Agenda

Special Topic: Basic Industrial Design (ID) Concepts

basic concepts you need to know to communicate with industrial designers

- Setting the Stage
- Concepts
- Toolkits and Techniques
- Q&A
Setting the Stage

• Though engineering sciences are often exceptional tools for optimizing subsystems of products, engineers often fail to ask broader questions and challenge design assumptions.

• Design teams need to better understand people, product use, and human context in order to better arrive at “black box” design constraints.

• Industrial Designers, working with business groups (marketing and product planning) conceptualize the product, early in its development. The results are often handed off to engineering.
Form follows function
Form communicates function
Form enables function
Form follows emotion
Concepts | Between science and art
Concepts

Analogue to Engineering

- Engineering: Applied Physics
- Industrial Design: Applied Social Sciences
  - Cognitive Psychology (aesthetics)
  - Anthropology (human factors / ethnography)
  - Sociology (context / narrative)
Design Decision

• How do we consider the physical and cognitive capabilities of our end users with design?
Human Factors/ergonomics

Designing for the interaction between the artifact/system and human beings

- Physical
- Cognitive
- Organizational
Physical ergonomics

• How to design for the comfort and functioning of the human body
• Anthropometrics – measuring humans
• Physiology – how the body functions
• Bio Mechanics – study of the structure of the body from a mechanical view – forces and actions

www.megep.meb.gov.tr
Cognitive ergonomics

- Mental processes as they effect interaction with products/systems
- Perception
- Memory
- Reasoning
- Motor Response
When Cognitive Ergonomics Go Wrong

- Cognitive “overload”
- Attention tunneling

- Warning systems
- Information systems
- Alarm systems
- User interfaces....
Organizational Ergonomics

- Optimization of systems involving humans
  - Structures
  - Policies
  - Procedures
  - Communication
  - Resource management
  - Community

www.centerhfe.com
Human Factors Methods

- **Activity mapping/task analysis** – watching how humans go about their lives/tasks
- **Iterative design** – prototype and test with humans for fit/comfort/understanding
- **Cognitive walkthrough** – putting yourself in the end user’s shoes to experience/evaluate the design
- **Personas** – design with an intended user in mind – define that user with concrete characteristics that most users would share
- **Scenarios** – develop problem situations that could be addressed or solved with design solutions – take the form of a narrative
Human Factors Resources

- www.osha.gov/SLTC/ergonomics/
- www.cdc.gov/niosh/topics/ergonomics/
- en.wikipedia.org/wiki/Human_factors_and_ergonomics
- www.iea.cc/whats/index.html
- www.ergonomics.org.uk
- Liberty Mutual
Both Engineering and ID share the design process:

- Explore & Understand
- Express a Design (hypothesis)
- Test the Prototype
- Refine and Iterate
Concepts

Understand

Express

Test

Cycle

Empathy

Creativity

Execution

Accept Design Process
Concepts

- Empathy
- Creativity
- Test
- Cycle

Tools
- Bug-listing
- Moccasins
- Ethnography Study
- Interviews

- Art & Design Elements
- Images / Story
- Drawings
- Models

- Prototyping / Manufacturing
- Engineering / CAD
- Focus Groups
- Statistical Analysis

Design Process
Concepts

Product Visualization
Several Techniques to quickly prototype product concepts
- Sketches
- Paper Prototypes / Foam Models
- Appearance Models
- Functional Models
- Computer 3D Modeling

Concepts
Gestalt Principles:

early 19th cent. Cognitive Psychology

- is a theory of mind and brain of the Berlin School
- the brain is holistic, parallel and analog with self-organizing tendencies
- based on theories by Von Goethe, Hume, Kant, and Ernst Mach
- has formed the basis of further research into the perception of patterns and objects and of research into behavior, thinking, and problem solving
Toolkits and Techniques: Elements of Art

• LINE
  - Line can be considered in two ways. The linear marks made with a pen or brush or the edge created when two shapes meet.
    • Horizontal - structure or calm
    • Vertical - reverence or balance
    • Diagonal and/or Zigzag - dynamic, movement
    • Curved - soft, organic
    • Line Weight as well as Line character

• SHAPE
  - A shape is a self contained defined area, which are comprised of lines or edges. A positive shape in a design automatically creates a negative shape.
    • Two dimensional - Flat
    • Geometric vs. Organic
    • Positive Shape vs. Negative Shape
Toolkits and Techniques: Elements of Art

• FORM
  - Form refers to three-dimensional shapes that have length, width and depth.
    - Three dimensional - Volume (in sculpture) or the illusion of volume (in 2D work)
  - Full Round
  - Bas Relief
  - Shading: Light / Shadow

• SPACE
  - Defined and determined by shapes and forms. Positive space is where shapes and forms exist; negative space is the empty space around shapes and forms.
    - Collection of single or multiple shapes / forms
    - Positive Space: the object(s) itself aka the subject
    - Negative Space: the environment aka the ground
Toolkits and Techniques: Elements of Art

• **COLOR**
  - *Color is produced when light strikes an object and reflects back in our eyes.*
    - **Hue:** Where the color is positioned on the color wheel. Terms such as red, blue-green, and mauve all define the hue of a given color.
    - **Value:** The general lightness or darkness of a color. How close to black or white a given color is.
    - **Saturation:** The intensity, or level of chroma, of a color. The more gray a color has in it, the less chroma it has.

