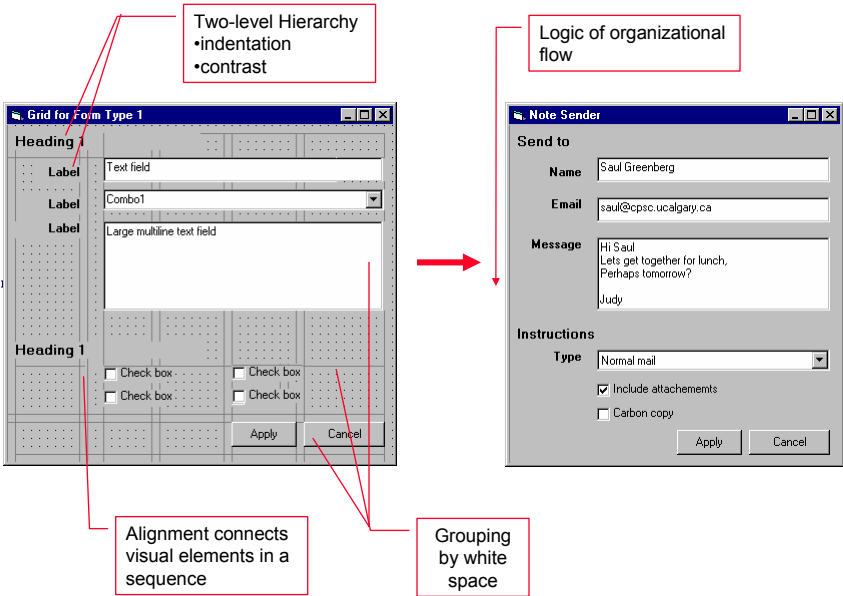
James Tam

No Grid: Inconsistent



James Tam

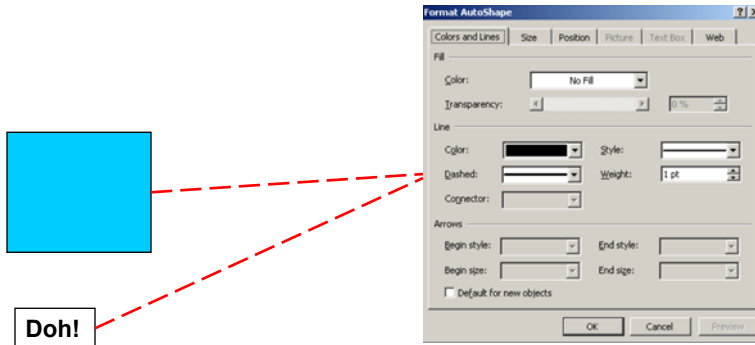
Another Grid Example



James Tam

Visual Consistency: Internal Consistency

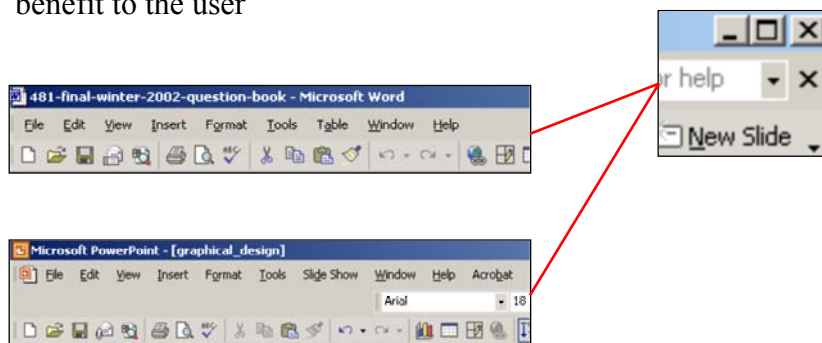
- Unless there is a compelling reason all elements of the same program follow the same rules and conventions
- Application specific grids can be used to enforce this



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



James Tam

External Consistency Violated

The screenshot displays a software interface for a project named "LIGANDFIT-SMALLPOX". It is divided into several sections:

- Primary Task Information:** Includes the project name "LIGANDFIT-SMALLPOX" and "SMALLPOX RESEARCH PROJECT". A description states: "This project employs computational chemistry on a massive computing grid to analyze candidates for a medical therapy to fight the smallpox virus. The strongest candidates will be turned over to the U.S. Department of Defense for further evaluations." It shows a "Task CPU Time" of "11 hrs: 50 mins: 21 secs" and a "Task Execution Progress" bar at 96%.
- Member Information:** Shows the member name "JimmyT", "Total Points: 371477", and "Total CPU Time: 2 years: 295 days: 11 h: 43 m: 17 s". A button "View your scores and rewards" is present.
- Device Information:** Shows "Overall Performance" with a score of 100 for "Processor" (labeled "Comparison Device: High-end Desktop System") and 113 for "Storage". Other categories like "Memory" and "Network" are also listed. A button "View your device list" is present.

