ME2110

Understanding People, Products and Context: Industrial Design Lite for Engineering

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Wayne Li

Oliver Professor of Practice in Design and Engineering
Georgia Institute of Technology
Director - Innovation and Design Collaborative
Agenda

Special Topic: Basic Industrial Design (ID) Concepts

*basic concepts you need to know to communicate with industrial designers*

- Setting the Stage
- Brief Bio / Introductions
- 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 it’s development. The results are often handed off to engineering.
Introductions

Education
★ BS:ME University of Texas @ Austin
★ BFA: Design University of Texas @ Austin
★ Industrial Design: College for Creative Studies
★ MS: Engineering Product Design : Stanford University

Academia
★ Stanford University - Adjunct Professor
★ Georgia Institute of Technology
  - Oliver Endowed Professor of Practice in Design and Engineering
Introductions

Work / Professional

- IDEO Product Development
- Design Edge
- Ford Motor Company
  - Vehicle Engineering
  - Corporate Design
- Volkswagen Electronics Research Lab
  - User Interface Lead Designer
- Pottery Barn : Williams Sonoma
  - Senior Designer
    - Clocks & Electronics
    - Home Office
    - Storage
    - Lighting & Decorative Lighting
    - Ledges & Wall Decor
- Wayne Li Design : Principal
Discussion

- Innovation and creativity fostered by intersection of diverse disciplines

- Multiple iterations of design process through prototyping

- Ideas that are rapidly built upon one another

- Research that is human centered and based on real world applicability

- Studio model courses are project based; culture of idea exchange
Concepts Between science and art
Concepts

Analogues to Engineering

★ Engineering : Applied Physics
★ Industrial Design: Applied Social Sciences
  - Cognitive Psychology (aesthetics)
  - Anthropology (human factors / ethnography)
  - Sociology (context / narrative)
Both Engineering and ID share the design process:

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

©2009 IDEO

Concepts

Design Process
Concept: Design Process: Design Thinking

[credit: Stanford d.school]

Understand
Empathy
Creativity
Execution

Test Cycle

Stanford d.school Design Thinking Process

https://dschool.stanford.edu
**Concepts**

- **Understand**
  - Empathy
  - Bug-listing
  - Moccasins
  - Ethnography Study
  - Interviews

- **Express**
  - Creativity
  - Art & Design Elements
  - Images / Story
  - Drawings
  - Models

- **Test**
  - Execution
  - Prototyping / Manufacturing
  - Engineering / CAD
  - Focus Groups
  - Statistical Analysis

**Design Process**

DESIGN THINKING WORKSHOP . SEPT 2018 . CONFIDENTIAL . INNOVATION & DESIGN COLLABORATIVE
Concepts

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

**Concepts**

DESIGN THINKING WORKSHOP . SEPT 2018 . CONFIDENTIAL . INNOVATION & DESIGN COLLABORATIVE
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
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

 Courtesy John Bell Designs
Think about Electives in the School of ID

ID 3320 Design Methods
Wayne Li, wayne.li@coa.gatech.edu

ID 2401 Visual Design Thinking
ID 4418 Design Sketching
Wendell Wilson,
wilson@designasaurus.com

ID 4106 Parametric Product Modeling
Kevin Shankwiler,
kshankwiler@gatech.edu