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Risk themes from ATAM data: preliminary results

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Report Documentation Page

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Overview

The data set

Process followed in categorizing data

Initial results

Implications

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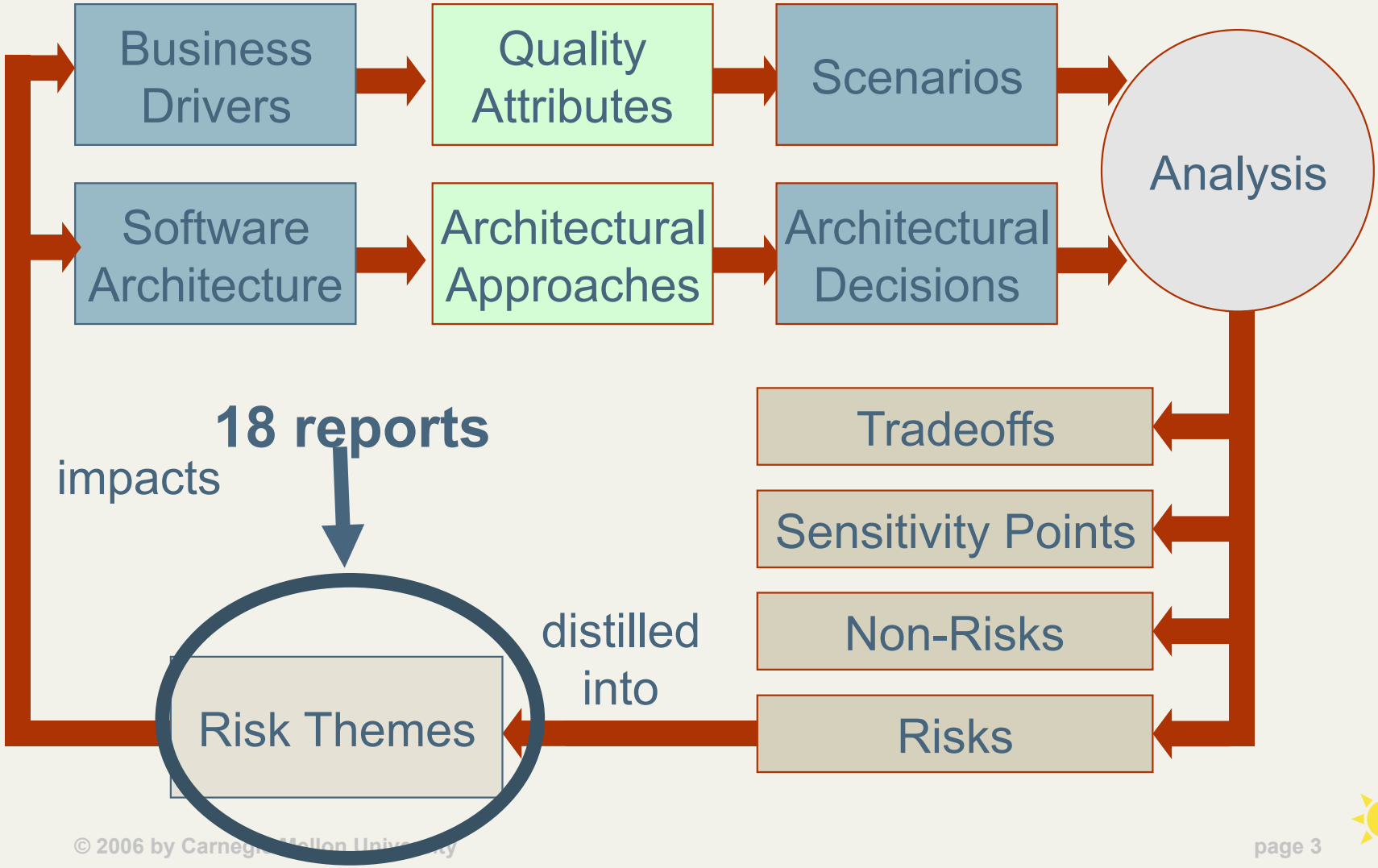
Conceptual Flow of the ATAM



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Data Set

18 ATAMs

- 12 DoD
- 2 other government agency
- 4 commercial

The ATAMs were performed between 2000-2005.

