# What is Design?

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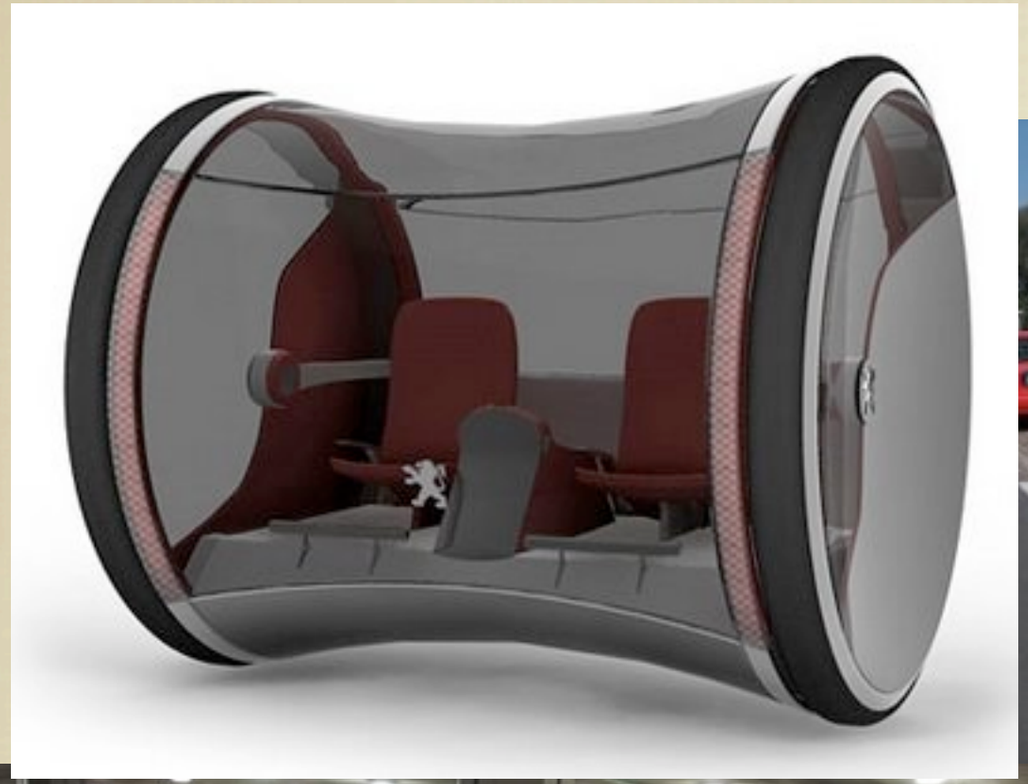
# Overview

- Review / Recap
  - What is a System?
- Toward Defining Design
  - Form versus Function
  - Aesthetics versus Formula
  - Choice Properties
- Satisfaction Driven Design
  - Choice Property Clustering
  - Design Qualities of Thriving Systems Theory

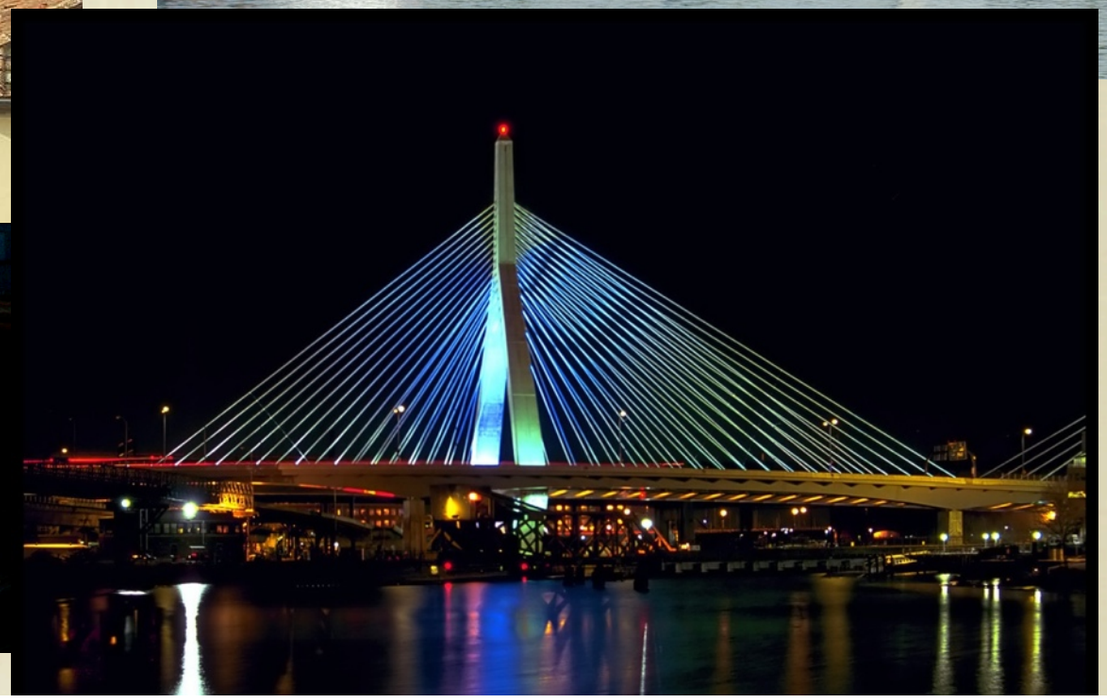
# What is a System?

