

Graphical Screen Design

Human Computer Interaction

Based on slide deck

Part 4: Designing and building visual interfaces. Graphical Screen Design

Human Computer Interaction I: Principles and Design

by

Saul Greenberg

Professor

University of Calgary, Canada

*The new slides are marked with a **

Slide deck by Saul Greenberg. Permission is granted to use this for non-commercial purposes as long as general credit to Saul Greenberg is clearly maintained. Warning: some material in this deck is used from other sources without permission. Credit to the original source is given if it is known.

Graphical Screen Design

CRAP – contrast, repetition, alignment, proximity

Grids are an essential tool for graphical design

Other visual design concepts

consistency

relationships

organization

legibility and readability

navigational cues

appropriate imagery

familiar idioms

Contrast

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

Repetition

- repeat design throughout the interface
- consistency
- creates unity

Alignment

- visually connects elements
- creates a visual flow

Proximity

- groups related elements
- separates unrelated ones

A first lesson in Graphical Design

Contrast

Repetition

Alignment

Proximity

Example: [this page](#).

home page

[Original](#)

[Proximity 2](#)

[Alignment 3](#)

[Contrast 4](#)

[Repetition 5](#)

Original

A First Lesson in Graphical Design

Contrast

Repetition

Alignment

Proximity

Examples

[This page](#)

[Saul's Home Page](#)

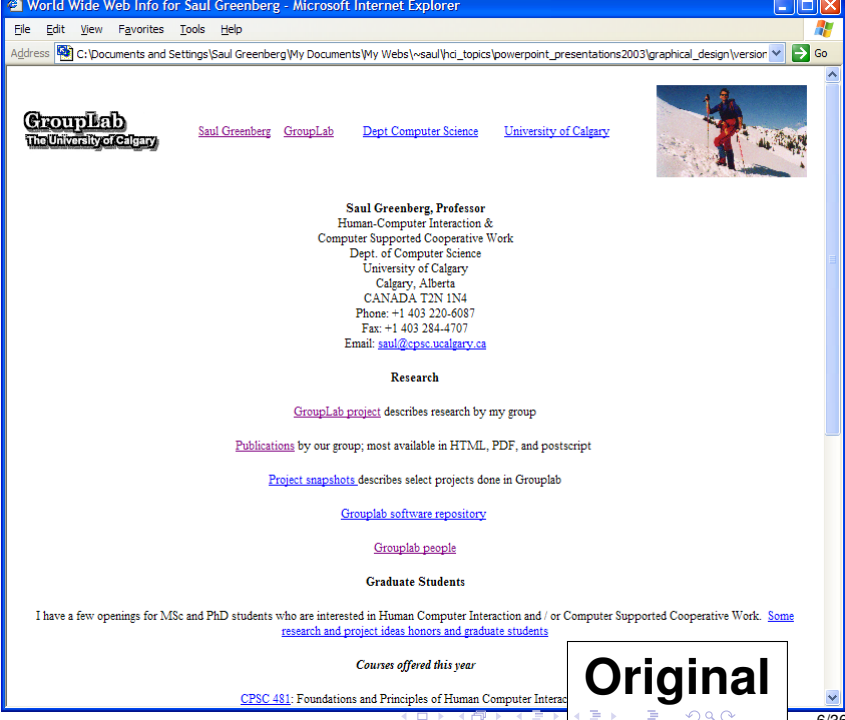
[Proximity](#)

[Alignment](#)

[Contrast](#)

[Repetition](#)

CRAP



GroupLab
The University of Calgary

[Saul Greenberg](#)

[GroupLab](#)

[Dept. Computer Science](#)

[University of Calgary](#)



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

Research

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

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

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

[Grouplab software repository](#)

[Grouplab people](#)