At the bottom, there is a "UNITED DEVICES" logo and a status bar that says "Primary task is executing..." with several system icons.

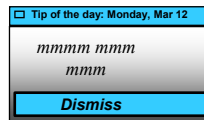
The UD agent © United Devices: www.ud.com

James Tam

A Tool For Ensuring Consistency: Mumble Text



✓

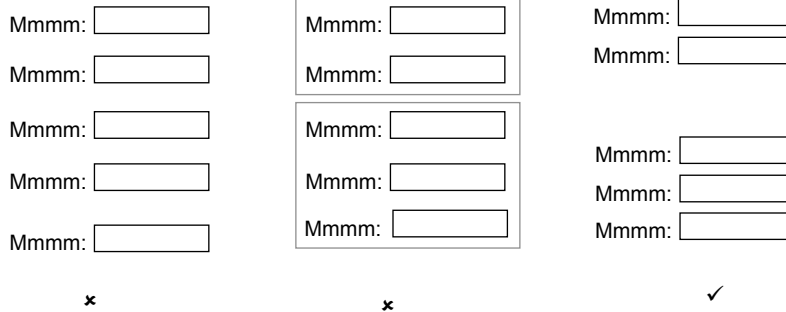


x

James Tam

Relationships Between Screen Elements

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



James Tam

Structure Is Difficult To Ascertain

Placement determines where the awareness information is located in the display. Awareness information has *situated* placement if the information is located in the part of the workspace where the event occurred, and it has *separate* placement if it is located somewhere else. Gutwin argues that situating awareness information takes advantage of a person's existing familiarity with the workspace, for it provides context. However, if many changes and events are taking place in the space over time then the potential downside is clutter leading to overload requiring increased effort to interpret the changes. Thus, some balance must be struck between context and overload.

The presentation dimension of Figure 4.1 classifies the display of awareness information as *literal* when it describes awareness information in the same form that it is gathered. In terms of change awareness this would mean that all the details about changes would be shown. It is *symbolic*, when only a subset of the information about a workspace event is displayed (Gutwin 1997). While a literal presentation may be easier to understand and interpret, in terms of change awareness, because of the potentially large amount of information that can accumulate as changes occur time an overly literal presentation may 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).

James Tam

Explicit Structure Imposed

Placement determines where the awareness information is located in the display. Awareness information has *situated* placement if the information is located in the part of the workspace where the event occurred, and it has *separate* placement if it is located somewhere else. Gutwin argues that situating awareness information takes advantage of a person's existing familiarity with the workspace, for it provides context. However, if many changes and events are taking place in the space over time then the potential downside is clutter leading to overload requiring increased effort to interpret the changes. Thus, some balance must be struck between context and overload.

The presentation dimension of Figure 4.1 classifies the display of awareness information as *literal* when it describes awareness information in the same form that it is gathered. In terms of change awareness this would mean that all the details about changes would be shown. It is *symbolic*, when only a subset of the information about a workspace event is displayed (Gutwin 1997). While a literal presentation may be easier to understand and interpret, in terms of change awareness, because of the potentially large amount of information that can accumulate as changes occur time an overly literal presentation may 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).

