软件系统设计与体系结构

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Concept of Software Architecture

- House Construction
  - Builders，Customers，Requirements
  - Architect must design blueprints.
  - Architects have many options to choose from, such as :
    - Style
      - Victorian
      - Cape Cod
      - etc.
    - Functionality
      - Vocational
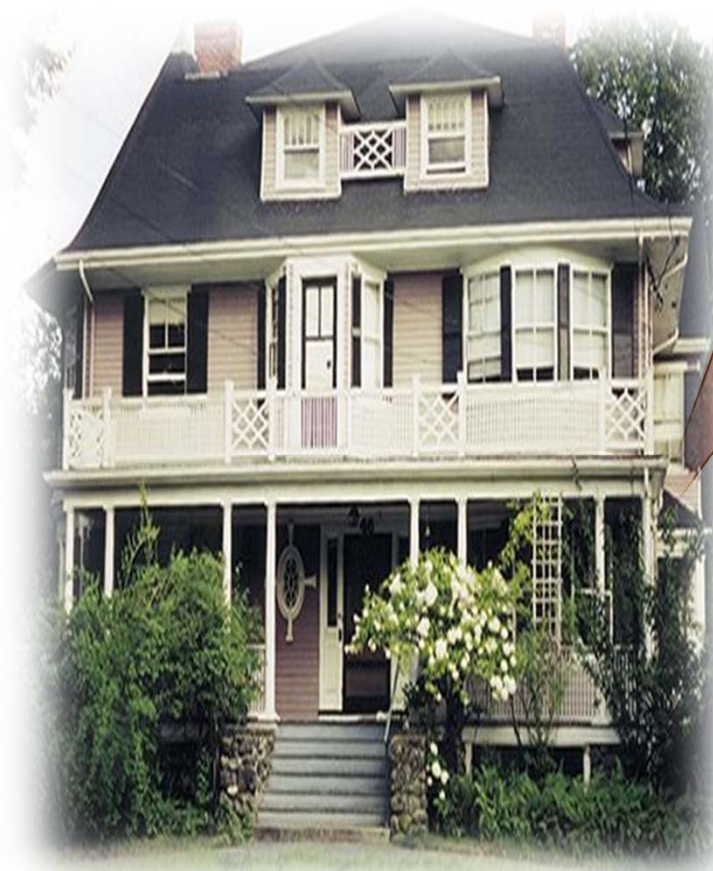   - Residential