Graduate Students

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

Courses offered this year

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

Original

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

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

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



Phone: +1 403 220-6087
Fax: +1 403 284-4707
Email: saul@cpsc.ucalgary.ca

Research

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

Graduate Students

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

Courses offered this year

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

Proximity

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

GroupLab
The University of Calgary

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

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

Phone: +1 403 220-6087

Fax: +1 403 284-4707

Email: saul@cpsc.ucalgary.ca



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

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

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

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

Alignment

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

GroupLab
The University of Calgary

Saul Greenberg Professor

Human-Computer Interaction &
Computer Supported Cooperative Work

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

Phone: +1 403 220-6087
Fax: +1 403 284-4707
Email: saul@cpsc.ucalgary.ca



Graduate Students

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

Courses offered this year

CPSC 481: Foundations and Principles of Human Computer Interaction

CPSC 581: Human Computer Interaction II: Interaction Design

CPSC 601.13: Computer Supported Cooperative Work

Previous Years

CPSC 681: Research Methodologies in Human Computer Interaction

CPSC 699: Research Methodology for Computer Science (old!)

CPSC 601.48: Special Topics: Heuristic Evaluation

CPSC 601.56: Advanced Topics in HCI: Media Spaces and Casual Interaction

SENG 609.05: Graphical User Interfaces: Design and Usability

SENG 609.06: Special Topics in Human Computer Interaction

Ego alert: My entry on U Calgary's 'Great Teachers' Web Site

Administration

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

GroupLab
The University of Calgary

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

Saul Greenberg Professor

Human-Computer Interaction &
Computer Supported Cooperative Work

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

Phone: +1 403 220-6087
Fax: +1 403 284-4707
Email: saul@cpsc.ucalgary.ca



Graduate Students

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

Courses offered this year

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

Previous Years

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

Administration

Ethics Committee for research with human subjects

Repetition

Grids

Horizontal and vertical lines to locate window components

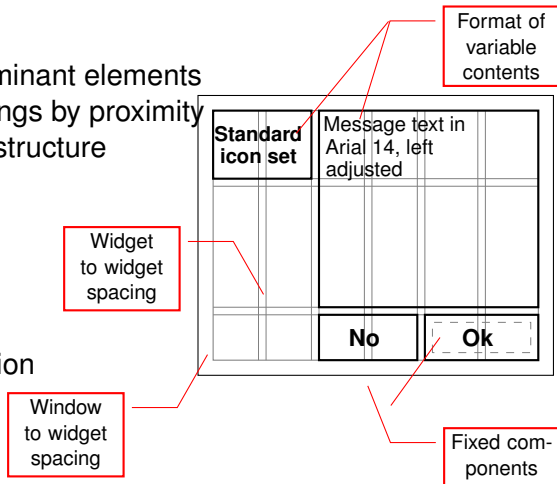
- aligns related components

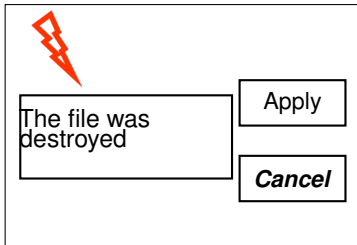
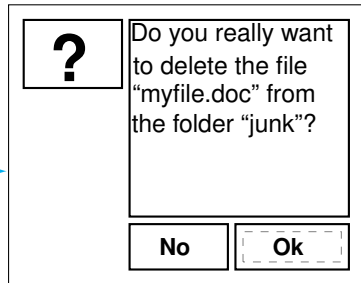
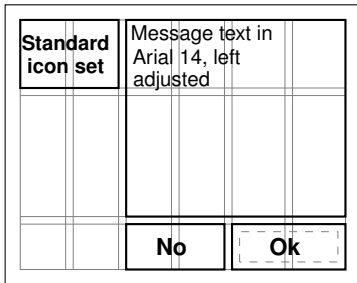
Organization

