

Fall 2014
SEI Research Review
Aligning Acquisition Strategy
and Software Architecture

Software Engineering Institute
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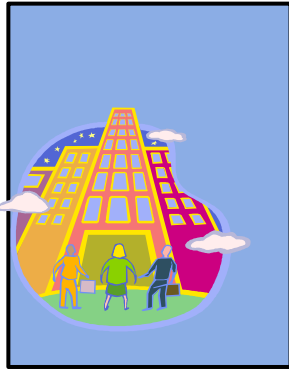
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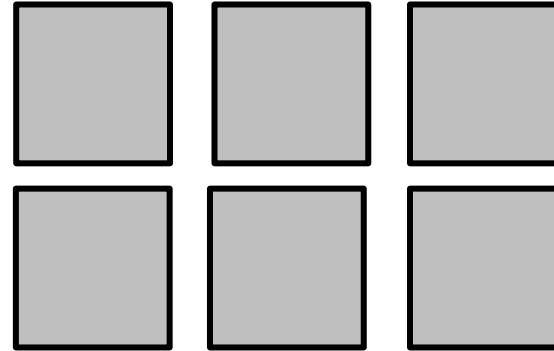
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Interplay of Acquisition and Architecture



monolithic legacy
architecture



new modular architecture with
new and legacy capabilities

Program Manager



Should I have 1 contractor, or 2 or 3 or 6?

If 1 contractor, how do I enforce a modular architecture?

If multiple contractors, how do I ensure the parts fit together?

Can I migrate legacy to give me a quick delivery?



Purpose of Our Research

Can we improve the probability of a program's success through a method, to be used by PMOs, that produces mutually constrained and aligned program acquisition strategy and software architecture?