Domains range from embedded to information systems

137 Business Goals

99 Risk themes

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Affinity Diagram

Bottom up process to discover groups in raw data

Developed by an anthropologist

Relies on intuition

Two data items are in the same group if the grouping team feels they have something in common

A data item can be placed into multiple groups

Groups are then categorized based on judgment, literature.

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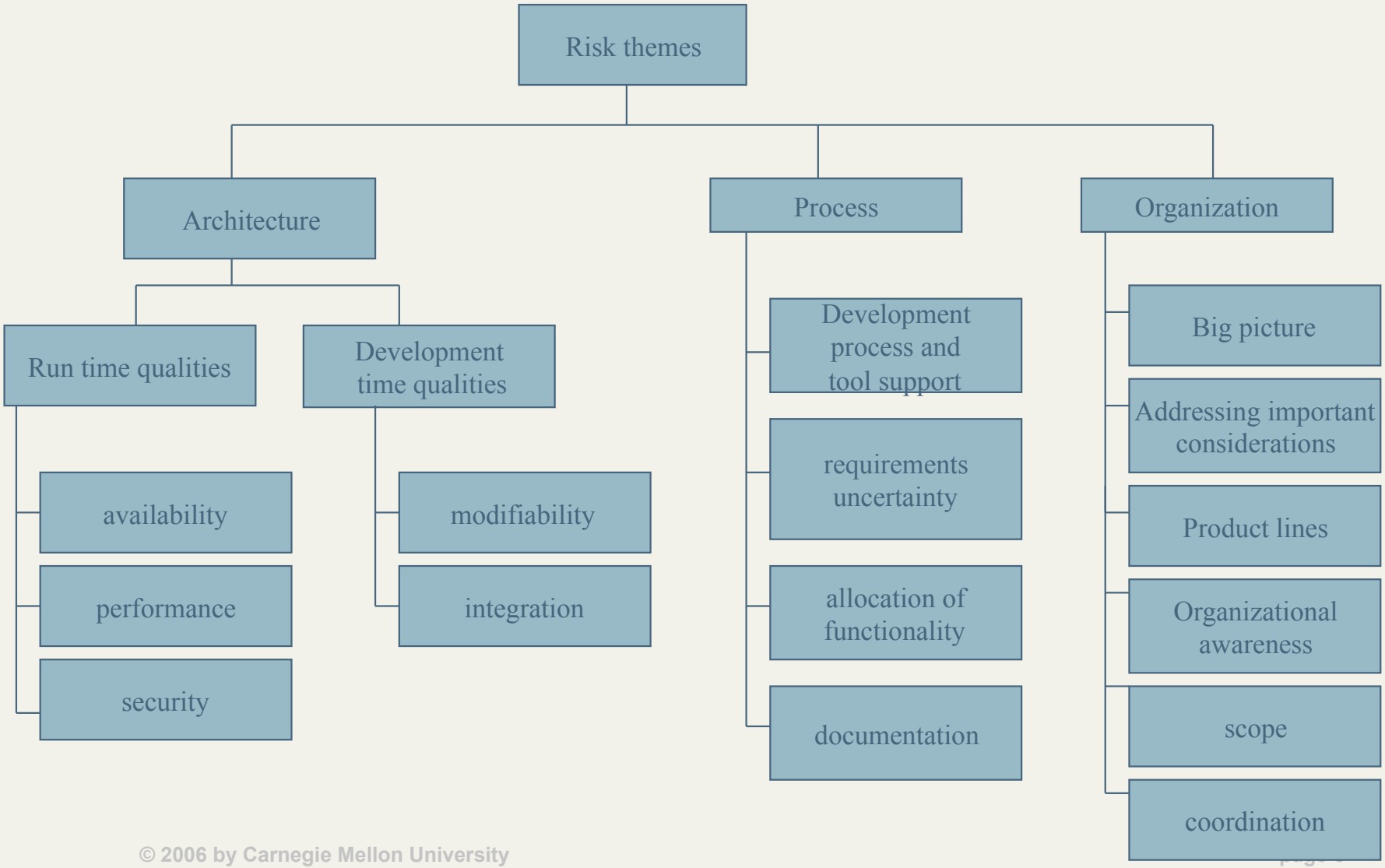
Risk Theme Categories