    - Features
      - Basement
      - Sunroom

Architecting a dog house

Can be developed or build by one person as it requires:
- Minimal modeling
- Simple Process
- Simple tools

Architecting a house

Built most efficiently and timely by a team. It requires:-
- Modeling
- Well-defined processes
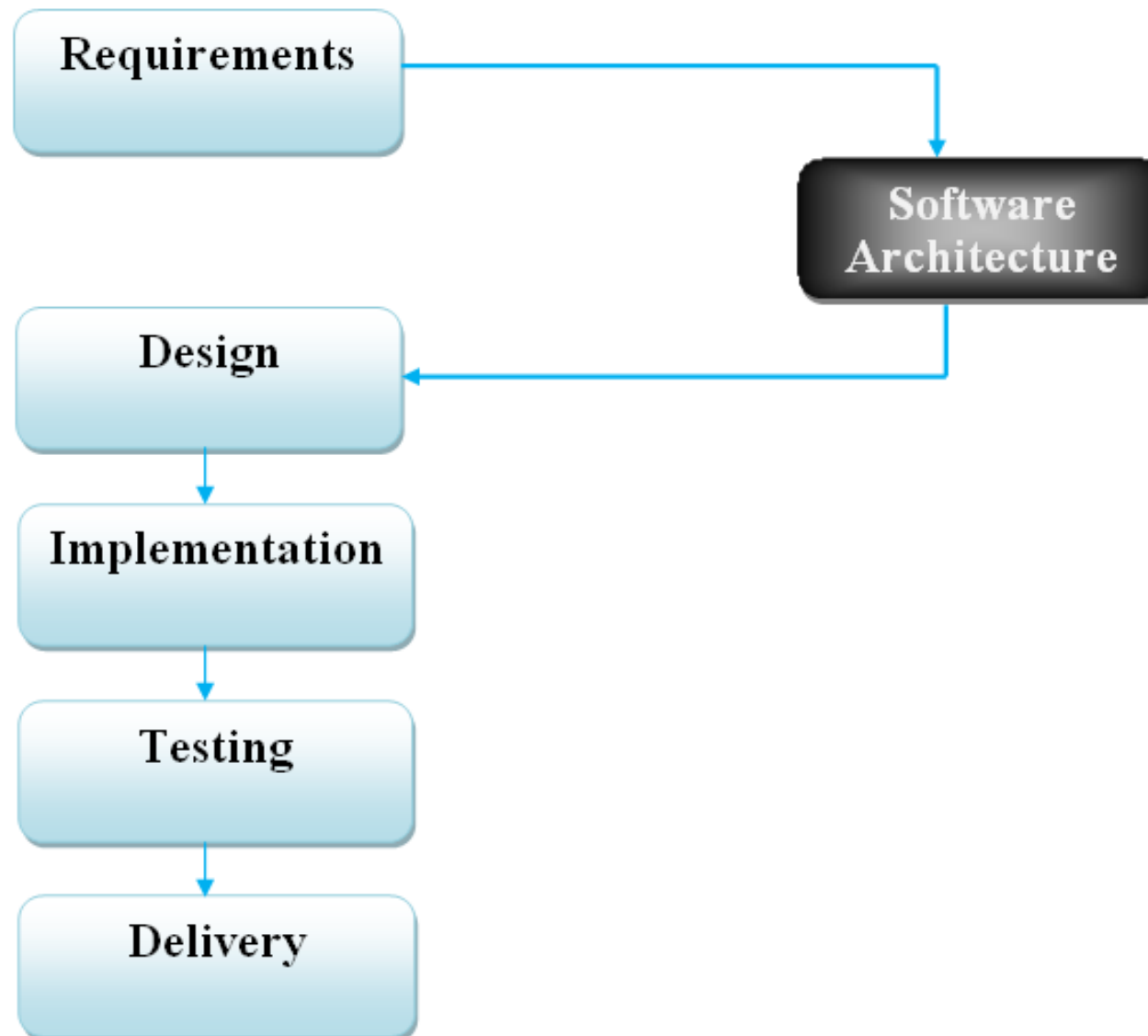- Power tools