James Tam

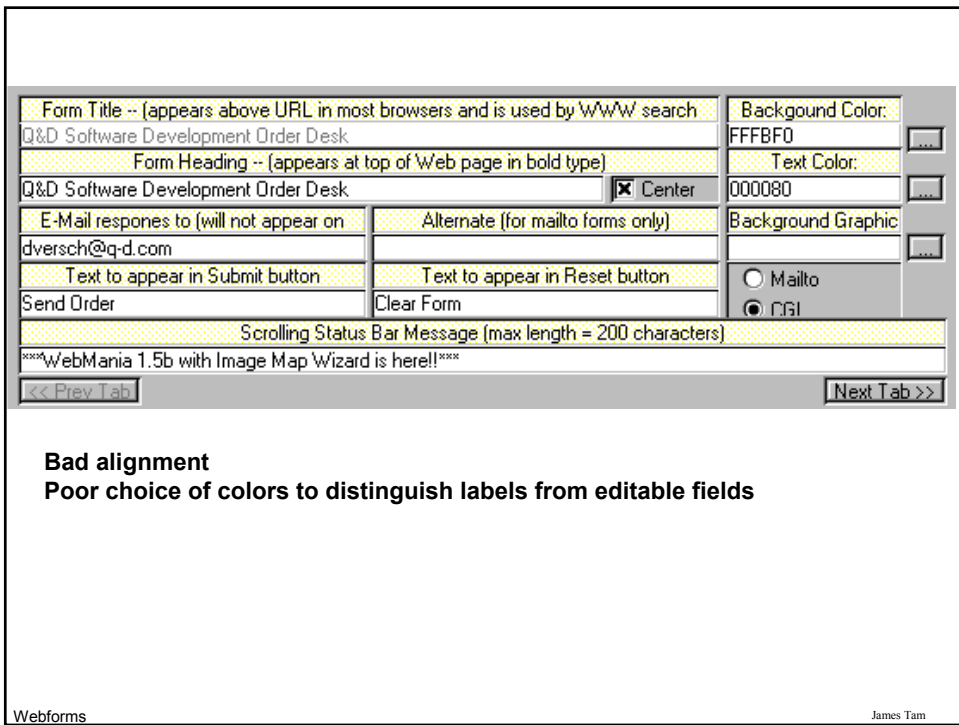
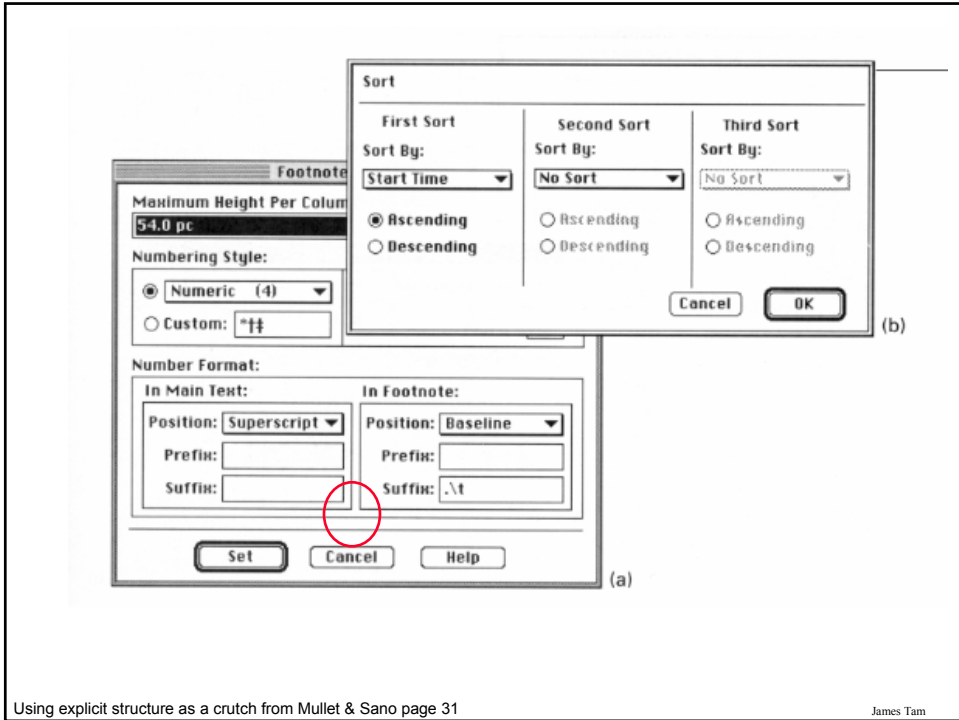
Structure Implied With White Space

Placement determines where the awareness information is located in the display. Awareness information has *situated* placement if the information is located in the part of the workspace where the event occurred, and it has *separate* placement if it is located somewhere else. Gutwin argues that situating awareness information takes advantage of a person's existing familiarity with the workspace, for it provides context. However, if many changes and events are taking place in the space over time then the potential downside is clutter leading to overload requiring increased effort to interpret the changes. Thus, some balance must be struck between context and overload.

