

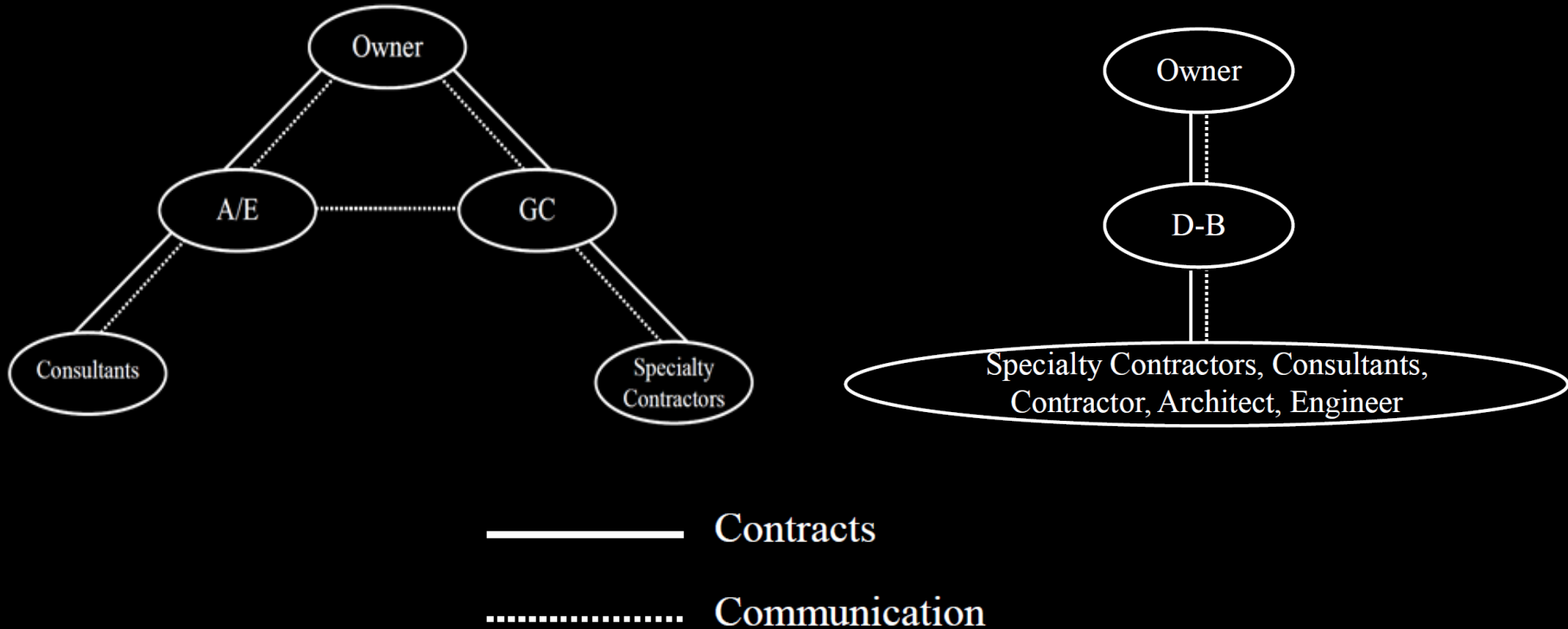


An Empirical Study of Resource Expenditure and Efficiency Impact of Single-Step (Turnkey) Design-Build

Mounir El Asmar, Ph.D., David Ramsey, G. Edward Gibson Jr., Ph.D., PE

Definitions and Motivation	Literature and Problem Statement	Objectives and Methodology	Data Characteristics	Research Results	Conclusions
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Traditional vs. Design-Build



Gransberg, D., Koch, J., Molenaar, K.R. (2006). Preparing for Design-Build Projects.