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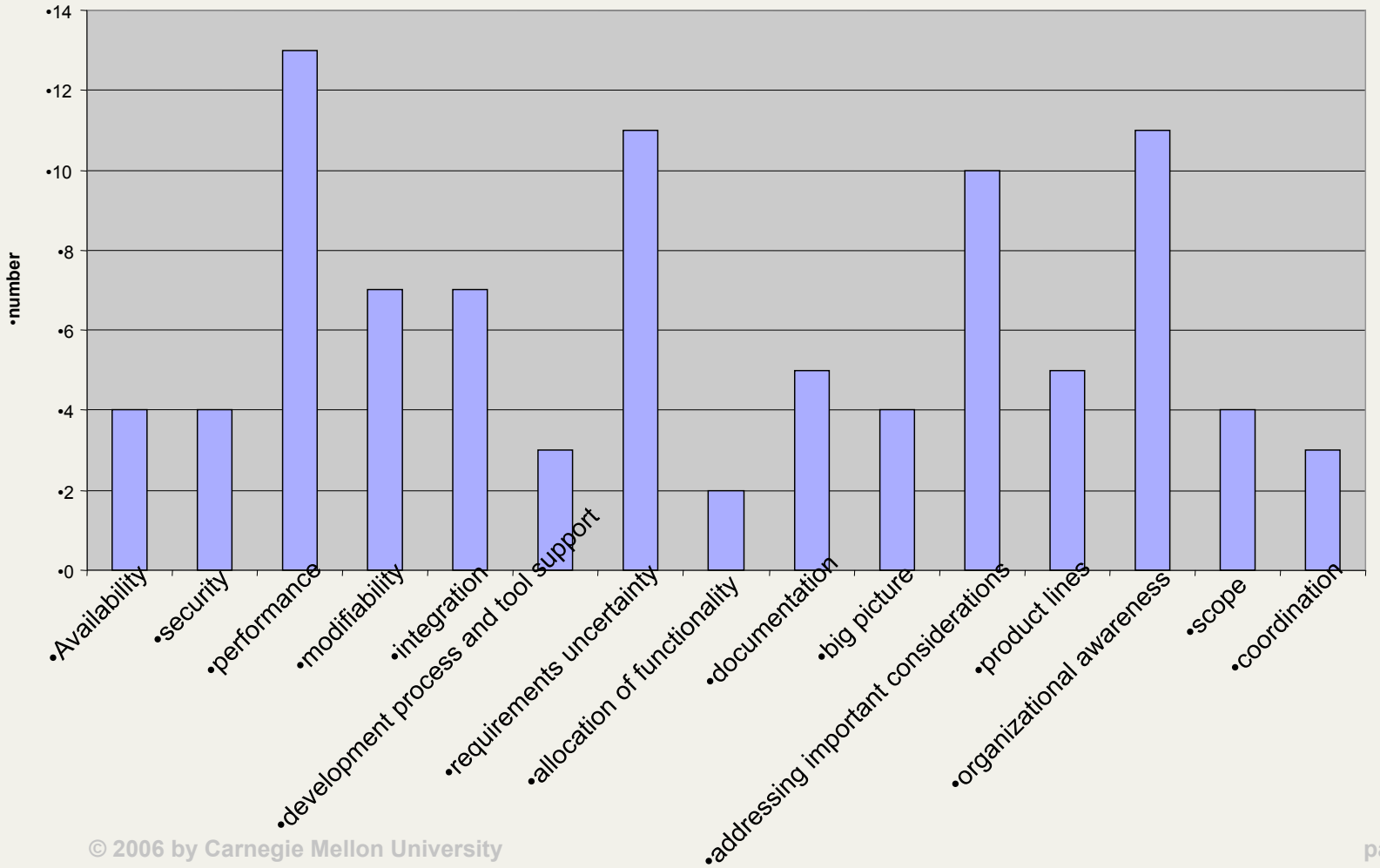
Risk theme distribution



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Interesting risk themes

Exhibited by over 50% of ATAMs

- Performance
- Requirements uncertainty
- Lack of addressing important considerations (samples
- Organizational awareness on next slides)

Documentation

- Occurred in exactly last 5 ATAMs
- May be due to
  - Increased sensitivity on part of evaluation team
  - Better documentation of system

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Sample risk themes – addressing important considerations

There are many risks arising from decisions not yet made. The volume of decisions not yet made suggests that the project schedule is at risk.

