

Software Acquisition Patterns of Failure and How to Recognize Them

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213

Lisa Brownsword, Pat Place,
Ceci Albert, David Carney

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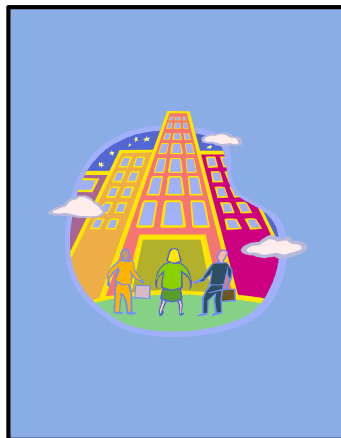
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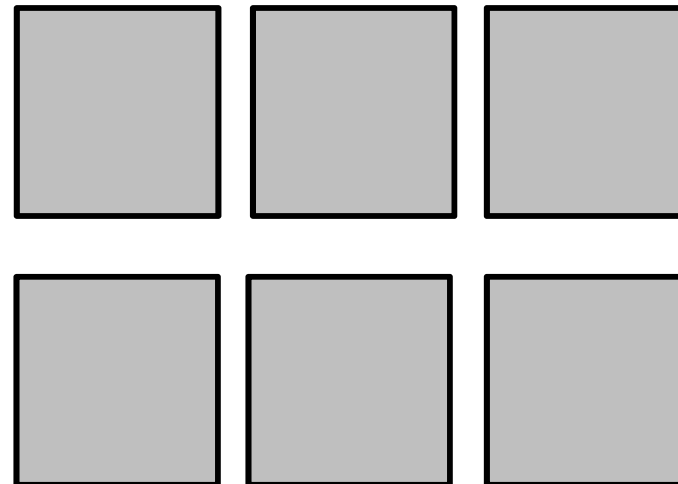
Alignment?



Should I have 1 contractor, or 2 or 3 or 6?
If 1 contractor, how do I enforce the modular architecture?
If multiple contractors, how do I ensure the parts fit together?
Can I migrate legacy to give me a quick delivery?



monolithic legacy
architecture



new modular architecture



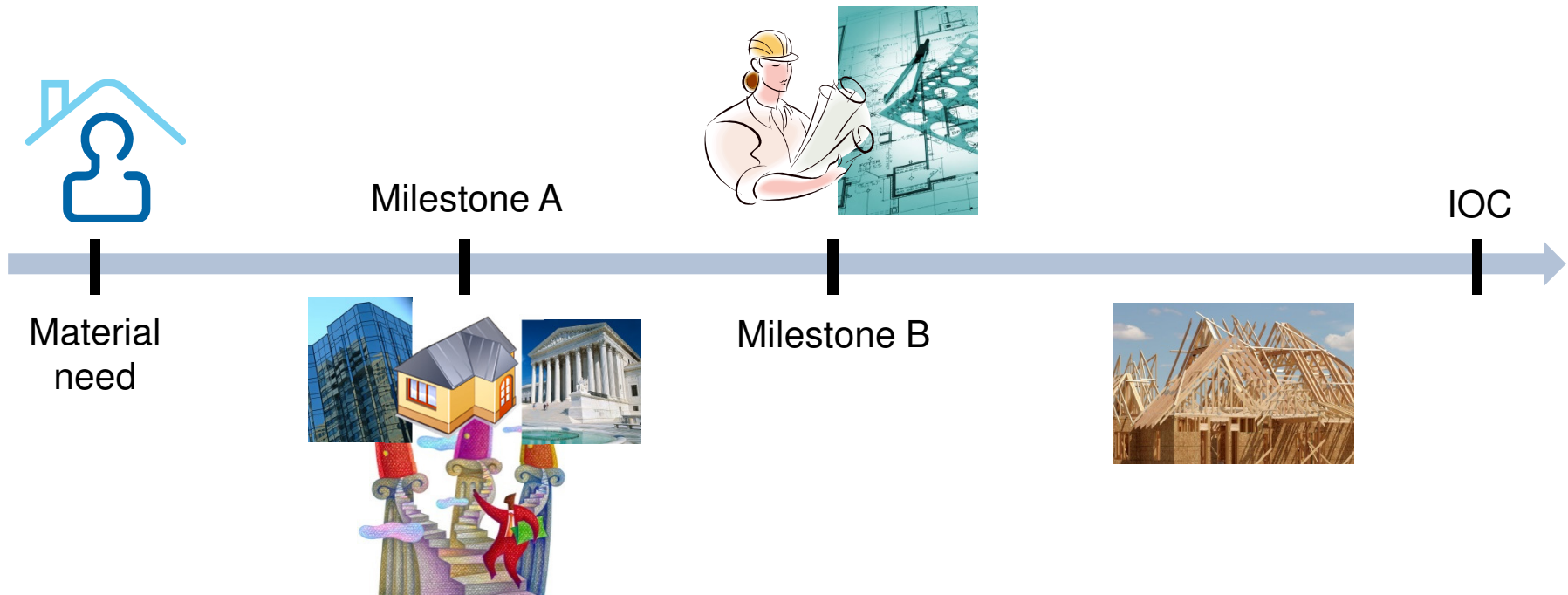
When is software considered?