Definitions and
Motivation

Literature and Problem
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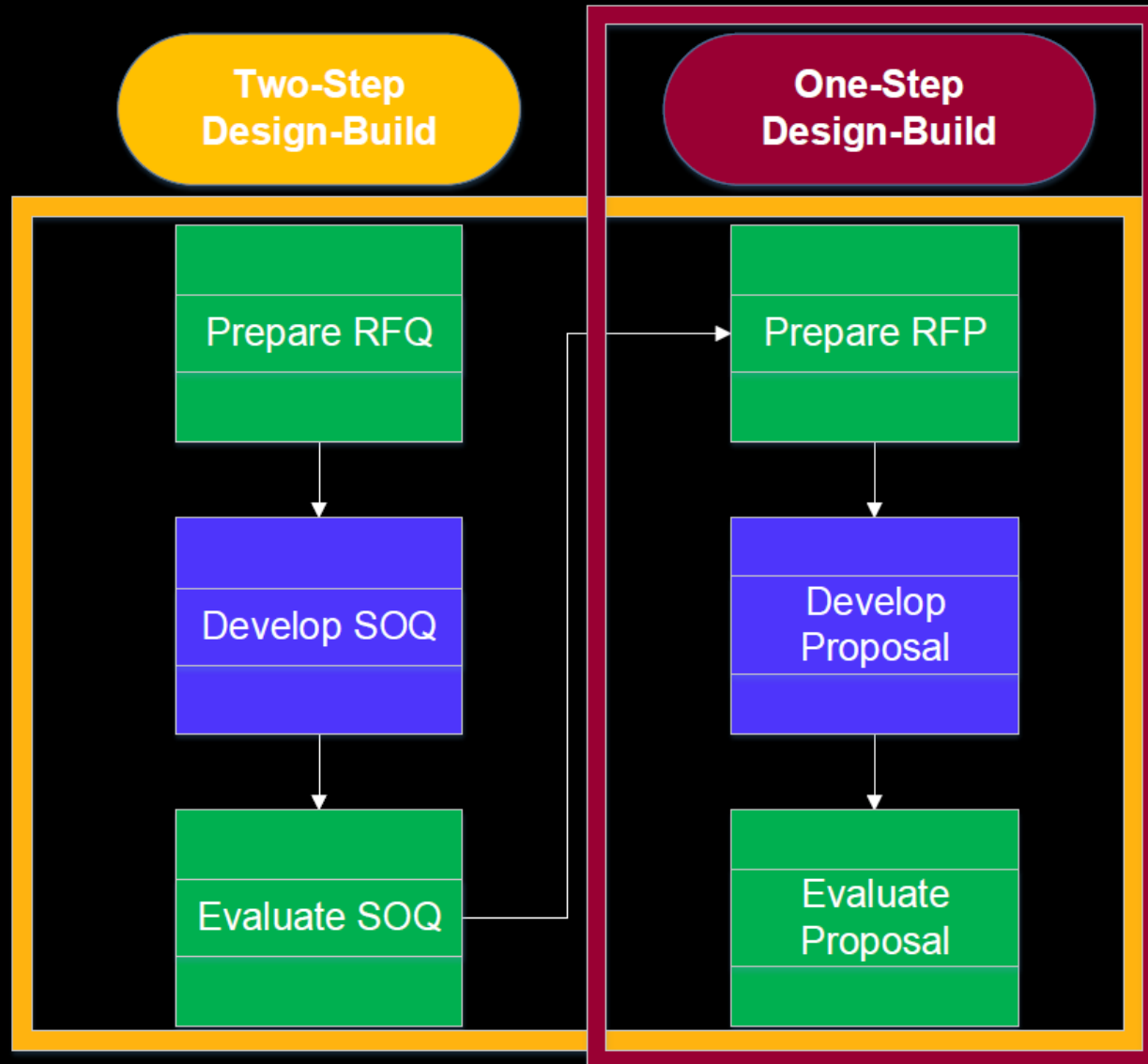
Objectives and
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DB Procurement Methods



Definitions and Motivation

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Literature Review

- DB **cost** and **schedule** performance has been shown to be superior to traditional project delivery systems

Konchar and Sanvido 1998; El-Wardani et al. 2006

- National forums have raised doubts of the potential performance implications of using single-step DB for relatively large construction projects

USACE Engineering and Construction Bulletin, No. 2012-23

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Literature Review

- Molenaar et al. (1999) compared single-step and two-step DB
- Showed that cost and schedule growth of two-step DB projects was reduced over single-step DB projects
- The only study to compare the performance of the two methods

*Molenaar, K.R., Songer, A., and Barash, M. (1999)
Public Sector Design-Build Evolution and Performance*

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Problem Statement

- Procurement assessments have not been extensively completed
- DB practices and processes have drastically evolved since the 1999 study
- Single-step DB potentially presents an unfair burden in terms of resources expended on procurement activities

Research Objectives

1. Quantify **resource expenditure** differences between Single-Step DB and Two-Step DB
2. Quantify any procurement and project **schedule** differences
3. Investigate **innovation**, quality, and any other differences

Research Methodology

Step 1:
Literature
Review



Step 2:
Survey
Development



Step 3: Data
Collection



Step 4: Data
Analysis

6 Sections:

Project Characteristics
Procurement Characteristics
Single-Step Projects
Two-Step Projects
Project Performance
Respondent background

