

Mission Analysis Discipline: Bringing Focus to the Fuzziness about Good Architectures

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Mission

- All systems are conceived, designed and built to satisfy some mission need
 - Captured in a Mission Needs Statement
 - “... achieving the goal, before this decade is out, of landing a man on the moon, and returning him safely to earth.”

John F. Kennedy, May 1961

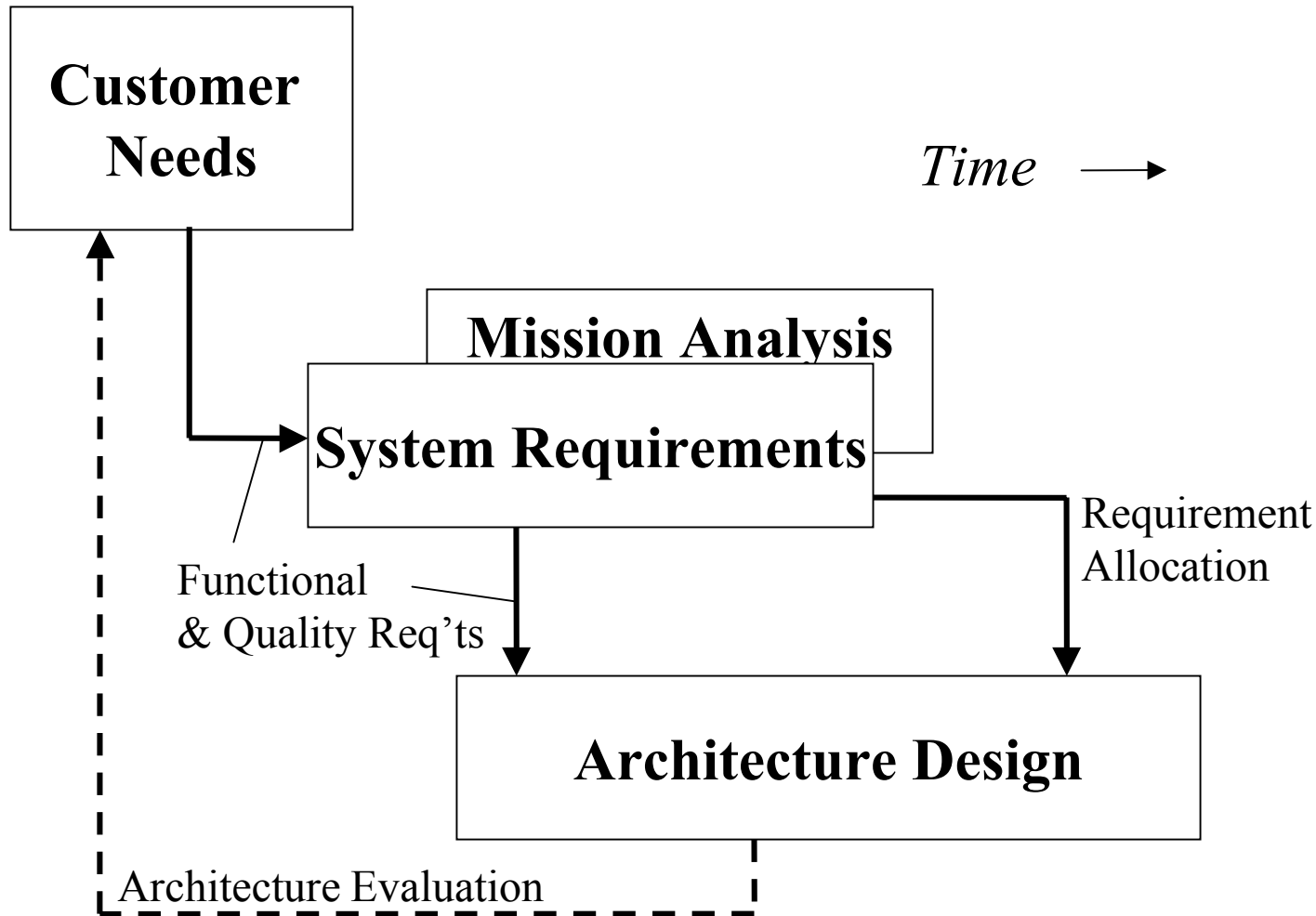
Mission

- All systems are conceived, designed and built to satisfy some mission need
 - Captured as Corporate Mission
 - “... providing best-value products and services for:
 - ...
 - System-of-Systems Architectures
 - ...”

Architecture

- How do you know when you have a “good” design?
 - Meets Requirements (What) ➤ Traceable
 - Can be Articulated (How) ➤ Views
 - Satisfy Expectations (How Well) ➤ “ilities”

