Thriving Systems Theory: An Emergent Information Systems Design Theory

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HICSS-46 - Maui, HI
January 8, 2013
Overview of This Talk

- Quality in Design & Designing for Quality
- Thriving Systems Theory
  - Experiencing Design Quality
  - Christopher Alexander’s Center Properties
  - Alexander mapped to Choice Properties
- The Anatomy of a Design Theory
- Thriving Systems Theory as an ISDT
- Beyond Choice Properties toward Thriving Systems
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

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

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The Theory of Design Quality Threads

- Notes on the Synthesis of Form (1964)
- The Oregon Experiment
  - A Pattern Language (1977)
  - A Timeless Way of Building (1979)
- Christopher Alexander
- A Vision of a Living World
- The Luminous Ground
- Notes on the Synthesis of Form (2005)
Alexander’s 15 Center Properties
Expressing Architectural Quality

1. Positive Space
2. Boundaries
3. Deep Interlock and Ambiguity
4. Not Separateness
5. Good Shape
6. Alternating Repetition
7. The Void
8. Simplicity and Inner Calm
9. Good Shape
10. Local Symmetries
11. Contrast
12. Roughness
13. Gradients
14. Levels of Scale
15. Strong Centers

The Taj Mahal

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# Translating the Properties from Centers to Choices

## Alexander's 15 Center Properties

- Levels of Scale
- Strong Centers
- Boundaries
- Alternating Repetition
- Positive Space
- Good Shape
- Local Symmetries
- Deep Interlock and Ambiguity
- Contrast
- Gradients
- Roughness
- Echoes
- The Void
- Simplicity and Inner Calm
- Not Separateness

## Vocabulary of Choice Properties

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

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<th>Choice Property</th>
<th>Modeling Action</th>
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Choice properties define a taxonomy of perceived organization in systems that resonates with our human conception of order - providing:

- a vocabulary for describing and comparing aspects of system design (*noun*), and
- design (*verb*) actions to shape design choices toward system characteristics that satisfy stakeholder expectations.

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The Design Process

“rules of thumb”
Traditional patterns

Stakeholder intensions
requirement elements
model elements
design elements

Representational paradigm or Ontology

Resulting Design Elements
The Design Process

Choice Property-Driven Design Principles

Stakeholder intentions
requirement elements
model elements
design elements

Representational paradigm or Ontology

Resulting Design Elements
The Anatomy of a Design Theory

- Purpose and scope
- Constructs
- Principle of form and function
- Artifact mutability
- Testable propositions
- Justificatory knowledge
- Principles of implementation
- Expository instantiation
Thriving Systems Theory: ISDT

Purpose and scope
- taxonomy of objective and aesthetic characteristics to assess and guide design choices realizing stakeholder satisfaction

Constructs
- design choices, expectations, resonance, choice properties, actions intensifying properties

Principle of form and function
- choice properties mediate resonance between expectation and experience

Artifact mutability
- actions that intensify design choice properties

Testable propositions
- quantitatively assess structure; subjectively assess aesthetics

Justificatory knowledge
- Alexander’s Nature of Order, Lakoff & Johnson’s Embodied Mind, Brooks Essence and Accidents

Principles of implementation
- choice property enlightened stakeholders formulating both expectation and design

Expository instantiation
- artifact quality (Apache), modeling choices expressing quality (OO, ER, agile)
“The Nature of Order” is evident in choice properties observable in information systems!

The translated properties denote design characteristics that may appear to be discrete.

Property strength and interaction resonate as quality.

Might a taxonomy of quality emerge based on property interaction?
“OBJECTIVE”
Structural

Elegance
Identity
Reliability
Patterns
Extensibility
User Friendliness
Correctness
Composition of Function
Scale
Factorability
Conductibility
Scalability
Robustness
Factorability
Constructibility
Encapsulation
Composition
Function
Cohesion
Composition
Factorability
Divisibility
Stepwise Refinement
Modularization
“OBJECTIVE”
Structural

Stepwise Refinement
Modularization
divisibility
robustness
scalability
confidence
Correctness
User Friendliness
Correctness
Composition of Function
Scalability
Factorability
Constructability
Composition of Function
Scale
Encapsulation
Cohesion
factorability
factorability

Predictability
Patterns
Extensibility

Reliability
Predictability

Usability
Intuitiveness

Identity
Elegance

Transparency

Patterns
Intuitiveness

Robustness
Divisibility

Correctness

User Friendliness
“OBJECTIVE”
Structural

“SUBJECTIVE”
Aesthetic
design quality across IT models

implementation

threshold

expectation

mindset
design quality across IT models

Implementation
hardware & software architecture

Threshold
interfaces

Expectation
requirements engineering & specification

Mindset
“systems think”

Choice Property-Driven Design Principles
A Mindset For Great Design

- Perceive the wholeness and the impact of individual design choices 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.

- Focus on why you use the modeling tools – not on the tools themselves. Redirect decision-making energy to the questions: “What does life mean to these stakeholders?” and “How does each choice increase the life in the system by fulfilling the stakeholders’ evolving concerns?”

Les Waguespack
How is it that one system is more effective, appealing, satisfying and/or more beautiful than another to its stakeholder community? This question drove Christopher Alexander's fifty-year quest to explain great physical architecture and give birth to pattern-languages for building that underpin much of modern systems engineering. How is it that so many individual stakeholders consistently recognize the same quality, the same beauty in a system? This question led George Lakoff to research the role of conceptual metaphor in human understanding. What is essential to stakeholders' satisfaction with systems? Fred Brooks addressed this question in No Silver Bullet: Essence and Accidents of Software Engineering. This monograph fuses these diverse streams of thought in proposing Thriving Systems Theory by translating Alexander's properties of physical design quality into the abstract domain of information systems and modeling. Metaphor-Driven Modeling incorporates the theory while examining its impact throughout the system life cycle: modeling, design and deployment. The result is holistic and innovative, a perspective on system quality invaluable to students, practitioners and researchers of software and systems engineering.

Les Waguespack is a computer science Ph.D., professor and chairperson of computer information systems at Bentley University, USA. Dr. Waguespack's experience as programmer, software engineer, software architect, database architect, project manager and systems consultant underpins 35 years of teaching and research, the last 20+ years teaching object-oriented modeling and systems engineering to undergraduates, graduate students and practicing professionals.
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