10 Pages

Unique surveys for Owners
and DB Teams

Cost
Schedule
Quality

t-tests
MWW tests
F-tests
Levene's tests

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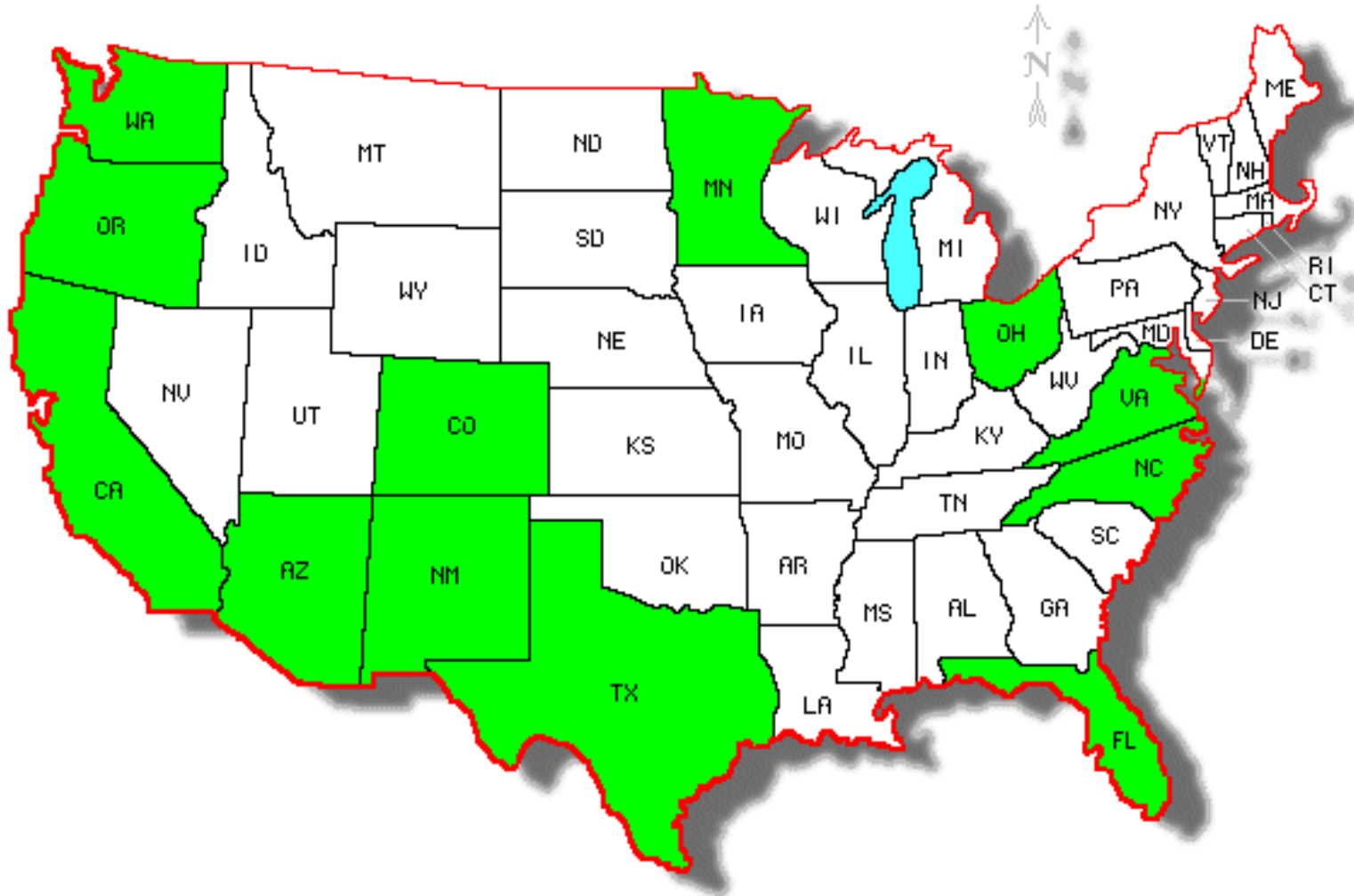
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12 States
32 Projects
\$2.4 Billion

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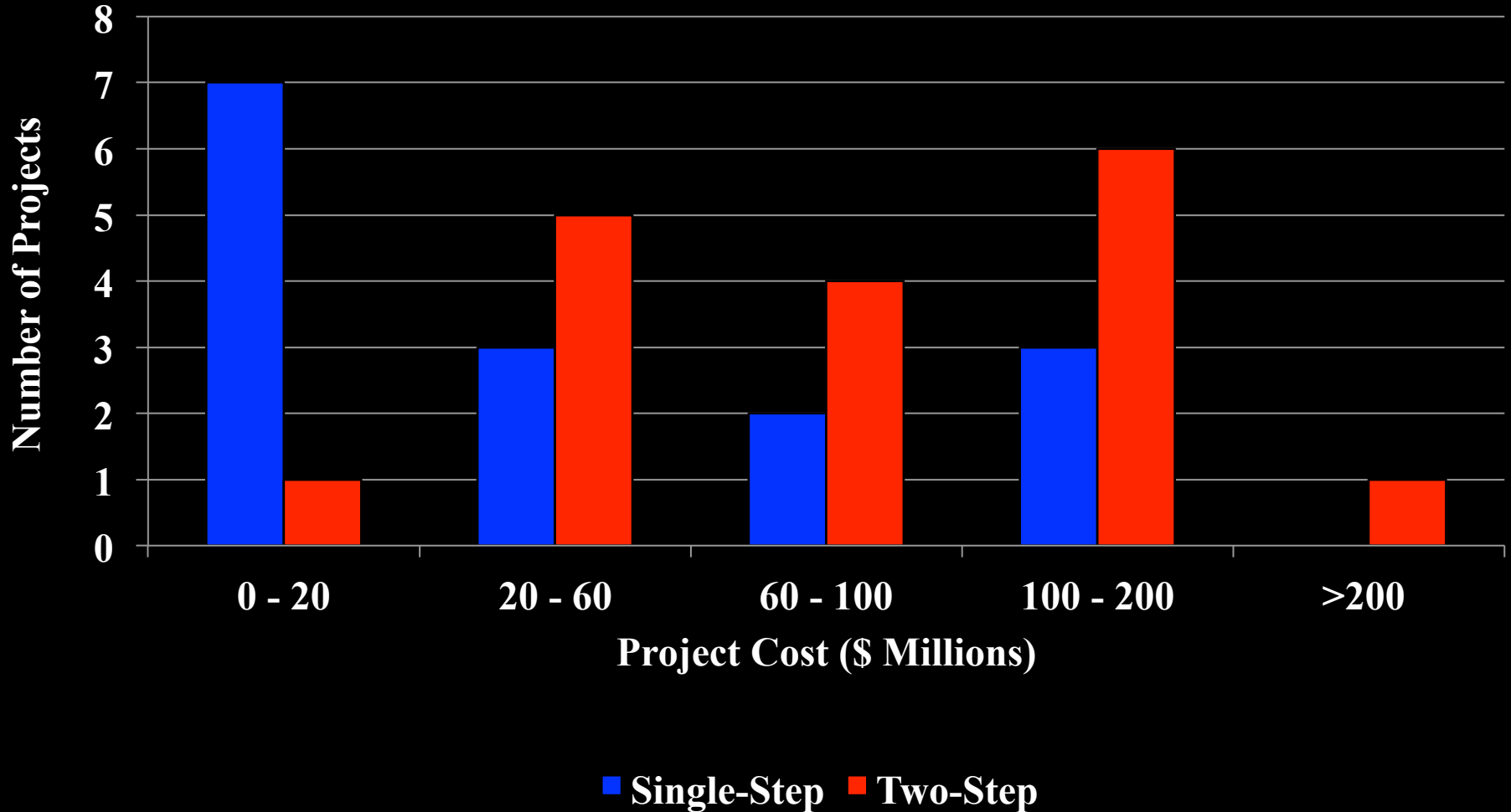
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Project Size