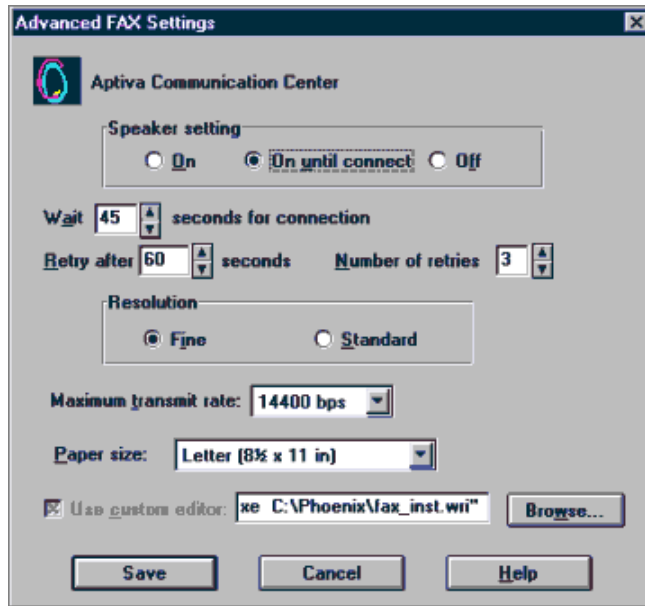
The presentation dimension of Figure 4.1 classifies the display of awareness information as *literal* when it describes awareness information in the same form that it is gathered. In terms of change awareness this would mean that all the details about changes would be shown. It is *symbolic*, when only a subset of the information about a workspace event is displayed (Gutwin 1997). While a literal presentation may be easier to understand and interpret, in terms of change awareness, because of the potentially large amount of information that can accumulate as changes occur time an overly literal presentation may 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).

