

## IDI – Universal Design Principles & Perception Laws

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## Design Principles & Usability

- Usability: Defined in ISO 9241 standard as
  - The ability in which a product may be used by **specific** users in order to carry out **specific** tasks *effectively, efficiently, and with satisfaction* in a **specific** use environment.
  - Usability is always referred to a **concrete user group** and a **concrete user application**
    - *Efficacy* is the ability of correctly and completely achieving a certain goal.
    - *Efficiency* is the relation of used resources and the completeness and correctness of achieved goals.
    - *Satisfaction* is the comfort and acceptance of a system by the users and other people that are affected by its use.

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## Usability Principles (Bruce Tognazzini)

- Fashion should never trump usability (**Aesthetics**)
- Bring to the user all the information and tools needed for each step of the process (**Anticipation**)
- Computer interface, and task environment all “belong” to the user (**Autonomy**):
  - *Customized interfaces,*
  - *Keep user informed: status, errors, progress indicators,...*
- When using color to convey information in the interface, also use clear, secondary cues (**Color**)
- **Consistency**: levels of consistency, induced inconsistency, continuity, with user expectations
- **Default Values**: easy to blow away, not everything default,
- **Discoverability**: Any attempt to hide complexity will serve to increase it, if user cannot find it, it does not exist:
  - *Controls should be visible, communicate the gestural vocabulary, use active discovery,...*
- Look at the user’s productivity, not the computer’s (**Efficiency**):
  - *Formularies, error messages, latency reduction*
- **Explorable interfaces**: Actions reversible
  - *Always allow undo, back to home page, visible navigation*
- **Good Metaphors**
- **Protect Users’s work**: *Ensure that users never lose their work*

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## Universal Principles & Perception Laws in Design

- **Principle concepts of Design**
  - From the “Universal Principles of Design” book
  - by William Lidwell, Kritina Holden, Jill Butler
- Perception Laws in Design: Gestalt Laws
- Color perception

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## Universal Principles of Design

- **Aesthetic-Usability Effect**
  - Aesthetics play an important role in the way designs are used
  - Aesthetic designs look easier to use, and encourage its use more than non aesthetic designs
  - This effect produces the perception that an aesthetic design is easier to use than a non-aesthetic design

We must devote important efforts to improving our designs.

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## Universal Principles of Design

- **Correct alignment**
  - Elements must be aligned, this creates a sense of unity and cohesion, as well as facilitates reading.
  - More later..

**Confusion over Palm Beach County ballot**

Although the Democrats are listed second in the column on the left, they are the third hole on the ballot.

Punching the second hole casts a vote for the Reform Party.

**Left Ballot (Confusion):**

(REPUBLICAN)	2
GEORGE W. BUSH - PRESIDENT and DICK CHENEY - VICE PRESIDENT	
(DEMOCRATIC)	4
AL GORE - PRESIDENT and JOE LIEBERMAN - VICE PRESIDENT	
(LIBERTARIAN)	5
HARRY BROWNE - PRESIDENT and ART OLIVER - VICE PRESIDENT	
(GREEN)	7
RALPH NADER - PRESIDENT and VINODIA LADUNE - VICE PRESIDENT	
(SOCIALIST WORKERS)	9
JAMES HARRIS - PRESIDENT and MARGARET TROWE - VICE PRESIDENT	
(NATURAL LAW)	11
JOHN HAZELIN - PRESIDENT and NAT GOLDHABER - VICE PRESIDENT	