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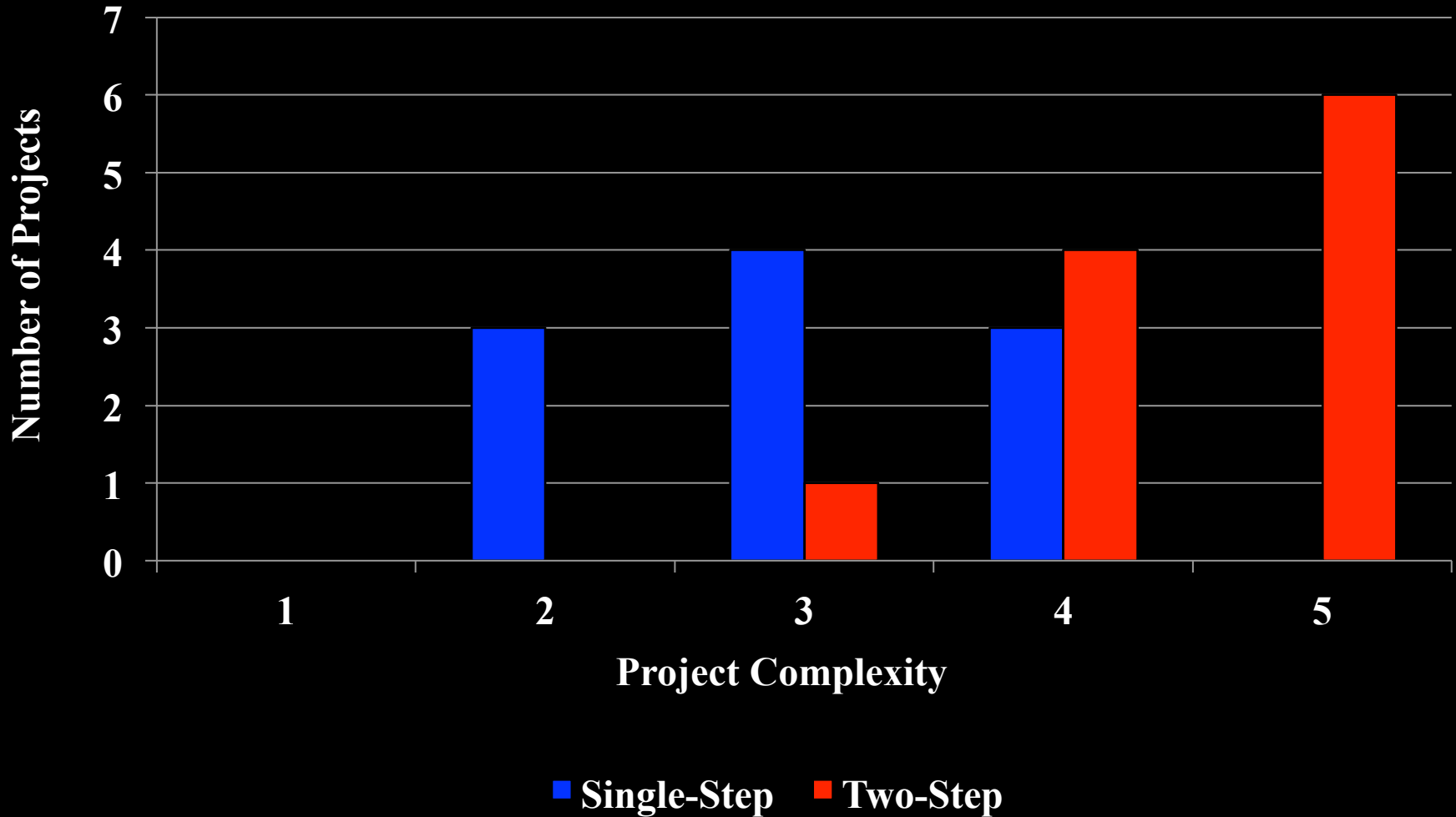
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Project Complexity