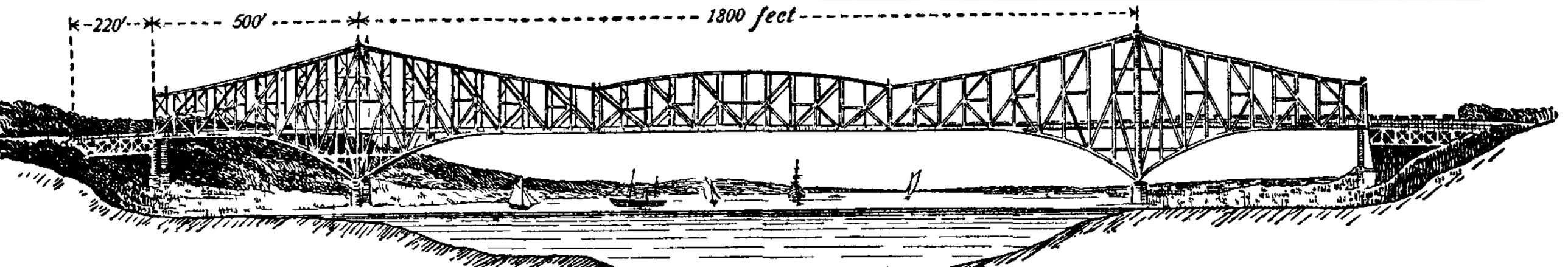
- A system is a subset of the universe, some reality.
- The art of system modeling is choosing a subset of the universe.
- The art of good system modeling is choosing an appropriate subset of the universe.
- The art of design is accounting for everything in the subset.
- The art of good design is satisfactorily accounting for everything in the subset.
- The universe is composed of only two things: structure and behavior both of which are dynamic (ii.e. behavior changes structure and structure enables behavior.)

