Design 101

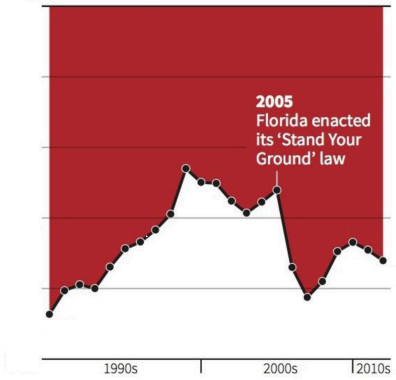
Michele Lanza

Lecture 02

Universal Principles of Design I

Gun deaths in Florida

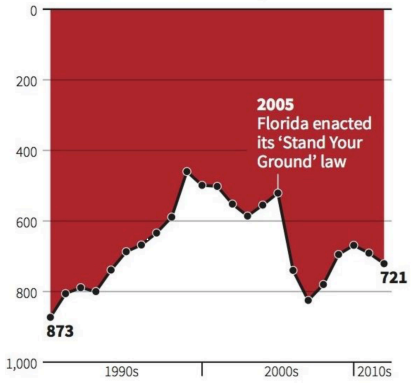
Number of murders committed using firearms



Source: Florida Department of Law Enforcement

Gun deaths in Florida

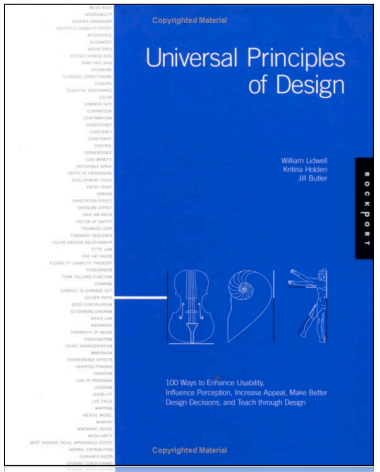
Number of murders committed using firearms



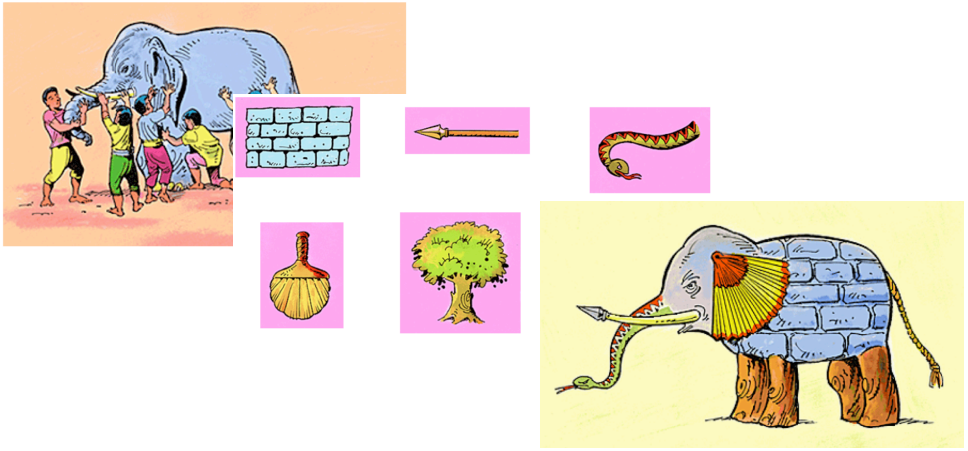
Source: Florida Department of Law Enforcement

Background Material

"Universal Principles of Design"
W. Lidwell, K. Holden, J. Butler

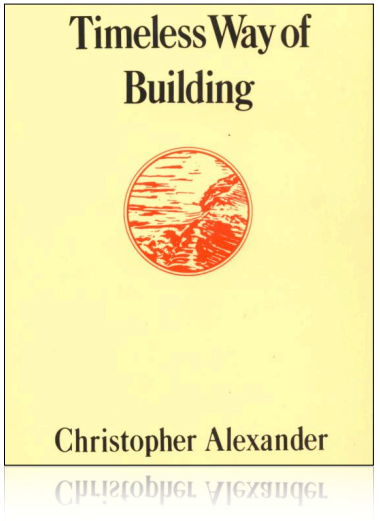


Reality is composed of (subjective) half-truths



Design..

"There is a central quality which is the root criterion of life and spirit in a man, a town, a building, or a wilderness. This quality is objective and precise, but it cannot be named."



Design Principles

- Design is hard to define; this is not the goal
- This course is about principles of design that help to get a better feeling for what design is
- We will go through a myriad of design principles
- These principles help to answer difficult questions
  - How can I influence the way a design is perceived?
  - How can I help people learn from a design?
  - How can I enhance the usability of a design?
  - How can I increase the appeal of a design?
  - How can I make better design decisions?