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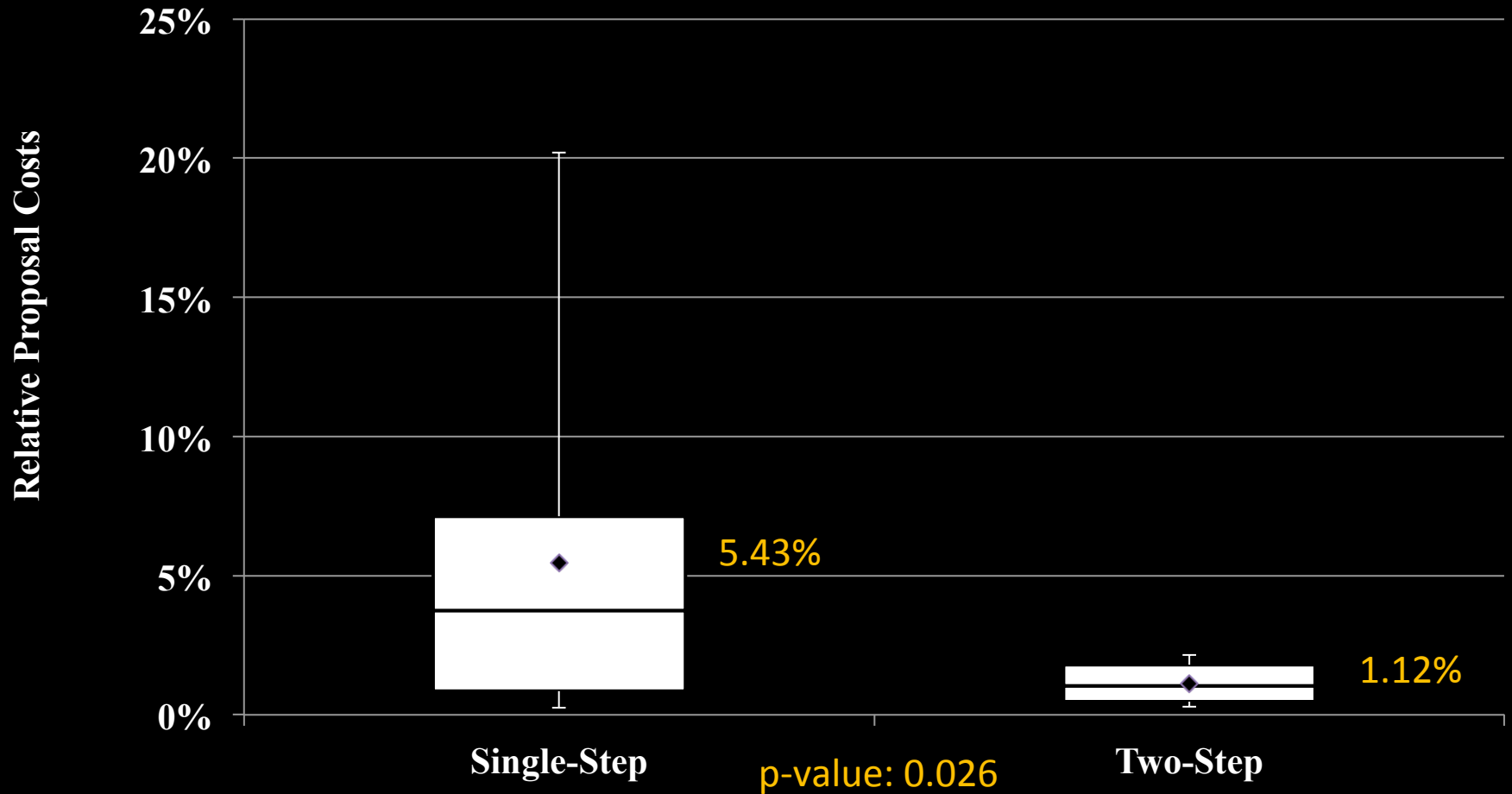
Conclusions