“Software is the major expense in the acquisition of software-intensive systems”

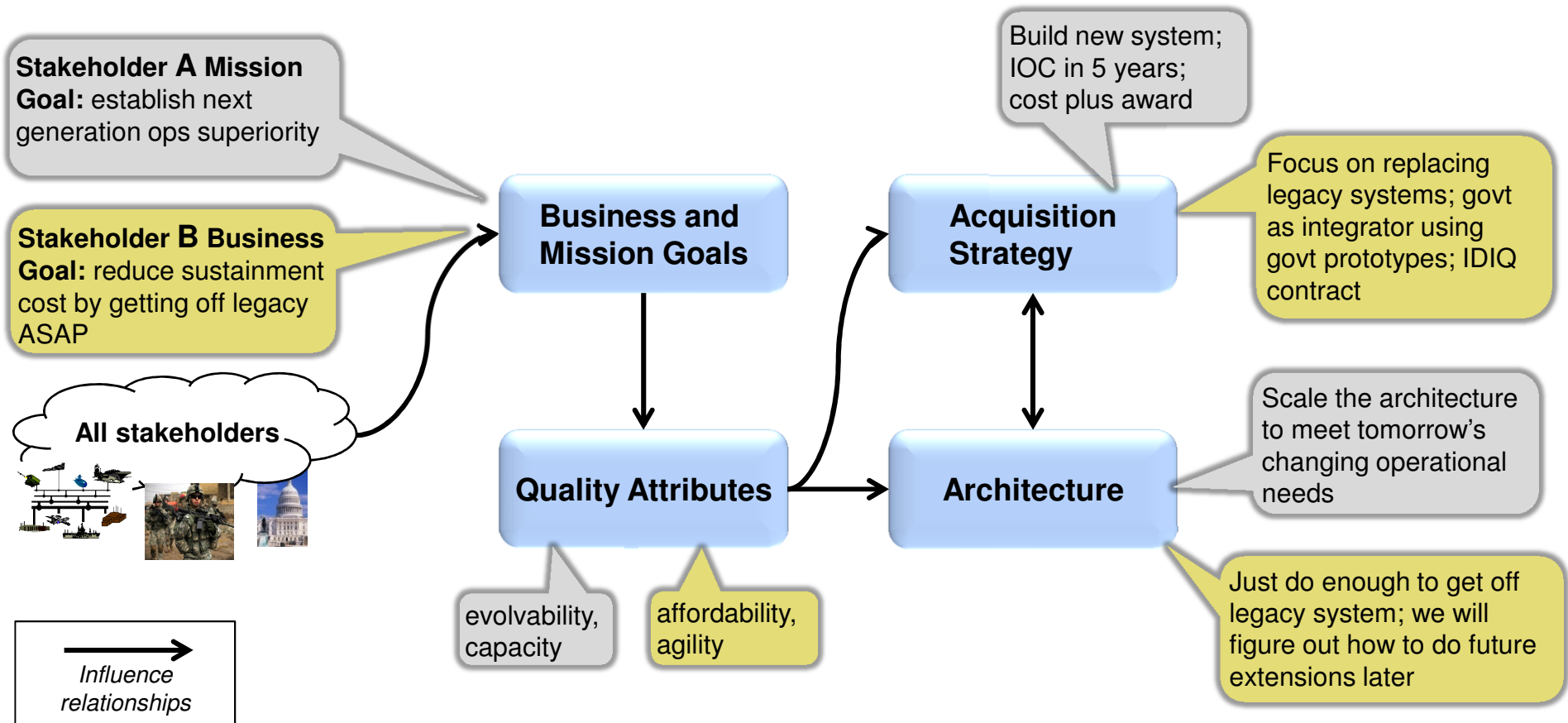
Defense Acquisition Research Journal

“The greatest trade space for programs and the largest risk reduction opportunities exist between Milestone A and Milestone B.”

DAPA study



What can go wrong?



An explicit record of all goals and QAs could highlight the mismatches



Reoccurring Patterns of Failure

Undocumented Business Goals

Poor Consideration of Software

Unresolved Conflicting Goals

Failure to Adapt

Turbulent Acquisition Environment

Overlooking Quality Attributes

Inappropriate Acquisition Strategies



Study results to be published in SEI TN: "Isolating Patterns of Failure in Department of Defense Acquisition "



Pattern Description Extract: Undocumented Business Goals

Context

- There is a lack of precise, well-defined, and *well-documented* business goals corresponding to the precise, well-defined mission goals.
- Business goals are the major driver for an acquisition strategy, and the software plays a major role in system functionality.
- The actual role that the detailed business goals play in the software architecture is often minimal.

Problem

- Business goals are not influencing the acquisition strategy or the software architecture.

Observed Response

- The architect will make assumptions about business goals when making architectural decisions – e.g., choosing a monolithic architecture for performance rather than architect for multiple contractors.