Universal Principles of Design

80/20 Rule	Accessibility	Advance Organizer	Aesthetic-Usability Effect	Affordance	Alignment	Archetypes	Attractiveness Bias	Baby-Face Bias	Chunking
Classical Conditioning	Closure	Cognitive Dissonance	Color	Common Fate	Comparison	Confirmation	Consistency	Constancy	Constraint
Control	Convergence	Cost-Benefit	Defensible Space	Depth of Processing	Development Cycle	Entry Point	Errors	Expectation Effect	Exposure Effect
Face-ism Ratio	Factor of Safety	Feedback Loop	Fibonacci Sequence	Figure-Ground Relationship	Fitt's Law	Five Hat Racks	Flexibility-Usability Tradeoff	Forgiveness	Form Follows Function
Framing	Garbage-In Garbage-Out	Golden Ratio	Good Continuation	Gutenberg Diagram	Hick's Law	Hierarchy	Hierarchy of Needs	Highlighting	Iconic Representation
Immersion	Interference Effects	Inverted Pyramid	Iteration	Law of Prägnanz	Layering	Legibility	Life Cycle	Mapping	Mental Model
Mimicry	Mnemonic Device	Modularity	Most Average Facial Appearance	Normal Distribution	Ockham's Razor	Operant Conditioning	Orientation Sensitivity	Performance Load	Performance Versus Preference
Picture Superiority Effect	Progressive Disclosure	Prospect-Refuge	Prototyping	Proximity	Readability	Recognition Over Recall	Redundancy	Rule of Thirds	Satisficing
Savanna Preference	Scaling Fallacy	Self-Similarity	Serial Position Effects	Shaping	Signal-to-Noise Ratio	Similarity	Storytelling	Structural Forms	Symmetry
Threat Detection	Three-Dimensional Projection	Top-down Lighting Bias	Uncertainty Principle	Uniform Connectedness	Visibility	vonRestorff Effect	Waist-to-Hip Ratio	Wayfinding	Weakest Link

Universal Principles of Design I

80/20 Rule	**Accessibility**	**Advance Organizer**	**Aesthetic-Usability Effect**	**Affordance**	**Alignment**	**Archetypes**	**Attractiveness Bias**	**Baby-Face Bias**	**Chunking**
Classical Conditioning	**Closure**	**Cognitive Dissonance**	**Color**	**Common Fate**	**Comparison**	**Confirmation**	**Consistency**	**Constancy**	**Constraint**

Universal Principles of Design II

80/20 Rule	Accessibility	Advance Organizer	Aesthetic-Usability Effect	Affordance	Alignment	Archetypes	Attractiveness Bias	Baby-Face Bias	Chunking
Classical Conditioning	Closure	Cognitive Dissonance	Color	Common Fate	Comparison	Confirmation	Consistency	Constancy	Constraint
Control	**Convergence**	**Cost-Benefit**	**Defensible Space**	**Depth of Processing**	**Development Cycle**	**Entry Point**	**Errors**	**Expectation Effect**	**Exposure Effect**
Face-ism Ratio	**Factor of Safety**	**Feedback Loop**	**Fibonacci Sequence**	**Figure-Ground Relationship**	**Fitt's Law**	**Five Hat Racks**	**Flexibility-Usability Tradeoff**	**Forgiveness**	**Form Follows Function**

Universal Principles of Design III

80/20 Rule	Accessibility	Advance Organizer	Aesthetic-Usability Effect	Affordance	Alignment	Archetypes	Attractiveness Bias	Baby-Face Bias	Chunking
Classical Conditioning	Closure	Cognitive Dissonance	Color	Common Fate	Comparison	Confirmation	Consistency	Constancy	Constraint
Control	Convergence	Cost-Benefit	Defensible Space	Depth of Processing	Development Cycle	Entry Point	Errors	Expectation Effect	Exposure Effect
Face-ism Ratio	Factor of Safety	Feedback Loop	Fibonacci Sequence	Figure-Ground Relationship	Fitt's Law	Five Hat Racks	Flexibility-Usability Tradeoff	Forgiveness	Form Follows Function
Framing	**Garbage-In Garbage-Out**	**Golden Ratio**	**Good Continuation**	**Gutenberg Diagram**	**Hick's Law**	**Hierarchy**	**Hierarchy of Needs**	**Highlighting**	**Iconic Representation**
Immersion	**Interference Effects**	**Inverted Pyramid**	**Iteration**	**Law of Prägnanz**	**Layering**	**Legibility**	**Life Cycle**	**Mapping**	**Mental Model**

Universal Principles of Design IV

80/20 Rule	Accessibility	Advance Organizer	Aesthetic-Usability Effect	Affordance	Alignment	Archetypes	Attractiveness Bias	Baby-Face Bias	Chunking
Classical Conditioning	Closure	Cognitive Dissonance	Color	Common Fate	Comparison	Confirmation	Consistency	Constancy	Constraint
Control	Convergence	Cost-Benefit	Defensible Space	Depth of Processing	Development Cycle	Entry Point	Errors	Expectation Effect	Exposure Effect
Face-ism Ratio	Factor of Safety	Feedback Loop	Fibonacci Sequence	Figure-Ground Relationship	Fitt's Law	Five Hat Racks	Flexibility-Usability Tradeoff	Forgiveness	Form Follows Function
Framing	Garbage-In Garbage-Out	Golden Ratio	Good Continuation	Gutenberg Diagram	Hick's Law	Hierarchy	Hierarchy of Needs	Highlighting	Iconic Representation
Immersion	Interference Effects	Inverted Pyramid	Iteration	Law of Prägnanz	Layering	Legibility	Life Cycle	Mapping	Mental Model
Mimicry	**Mnemonic Device**	**Modularity**	**Most Average Facial Appearance**	**Normal Distribution**	**Ockham's Razor**	**Operant Conditioning**	**Orientation Sensitivity**	**Performance Load**	**Performance Versus Preference**
Picture Superiority Effect	**Progressive Disclosure**	**Prospect-Refuge**	**Prototyping**	**Proximity**	**Readability**	**Recognition Over Recall**	**Redundancy**	**Rule of Thirds**	**Satisficing**