RESULTS

Straight Ahead



Procurement Cost



Definitions and Motivation

Literature and Problem Statement

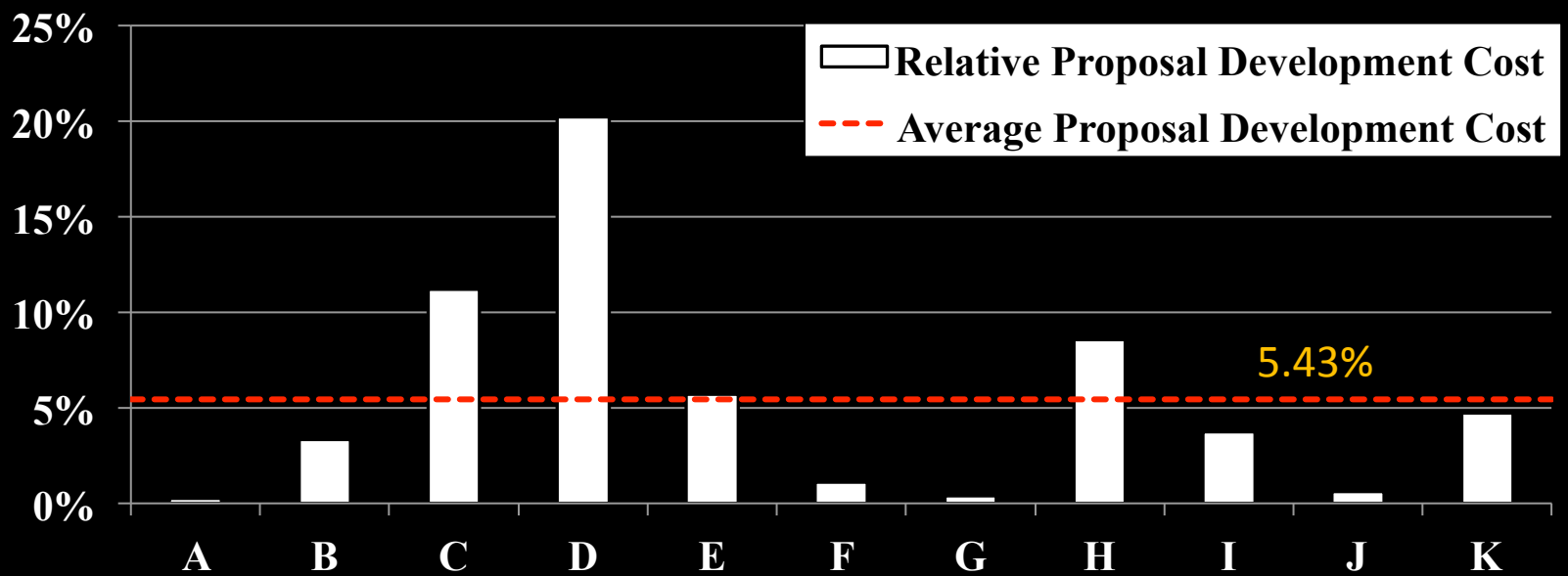
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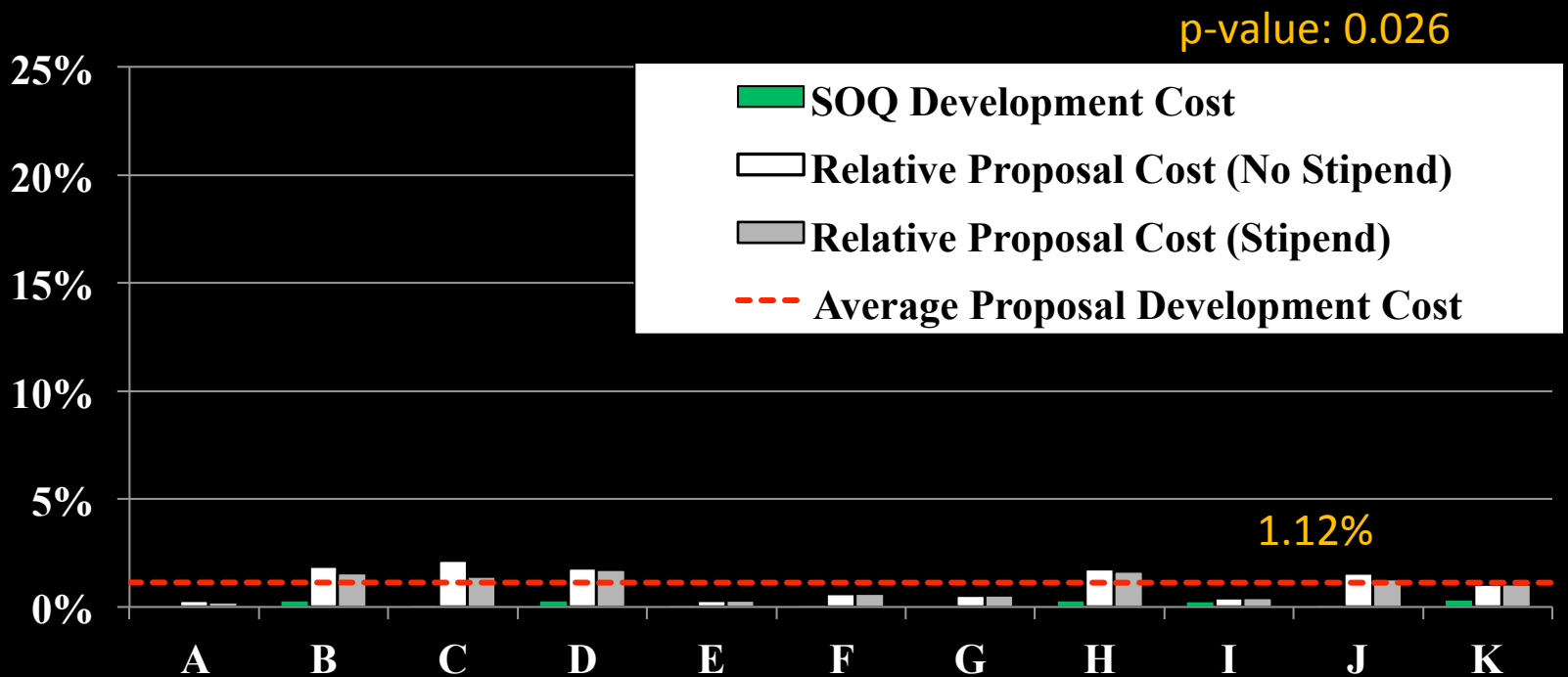
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Relative Cost to Develop
All Proposals