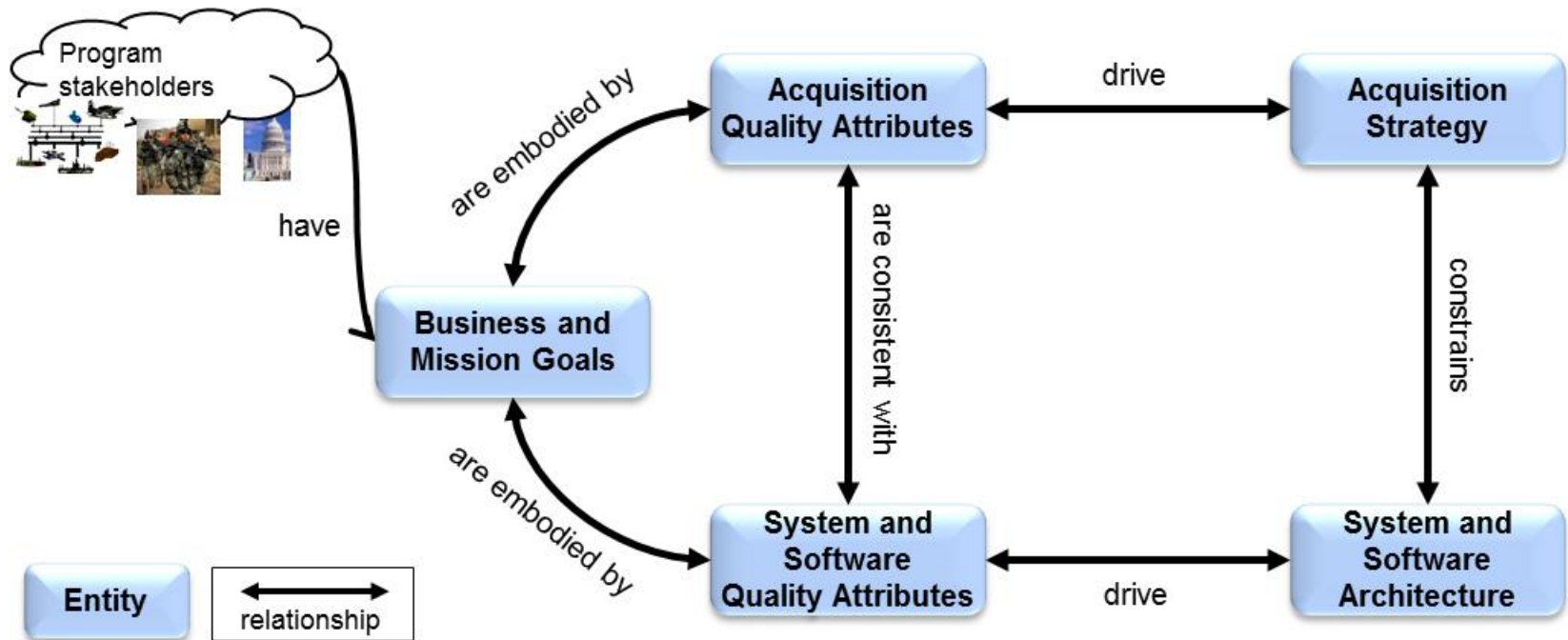
Why this is important

- Software is increasingly important to the success of government programs.
- There continues to be little consideration of the software architecture in the development of either the system architecture or the program's acquisition strategy.
- Software architecture is often over constrained by decisions made early in the acquisition lifecycle when key program choices are being made—negatively affecting program success.