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

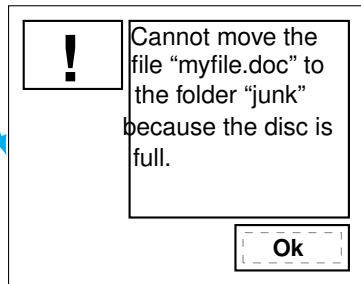
Consistency

- location
- format
- element repetition
- organization





X



✓

Two-level Hierarchy

- indentation
- contrast

Logic of organizational flow

The screenshot shows a form titled "Grid for Form Type 1". It features a two-level hierarchy with "Heading 1" repeated twice. The first heading is followed by three labels: "Label", "Label", and "Label". The second heading is followed by four checkboxes, each labeled "Check box". The form also includes a "Text field", a "Combo1" dropdown, and a "Large multiline text field". At the bottom, there are "Apply" and "Cancel" buttons. A red arrow points from the "Two-level Hierarchy" box to the form, and another red arrow points from the "Alignment connects visual elements in a sequence" box to the form.

Alignment connects
visual elements
in a sequence

Grouping by
white space

The screenshot shows a "Note Sender" dialog box. It has a logical flow of information: "Send to" (Name: Saul Greenberg, Email: saul@cpssc.ucalgary.ca), "Message" (Hi Saul, Lets get together for lunch, Perhaps tomorrow?, Judy), and "Instructions" (Type: Normal mail, Include attachments checked, Carbon copy unchecked). At the bottom, there are "Apply" and "Cancel" buttons. A red arrow points from the "Logic of organizational flow" box to the dialog box.

Visual consistency (repetition)

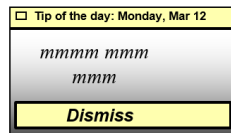
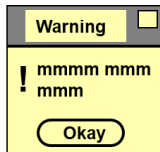
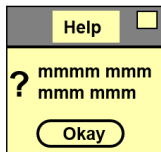
internal consistency

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

external consistency

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

deviate only when it provides a clear benefit to user



Relating screen elements

proximal clusters
alignment
white (negative) space
explicit structure

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

✗

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

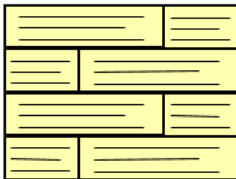
✓

Navigational cues

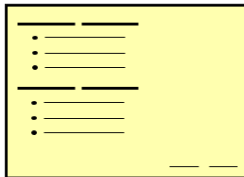
provide initial focus

direct attention as appropriate to important, secondary, or peripheral items as appropriate

order should follow a user's conceptual model of sequences



x



✓

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

A diagram of a cluttered form. It contains two main sections, each with a title in bold: **MMMM** and **NNNN**. Each section has two rows of labels 'xxx:' followed by a blank line. Below the first section are four rounded rectangular buttons arranged in two rows of two. Below the second section are three rounded rectangular buttons in a single row. The form is enclosed in a single large box, and the entire design is marked with a large 'x' below it, indicating it is a poor example of economy.

A diagram of a clean form design using multiple windows. It consists of two overlapping yellow rectangular windows. The front window has a title **MMMM** and three rows of labels 'xxx:' followed by a blank line. At the bottom right of this window are two rounded rectangular buttons. The back window has a title **NNNN** and is partially obscured by the front window. This design is marked with a checkmark below it, indicating it is a good example of economy.



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
CAPITALS

Text set in
Braggadocio

Text set in
Courier



Legibility and readability

Proper use of typography

- 1 - 2 typefaces (3 max)
- normal, italics, bold
- 1 - 3 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

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



Example

Form Title -- (appears above URL in most browsers and is used by W/W/W search)		Background Color:
Q&D Software Development Order Desk		FFFBF0
Form Heading -- (appears at top of Web page in bold type)		Text Color:
Q&D Software Development Order Desk <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 >>