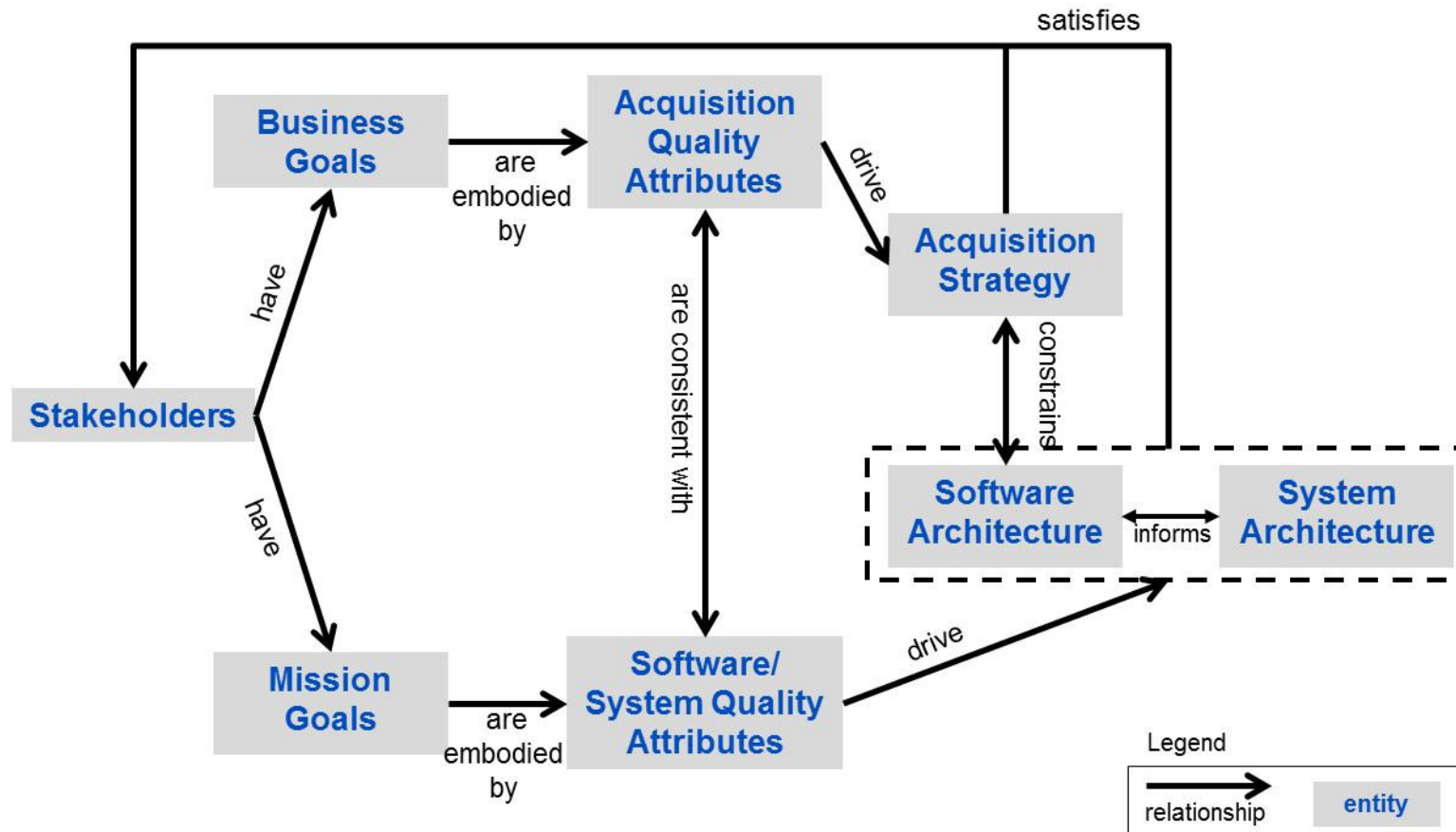
Consequences

- Major shifts in the program's focus causing rework, cost, and delay.