**Right Ballot (Correct):**

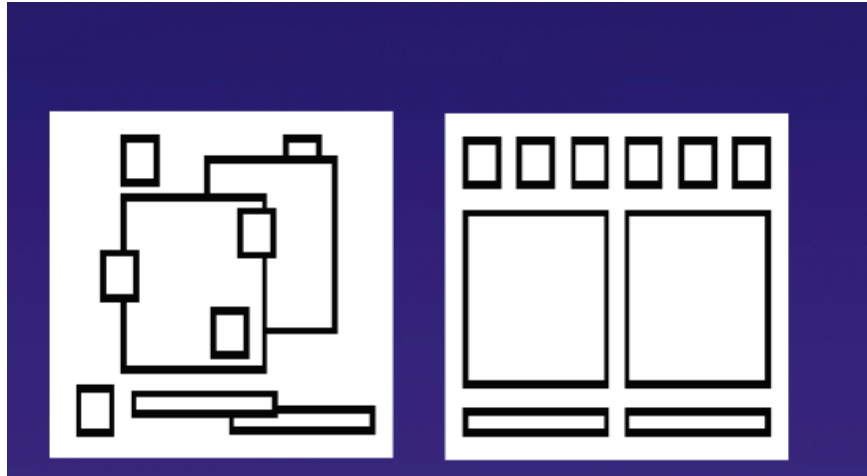
REPUBLICAN	2
GEORGE W. BUSH - PRESIDENT and DICK CHENEY - VICE PRESIDENT	
DEMOCRATIC	4
AL GORE - PRESIDENT and JOE LIEBERMAN - VICE PRESIDENT	
LIBERTARIAN	5
HARRY BROWNE - PRESIDENT and ART OLIVER - VICE PRESIDENT	
GREEN	6
RALPH NADER - PRESIDENT and VINODIA LADUNE - VICE PRESIDENT	
SOCIALIST WORKERS	7
JAMES HARRIS - PRESIDENT and MARGARET TROWE - VICE PRESIDENT	
NATURAL LAW	8
JOHN HAZELIN - PRESIDENT and NAT GOLDHABER - VICE PRESIDENT	
REFORM	9
PAT BUCHANAN - PRESIDENT and EZOLA FOSTER - VICE PRESIDENT	
SOCIALIST	10
DAVID MACREYNOLDS - PRESIDENT and MARY CAL HOLLES - VICE PRESIDENT	
CONSTITUTION	11
HOWARD PHILLIPS - PRESIDENT and J. CURTIS FRAZIER - VICE PRESIDENT	
WORKERS WORLD	12
MONICA MACREYNOLDS - PRESIDENT and GLORIA LA BEVA - VICE PRESIDENT	

WRITE-IN CANDIDATE: To vote for a write-in candidate, follow the directions on the long stub of your ballot card.

WRITE-IN CANDIDATE: To vote for a write-in candidate, follow the directions on the long stub of your ballot card.

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## Universal Principles of Design



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## Universal Principles of Design

### • Chunking

- A **chunk** is a unit of information in short-term memory
- **Chunking** is a technique that seeks to place the information in a way that accommodates to the limits the humans have to process bits of information.
  - Smaller chunks are easier to remember than larger lists  
Most people can remember a list of 5 words for 30 seconds, but few can remember a list of 10 words for 30 seconds.
  - Magical number:  $7 \pm 2$  (contemporary estimation  $4 \pm 1$ )
- It refers to elements that must be memorize:
  - Menu items, telephone numbers...
- But it is not required to divide all the elements in a screen or page in groups of 5 or so
  - Elements such a dictionary pages must not be chunked.

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## Universal Principles of Design

- Colour
  - It is an important feature that can make a design *more visually pleasing and aesthetic*
  - Can be used to *reinforce layout design and the meaning of elements*

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## Universal Principles of Design

- Colour: Aspects to consider:
  - Number of colours:
    - Keep it low, *up to five* and *Use a second cue.*
  - Colour combinations (more later):
    - Analogous (neighbours), complementary, or combinations of colours found in nature
  - Saturation: Attracts attention
    - When performance and efficiency are important, the use of *desaturated colours may help, perceived as more professional*
    - *Saturated colours attract attention* and are perceived as *more exciting and dynamic* (but may increase eye fatigue)
  - Symbolism:
    - The meanings of colours may vary among cultures

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## Universal Principles of Design