Universal Principles of Design V

80/20 Rule	Accessibility	Advance Organizer	Aesthetic-Usability Effect	Affordance	Alignment	Archetypes	Attractiveness Bias	Baby-Face Bias	Chunking
Classical Conditioning	Closure	Cognitive Dissonance	Color	Common Fate	Comparison	Confirmation	Consistency	Constancy	Constraint
Control	Convergence	Cost-Benefit	Defensible Space	Depth of Processing	Development Cycle	Entry Point	Errors	Expectation Effect	Exposure Effect
Face-ism Ratio	Factor of Safety	Feedback Loop	Fibonacci Sequence	Figure-Ground Relationship	Fitt's Law	Five Hat Racks	Flexibility-Usability Tradeoff	Forgiveness	Form Follows Function
Framing	Garbage-In Garbage-Out	Golden Ratio	Good Continuation	Gutenberg Diagram	Hick's Law	Hierarchy	Hierarchy of Needs	Highlighting	Iconic Representation
Immersion	Interference Effects	Inverted Pyramid	Iteration	Law of Prägnanz	Layering	Legibility	Life Cycle	Mapping	Mental Model
Mimicry	Mnemonic Device	Modularity	Most Average Facial Appearance	Normal Distribution	Ockham's Razor	Operant Conditioning	Orientation Sensitivity	Performance Load	Performance Versus Preference
Picture Superiority Effect	Progressive Disclosure	Prospect-Refuge	Prototyping	Proximity	Readability	Recognition Over Recall	Redundancy	Rule of Thirds	Satisficing
Savanna Preference	**Scaling Fallacy**	**Self-Similarity**	**Serial Position Effects**	**Shaping**	**Signal-to-Noise Ratio**	**Similarity**	**Storytelling**	**Structural Forms**	**Symmetry**
Threat Detection	**Three-Dimensional Projection**	**Top-down Lighting Bias**	**Uncertainty Principle**	**Uniform Connectedness**	**Visibility**	**vonRestorff Effect**	**Waist-to-Hip Ratio**	**Wayfinding**	**Weakest Link**

Universal Principles of Design

80/20 Rule	Accessibility	Advance Organizer	Aesthetic-Usability Effect	Affordance	Alignment	Archetypes	Attractiveness Bias	Baby-Face Bias	Chunking
Classical Conditioning	Closure	Cognitive Dissonance	Color	Common Fate	Comparison	Confirmation	Consistency	Constancy	Constraint
Control	Convergence	Cost-Benefit	Defensible Space	Depth of Processing	Development Cycle	Entry Point	Errors	Expectation Effect	Exposure Effect
Face-ism Ratio	Factor of Safety	Feedback Loop	Fibonacci Sequence	Figure-Ground Relationship	Fitt's Law	Five Hat Racks	Flexibility-Usability Tradeoff	Forgiveness	Form Follows Function
Framing	Garbage-In Garbage-Out	Golden Ratio	Good Continuation	Gutenberg Diagram	Hick's Law	Hierarchy	Hierarchy of Needs	Highlighting	Iconic Representation
Immersion	Interference Effects	Inverted Pyramid	Iteration	Law of Prägnanz	Layering	Legibility	Life Cycle	Mapping	Mental Model
Mimicry	Mnemonic Device	Modularity	Most Average Facial Appearance	Normal Distribution	Ockham's Razor	Operant Conditioning	Orientation Sensitivity	Performance Load	Performance Versus Preference
Picture Superiority Effect	Progressive Disclosure	Prospect-Refuge	Prototyping	Proximity	Readability	Recognition Over Recall	Redundancy	Rule of Thirds	Satisficing
Savanna Preference	Scaling Fallacy	Self-Similarity	Serial Position Effects	Shaping	Signal-to-Noise Ratio	Similarity	Storytelling	Structural Forms	Symmetry
Threat Detection	Three-Dimensional Projection	Top-down Lighting Bias	Uncertainty Principle	Uniform Connectedness	Visibility	vonRestorff Effect	Waist-to-Hip Ratio	Wayfinding	Weakest Link

Ready?

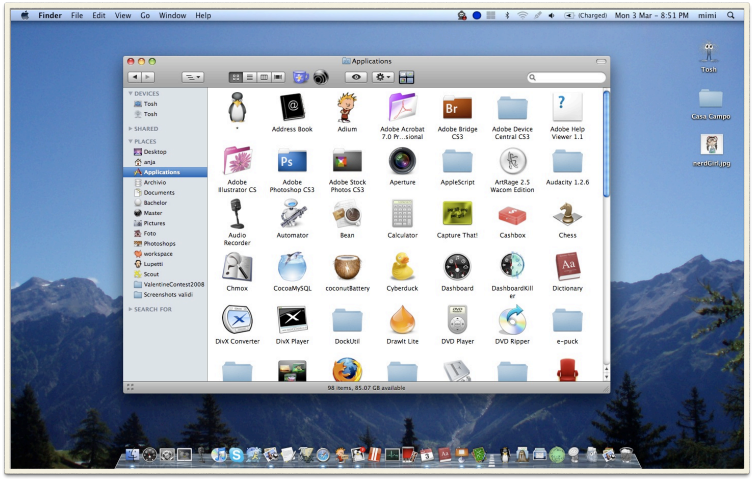
Universal Principles of Design I

80/20 Rule	Accessibility	Advance Organizer	Aesthetic-Usability Effect	Affordance	Alignment	Archetypes	Attractiveness Bias	Baby-Face Bias	Chunking
Classical Conditioning	Closure	Cognitive Dissonance	Color	Common Fate	Comparison	Confirmation	Consistency	Constancy	Constraint

80/20 Rule

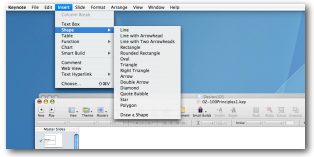
> A high percentage of effects in any large system are caused by a low percentage of variables

- Also known as “Pareto Principle”
- First stated by Vilfredo Pareto, who observed that 20% of the Italians possessed 80% of the wealth
- Observable in all complex systems
- The numbers are not important, can also be 90/10 or 70/30
- Linked to normally distributed systems
  - The application of this rule is limited to variables that are influenced by many small and unrelated effects