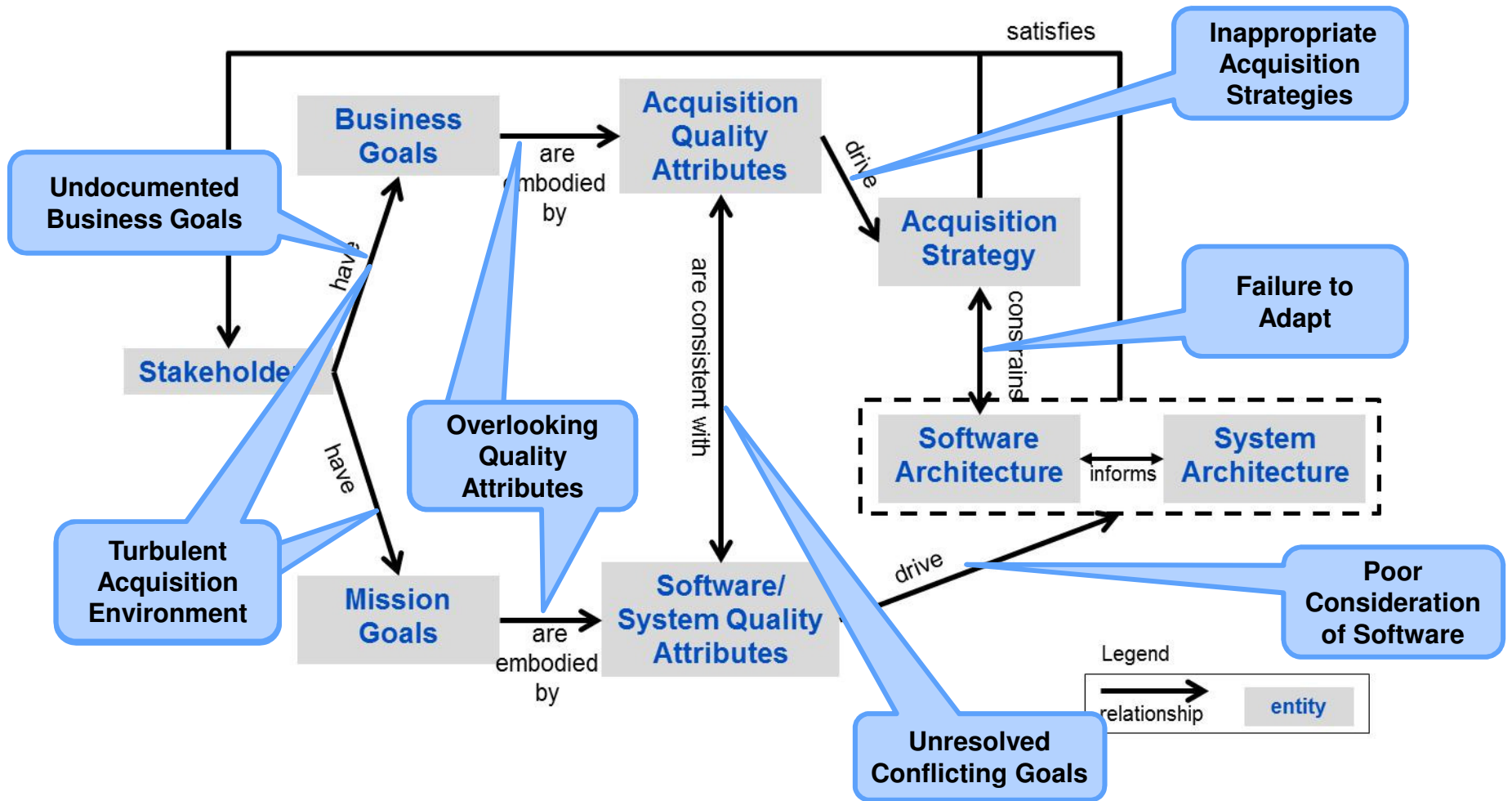
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