- Colour

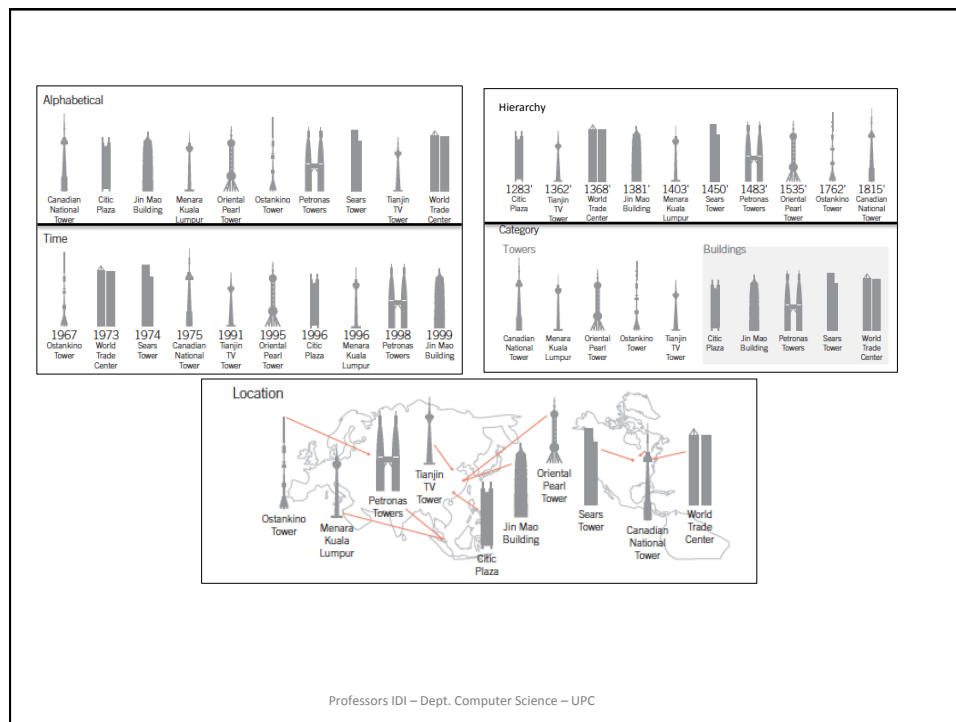


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## Universal Principles of Design

- **LATCH principle.** Information is organized according to:
  - **Location:** Information comes from different places (medicine: location of the body, cities, emergency exits).
  - **Alphabet:** Usually for large amounts of data (words in dictionary, contacts)
  - **Time:** Events with fixed durations. (meeting schedules, TV programs).
  - **Category:** To classify goods/elements of similar importance. Suitable for shops...
  - **Hierarchy:** By magnitude, order of importance (cost, league results)

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## Universal Principles of Design

- **Garbage-in garbage-out (GIGO):**  
Computer scientists have long known that  
inadequate input information often generates bad results
  - **Type error:** The input is provided in an incorrect type (*mistakes*).  
If undetected, it may generate large amounts of garbage.  
*Ex.: Numerical fields filled with a phone number or credit card number...*  
Type checks, input formatting, default values, example of inputs
  - **Quality error:** The input has the correct type but has some defects (*slips*).  
*Ex.: Amounts of money.*  
May be alleviated with confirmations and previews.

## Original Form

Order Form: Billing and Shipping Information page 2 of 2

<b>Shipping Address:</b>		<b>Billing Address:</b>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Credit Card Information:**

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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**Shipping Method:**  **Date to Ship:**

Unconstrained fields increase the probability of garbage input.

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## Redesigned Form

Order Form: Billing and Shipping Information page 2 of 2

Click here to view the information entered with your account

<b>Shipping Address:</b>		<b>Billing Address</b>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Credit Card Information:**

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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**Shipping Method:**  **Date to Ship:**

Your order will not be placed until you review the information you entered and click the "submit order" button.

March 21, 2003

1 dozen chocolate chip cookies

Ship to: Randy Williams  
101 Main Street  
Houston, TX 90990

Ship on: March 30, 2003

Bill to: Kristen Johnson  
211 Elm Street  
Columbus, OH 44354

VISA, \*\*\*\* \* 3041  
Exp. Date 5/2006  
Name on Card: Kristen J. Johnson

Allow users to automate input by accessing stored information.

Constrain input when a specific amount of information is required.

Constrain input using menus of options.

Allow users to preview information before they complete transactions.





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## Universal Principles of Design

- **Iconic representation:** Images try to represent objects or actions.