80/20 Rule Exemplified

- 80% of a product's usage involves 20% of its features
- 80% of a town's traffic is on 20% of its roads
- 80% of innovation comes from 20% of the people
- The 80/20 rule is useful to focus resources
  - Use them to test 20% of the features of a product
  - Use them to have 20% of the roads in good conditions
- Getting to the last 20% is hard, a.k.a. the "last mile" problem



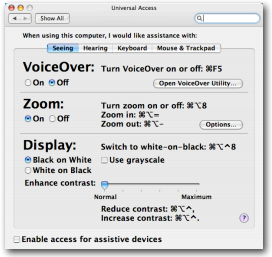
Accessibility

> Objects and environments should be designed to be usable, without modification, by as many people as possible

- Assertion: Designs should be usable by people of diverse abilities, without special adaptation or modification
- The 4 characteristics of accessible designs

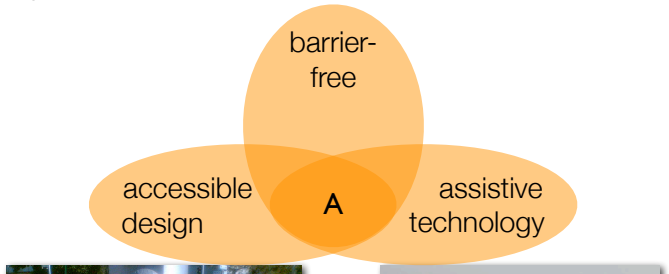
1. **Perceptibility**: Everyone can perceive the design, regardless of sensory abilities
2. **Operability**: Everyone can use the design, regardless of physical abilities
3. **Simplicity**: Everyone can easily understand and use the design, regardless of experience, literacy, or concentration level
4. **Forgiveness**: Minimize consequences and occurrences of errors

Accessibility (de)Exemplified



Accessibility to the Limit

Accessibility too



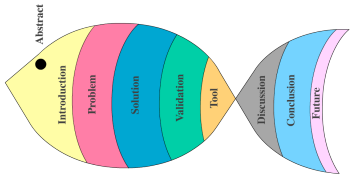
Guidelines for Accessible Designs

Principle	Guidelines
Perceptibility	Present information using redundant coding methods
	Provide compatibility with assistive sensory technologies
	Position controls and information so that seated and standing users can perceive them
Operability	Minimize repetitive actions and the need for sustained physical effort
	Facilitate use of controls through good affordances and constraints
	Provide compatibility with assistive physical technologies
	Position controls and information so that seated and standing users can access them
Simplicity	Remove unnecessary complexity
	Clearly and consistently code and label controls and modes of operation
	Use progressive disclosure to present only relevant information and controls
	Provide clear prompting and feedback for all actions
	Ensure that reading levels accomodate a wide range of literacy
Forgiveness	Use good affordances and constraints to prevent errors from occurring
	Use confirmations and warnings to reduce the occurrence of errors
	Include reversible actions and safety nets to minimize the consequences of errors

Advance Organizer

An instructional technique that helps people understand new information in terms of what they already know

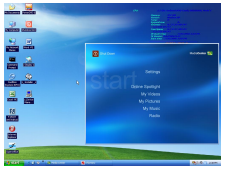
- Brief chunks of information (spoken, written, illustrated) presented prior to new material to facilitate learning
- "The big picture" before the details
- Examples: Introduction lectures or *well done* "contents" slides



Aesthetic-Usability Effect

Aesthetic designs are perceived as easier to use than less-aesthetic designs

- A psychological phenomenon leading to the assumption: it if looks cool, then it is easier to use
- Effect: Many designs focus on "coolness" at the expense of usability
- Baseline: Always try to create aesthetic designs



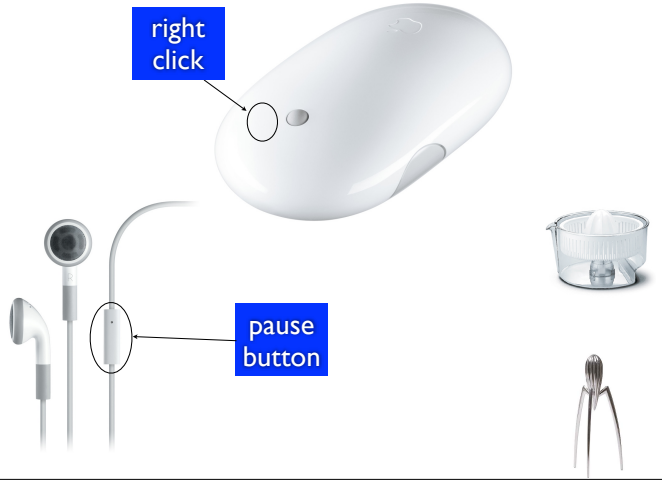
When things go too far

Affordance

> A property in which the physical characteristics of an object or environment influence its function

- When the affordance of an object or environment corresponds with its intended function, the design will perform more efficiently and will be easier to use
- Images of common objects can enhance usability
- Design objects and environments to afford their intended function, and negatively afford improper use

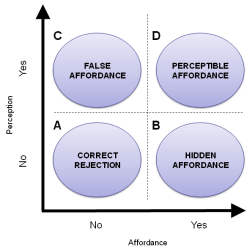
Extreme Design..