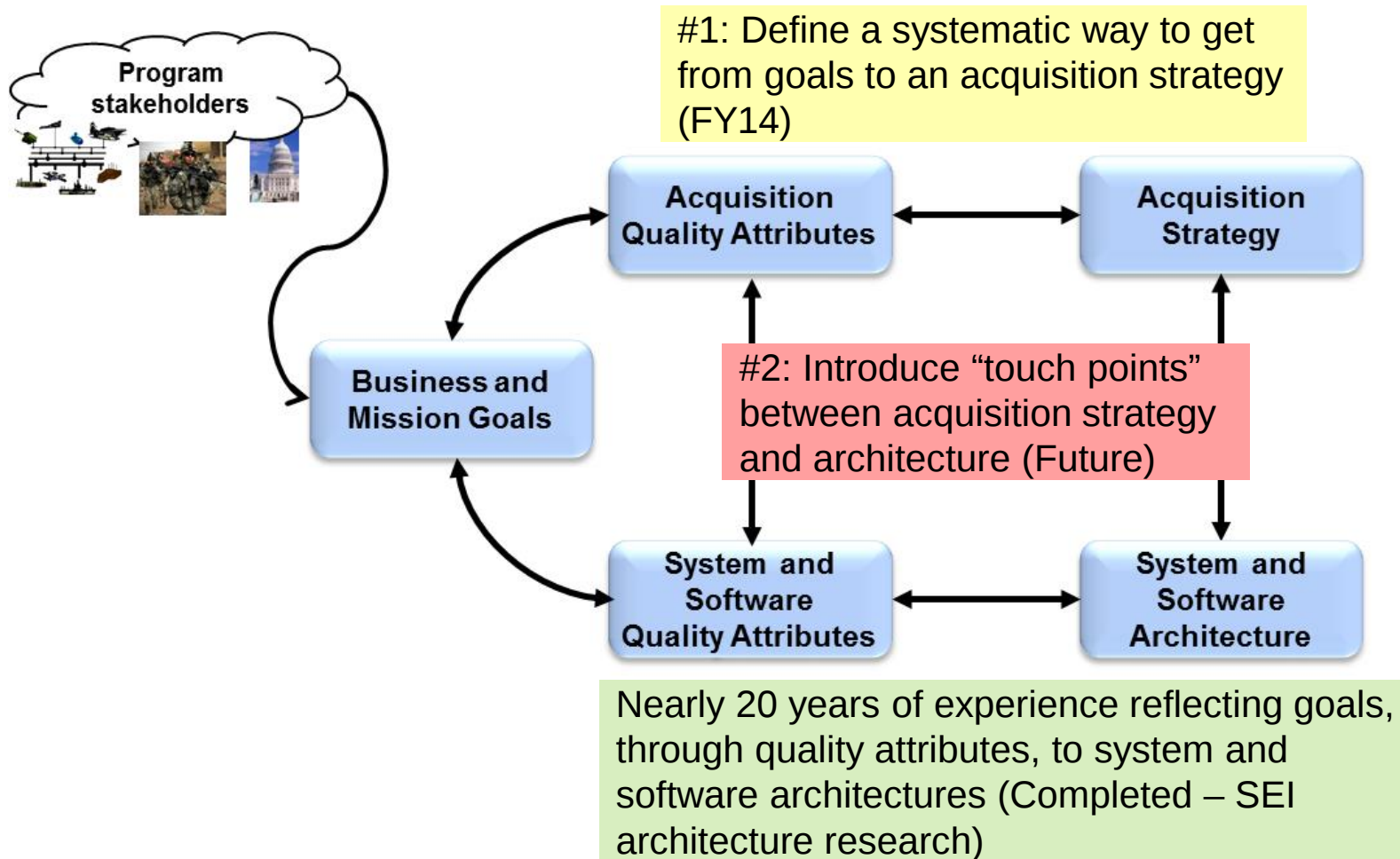
Our Early Research

- ❖ Discovered reoccurring patterns of failure
- ❖ Identified key entities and relationships involved in those failures

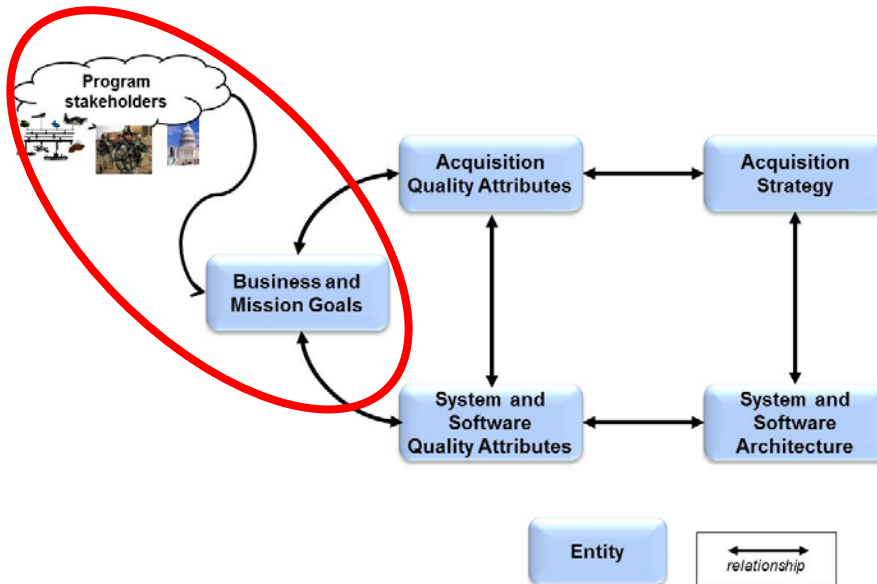


Alignment of acquisition strategy and software and system architectures does not occur naturally

Research Opportunities



Goal Determination



Focus on capturing business and mission goals

- Identify stakeholders
- Elicit business goals
- Represent goals in standard form*

Analyze goal subjects and objects to identify additional stakeholders

Note: applies for elicitation of mission goals

*Business goal scenarios found in SEI TN CMU/SEI-2010-TN-018:
“Relating Business Goals to Architecturally Significant
Requirements for Software Systems”

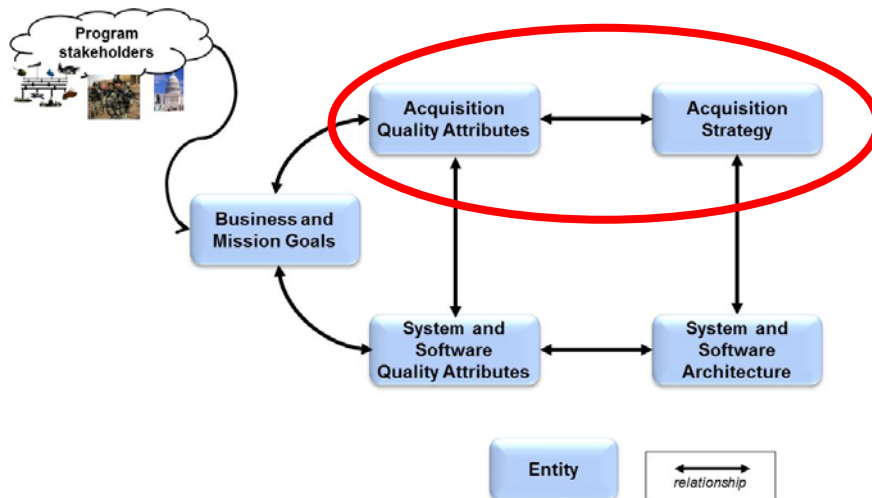


Acquisition Quality Attribute (AQA) Consistency

Example AQAs	
Flexibility	Executability
Performability	Responsiveness
Realism	Programmatic Transparency
Affordability	Innovativeness
Survivability	Schedulability