James Tam

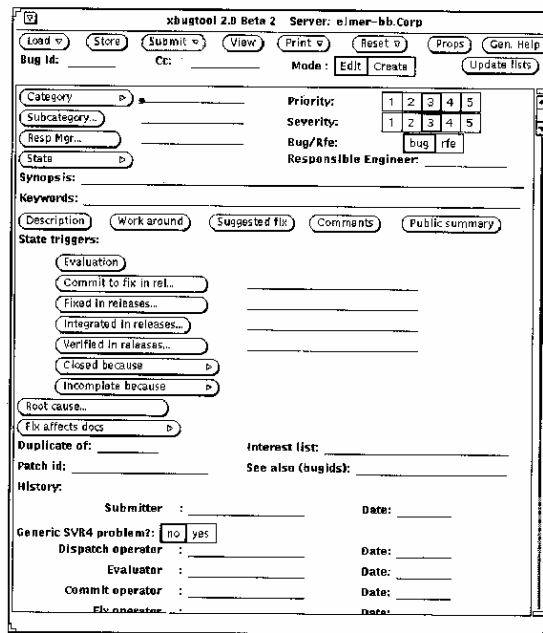


No regard for order and organization



IBM's Aptiva Communication Center

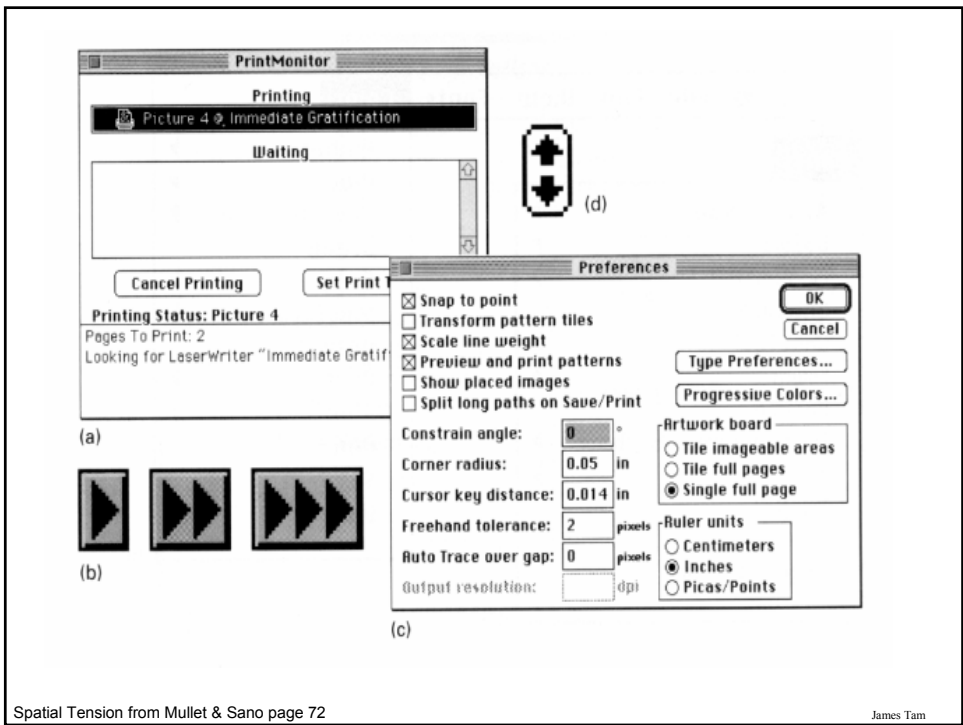
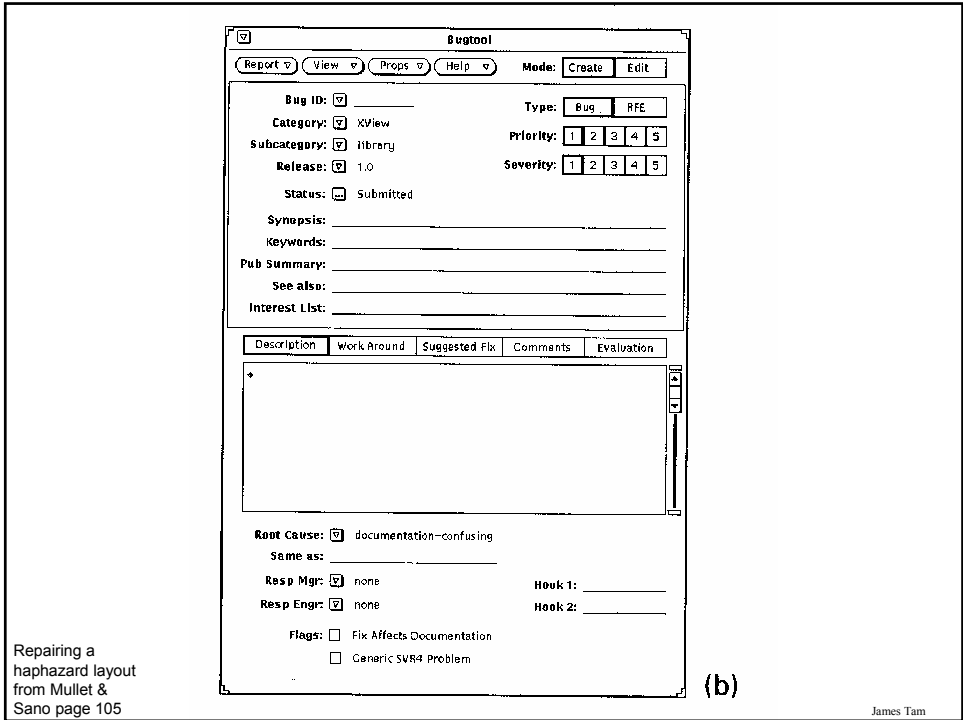
James Tam



(a)

Haphazard layout from Mullet & Sano page 105

James Tam

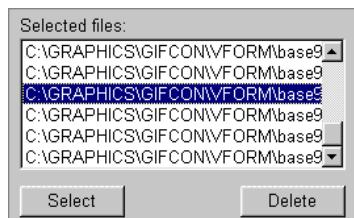




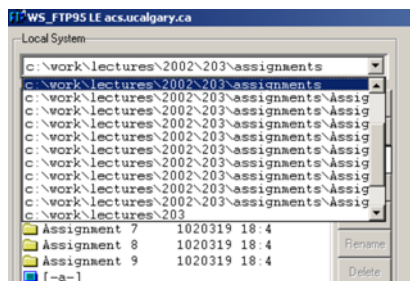
Overuse of 3-D effects makes the window unnecessarily cluttered

Relationships Between Screen Elements

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



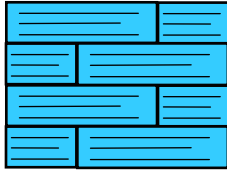
GIF Construction Set



WS-FTP

Navigational Cues

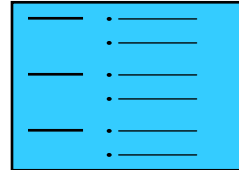
- Provide initial focus
- Direct attention to important, secondary, or peripheral items as appropriate
- Assist in navigation through material



x

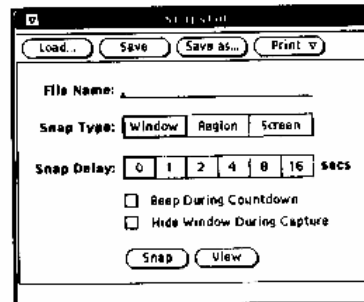
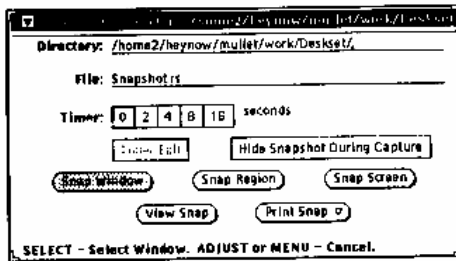