More Affordance

Gaver's Affordance Framework

- False affordance: there is no action possibility, but the perception says there is
- Correct rejection: no affordance, and no perception (window without a handle)
- Hidden affordance: affordance is there, but not perception (hidden door)
- Perceptible affordance: affordance is there, perception too



Alignment

> The placement of elements such that edges line up along common rows or columns, or their bodies along a common center

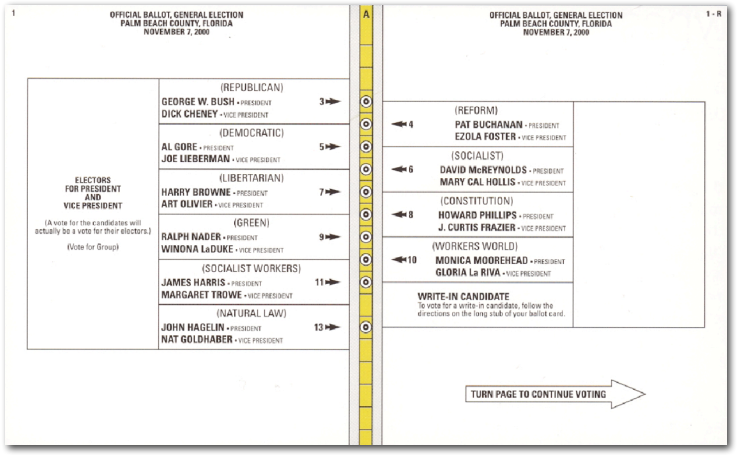
- Alignment creates a sense of unity and cohesion, contributing to the design's overall aesthetic and perceived stability
- Alignment leads to (invisible) cues to aid understanding
- In paragraph text, center alignment is the worst

The placement of elements such that edges line up along common rows or columns, or their bodies along a common center

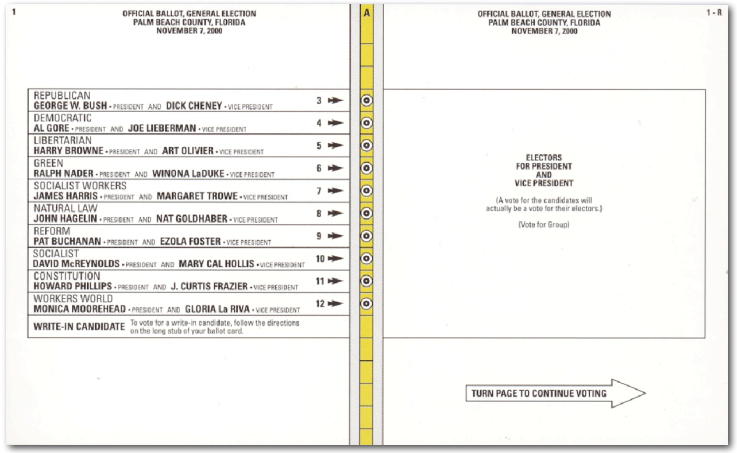
The placement of elements such that edges line up along common rows or columns, or their bodies along a common center

The placement of elements such that edges line up along common rows or columns, or their bodies along a common center

Alignment (De)Exemplified



Misalignment considered harmful...



Archetypes

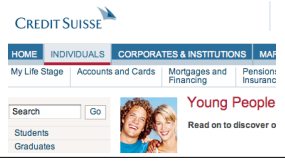
> Universal patterns of theme and form resulting from innate biases or dispositions

- Found in themes of myths, literature, imagery, etc.
- “Hardwired” into the brain over the course of generations
- Specific archetypes may vary across cultures

Attractiveness Bias

> A tendency to see attractive people as more intelligent, competent, moral, and sociable than unattractive people

- Tied to evolutionary processes (good looking = healthy = good mate)
- For women: looks & money
- For men: mostly looks
- When using people in designs, always use well-clothed, good-looking people
- “First impressions are lasting impressions”



Beauty is in the eye of the beholder..

Reflections

beautiful = good?

ugly = bad?

1 murder
9 attempted murders
9 robberies

Attractiveness Bias?

25+ trials + 18 "ad personam" laws
=
(Italian Prime Minister)^4

Baby-Face Bias

A tendency to see people and things with baby-faced features as more naïve, helpless, and honest than those with mature features

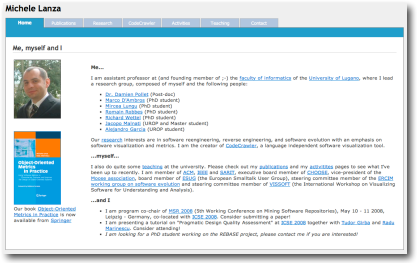
- Children with round features are loved more!
- Baby-faced adults are taken less seriously
  - In legal proceedings they are less likely to be found guilty for intentional crimes, but pursued harder for negligent acts
- Use mature-faced people when communicating authority & power
- Use baby-faces when communicating innocence

Chunking

A technique of combining many units of information into a limited number of units or chunks, so that the information is easier to process and remember