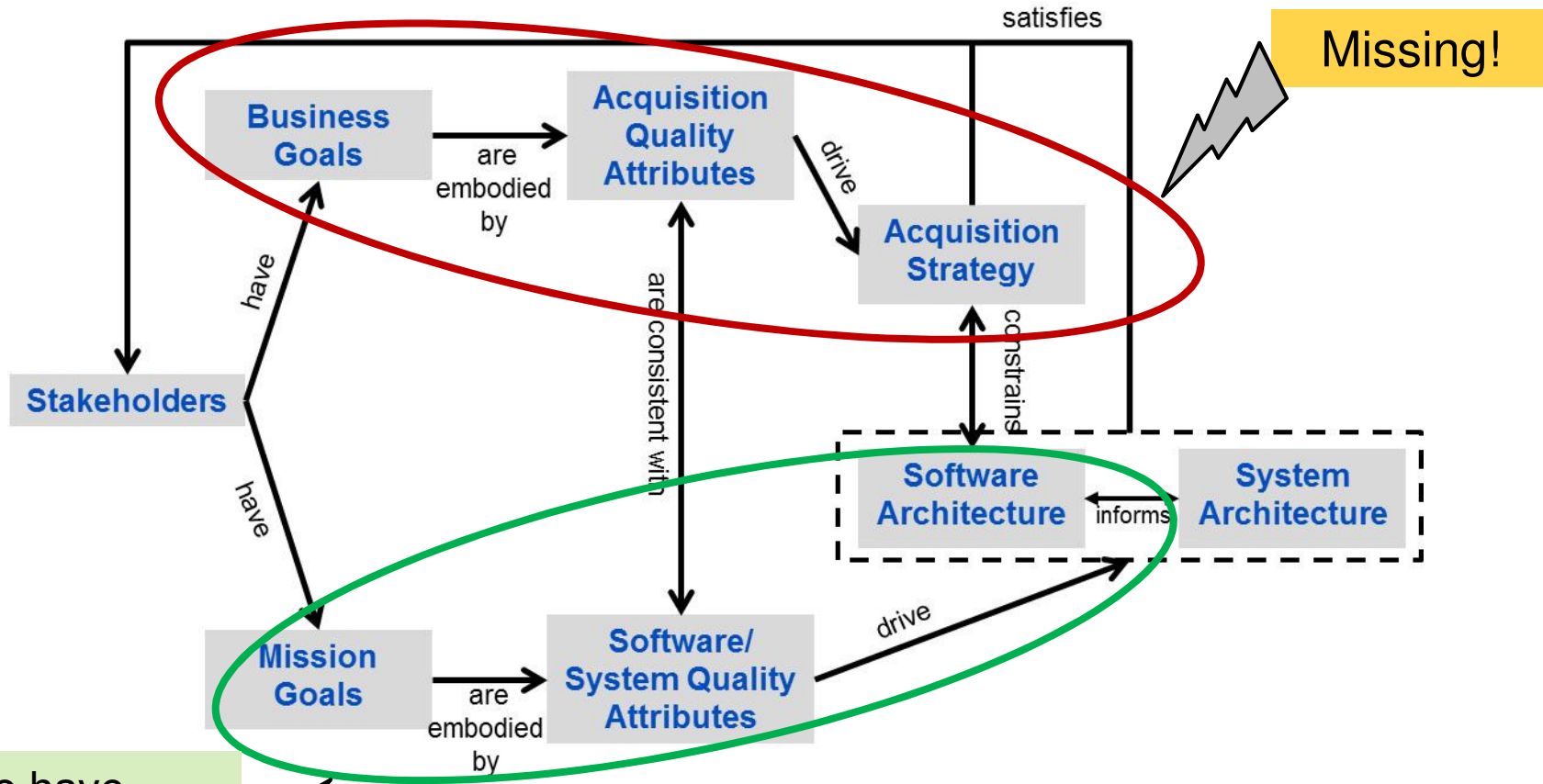
The Way It Should Be