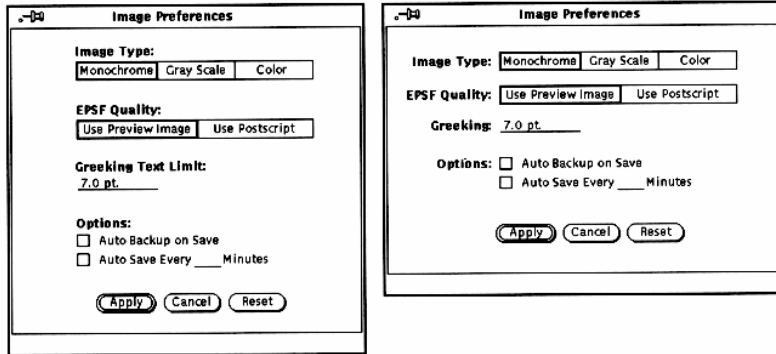
✓



✓

James Tam



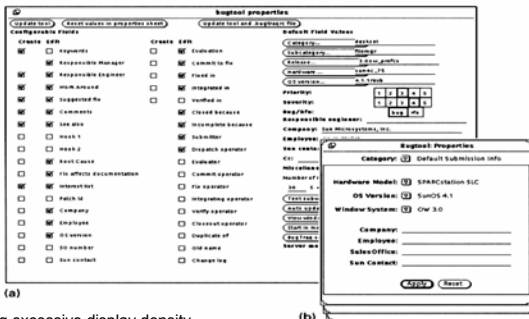


The importance of negative space from Mullet & Sano page 129

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

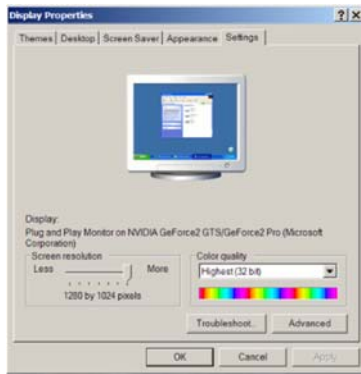


Repairing excessive display density from Mullet & Sano Page 111

James Tam

Economy Of Visual Elements (Tabs)

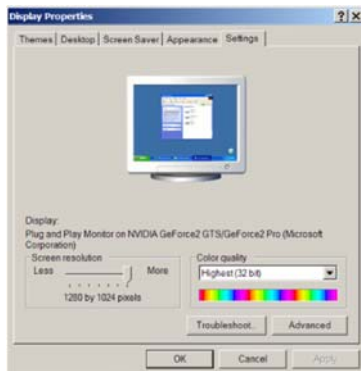
Excellent means for factoring related items



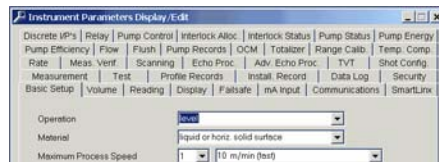
James Tam

Economy Of Visual Elements (Tabs)

Excellent means for factoring related items



But it can be overdone



James Tam

Legibility And Readability

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 of the screen.

Legibility And Readability

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?

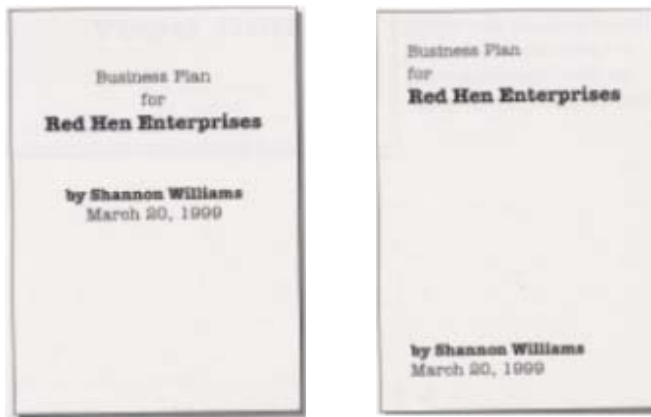
Upper Case Text

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.

James Tam

Center Alignment

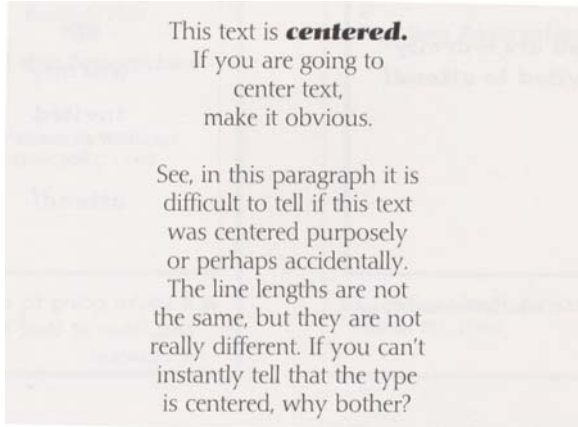
- Some regard it as unprofessional and advocate against it's use.
- It's described as being unprofessional looking and plain.