• **TEXTURE**
  - refers to the surface quality or "feel" of an object - smooth, rough, soft, etc.
  - Textures may be actual (felt with touch - tactile) or implied (suggested by the way an artist has created the work of art - visual)
Concepts

Visual Hierarchy and Language

- **Definition**
  - *is the order in which the human eye perceives what it sees. This order is created by the visual contrast between forms in a field of perception. Objects with highest contrast to their surroundings are perceived first.*
  - Color
  - Size
  - Alignment
  - Character

- **Basis**
  - *Based on 20th century German Gestalt psychological theory*
    - innate in the human brain
    - to “structure individual elements, shapes or forms into a coherent, organized whole.”
  - Designers attempt to control visual hierarchy to guide the eye to information in a specific order for a specific purpose.
Toolkits and Techniques: Principles of Design

- **RHYTHM (MOVEMENT)**
  - is the repetition or alternation of elements, often with defined intervals between them. Rhythm can create a sense of movement, and can establish pattern and texture. There are many different kinds of rhythm, often defined by the feeling it evokes when looking at it.
    - Regular: A regular rhythm occurs when the intervals between the elements, and often the elements themselves, are similar in size or length.
    - Flowing: A flowing rhythm gives a sense of movement, and is often more organic in nature.
    - Progressive: A progressive rhythm shows a sequence of forms through a progression of steps.

- **BALANCE**
  - is the arrangement of the objects in a given design as it relates to their visual weight within a composition. Balance usually comes in two forms: symmetrical and asymmetrical.
    - Symmetrical balance occurs when the weight of a composition is evenly distributed around a central vertical or horizontal axis or radially from a central point.
    - Asymmetrical balance occurs when the weight of a composition is not evenly distributed around a central axis or point.
Toolkits and Techniques: Principles of Design

• PROPORTION
  – is the comparison of dimensions or distribution of forms. It is the relationship in scale between one element and another, or between a whole object and one of its parts.
    • Inherent
    • Comparative
    • Overall

• EMPHASIS or DOMINANCE
  – determines the visual weight of a composition, establishes space and perspective, and often resolves where the eye goes first when looking at a design.
    • Through the various elements and principles: shape, line, rhythm etc.
    • Focus/depth of field pushes/pull your attention/the eye

• HARMONY or UNITY
  – describes the relationship between the individual parts and the whole of a composition. Closure
    • Continuance
    • Similarity, Proximity and Alignment
Toolkits and Techniques: Grids

• Definition
  – a series of lines (usually horizontal and vertical) that seek to define a space/page in order to better organize visual elements (e.g., text, images)
    • typographic grids for page layout
    • character lines for 3d sculpture/industrial design

• Considerations
  – manifestation of your visual hierarchy
    • use all Gestalt principles: i.e. Art Elements/Principles of Design
      – closure, similarity, proximity, color, size etc.
      – consider organization, balance, emphasis
        (dominant, subdominant subordinate etc)
    • cultural: US: left to right, top to bottom
      Asia: top to bottom, right to left
Grids

Examples

- Designer unknown
- Medea M, for Opernhaus, designed by Ruedi Rüegg, 1972
- Atembogen, for Baltis und Rüegg, designed by Hug + Söhne, 1979
- Birth of the Cool, designed by Cornel Windlin, 1997

Pla Gra Des (Plakate Grafik Design), by Georg Staehelin, 1999

Designer unknown
Application

Principles of design
Concepts

Materials and Manufacture

*Understanding the cognitive implication and perception of materials wrt aesthetics*

- Color Choice and Materials
- Surface Feeling / Texture
- Sustainability and Environmental Impact
- Aesthetic Consistency
- Quality Assurance
- Manufacturing Processes
Concepts

Systems + Visual Language

• Definition
  – visual language is a system of communicating using visual elements
    • utilizes same concepts for visual hierarchy (color, size, shape etc), but orders the weighting of the hierarchy.
    • Gauges the use of contrast relative to multiple applications

• Considerations
  • used effectively, systems can retain a consistent aesthetic, tone or meaning
  • used often in branding and marketing materials
  • can establish visual, graphic rules whereby further variants of a design are constructed
Systems - Visual Language
 Concepts

Ethnography: User Observation

• the rigorous study of the routine daily lives of a group of people

Key Attributes

• People make sense
• Accessing implicit and explicit information
• Multiple Perspectives
• Natural Environment

Process

• Watch what people do
• Listen to what people say
• Listen to what people say about what they do
• Look more for what people are thinking and doing than the words they say
Toolkits and Techniques

Interview Structure

Introduction and Kick Off
- Set up a comfortable place for the interview
- Describe your purpose
- Let them know their knowledge is important

Build Rapport:
- Ease defensiveness through reassurance
- Start with general concrete questions, then explore their experiences
- Let them tell the stories they want to

Grand Tour
- Ask interviewee for a narrated tour of the setting
- Ask questions, act out scenarios

Reflection
- At end of interview explore more abstract feelings and thoughts

Wrap-Up
- Expect important information after interview is “over”
Concepts

Narratives and Story Structure
- are the stories that sustain and transmit culture; cultural vessels
- pass through generation to generation; they are timeless
- are representative of our values and belief systems

Stories are highly effective
- memorable, natural
- very informative: news (visual/verbal)
- spread quickly (word of mouth to the twitter feed)
- highlight social tensions or injustice

Examples:
- Religious / Bible Stories: “Great Flood”
- Spoken / Oral tradition: “the Odyssey”
- Books / Novels: Bradbury / Orwell
- Plays / Movies: Batman Dark Knight: Crime drama, morality play
Toolkits and Techniques

Storyboarding

- Comic Book vernacular
- Basic, Visual Story Structure (1st draft)
- Moquette & Animatics
Q & A

FINAL VERSION: PROFILE: RACCUDA: AIR CUSHION
Think about Electives in the School of ID

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