Where Failures Occur



What can we do about it?

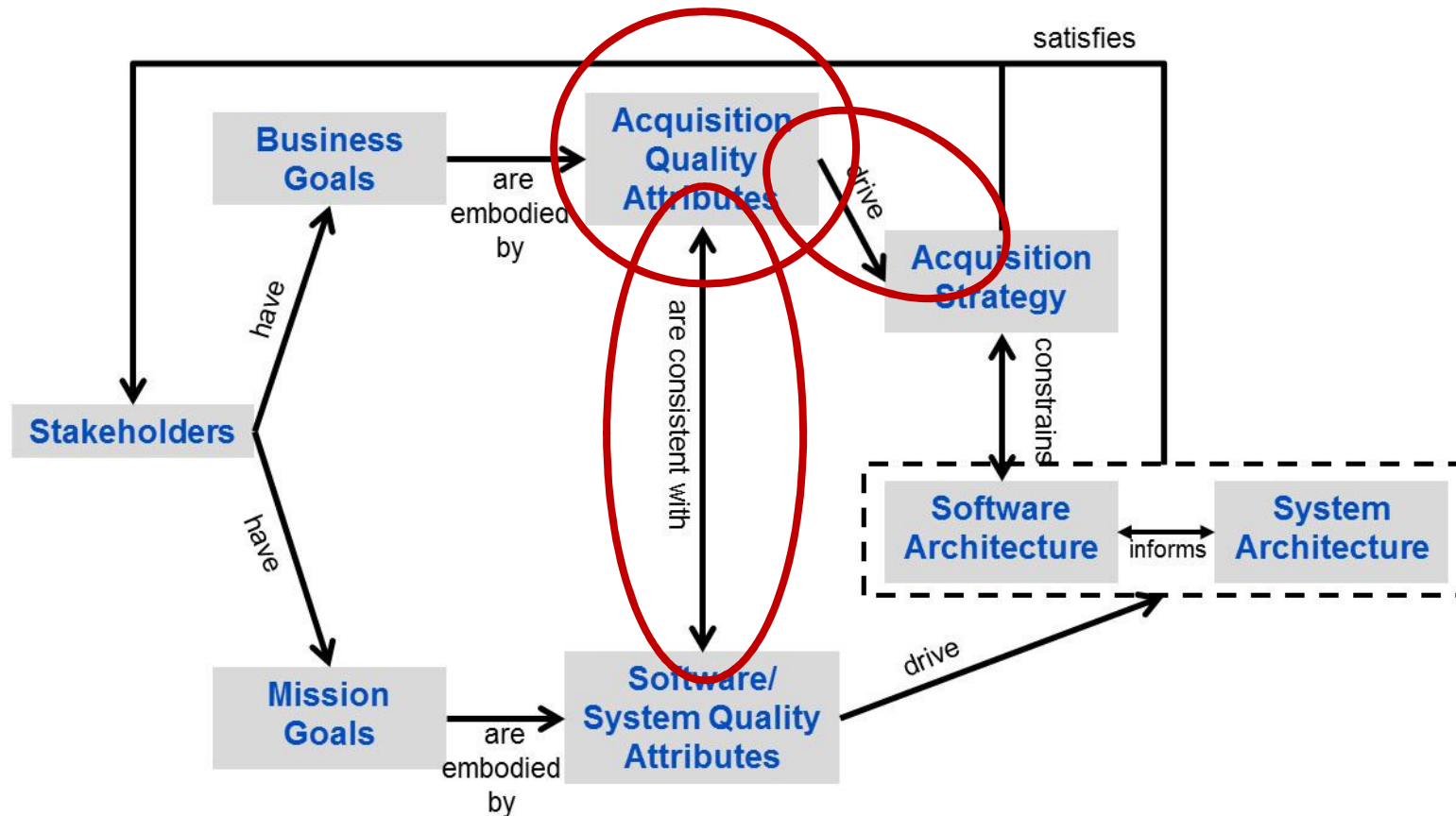


We have methods and processes to do this

Create a method so programs have a way to explicitly align their acquisition strategy and software architecture



What we can do about it – Phase 1



Start filling the gaps



Candidate Acquisition Quality Attributes (AQAs)

Sources

- DoD acquisition strategy guidance and instruction documents
- SEI experiments developing scenarios from actual programs

<ul style="list-style-type: none">• Acceptability• Accountability• Affordability• Appropriateness of contract• Appropriateness of technology• Achievability• Accreditability• Balance• Commitability• Communicability	<ul style="list-style-type: none">• Competitiveness• Contract manageability• Credibility• Effectiveness• Evolvability• Fairness• Flexibility• Implementability• Legality• Manageability of risk• Management visibility	<ul style="list-style-type: none">• Modifiability• Promptness in reporting problems• Responsibility• Responsiveness• Sensibility• Staffability• Suitability• Sustainability• Timeliness• Traceability with requirements
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Acquisition Quality Attribute Scenarios

6-part scenarios give meaning to an attribute in the context of a specific acquisition

- Modeled after software QAs: **Source**, **Stimulus**, **Environment**, **Artifact**, **Response**, **Response Measure**

Example of “flexibility” for Program A: **Warfighters in the field demand a new capability now**. Where continuing resolution bans new program starts, **an existing development contract is modified to add the desired capability without change in scope**.