Center Alignment



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



Legibility And Readability

- 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



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*

✗

James Tam

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

✓

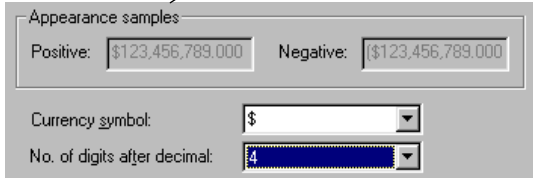
Unreadable: Design components to be easy to interpret and understand. Design components to be inviting and attractive

✗

James Tam

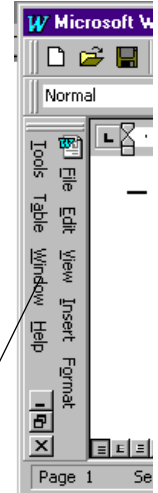
Legibility And Readability

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

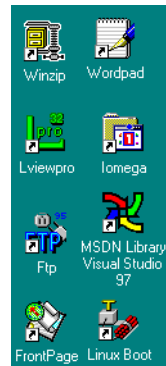
- Right choice within spectrum from concrete to abstract



BOOZE!

Icon design *very* hard

- Except for most familiar, always label them

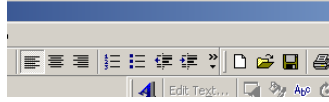


James Tam

Imagery (Continued)

Image position and type should be related

- Image “family”



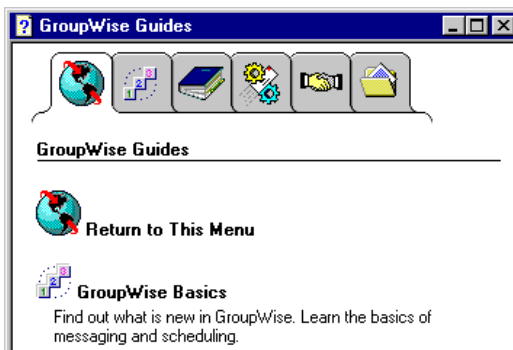
- Don't mix metaphors

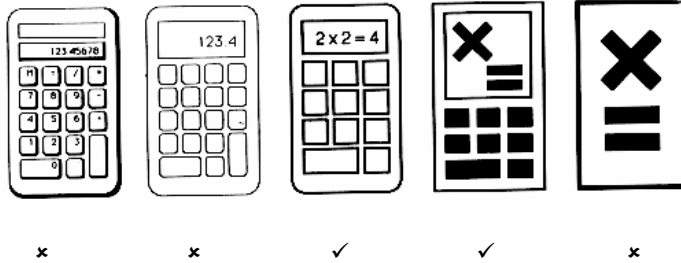
Consistent and relevant image use

- Not gratuitous
- Identifies situations, offerings...

James Tam

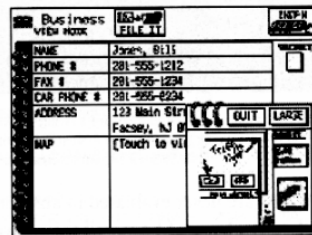
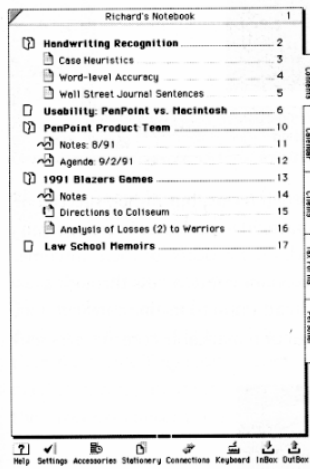
An Example Of Why Icon Design Is Hard