What About Skyscrapers ?

Differences
- Scale
- Process
- Cost
- Schedule
- Skills and development teams
- Material and technologies
- Stakeholders
- Risks

Software Architecture in Development

Why Develop a Software Architecture ?

- **Early Problem Analysis**
  - Architecture represents the set of earliest design decisions
    - Hardest to change
    - Most critical to get right
  - Communicate back to Customer
- **Define Interfaces**
  - Avoid problems during integration
- **Early information for**
  - Testing
  - Planning
- **Make plans.**
  - Assess risks and budgets.

Advantages of Explicit Architecture

- **Stakeholders Communication**
  - Architecture may be used as a focus of discussion by system stakeholders.

- **System Analysis**
  - Means that analysis of whether the system can meet its non-functional requirements is possible.

- **Large Scale Re-use**
  - The architecture may be reusable across a range of systems

Advantages of Explicit Architecture
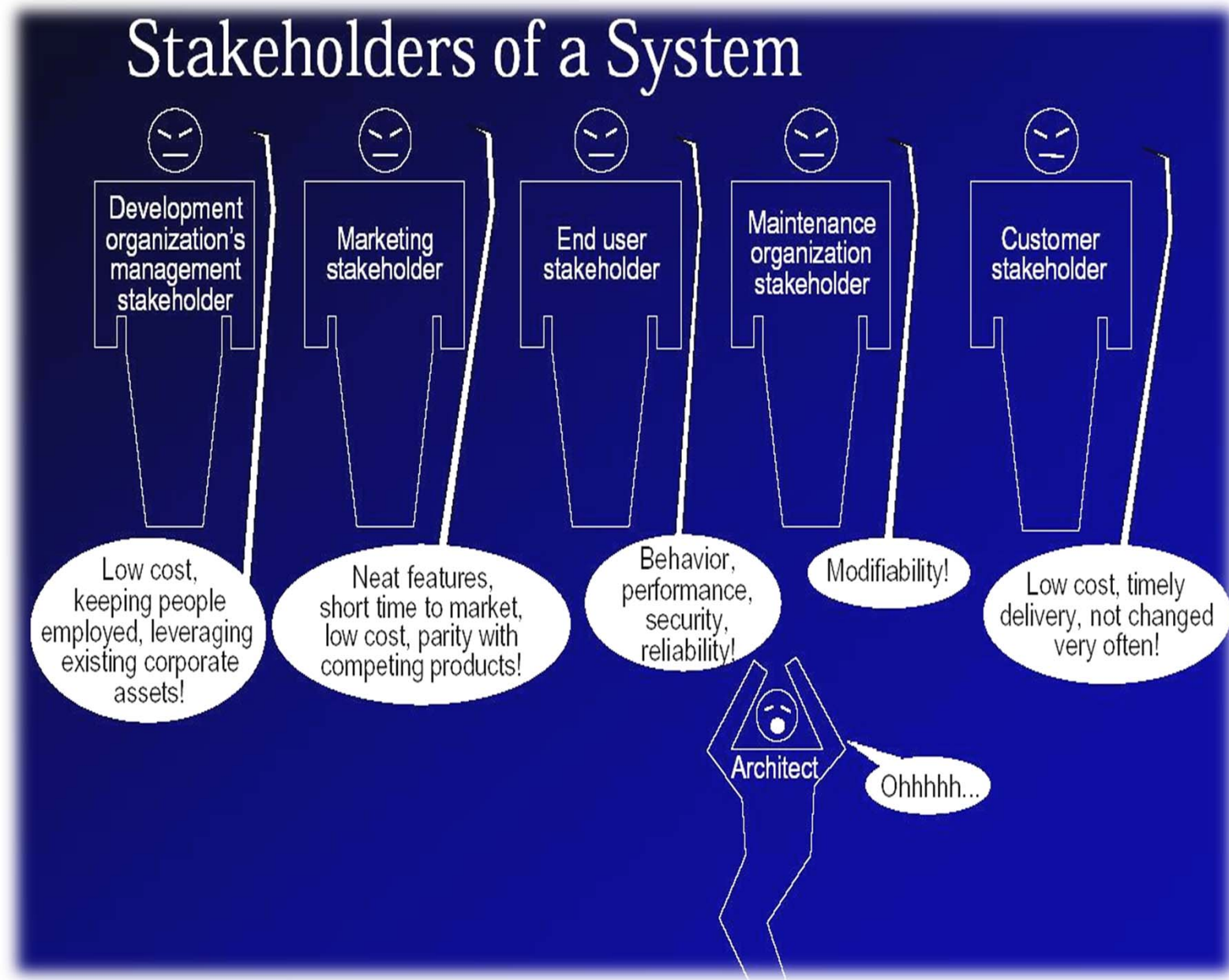
- **Tools for**
  - Understanding
    - System
    - Theoretical Limitations
  - Planning
    - Resources
    - Labor
  - Communication
    - Customer
    - Maintenance department
  - Evaluating Quality

Influencing Factors

- Technical and organizational Factors
  - Quality requirements from target domain
  - Technical environment
- Business Factors
  - Overall business goals
- System Stakeholders
  - Management "Low cost, keep people employed"
  - Marketing "Neat features, low cost, time-to-market
  - End user "behavior, performance, reliable"
  - Maintenance org "modifiable, understandable"
  - Customer "Low cost, timely delivery"
- Other quality requirements.