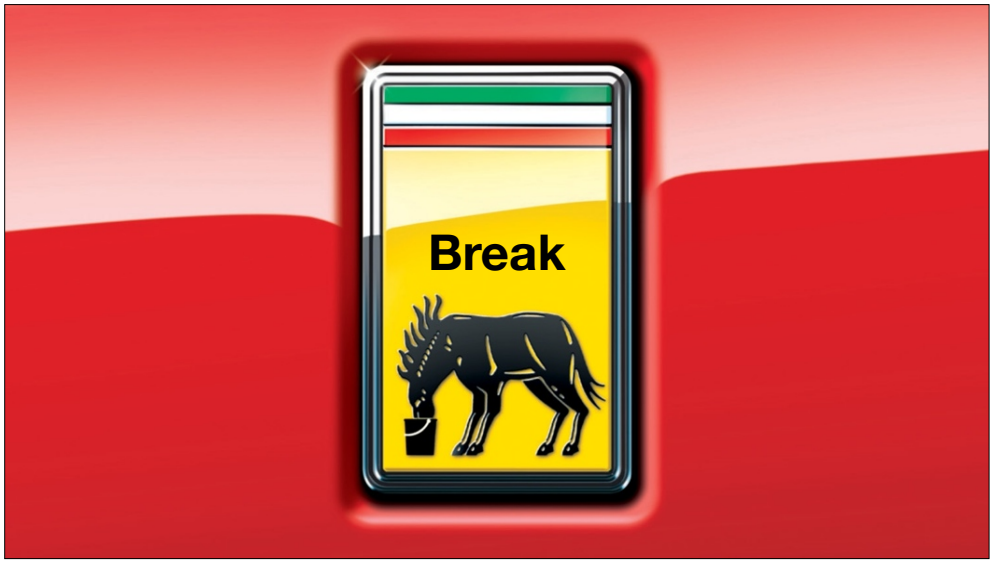
- Chunk = unit of information in short-term memory, e.g., a string of letters, words, or a series of numbers
- Maximum number of chunks that can be held: 4 (± 1) to 7 (± 2)
- Chunking is often misused at the expense of efficiency (e.g., a dictionary, many websites, etc.)
- Do not use chunking for information that is to be searched or scanned

Exemplifying Chunking



0041586664659
+41 (0)58 666 4659

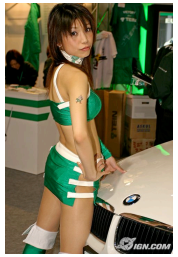
angry	thrunced
snuggle	rooped
search	croodle
fatigue	poosk
stutter	quanked
scorch	maffle
warning	brizzle
teenager	gardyloo
anxious	haspenaid



Classical Conditioning

A technique used to associate a stimulus with an unconscious physical or emotional response

- First discovered by Pavlov, whose experiments involved dogs
- Many phobias are caused by this type of association
- In advertisement this is heavily exploited



Closure

MTO

> A tendency to perceive a set of individual elements as a single, recognizable pattern, rather than multiple, individual elements

- One of the *Gestalt* principles
- Automatic & subconscious: an innate preference for simplicity over complexity, pattern over randomness
- Only works if the energy required to complete the picture is smaller than the energy required to perceive the individual elements
- The viewer *enjoys* closure

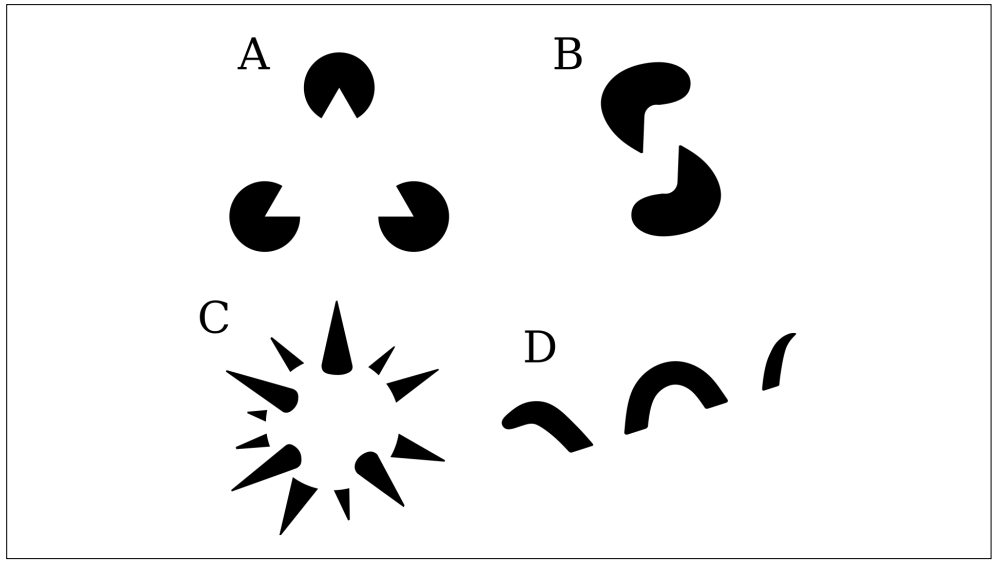
Closure exemplified

Closure Exemplified 2

Intermezzo On Gestalt Psychology

Gestalt Psychology

- A school of psychology and a theory of perception that emphasises the processing of entire patterns and configurations, and not merely individual components
- Emerged in the early 20th century in Austria & Germany
- Associated with the adage “The whole is greater than the sum of its parts” >> holism
  - Information is processed as wholes rather than disparate parts, which are then processed summatively
- Gestalt ~ pattern / configuration
- The key principles of Gestalt systems are reification, multistability, and invariance
- We will encounter several Gestalt principles



Cognitive Dissonance

> A tendency to seek consistency among attitudes, thoughts, and beliefs

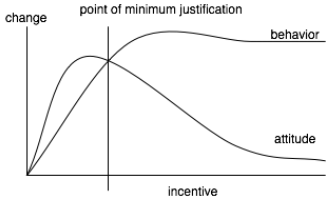
- “The concept, dear to brainwashers, that you eventually come to believe whatever you say” [Warren Bennis et al., “Organizing Genius”]
- Cognitive Dissonance (CD) is the state when a person’s cognitions (attitudes, thoughts, beliefs) conflict
- People react to cognitive dissonance in three ways, by
- reducing the importance of dissonant cognitions
- adding consonant cognitions
- removing or changing dissonant cognitions
- Cognitive dissonance is used to persuade and influence people

Exemplifying Cognitive Dissonance

- “Diamonds are a girl’s best friend”
- Ad campaigns seek to create CD in people: “love for somebody” vs “prove your love by buying diamonds”
  - Reducing CD: diamonds are after all only compressed carbon
  - Add consonant cognitions: they’re just trying to manipulate me
  - Remove/change CD: let’s buy the thing and get it over with