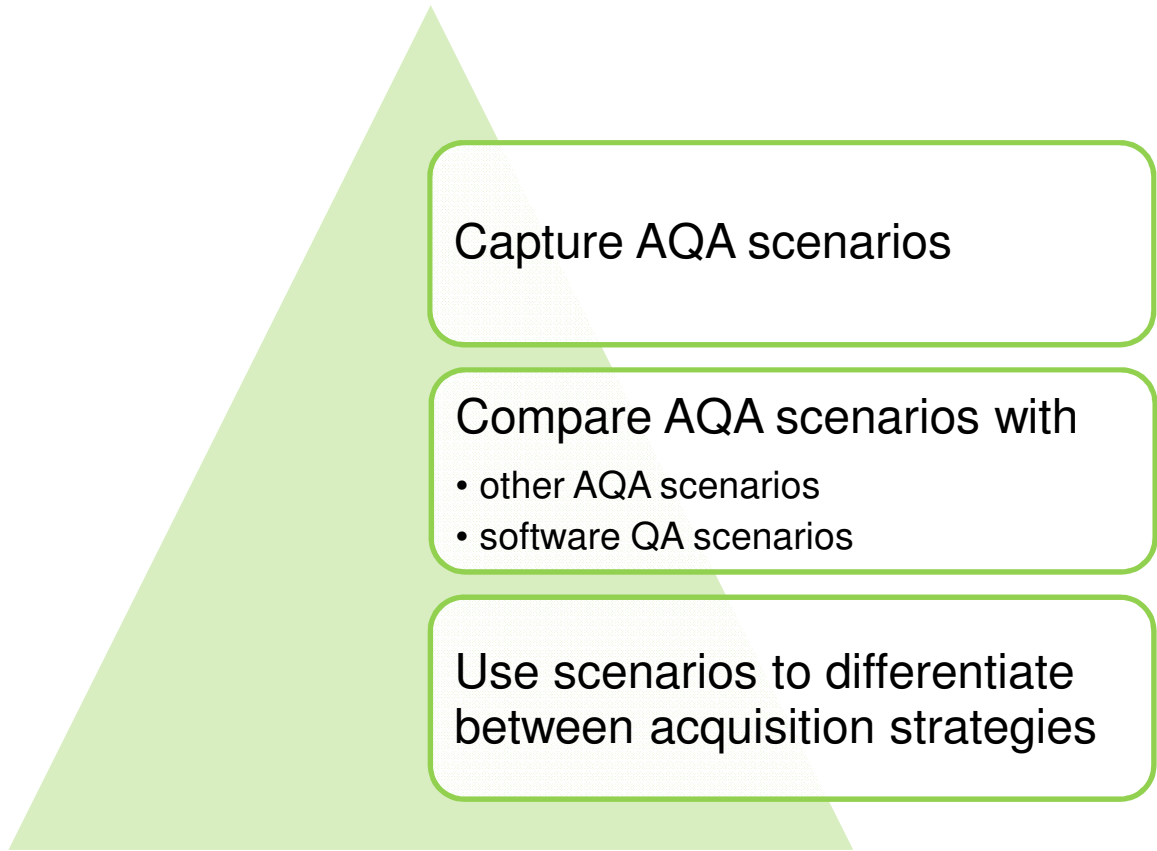
- Implications for acquisition strategy: Make the scope very broad so future enhancements are within the original scope and can be readily accommodated without a new program

Example of “flexibility” for Program B: **Warfighters in the field, demand a new capability now**. The deployment strategy has not yet been fully defined, **so the development contract is modified to provide the desired capability to support an early delivery**.

- Implications for acquisition strategy: Specify contractor responsibility for multiple deployments with increasingly complete functionality



Current Work – Phase 1



Future Work – Phase 2



Investigate and document more patterns

Develop a method that leads to alignment

Work with real programs to test the method



We welcome further discussion!



Lisa Brownsword

Telephone: +1 703.908.8203

Email: llb@sei.cmu.edu

Pat Place

Telephone: +1 412.268.7746

Email: prp@sei.cmu.edu



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