Four types:

- **Similarity:** The icon is visually similar to the action/object to be represented. Adequate for simple objects (turn right) 
- **Example:** Elements can be related to the image (plane for airport). 
- **Symbolic:** High level of abstraction (unlock icon) 
- **Arbitrary:** No relationship with element or action (nuclear symbol) 

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## Universal Principles & Perception Laws in Design

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From the “Universal Principles of Design” book  
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- Color perception

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## Perception Laws in Design. Gestalt Laws

- **Gestalt Laws relevant for visual design** are:

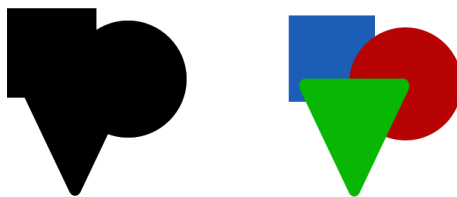
- Prägnanz Law
- The law of closure
- The law of similarity
- The law of proximity
- The law of symmetry
- The law of continuity
- The law of common fate



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## Perception Laws in Design. Gestalt Laws

- **Prägnanz Law:** Law of good figure, simplicity.  
We tend to perceive simpler shapes



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## Perception Laws in Design. Gestalt Laws

- **The law of closure:**

The mind may experience elements it does not perceive through sensation, in order to complete a regular figure

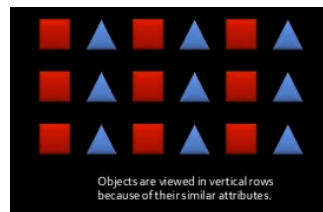


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## Perception Laws in Design. Gestalt Laws

- **The law of similarity:**

The mind groups similar elements into collective entities or totalities. This similarity might depend on relationships of form, colour, size, or brightness.

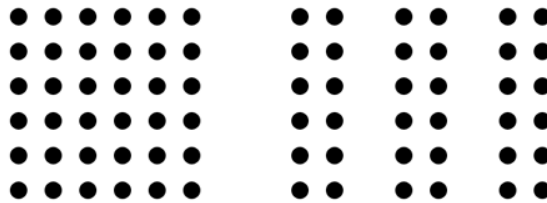


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## Perception Laws in Design. Gestalt Laws

- **The law of proximity:**

Spatial or temporal proximity of elements may induce the mind to perceive a collective or totality.

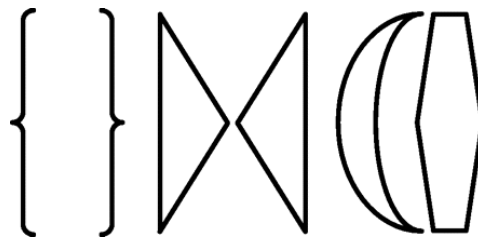


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## Perception Laws in Design. Gestalt Laws

- **The law of symmetry:**

Symmetrical images are perceived collectively, even in spite of distance.



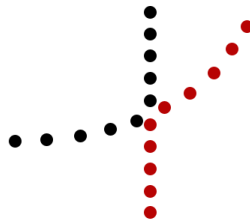
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## Perception Laws in Design. Gestalt Laws

- **The law of continuity:**

The mind continues visual, auditory, and kinetic patterns.

Elements on a line/curve may be perceived as more related than elements not on the line/curve.



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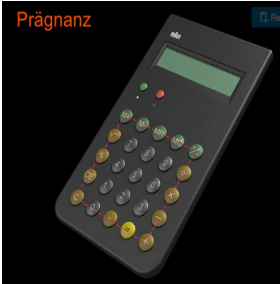
## Perception Laws in Design. Gestalt Laws

- **The law of common fate:** Elements with the same moving direction are perceived as a collective or unit.



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## Example



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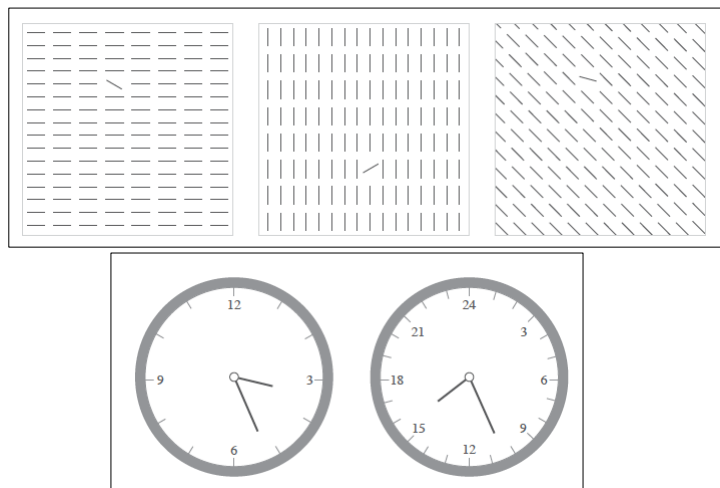


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## Perception Laws in Design.