Choosing levels of abstraction from Mullet & Sano Page 174

James Tam



Refined vs excessive literal metaphors from Mullet & Sano page 25

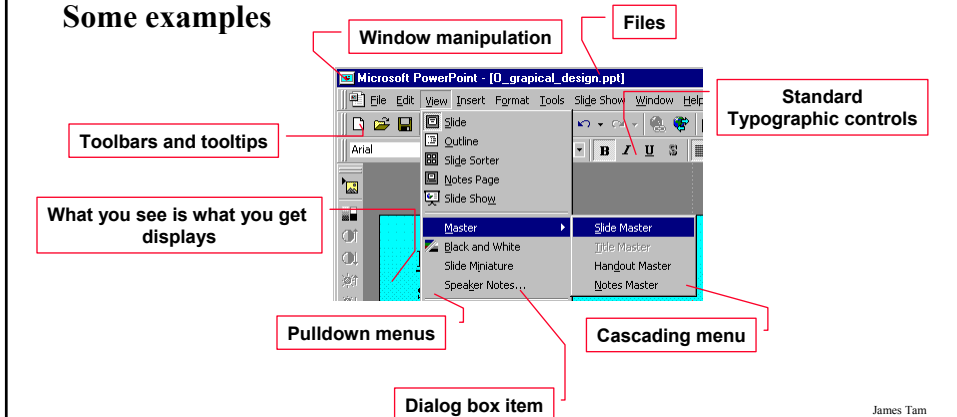
James Tam

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

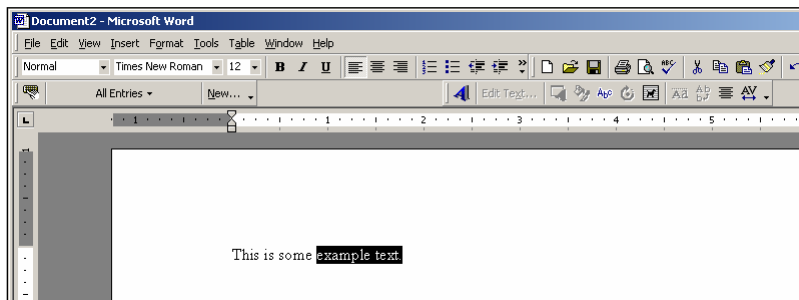


James Tam

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



James Tam

How To Choose Between Widgets (Continued)

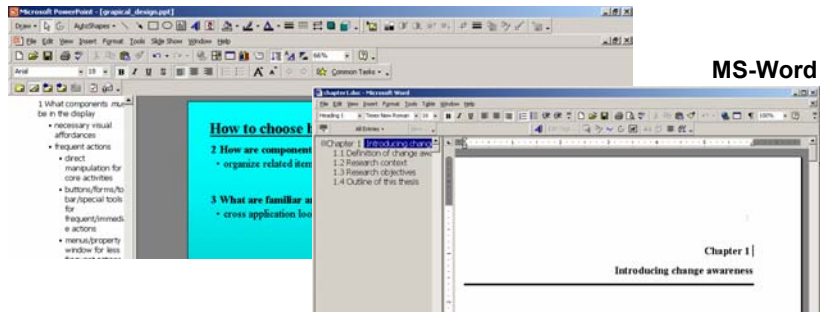
2) How are components related?

- Organize related items as “chunks”

3) What are familiar and expected idioms?

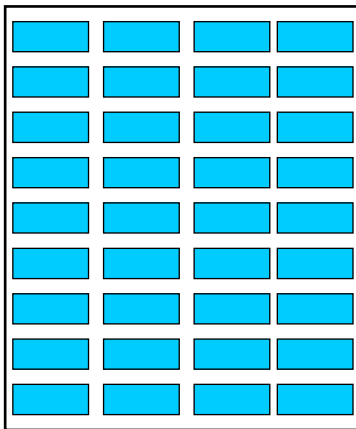
- Cross application look and feel

MS-PowerPoint

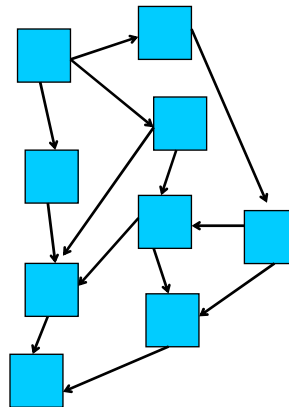


James Tam

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



x

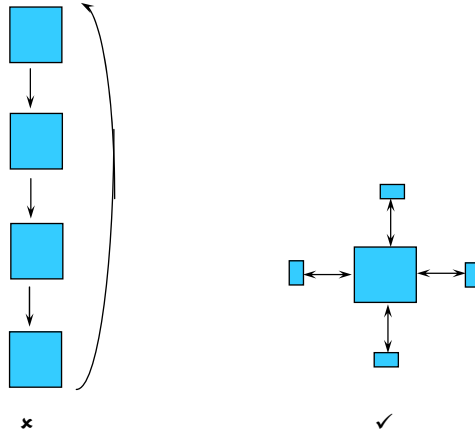


x

James Tam

Widgets And Complexity

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



James Tam

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