Relative Cost to Develop
All SOQs and Proposals



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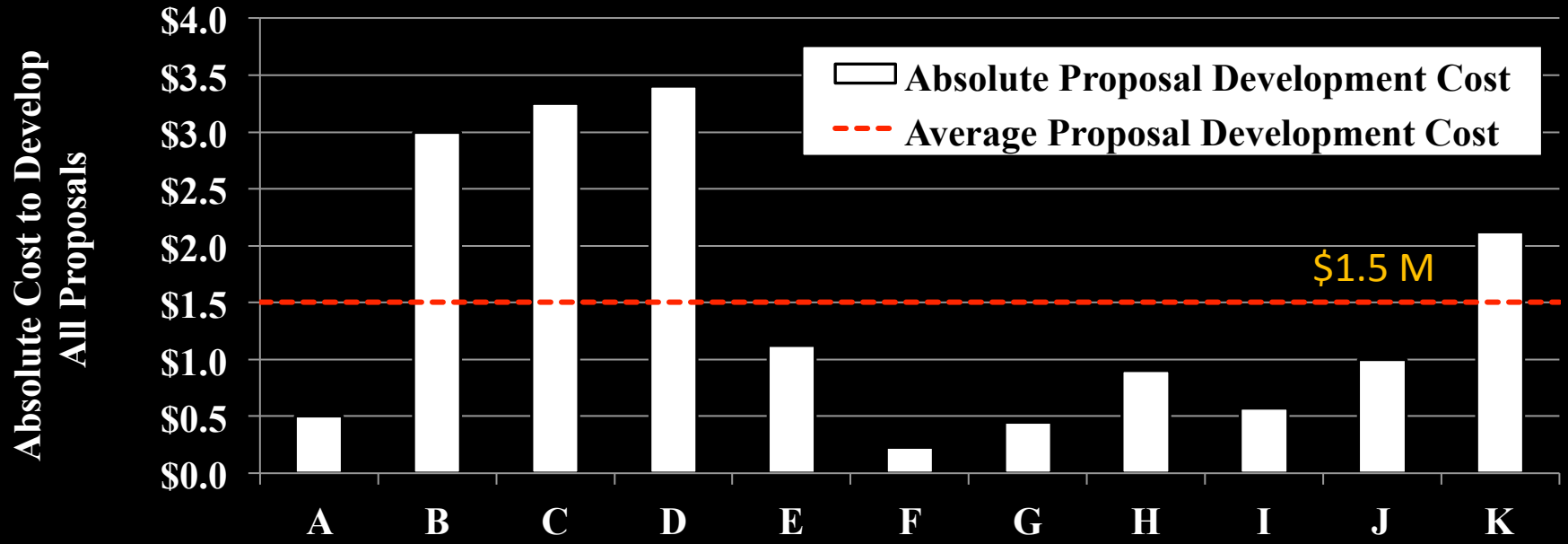
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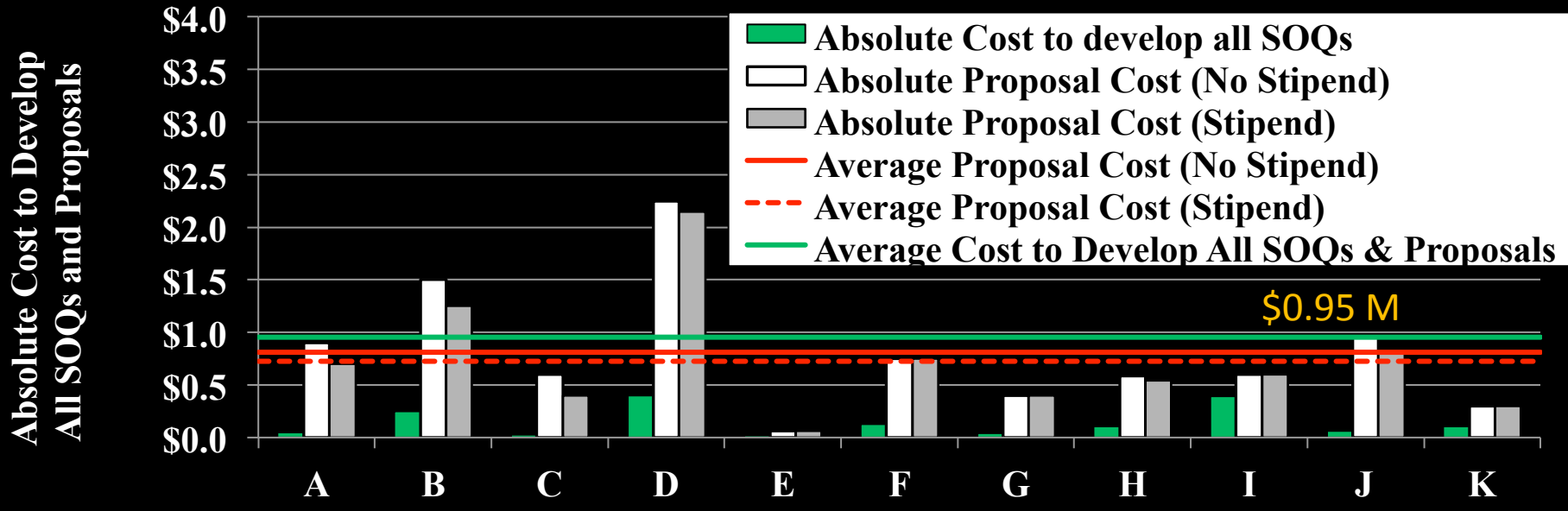
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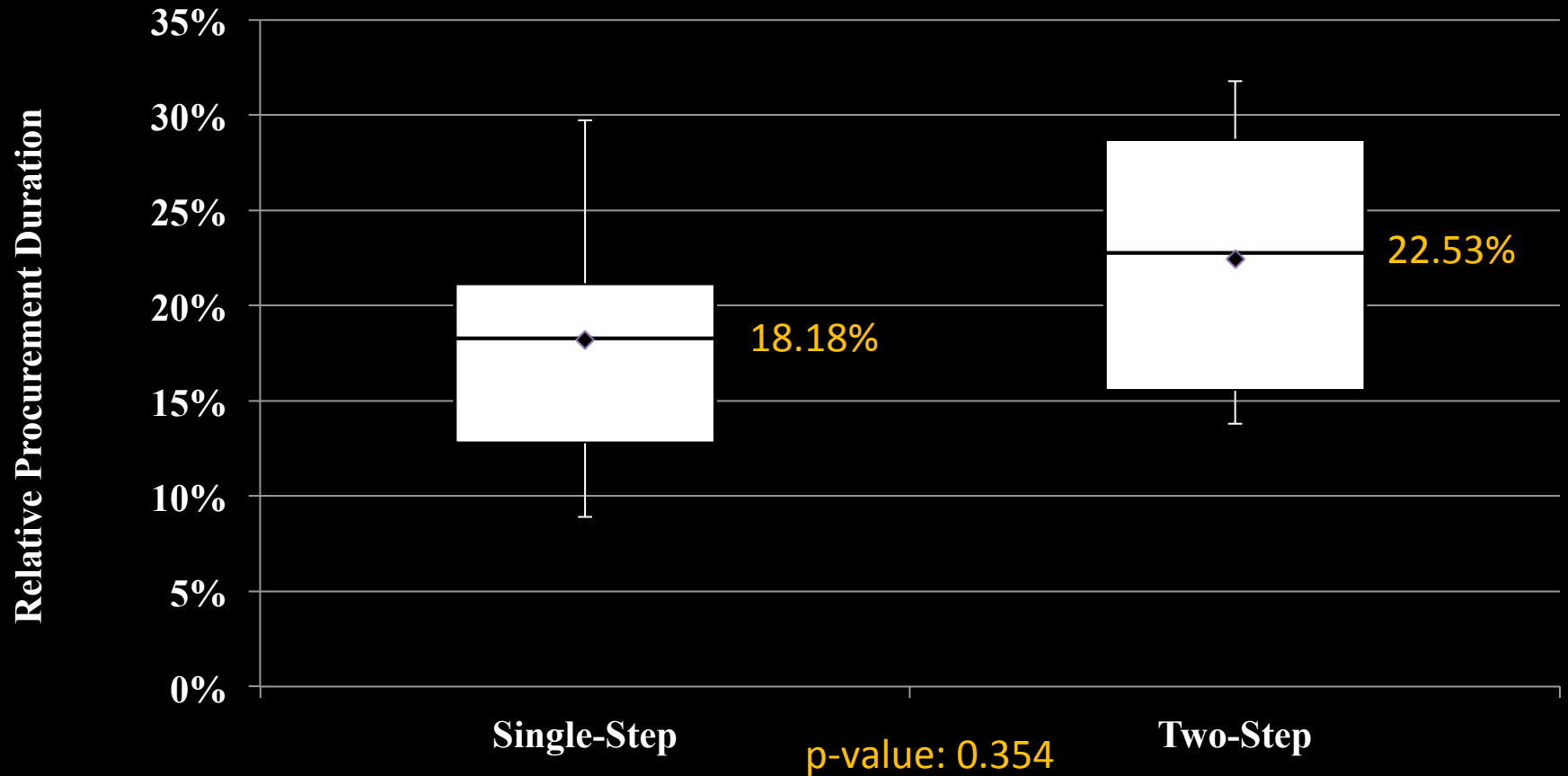
Conclusions



