Systems Integration

1 - Introduction

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Source: A significant part is from Mark W. Maier and Eberhardt Rechtin's *The Art of Systems Engineering 3rd Ed*

Classical Architecting Methods

Normative method

- Prescribes how it *should be*
- Handbooks, civil code, pronouncements my masters

Rational method

- Scientific and mathematic principles
- Method-based instead of rule-based

Participative methodology

- Recognizes complexities created by multiple stakeholders
- Objective: consensus

Heuristics methodology

- Based on *common sense*
- Collective experience

Introduction

Art and practice of architecting

- Nonanalytic
- Inductive
- Difficult to certify
- Less understood

Key to create new systems for unprecedented applications

- Past data is of limited use
- Too many unknowns, stakeholders, possibilities
- Too little time to get data and analyse
- Important factors not measurable (worth, safety, affordability, political acceptance, environmental impact, public health, national security)
- Has to work at the first try

Art of architecting

- Complements sciences where they are weakest:
  - Dealing with immesurables, translating past wisdom to practice, conceptualization, putting disparate things together, providing *sanity checks*, warning about likely but unprovable trouble ahead.
- Specific language terms
  - Reasonable assumptions, guidelines, indicators, elegant design, beautiful performance
  - Lemon, disaster, snafu, loser
- Heuristics: based on *common sense*
  - Collective experience stated simple and concise
  - *Simplify!*: first and most important heuristics

Phases of architecting

Early phases

- Structure and unstructured mix of dreams, hopes, neeeds and technical possibilities
- "Inspired synthesizing of feasible technologies"
- The time of *Art*

Later

- Integration of (and mediation among) competing subsystems and interests
- The time of rational and normative methodology

Finally

- Certification
- Tell that the system is complete, suitable and ready for use

Some material to think and discuss

Cite

The greatest architectures are the product of a single mind (or of a small, carefully structured team)

Addition

...and a responsible and patient client, a dedicated builder and talented designers and engineers.