There is a lack of support for data management: There is no uniform specification for managing meta-data and its persistence. There is no strategy for ensuring that data sets are accessible outside of an implementation of a sub domain. This means that while data is, in theory, exchanged by all sub domains, they may not be sharing the same assumptions about the data. And it may not be easy for one sub domain to gain access to data sets from another domain.

There is a trend to move toward an integration role for the development organization. This increases exposure to liability risks in customer and 3rd party software integrated with development organization software. The market is forcing the development organization to be an integrator, but there is no clear business goal that states this.

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Sample risk themes – organizational awareness

There are risks arising from a lack of an adequate training program especially for the pool of developers that will be implementing the system under review

The new architecture may not be institutionalized for two primary reasons:

1. *Not everyone is sensitive to the benefits that the architecture can offer.*
2. *The guidelines and rules for developers regarding when to use which architectural mechanisms are not complete yet."*

The new component-based product-line approach provides extensive potential which cannot be exercised without training, application development guidance, and tool support.

There is a lack of attention to support and training issues in the architecture of the system under review.

There is a test requirement to interoperate with other systems but neither test plan nor test capabilities have been detailed beyond those internal to the system under review

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A Different Categorization of Risk Themes

Risks of commission - those risk themes that refer to a decision in the architecture that is problematic

Risks of omission – those risk themes that refer to the lack of a decision or investigation

Other – those risk themes that are neither commission or omission

Commission:	25 of 99	
Omission:	57 of 99	(inter-rater reliability test is
Other:	18 of 99	.82)

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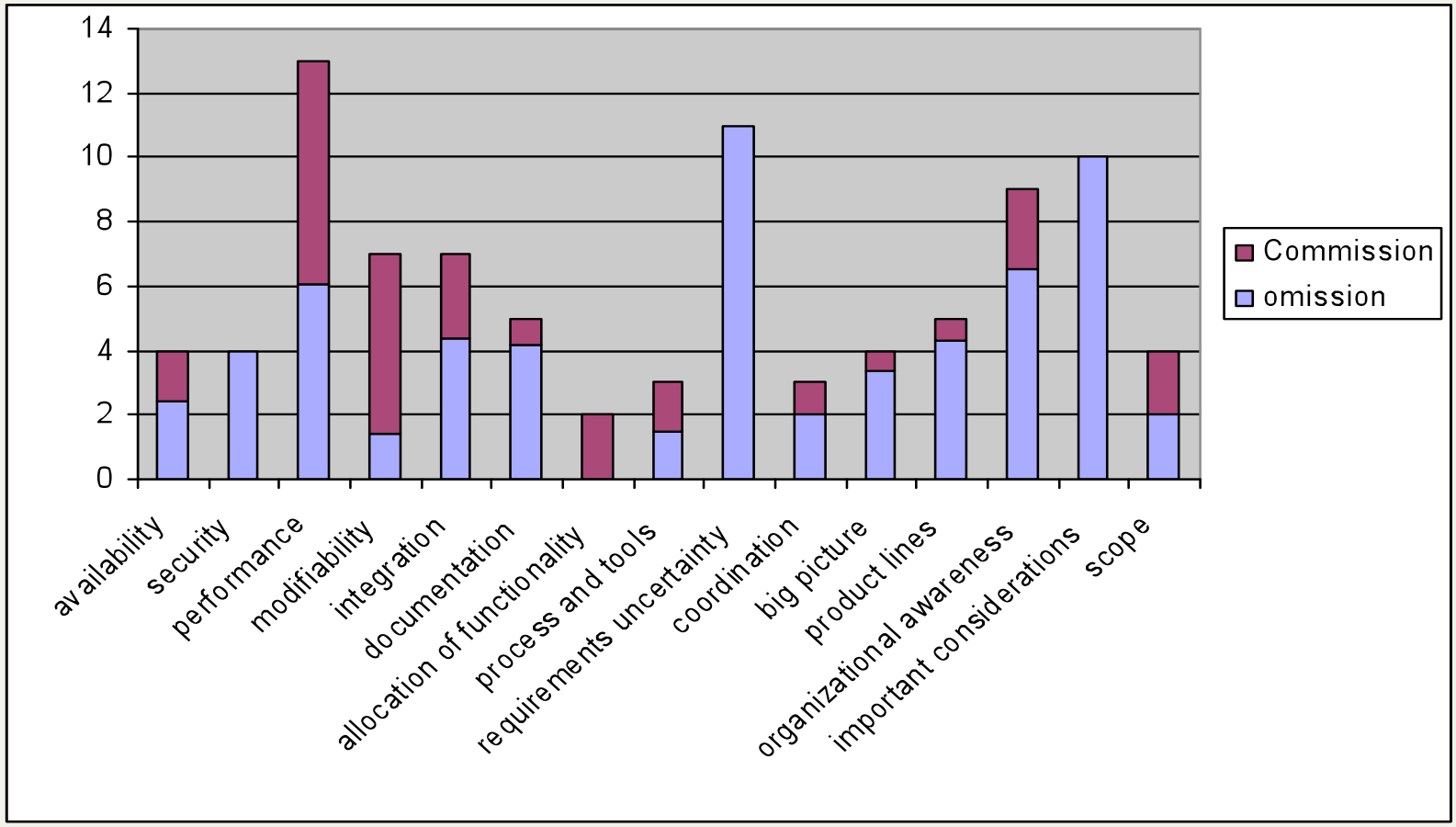
Risk Themes Categorized by Omission and Commission