- **Orientation Sensitivity:** *Efficient perception of line orientation is highly limited.*
  - Vertical or horizontal orientations are ok, while oblique orientations are more difficult to distinguish (30° is the minimum recommended).
  - Due to two main phenomena in visual perception:
    - **Oblique effect:** The relative deficiency in perceptual performance of our neurons for oblique contours as compared to the performance for horizontal or vertical contours.
    - **Pop-out effect:** It is the tendency of certain elements in a display to pop out as figure elements, and therefore be easily detectable. Better if they differ minimum 30°

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## Perception Laws in Design.

- **Pictorial superiority effect:**

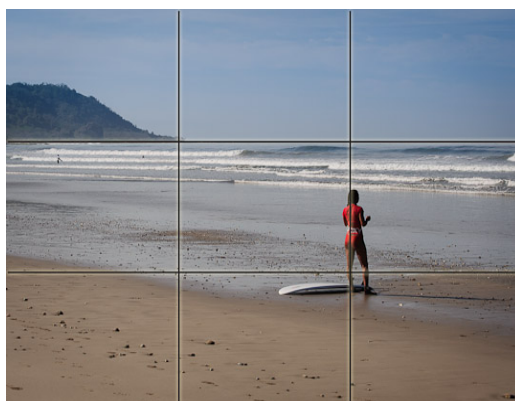
Concepts are much more likely to be remembered experientially if they are presented as pictures rather than as words.

- After 30 seconds
- Before 30 seconds, the same amount of information can be recalled in text than in pictures

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## Perception Laws in Design.

- **Rule of thirds**



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## Perception Laws in Design.

- **Signal to noise ratio:**

Measure used in science and engineering that compares the level of a desired signal to the level of background noise.

- A ratio higher than 1:1 indicates more signal than noise.
- *The goal of communication is maximizing signal and minimizing noise.*

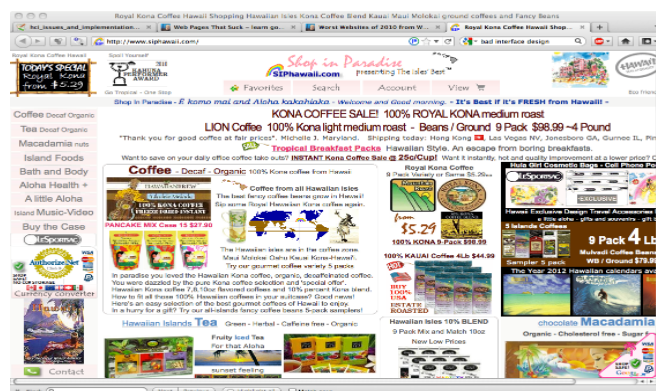
- Keep the design simple => enhance perception
- We can enhance information by using redundant coding and highlighting.
- Remove noise by eliminating unnecessary elements.

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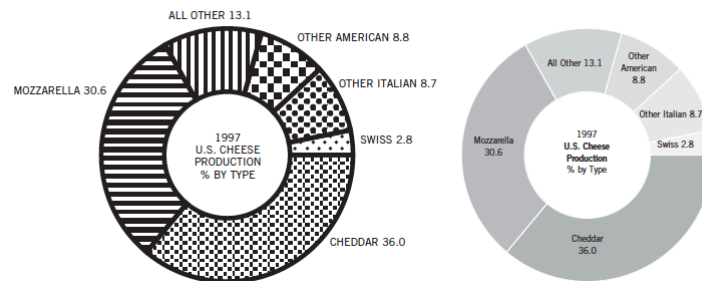
## Design Mistakes. Web pages

### Problems

- White space?



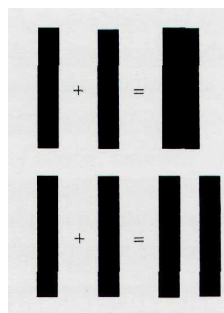
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## Universal Principles of Design

- **1+1 = 3**



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