# Automotive Systems

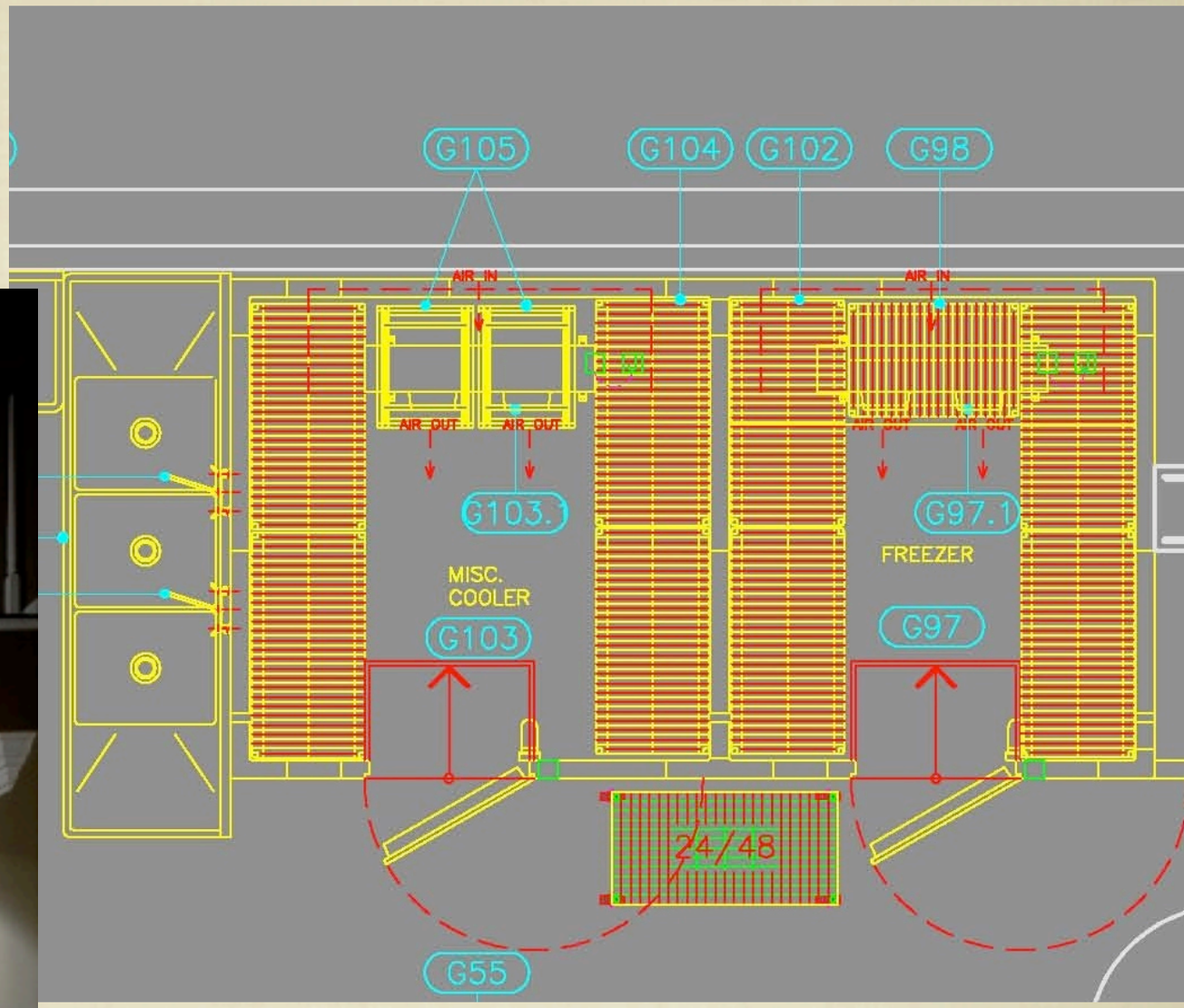



# Bridge Systems



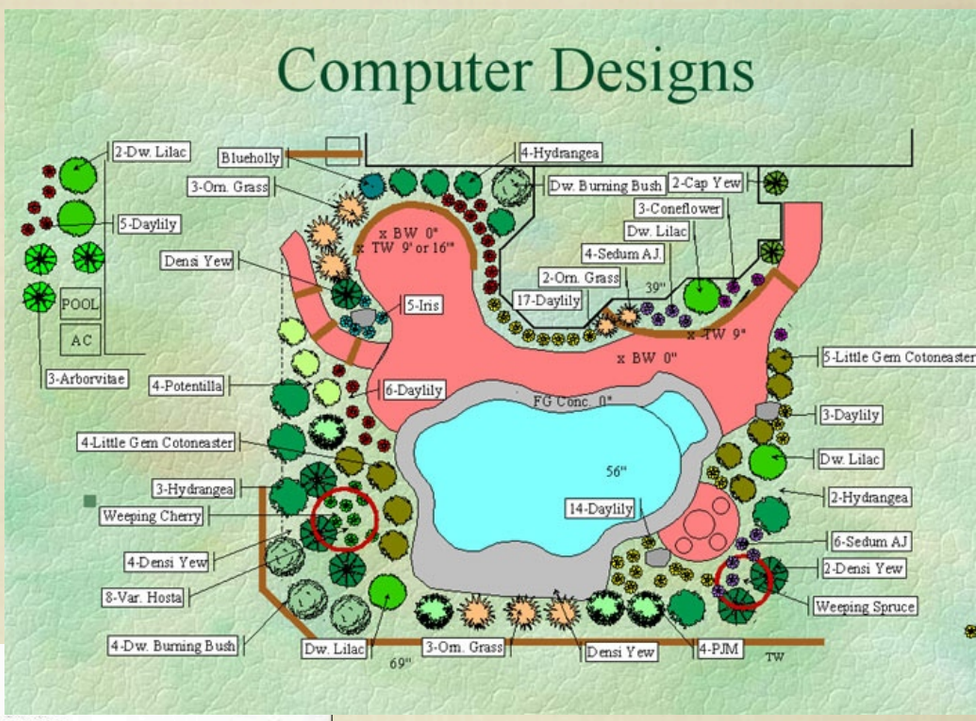


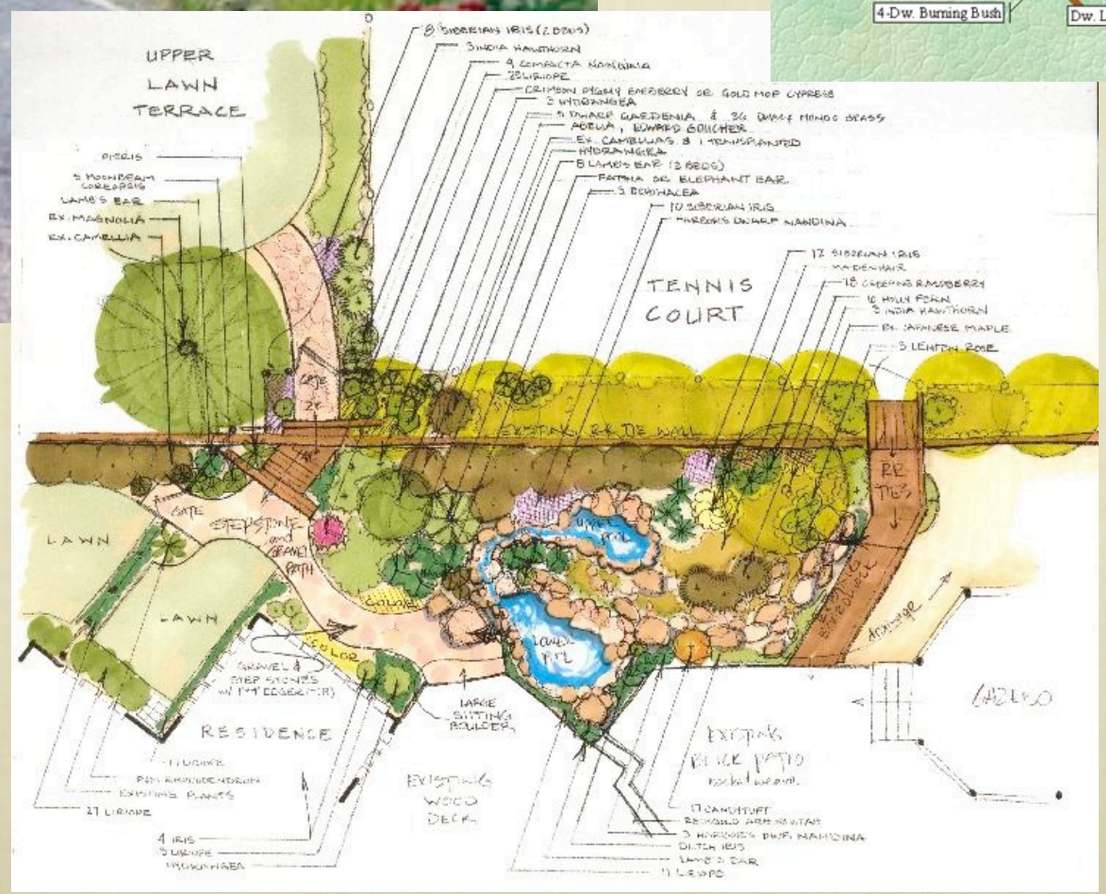
# Building Systems




# Fashion Systems