Characterize relationship between AQA scenarios and acquisition strategy

- Based on research that captured 75 scenarios across 23 programs*
- Defined types of scenarios that might occur for a given AQA
- Created acquisition strategy tactics associated with AQAs



*Results published in SEI TN CMU/SEI-2013-TN-026:

“Results in Relating Quality Attributes to Acquisition Strategies”



Value of AQA scenarios₁

AQA scenarios can be used to

- Express effects of business and mission goals
- Inform the development of the acquisition strategy
- Determine appropriateness of acquisition strategy with respect to any given scenario

Acquisition Quality Attribute	Scenario	Potential Acquisition Tactic
Flexibility	The user's system requirements change radically 30 days before the RFP is released and the "go live" date is fixed; the RFP is released regardless.	Establish fallback strategies that protect the "go live" date.
Affordability	The program discovers that the cost of operating the system will be higher than the ceiling mandates during development but before initial fielding; the system (including its architecture) is shifted to a less costly alternative.	Emphasize the need for architecture adaptability.



Value of AQA scenarios₂

- Scenarios can help identify possible incompatibilities

Stakeholder A: advocates use of open source software as a means of increasing responsiveness to users

Stakeholder B: is responsible for ensuring that the deliverables meet rigorous safety standards

Stimulus	Users request significant new functionality to be delivered rapidly
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Stimulus	A new requirement to adhere to a rigorous safety standard is applied to the system
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Environment	during the program's development phase
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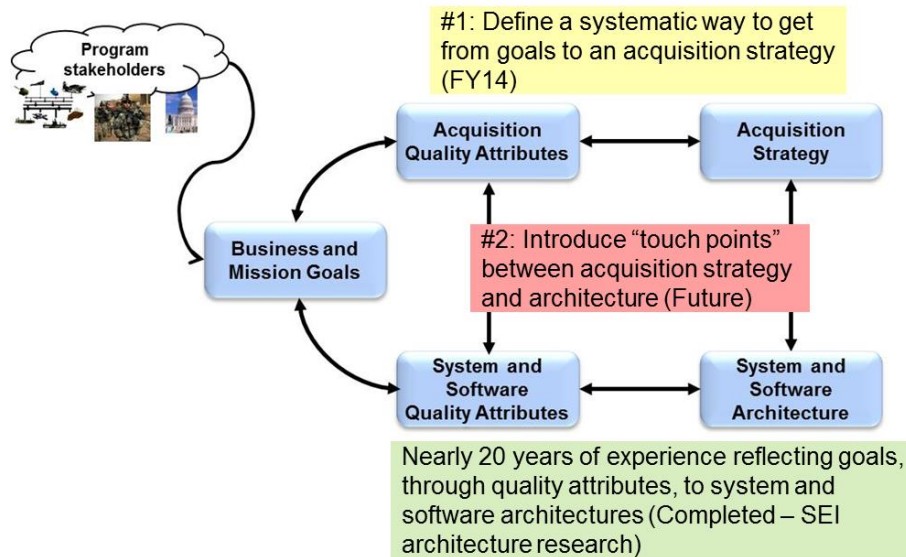
Environment	during the program's development phase
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Response	create the functionality rapidly by reusing open source and software from other projects to provide much of the capability.
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Response	The developers remove all unreachable code to insure that the system will pass stringent new certification standards.
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Wrap Up



Our research has defined an initial alignment method*

- Fosters explicit, program-specific, discussion of the goals that are driving the program
- Allows for more reasoned analysis and tradeoffs among the goals through the use of scenarios; making conflicts more visible
- Assists in ensuring that the goals are supported in the acquisition strategy

More research is needed that focuses on research opportunity #2

*Initial alignment method to be published in SEI TN CMU/SEI-2014-TN-019:
"A Method for Aligning Acquisition Strategies and Software Architectures"



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