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Possible factors to predict risk themes

Came to the SEI – not a random sample of systems by any means

Business goals – e.g. do systems with performance as a business goal have performance risks?

Domain of system – e.g. do embedded systems display different set of risk themes than information systems?

Dominant architectural style – e.g. do client server systems display a different set of risk themes than cyclic executives?

Evaluation team – are risks result of examiners?

Development team – maturity of team, size of system, skill set of team?

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We have explored two possible causes for risk theme patterns:

Business goals

Domain

In each case, we are looking for patterns in risk themes that share either business goals or are in the same domain.

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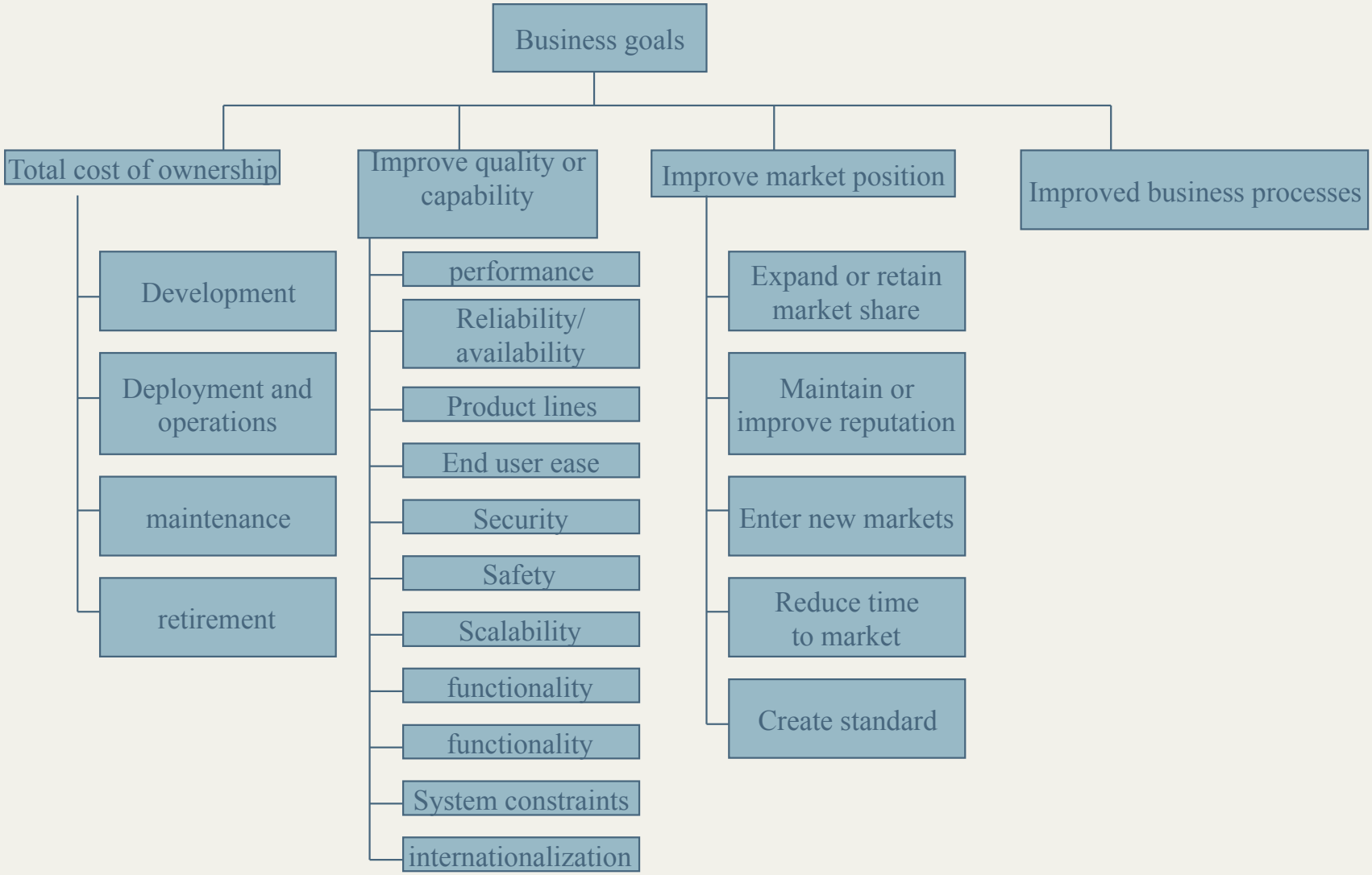
Business goal categories



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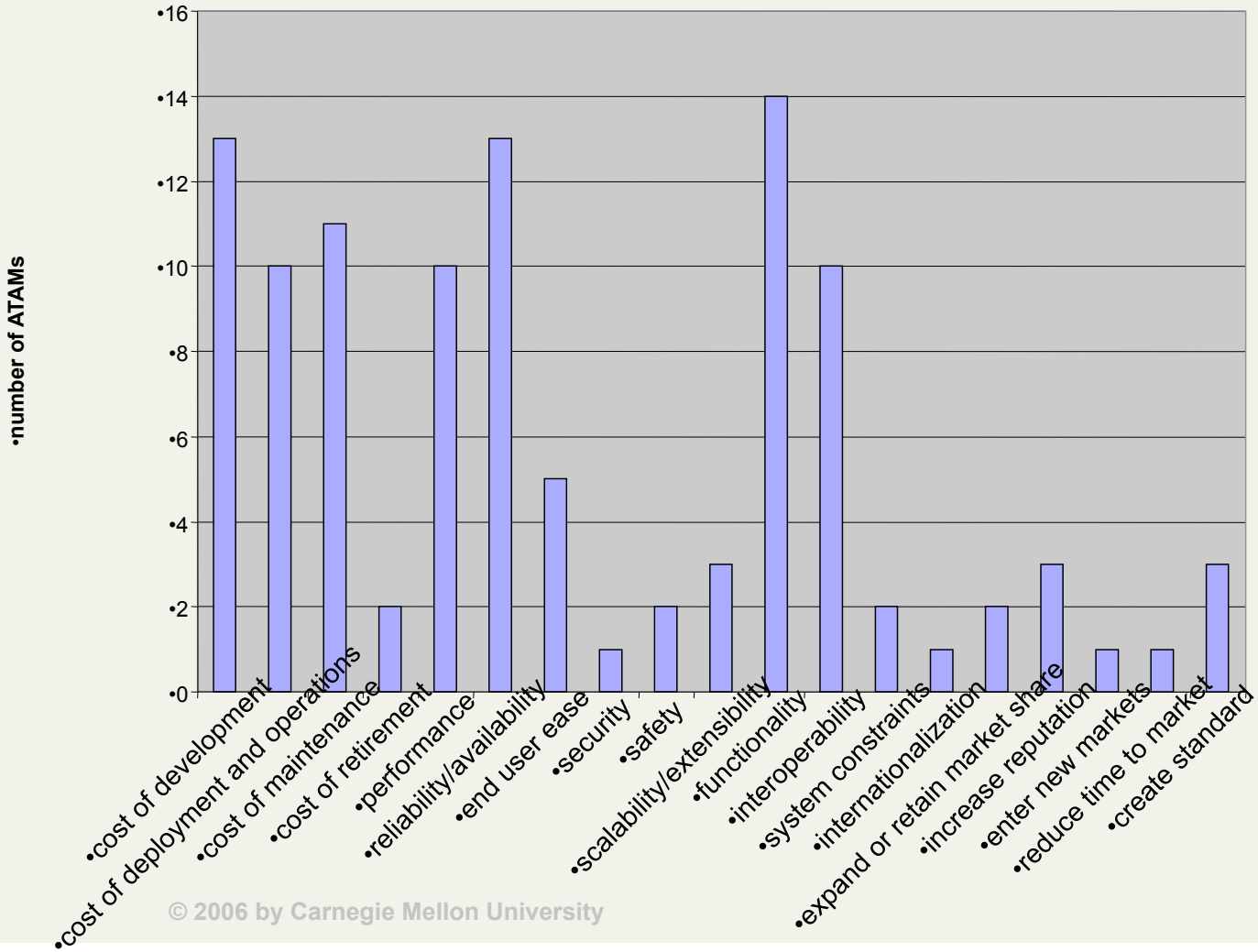
Business goal distribution