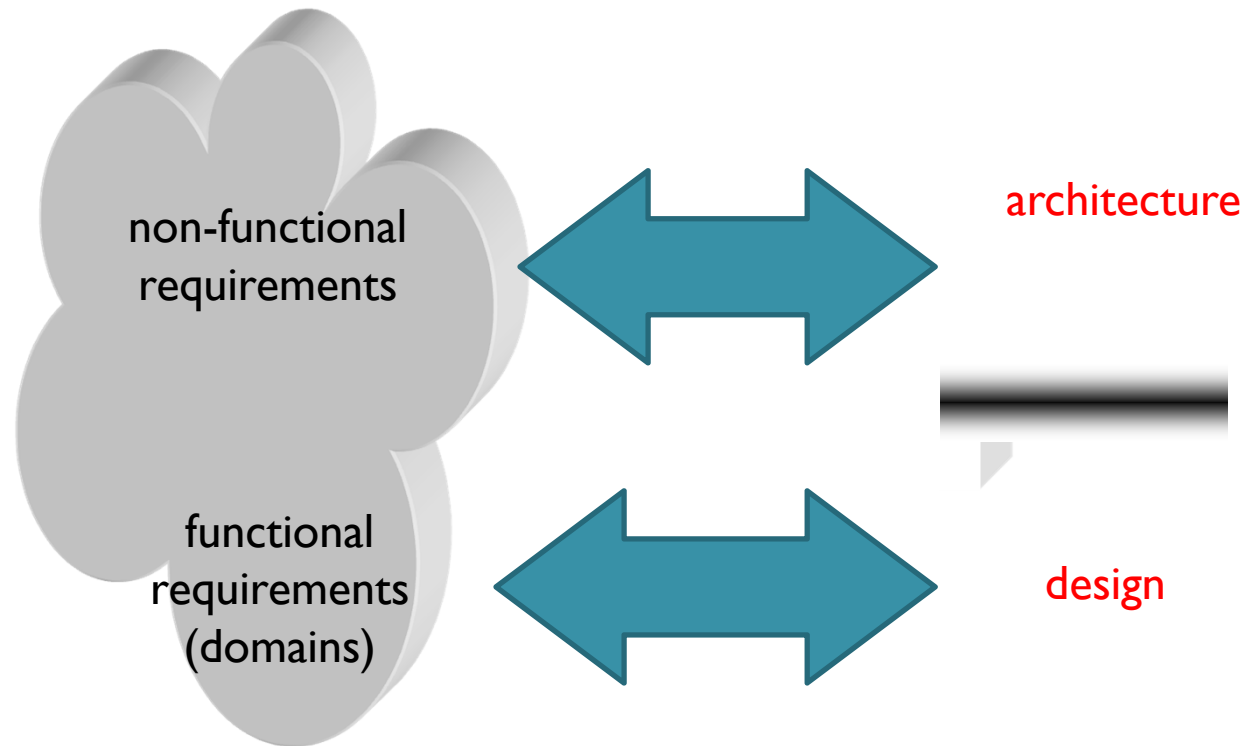# Who Influences Software Architecture?
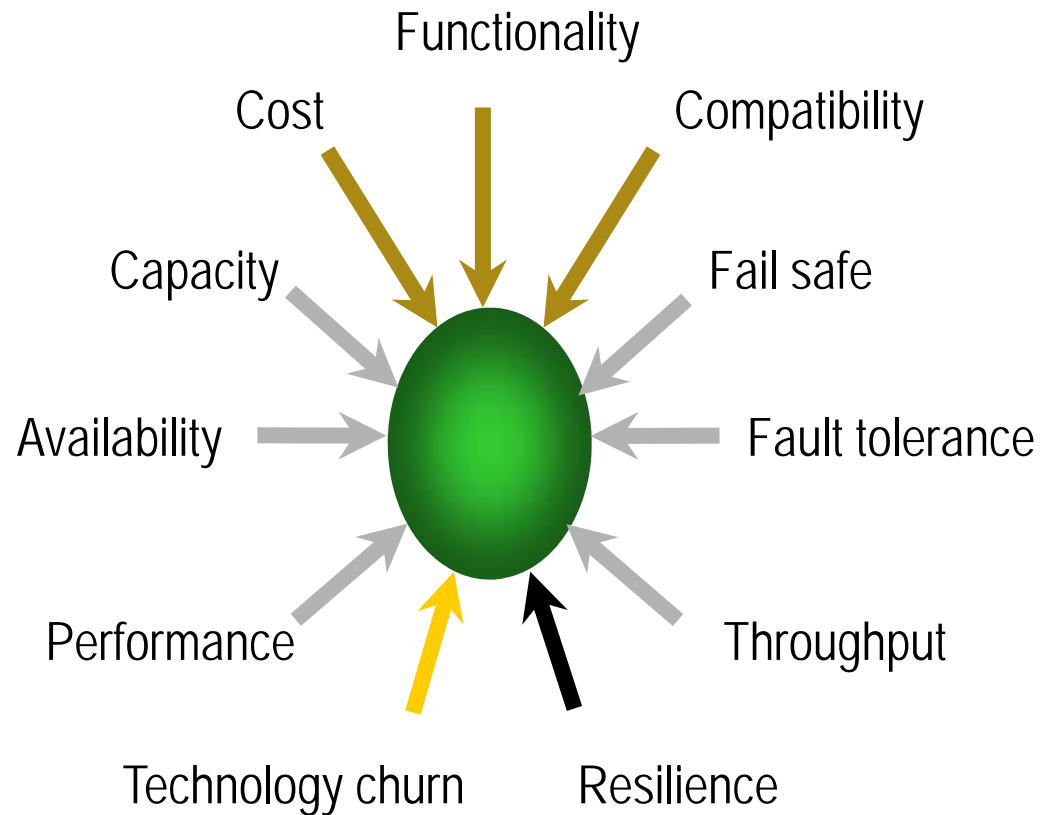
Architecture is Early

- Architecture represents the set of earliest design decisions
  - Hardest to change
  - Most critical to get right
- Architecture is the first design artifact where a system's quality attributes are addressed

Difference between Architecture and Design

- Architecture
  - Where non-functional decisions are cast, and functional requirements are partitioned
- Design
  - Where functional requirements are accomplished