# Horticultural Systems



# Aviation Systems

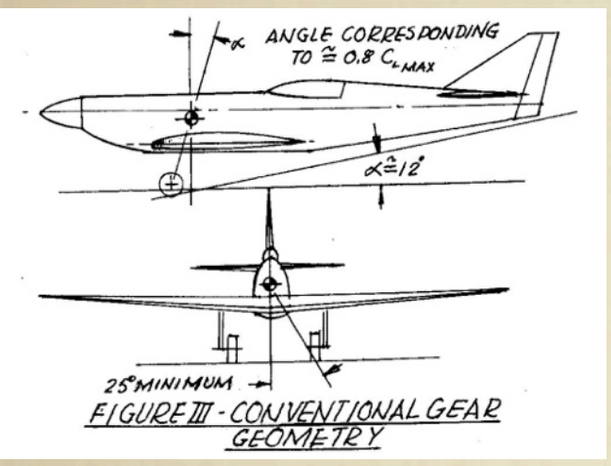
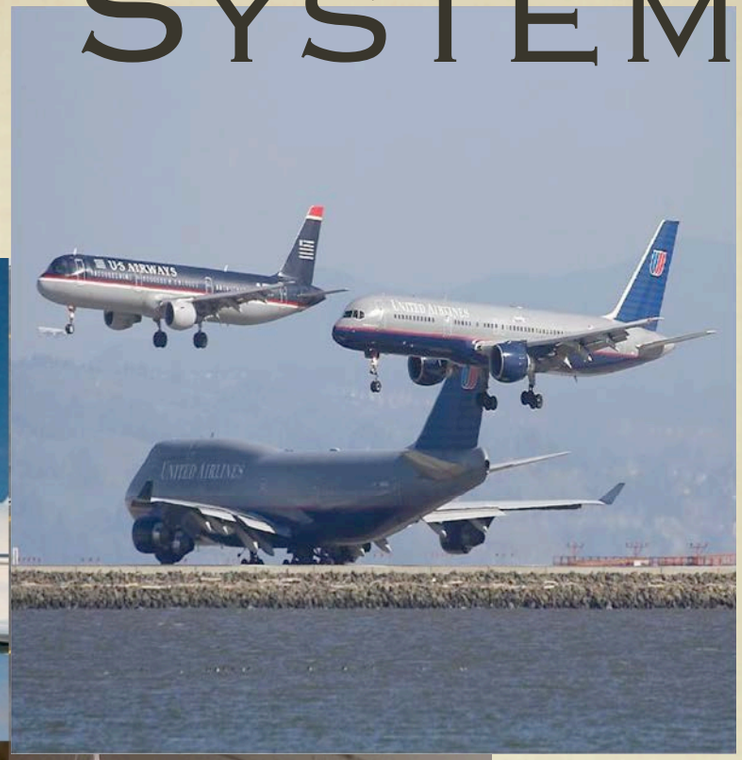
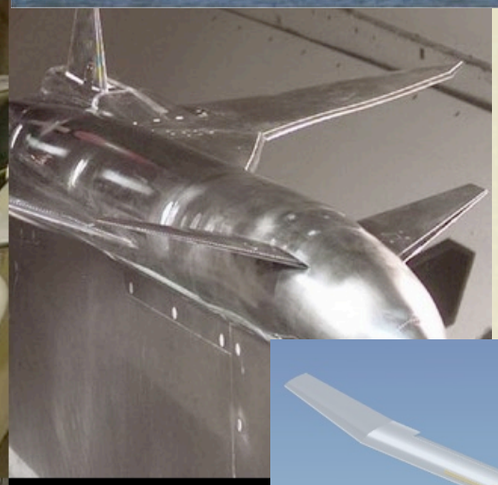
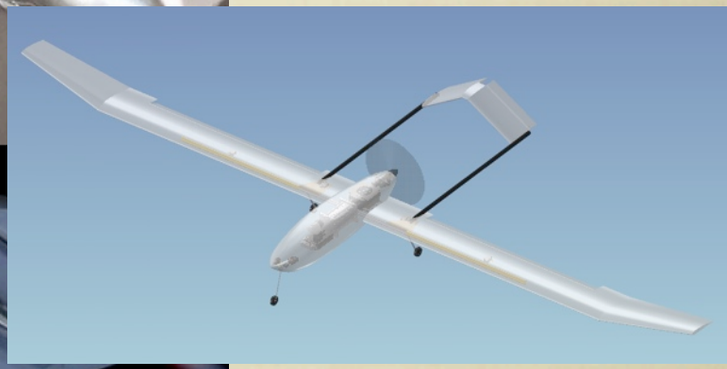