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Do systems with performance as business goals exhibit higher probability of performance risk?

•**Symmetric Measures**

		•Value	•Asymp. •Std. Error[a]	•Approx. T[b]	•Approx. Sig.
•Interval by Interval	•Pearson's R	•.194	•.233	•.792	•.440[c]
•Ordinal by Ordinal	•Spearman Correlation	•.194	•.233	•.792	•.440[c]
•N of Valid Cases		•18			

•a.•Not assuming the null hypothesis.

•b.•Using the asymptotic standard error assuming the null hypothesis.

•c.•Based on normal approximation.

NO!

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How about domains?

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Identified the following domains in the 18 ATAMs

Domain	Number of ATAMs
Avionics	3
C4ISR	1
Command and control	4
Command and Intelligence	1
Distributed infrastructure	1
Embedded information systems	2
Embedded control systems	2
Information Systems	1
Information, Surveillance, Reconnaissance	1
Mission computing	1
Modeling and simulation	1

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Do systems from the same domain exhibit a pattern of risk themes?

For domains with more than 1 ATAM, we calculated a measure of similarity of risk themes. We are still thinking about what constitutes a good measure of similarity (.7 means significant similarity for the measure we are using.)

Domain	N	Measure of similarity
Avionics	3	.245
Command and control	4	.131
Embedded information system	2	.293
Embedded control system	2	.415

NO!

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What about other possible predictors of risk themes?

Found no predictors of risk themes in business goals or domains.

Have not analyzed based on architectural styles.

18 is a limited data set and ATAM does not necessarily collect the correct information for predicting risk themes.

Conjecture: Organization setting is a significant factor in predicting risk themes.

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Recommendations based on what is known so far

Practitioner

- Use checklists early in the project to mitigate likely risks
- Use known techniques for mitigating performance and requirements volatility risks.

Researcher

- Explore hypothesis that risks are related to organizational setting
- Determine techniques to mitigate risks of organizational awareness and lack of addressing important considerations.

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ATAM Evolution

Initial thoughts:

- Integrate business goals into utility tree
- Develop risk themes based on categories presented here.

We welcome ideas as to how this data can be used to improve the ATAM method.

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More information

Categorizing Business Goals for Software Architectures

Rick Kazman

Len Bass

Technical Report
CMU/SEI-2005-TR-021

Report on risk themes in preparation.

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Questions?

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