Incentives and Cognitive Dissonance

- Incentives of different sizes yield different results
- Scenario: you have to do something unpleasant
  - A small incentive makes you change the CD
    - “It’s OK to do this, after all I kind-of like it”
  - A big incentive makes you add consonance
    - “It’s OK, after all they’re paying me well”
- When incentives increase, people retain their original opinion
- Any incentive beyond a certain size reduces the probability of changing attitude towards a thing
  - This is known as “the point of minimum justification”



Color

```
Color is used in design to attract attention, group elements, indicate meaning, and enhance aesthetics
```

- Color makes designs more visually interesting and aesthetic, and can reinforce the organization and the meaning of elements
- Guidelines for using colors
  - Number of colors
  - Color Combinations
  - Saturation
  - Symbolism

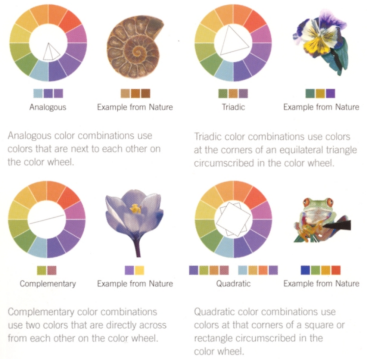
The Color Wheel

Number of Colors

- Limit the palette of colors to what the eye can process at one time (ca. 5)

Color Combinations

- Achieve aesthetic combinations using colour scheme that are
  - adjacent,
  - Complementary (= opposing),
  - triadic,
  - quadratic,
  - or colors used in nature



Complementary Color Schemes

Analogous Color Schemes

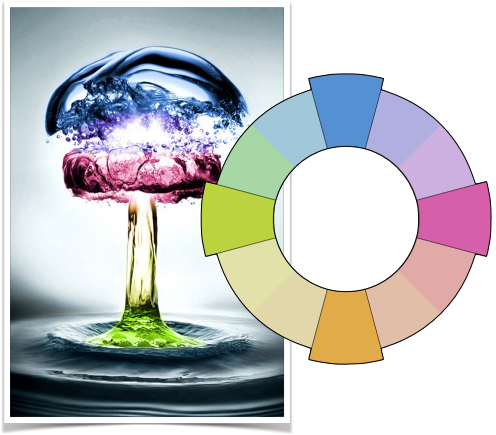
Triadic Color Schemes

Split-Complementary Color Schemes

Rectangle Color Schemes

Square Color Schemes

Square Color Scheme



Saturation

- Use saturated colors to attract attention
- Use desaturated colors when performance and efficiency are priority

Color & Symbolism

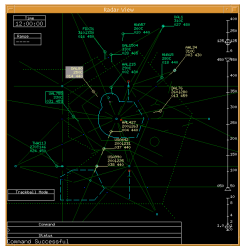
- No universal symbolism across cultures, but you can assume that
  - Dark colors make people sleepy
  - Light colors make people lively
  - Irritating colors make people irritated

CREDIT SUISSE

Common Fate

```
Elements that move in the same direction are perceived to be more related than elements that
move in different directions or are stationary
```

- Another Gestalt principle
- Used to group things which are otherwise unrelated
- Moving elements are perceived as figure elements, stationary elements as background
- http://www.youtube.com/watch?v=qQX1pW4G5yY&feature=related

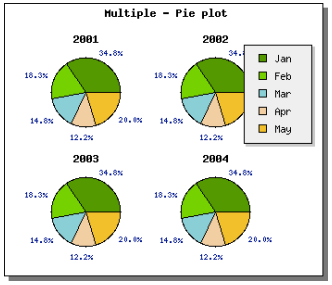


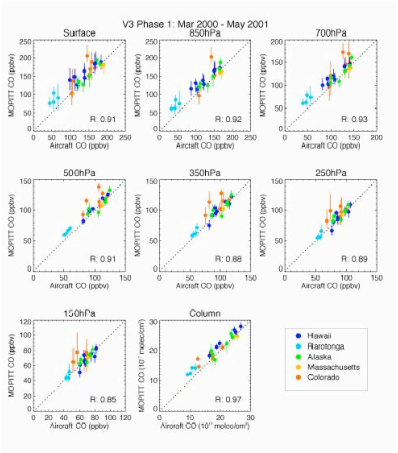
Comparison

```
A method of illustrating relationships and patterns in system behaviors by representing two or
more system variables in a controlled way
```

- People are good at spotting differences
- Key techniques for comparison data presentation
  - **Apples to Apples**: use common measure and common units
  - **Single Context**: use a single context to highlight differences
  - **Benchmarks**: provide a point of reference

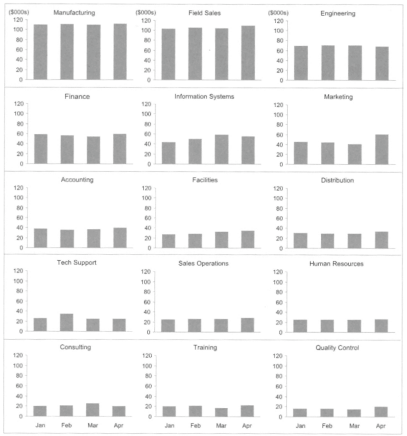
(De)exemplifying Comparison





Well-done Comparison

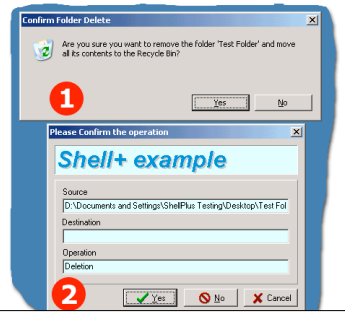
- “Data-Ink Ratio”...
- Common scales



Confirmation

> A technique for preventing unintended actions by requiring verifications of the actions before they are performed

- Slows down performance, therefore use it sparingly, but use it when necessary!