Example

Terrible alignment

- no flow

Poor contrast

- cannot distinguish colored labels from editable fields

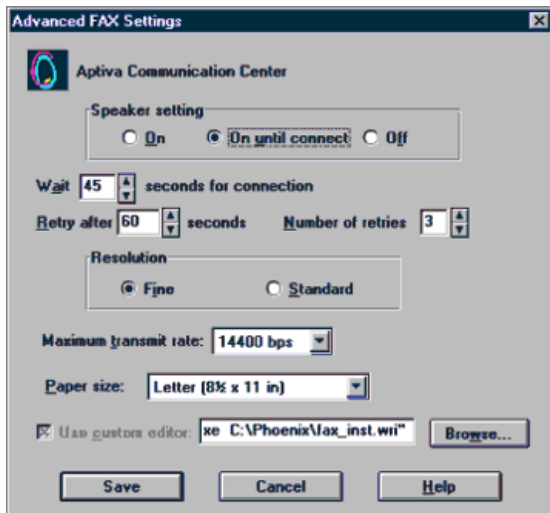
Poor repetition

- buttons do not look like buttons

Poor explicit structure

- blocks compete with alignment

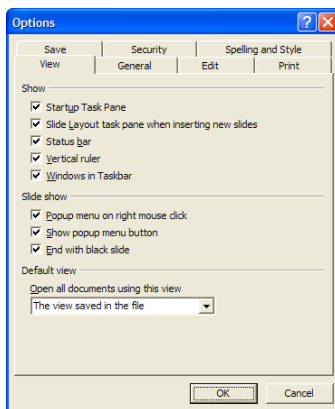
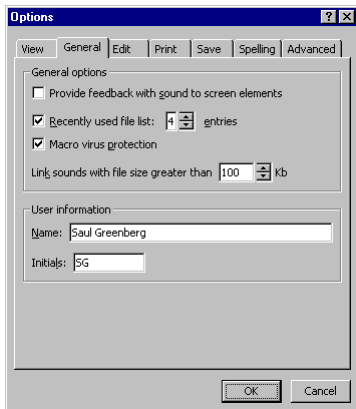
Example



No regard for order and organization

IBM's Aptiva Communication Center

Example



Tabs

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

Example

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?

Example

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

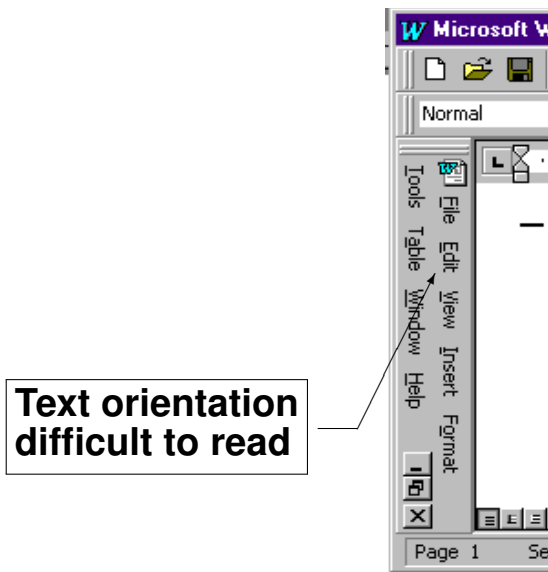
Appearance samples

Positive:	\$123,456,789.000	Negative:	(\$123,456,789.000)
-----------	-------------------	-----------	---------------------

Currency symbol: \$

No. of digits after decimal: 4

Example



Imagery

Signs, icons, symbols

- right choice within spectrum from concrete to abstract

Icon design **very** hard

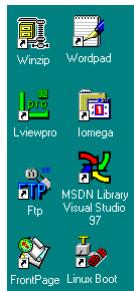
- except for most familiar, always label them

Image position and type should be related

- image "family"

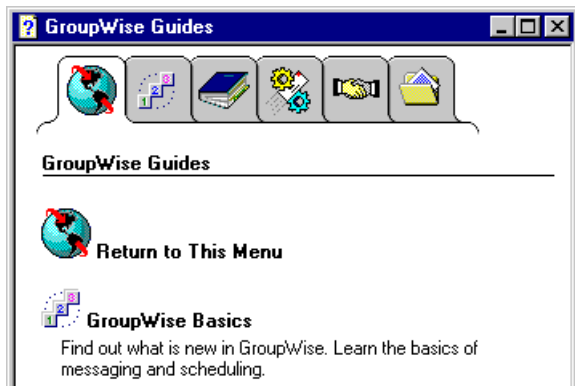
Consistent and relevant image use

- identifies situations, offerings...