FIGURE III - CONVENTIONAL GEAR GEOMETRY

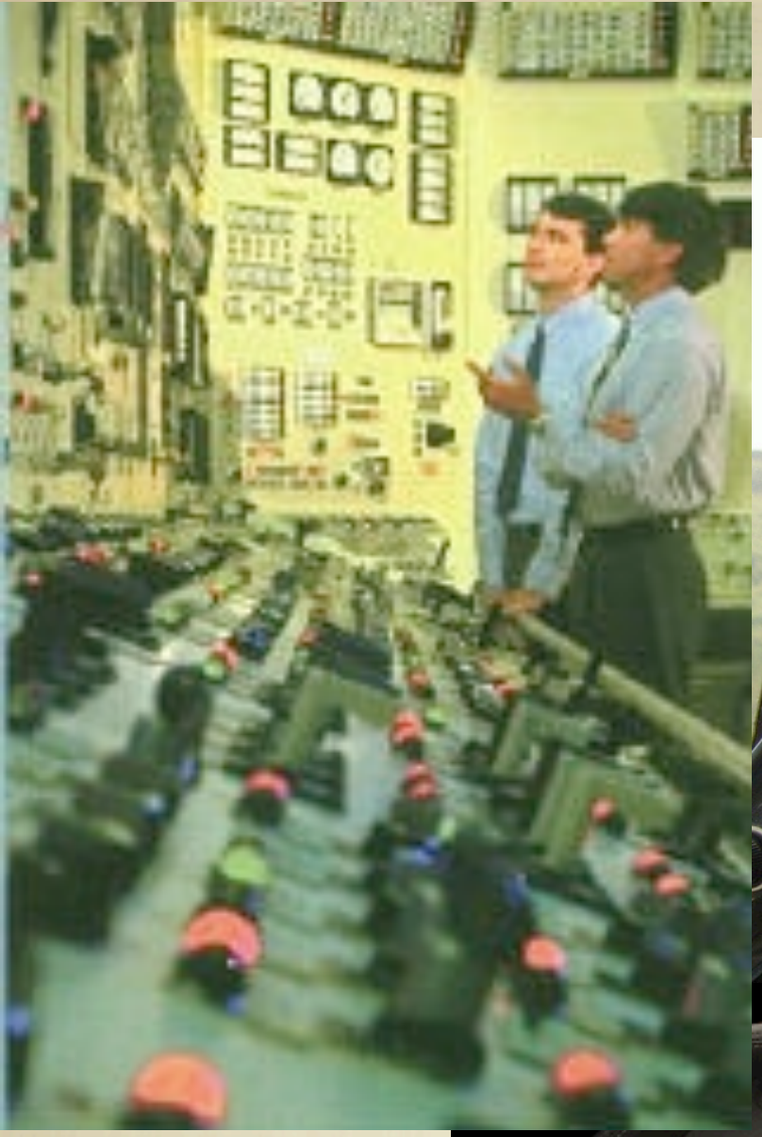





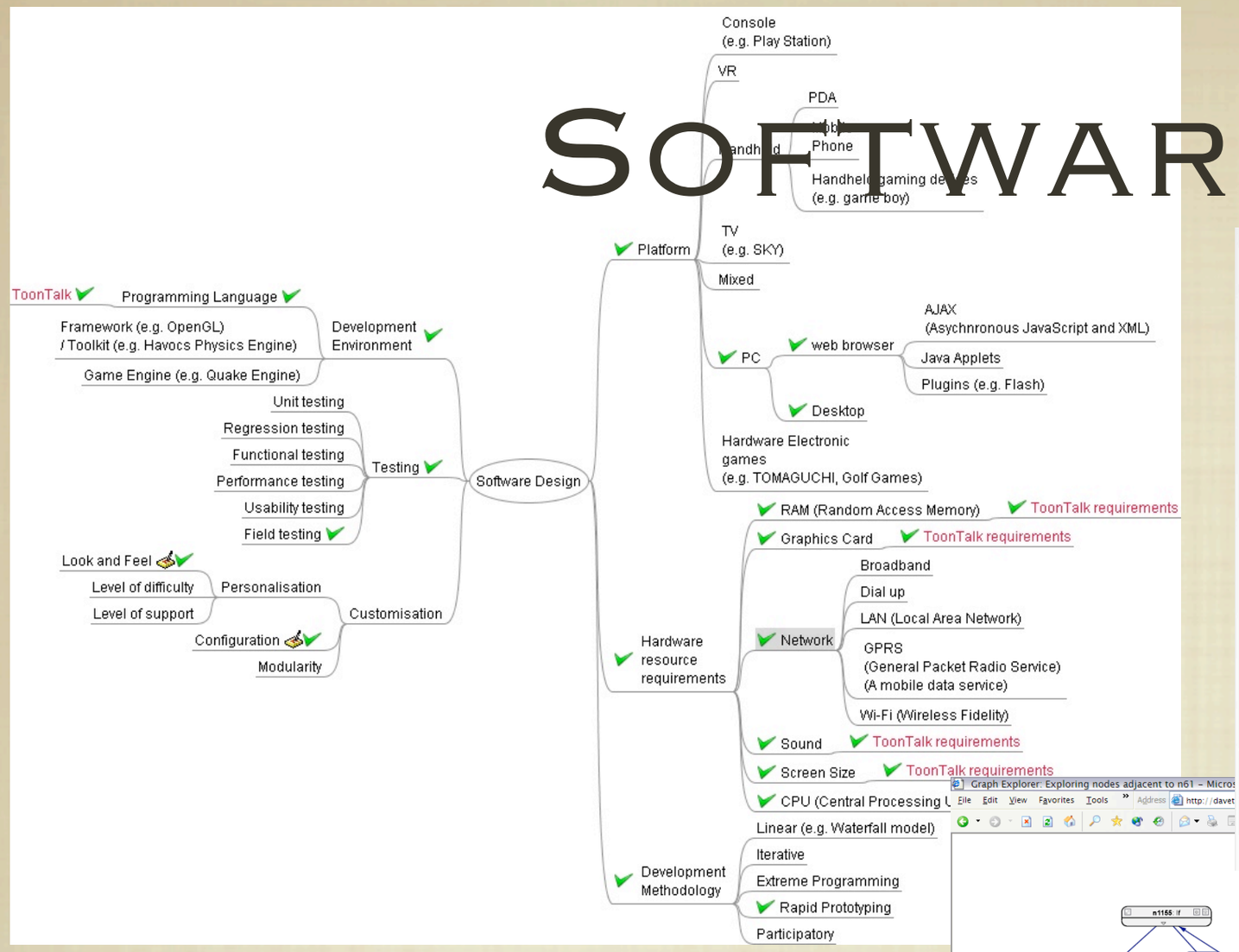


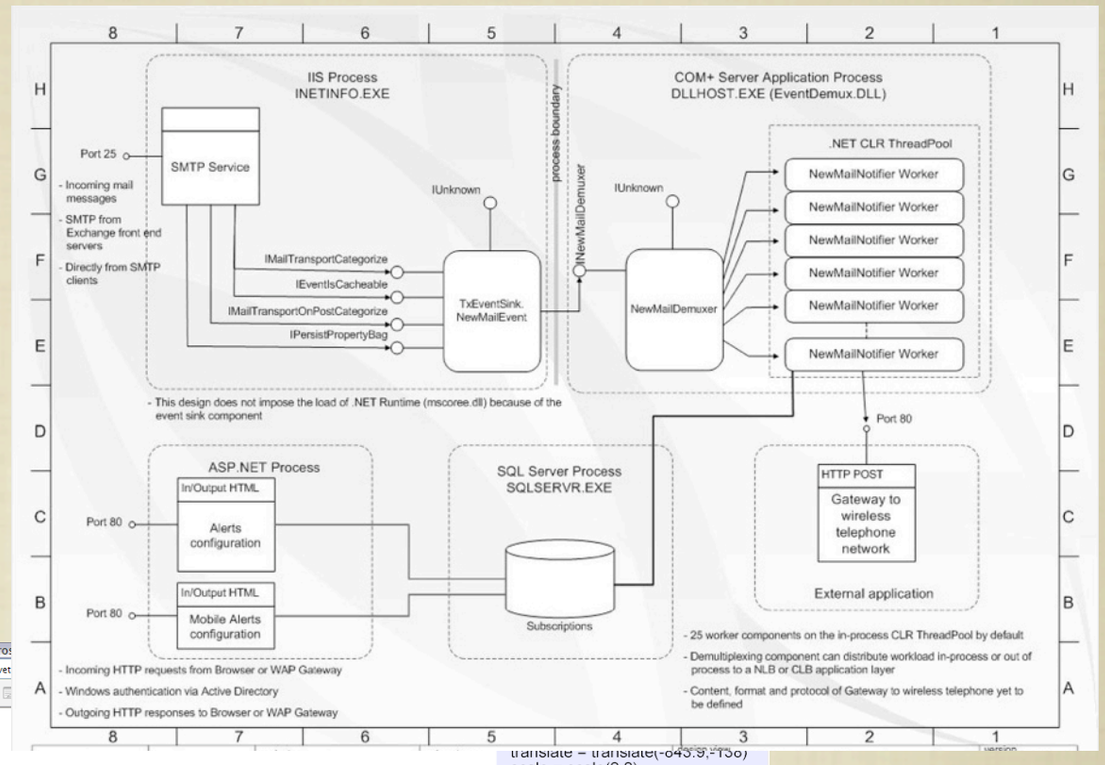



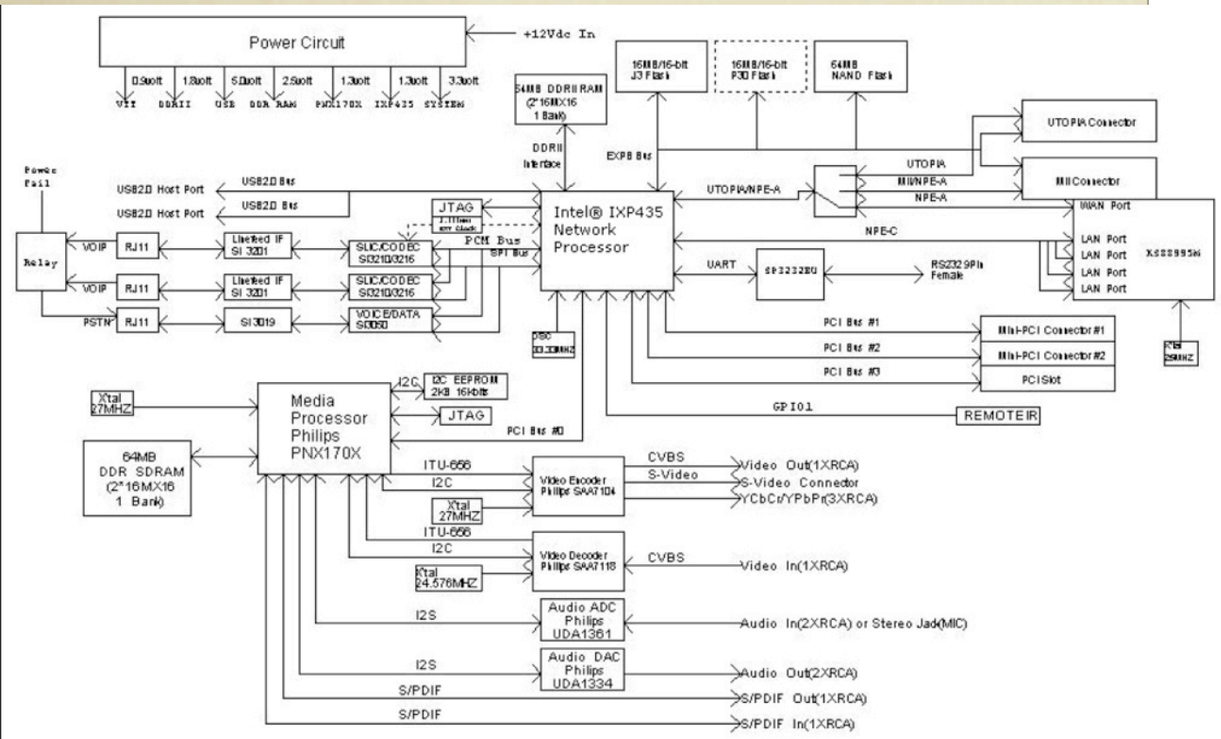
# Control systems

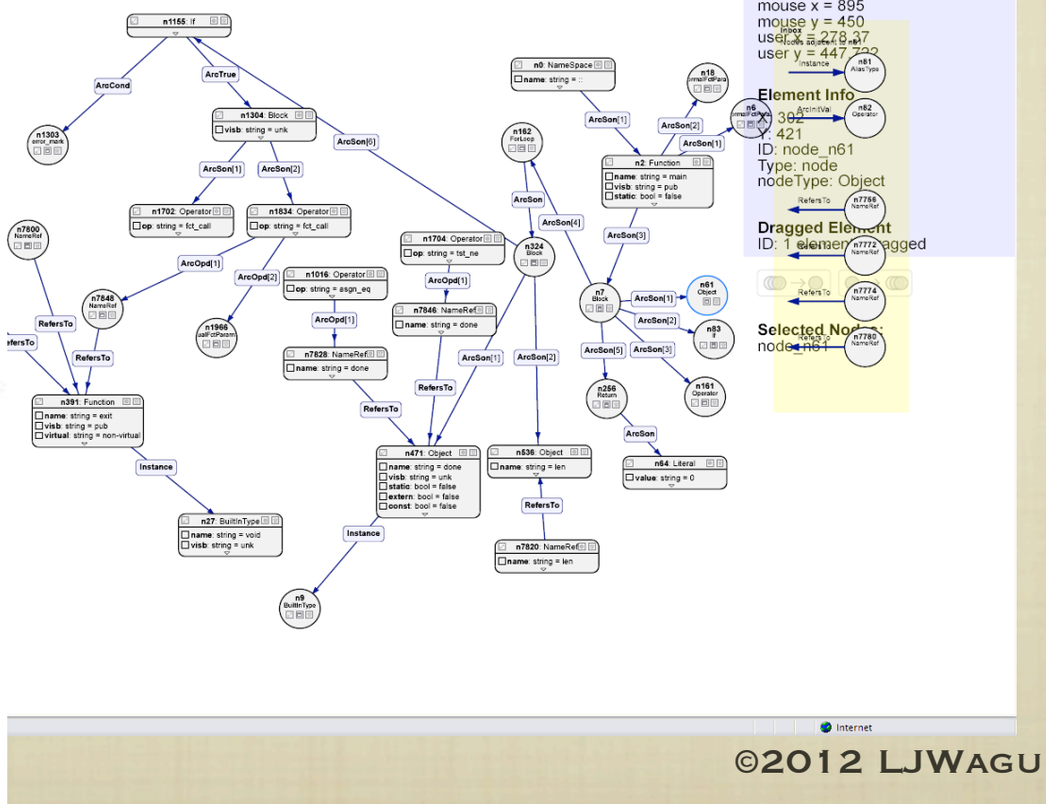



# Software Systems



# What is Design?

- Design is the formulation of modeling choices to impact the stakeholder experience.
- "Good" design results from choices that achieve a degree of stakeholder satisfaction.
- Stakeholder satisfaction is composed of the logical and the aesthetic.