Consistency

> The usability of a system is improved when similar parts are expressed in similar ways

- Consistency enables people to efficiently transfer knowledge to new contexts, learn new things quickly, and focus on the relevant aspects of a task
- McDonald’s is the same everywhere..

4 Kinds of Consistency

- **Aesthetic**, referring to style and appearance
  - Enables recognition, communicates membership, sets emotional expectations
- **Functional**, referring to meaning and action
  - Improves usability and learnability
- **Internal**, referring to other elements in the system
  - Cultivates trust, indicates design, not chaos
- **External**, referring to elements outside of the system
  - Extends the benefits or internal consistency

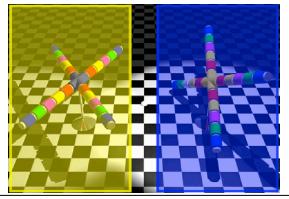
Guidelines on Consistency

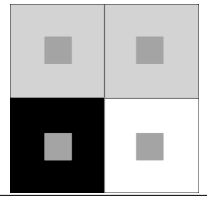
- Consider aesthetic and functional consistency in all aspects of design
- Use aesthetic consistency to establish unique identities that can be easily recognized
- Use functional consistency to simplify usability and ease of learning
- Ensure internal and external consistency whenever possible
- Do not compromise clarity or usability for consistency

Constancy

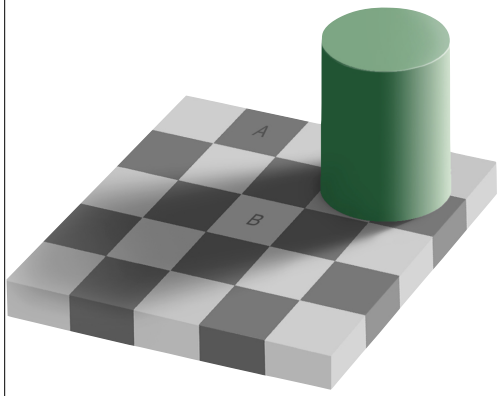
> The tendency to perceive objects as unchanging, despite changes in sensory inputs

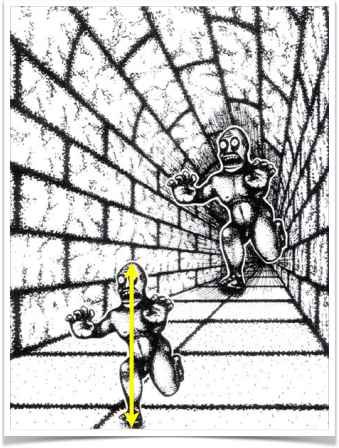
- Also known as *perceptual constancy*
- All senses exhibit constancy to some extent
- Counterexamples: http://www.echalk.co.uk/amusements/OpticalIllusions/illusions.htm





Constancy Examples





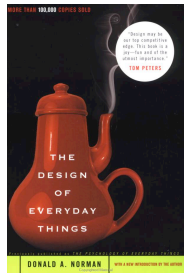
Constancy Applications

- **Size**: The size of objects is perceived to be constant, even though a change in distance appears smaller or larger
- **Brightness**: The brightness of objects is perceived to be constant, even though changes in illumination make the objects appear brighter or darker
- **Shape**: The shape of objects is perceived to be constant, even though change in perspective make the objects appear to have different shapes
- **Loudness**: The loudness of an object is perceived to be constant, even though a change in distance makes the sound seem louder or softer

Constraint

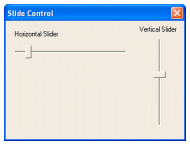
```
A method of limiting the actions that can be performed on a system
```

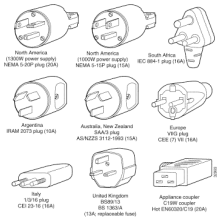
- Proper use of constraints makes systems easier to use and reduces error probability
- There are 2 basic kinds of constraints
  - Physical Constraints: limits the range of possible actions by redirecting motion in specific ways
  - Psychological Constraints: limits the range of possible actions by leveraging the way people perceive and think about the world
- Seminal Work: “The Design of Everyday Things” by Donald Norman



Physical Constraints

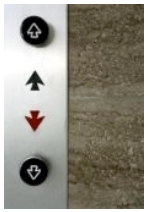
- The 3 kinds of physical constraints are *paths, axes, barriers*
  - **Paths** convert applied forces into linear or curvilinear motion using channels or grooves
  - **Axes** convert applied forces into rotary motion
  - **Barriers** absorb or deflect applied forces, thus halting, slowing, or redirecting the forces around the barrier





Psychological Constraints

- The 3 kinds of psychological constraints are *symbols, conventions, mappings*
  - **Symbols** influence behavior by communicating meaning through language and icons
  - **Conventions** influence behavior based on tradition
  - **Mappings** influence behavior based on relationships between elements



Guidelines on Constraints

- Use constraints in design to simplify usability and minimize errors
- Use physical constraints to reduce sensitivity of controls, minimize unintentional inputs, and prevent or slow down dangerous actions
- Use psychological constraints to improve clarity and intuitiveness of a design

Universal Principles of Design I

80/20 Rule	Accessibility	Advance Organizer	Aesthetic-Usability Effect	Affordance	Alignment	Archetypes	Attractiveness Bias	Baby-Face Bias	Chunking
Classical Conditioning	Closure	Cognitive Dissonance	Color	Common Fate	Comparison	Confirmation	Consistency	Constancy	Constraint

Homework

- Nothing for now