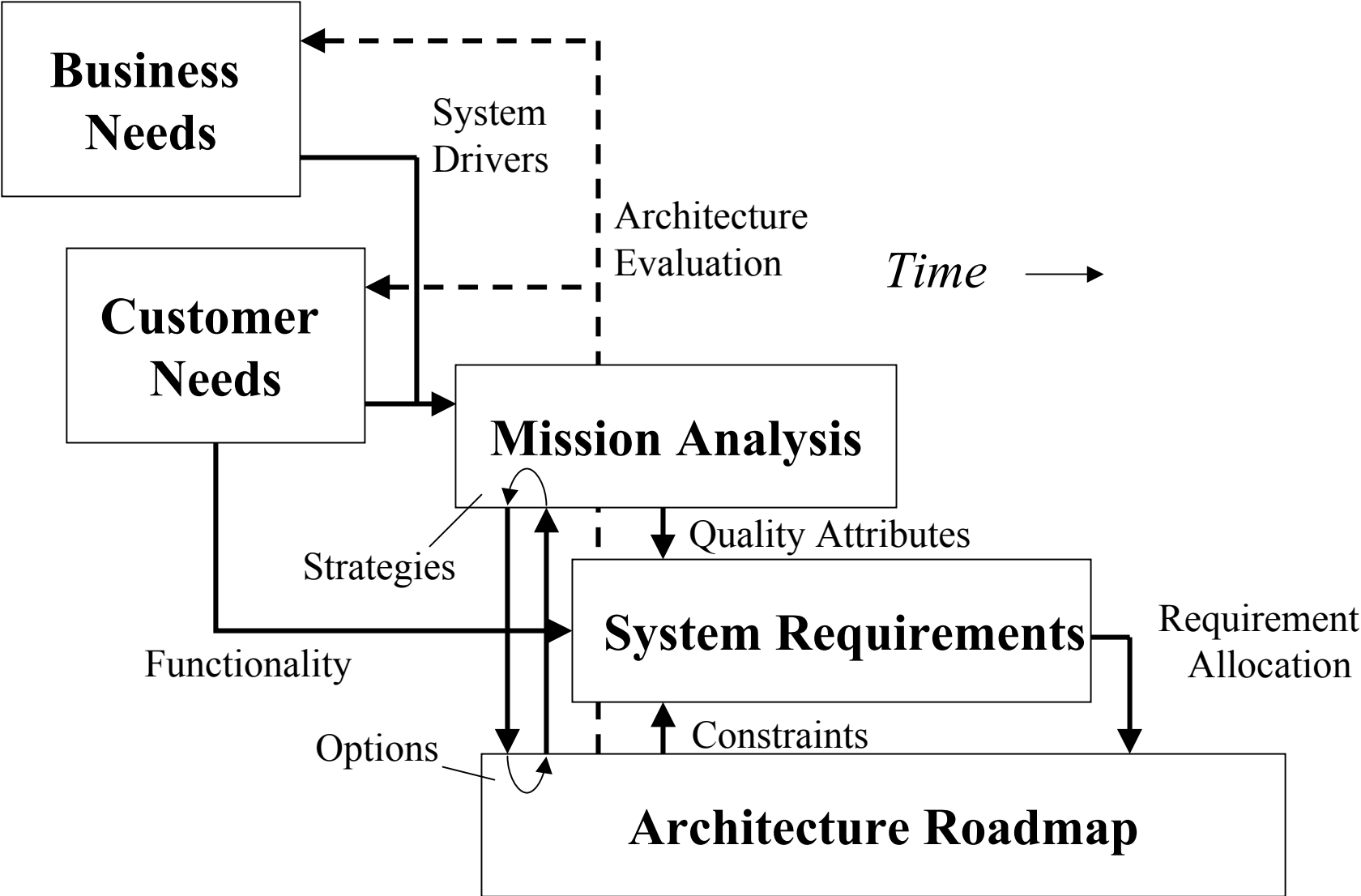
Current Relationships in Early System Design



Mission Analysis

- Mission Analysis deals with the **strategic convergence** of *Business* and *Technical* options to meet the mission
- Mission Analysis defines the **boundaries** of the option *trade space*

New Relationships with Mission Analysis



Examples

- Apollo
 - Three different concepts for mission / three different architectures for the Lunar Lander
 - Direct Ascent
 - Earth Orbit Rendezvous
 - Lunar Orbit Rendezvous
 - Each concept had unique drawbacks – no clear winner until June 1962

Examples

- Security of Next Generation Products
 - Technologies available can create burden on the business at the very time it is being protected
 - Firewalls prevent certain desired deployments
 - Encrypted Data slows transaction rate
 - Code Obfuscation slows / complicates the fielding of updates to customers
 - Code compiling removes machine independence

Technical Business Strategy

Quality Attribute Topic

Goal

What business / customer objective is being debated?

Issues

Business / Customer / User
Technology

What are the boundaries from both Business and Technology?

Options

Benefit
Risks
Cost
Supporting analysis
Impact to other quality attributes

What are the Pros and Cons of available choices (including impact to other topics)?

Recommendation

Attribute Trade-offs

	Availability	Efficiency	Flexibility	Integrity	Interoperability	Maintainability	Portability	Reliability
Availability								+
Efficiency			—		—	—	—	—
Flexibility		—		—		+	+	+
Integrity		—			—			
Interoperability		—	+	—			+	
Maintainability	+	—	+					+
Portability		—	+		+	—		
Reliability	+	—	+			+		

1985

1995

2005

Requirements Engineering

Requirements Focus

DOD 498 / 2167A Methodology

Yourdon

DeMarco

McMenamin and Palmer

Requirements Management Tools

1985

1995

2005



**Architecture
Engineering**

Zachman Framework
C4ISR Framework
DODAF / FEAF

Architecture
Focus

Architecture Tools

Krutchin
Rechtin

Zachman
Maier

A new focus emerging?

1985

1995

2005



Business Process Re-Engineering
Best Value Analysis

Shell
??

Decision Analysis Tools
Architecture Optimization Techniques

**Value
Engineering**

Strategy
Focus

What's next?

- Vision
 - Industry Recognition of Mission Analysis as a necessary and *distinct* ingredient of Systems Engineering
- Action
 - Start Interest Group
 - Explore possibilities of Mission Analysis in SE lifecycle
 - Coalesce on terms and definitions of myriad “ilities”