Forces in Software

Functionality

Cost

Compatibility

Capacity

Fail safe

Availability

Fault tolerance

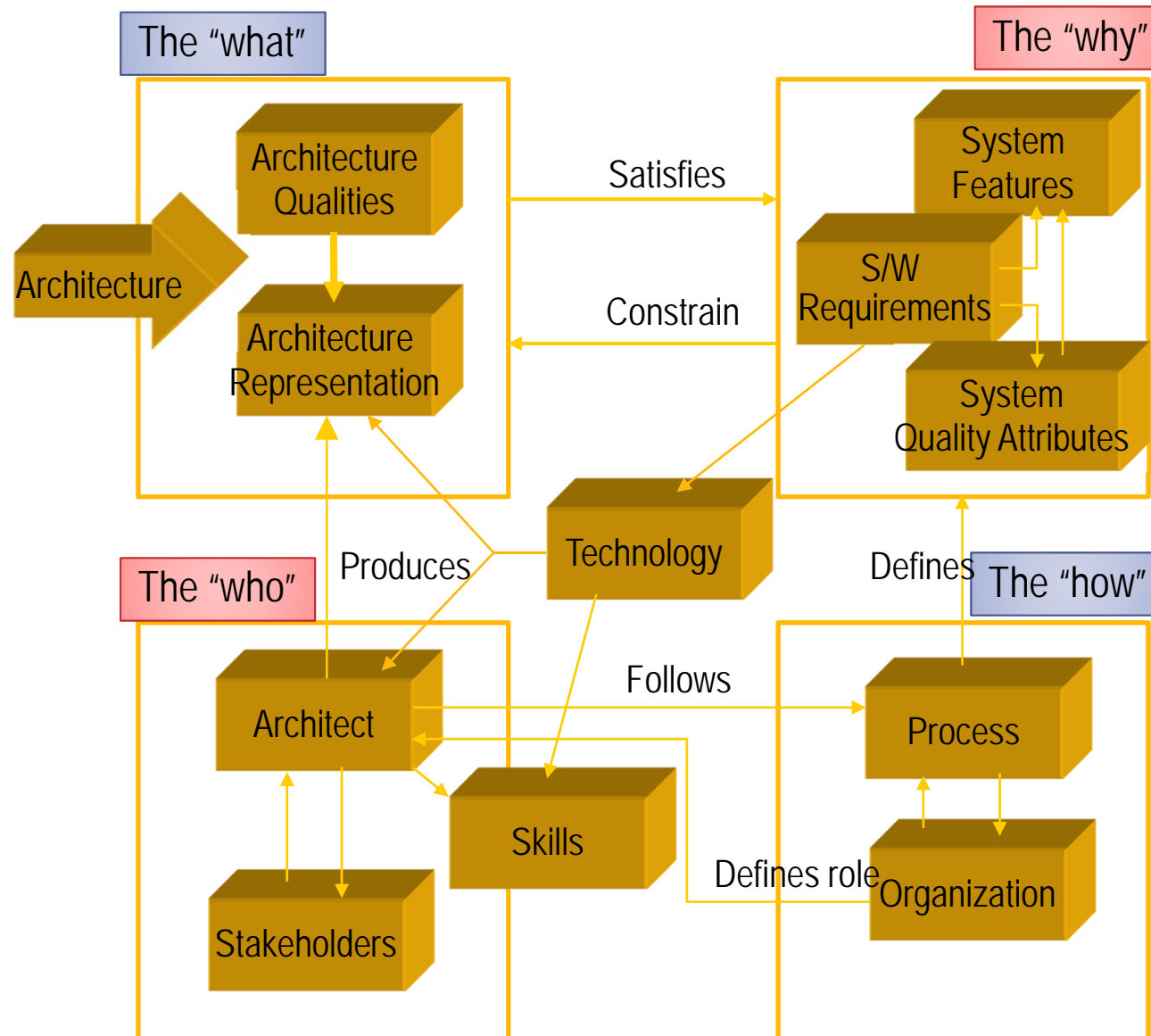Performance

Throughput

Technology churn

Resilience

The challenge over the next 20 years will not be speed or cost or performance; it will be a question of complexity.
Bill Raduchel, Chief Strategy Officer, Sun Microsystems

Our enemy is complexity, and it's our goal to kill it.
Jan Baan

The Domain of Architecting

The Need of Architecture

The Winchester "Mystery" House

- 38 years of construction – 147 builders 0 architects

- 160 rooms – 40 bedrooms, 6 kitchens, 2 basements, 950 doors

- 65 doors to blank walls, 13 staircases abandoned, 24 skylights in floors

- No architectural blueprint exists

Famous Last Words

"It is a very humbling experience to make a multimillion-dollar mistake, but it is also very memorable…." (Fred Brooks)