Partial icon family

Example



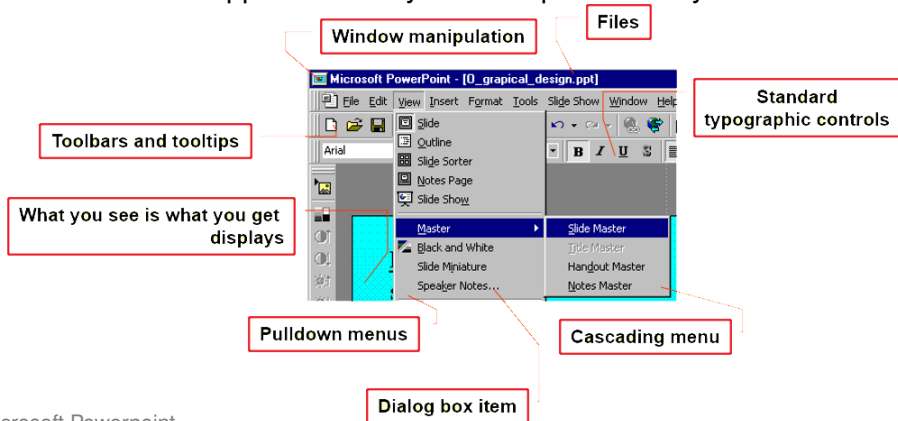
What do these images mean?

- no tooltips included
- one of the tabs is a glossary explaining these images!
Which one?

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



How to choose between widgets

What components must be in the display?

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

How are components related?

- organize related items as "chunks"

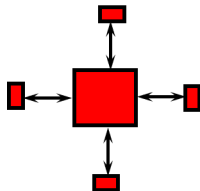
What are familiar and expected idioms?

- cross application look and feel

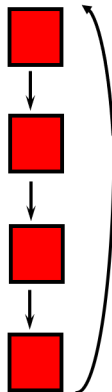
Widgets and complexity

How can window navigation be reduced?

- avoid long paths
- avoid deep hierarchies



✓



✗

What you now know

CRAP

Grids are an essential tool for graphical design

Other visual concepts include

- visual consistency
 - repetition
- visual organization
 - contrast, alignment and navigational cues
- visual relationships
 - proximity and white space
- familiar idioms
- legibility and readability
 - typography
- appropriate imagery

Interface Design and Usability Engineering

Goals:

Articulate:
•who users are
•their key tasks

Brainstorm
designs

Refined
designs

Completed
designs

Methods:

Task centered
system design

Participatory
design

User-centered
design

Evaluate
tasks

Psychology
of everyday
things

User involve-
ment
**Representation
& metaphors**

Participatory
interaction
Task
scenario
walk-
through

low fidelity
prototyping
methods

Graphical
screen
design

Interface
guidelines
Style
guides

high
fidelity
prototyping
methods

Usability
testing
Heuristic
evaluation

Field
testing

Products:

User and
task descrip-
tions

Throw-
away paper
prototypes

Testable
prototypes

Alpha/beta
systems or
complete
specification

- Saul Greenberg, **Designing and building visual interfaces. Graphical Screen Design**, University of Calgary, Canada
<http://pages.cpsc.ucalgary.ca/~saul/481/>
- Keith Andrews, **Human Computer Interaction, Chapter 11. Visual Design and Typography, Chapter 12. Icon Design**, TU Graz, Austria
<https://courses.isds.tugraz.at/hci/hci.pdf>

- Teo Siang, **Bad Design vs. Good Design: 5 Examples We can Learn From**

`https://www.interaction-design.org/
literature/article/
bad-design-vs-good-design-5-examples-we-can-learn-from`

- **6 Bad UI Design Examples & Common Errors of UI Designers**

`https://www.mockplus.com/blog/post/
6-bad-ui-design-examples`