# Deciphering Satisfaction

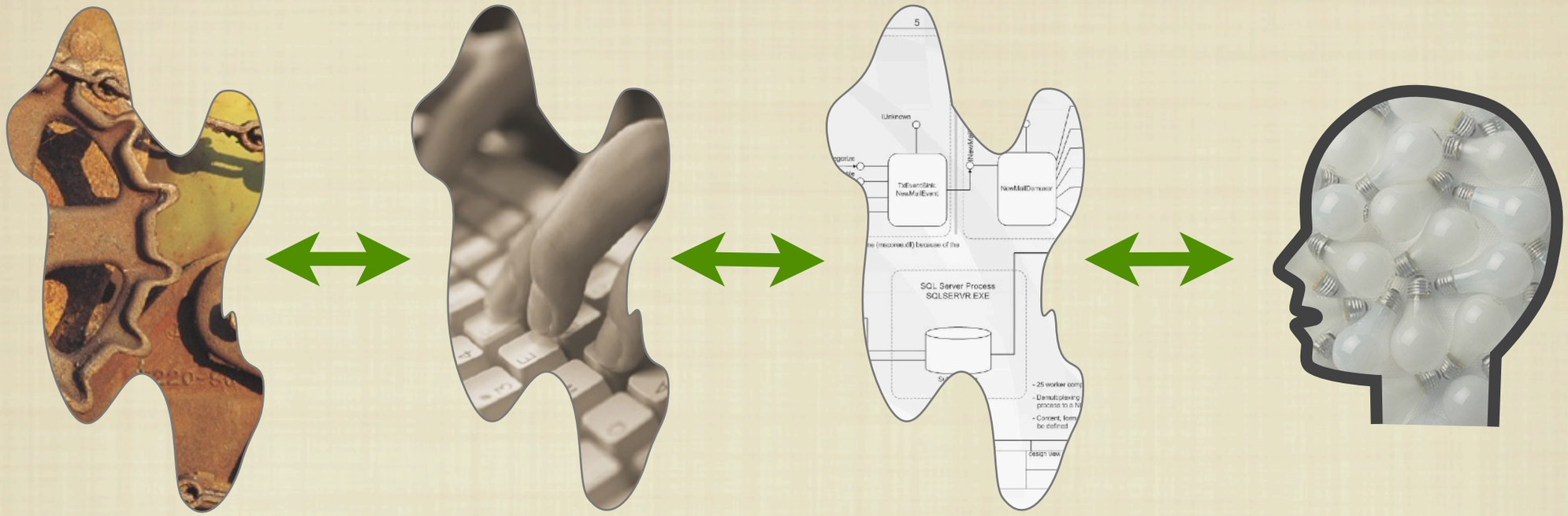
**logical** |ˈläjikəl| adjective

of or according to the rules of logic or formal argument *: a logical impossibility.*
• characterized by clear, sound reasoning *: the information is displayed in a simple and logical fashion.*
• (of an action, development, decision, etc.) natural or sensible given the circumstances *: it is a logical progression from the job before.*

**aesthetic** |esˈθetik| (also **esthetic**) adjective

concerned with beauty or the appreciation of beauty : the pictures give great aesthetic pleasure.
• giving or designed to give pleasure through beauty; of pleasing appearance.

# the individual's experience of design quality




implementation

the assembled artifact's realization that creates the opportunity for observation

threshold

the point of encounter between the expectation and the system's features

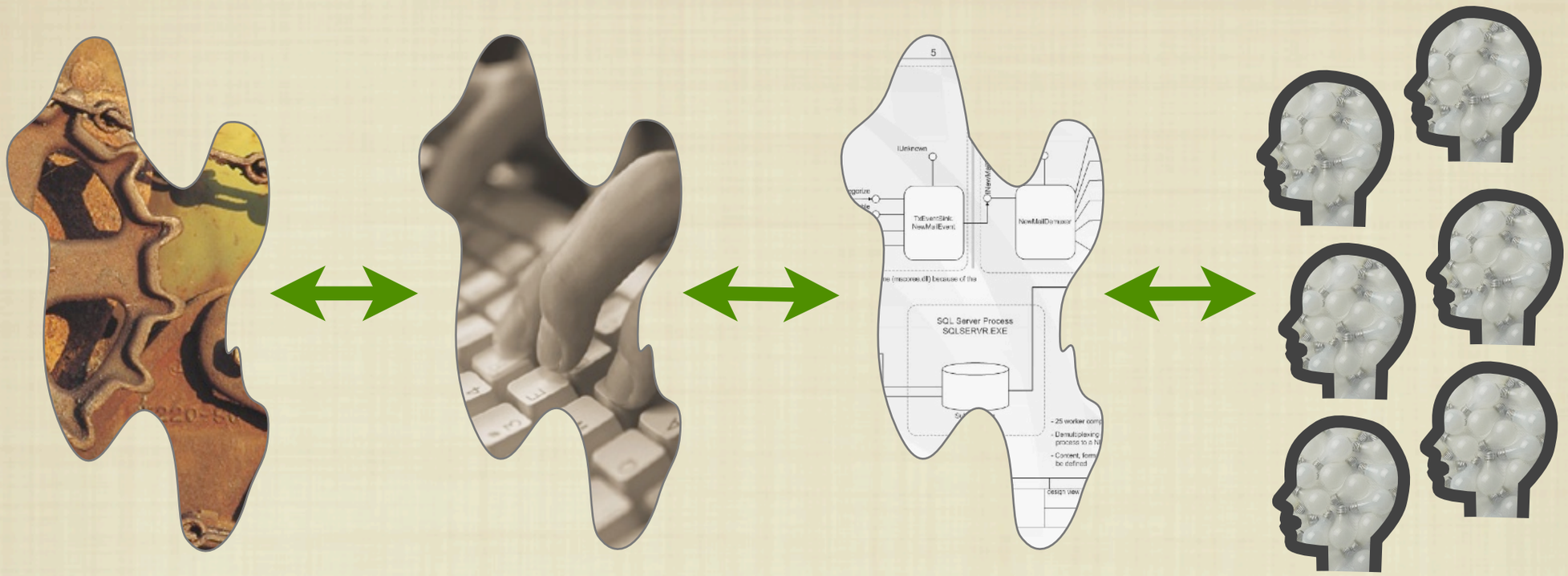
expectation

the subset of the observer's mindset (conscious or unconscious) that is specifically relevant to the event

mindset

the "mental picture" the observer brings to the experience within which they will "understand" the experience

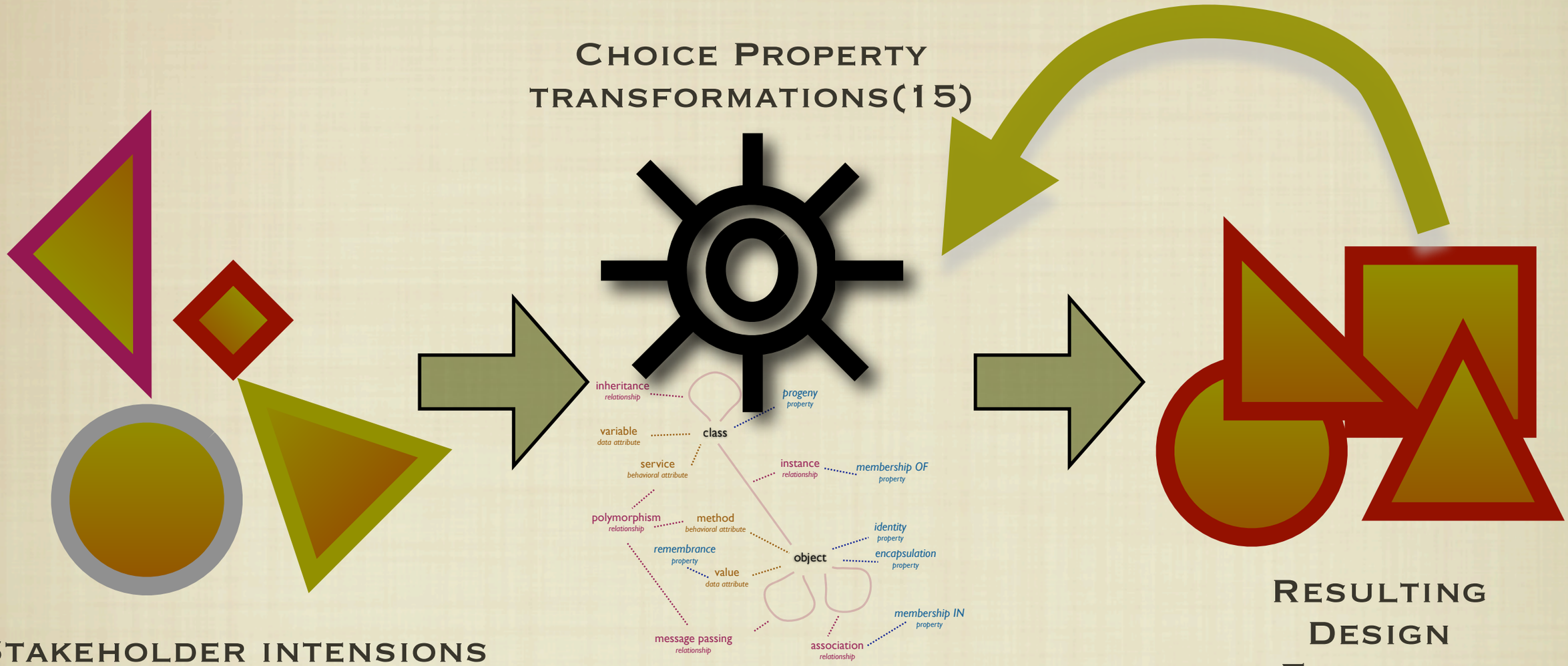
# the community's experience of design quality




| implementation | threshold | expectation | mindset |
|---|---|---|---|
| the assembled artifact's realization that creates the opportunity for observation | the point of encounter between the expectation and the system's features | the subset of the observer's mindset (conscious or unconscious) that is specifically relevant to the event | the "mental picture" the observer brings to the experience within which they will "understand" the experience |

# The Design Process

Choice Property transformations(15)




Stakeholder intensions
requirement elements
model elements
design elements

Representational
paradigm or Ontology

Resulting
Design
Elements

# Design Choice Properties

- Stepwise Refinement
- Cohesion
- Encapsulation
- Extensibility
- Modularization
- Correctness
- Transparency
- Composition of Function
- Identity
- Scale
- User Friendliness
- Patterns
- Programmability
- Reliability
- Elegance

| | Choice Property | Modeling Action | Action Rendition |
|---|---|---|---|
| 1 | Stepwise Refinement | elaborate | develop or present (a theory, policy, or system) in detail |
| 2 | Cohesion | factor | express as a product of factors |
| 3 | Encapsulation | encapsulate | enclose the essential features of something succinctly by a protective coating or membrane |
| 4 | Extensibility | extend | render something capable of expansion in scope, effect, or meaning |
| 5 | Modularization | modularize | employing or involving a module or modules as the basis of design or construction |
| 6 | Correctness | align | put (things) into correct or appropriate relative positions |
| 7 | Transparency | expose | reveal the presence of (a quality or feeling) |
| 8 | Composition of Function | assemble | fit together the separate component parts of (a machine or other object) |
| 9 | Identity | identify | establish or indicate who or what (someone or something) is |
| 10 | Scale | focus | (of a person or their eyes) adapt to the prevailing level of light [abstraction] and become able to see clearly |
| 11 | User Friendliness | accommodate | fit in with the wishes or needs of |
| 12 | Patterns | pattern | give a regular or intelligible form to |
| 13 | Programmability | generalize | make or become more widely or generally applicable |
| 14 | Reliability | normalize | make something more normal, which typically means conforming to some regularity or rule |
| 15 | Elegance | coordinate | bring the different elements of (a complex activity or organization) into a relationship that will ensure efficiency or harmony |

# A Sense of Great Design

- "Perceive the wholeness and the impact of individual design decisions on the system as a whole – not only in the static present but, in the dynamic unfolding of the stakeholders' perspectives of life; in the system they will live in." (Waguespack)

- Realign the modeling focus. Focus on why to use the tools – not on the tools themselves. Redirect decision-making energy to the question, "How does each decision increase the life in the system by fulfilling the stakeholders' evolving concerns?" and "What does life mean to these stakeholders?"