p-value: 0.001



Procurement Schedule



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Motivation

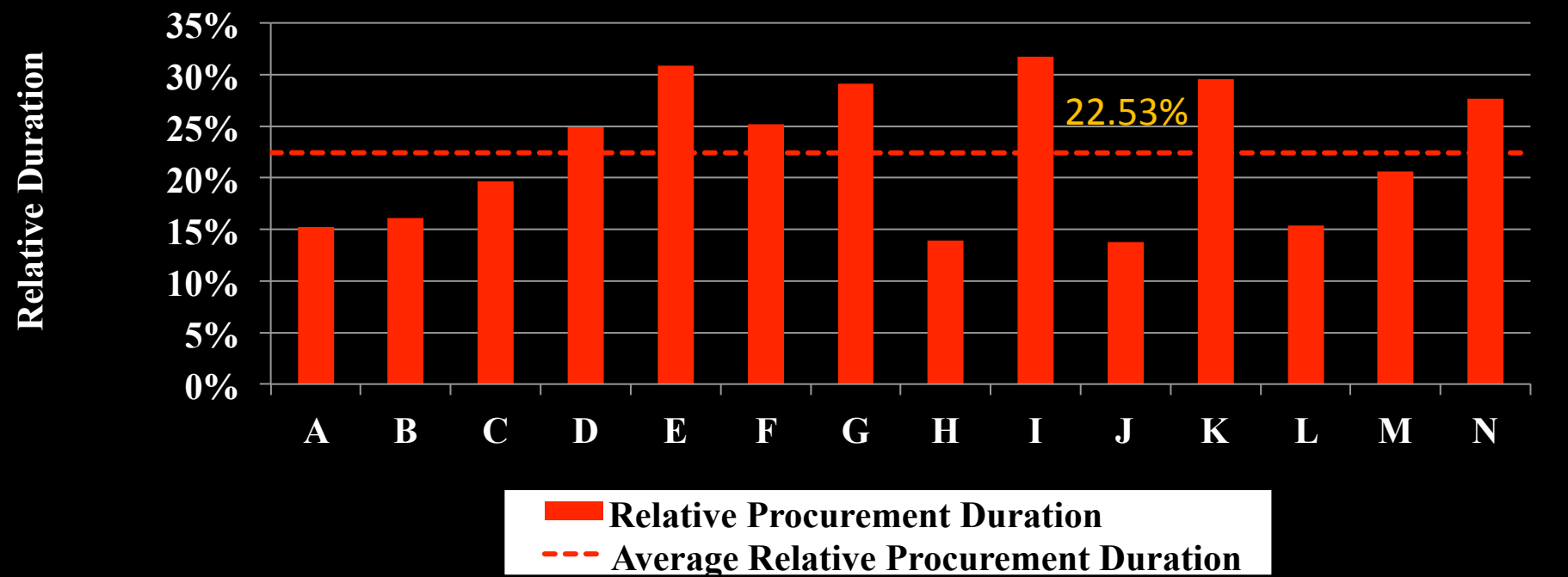
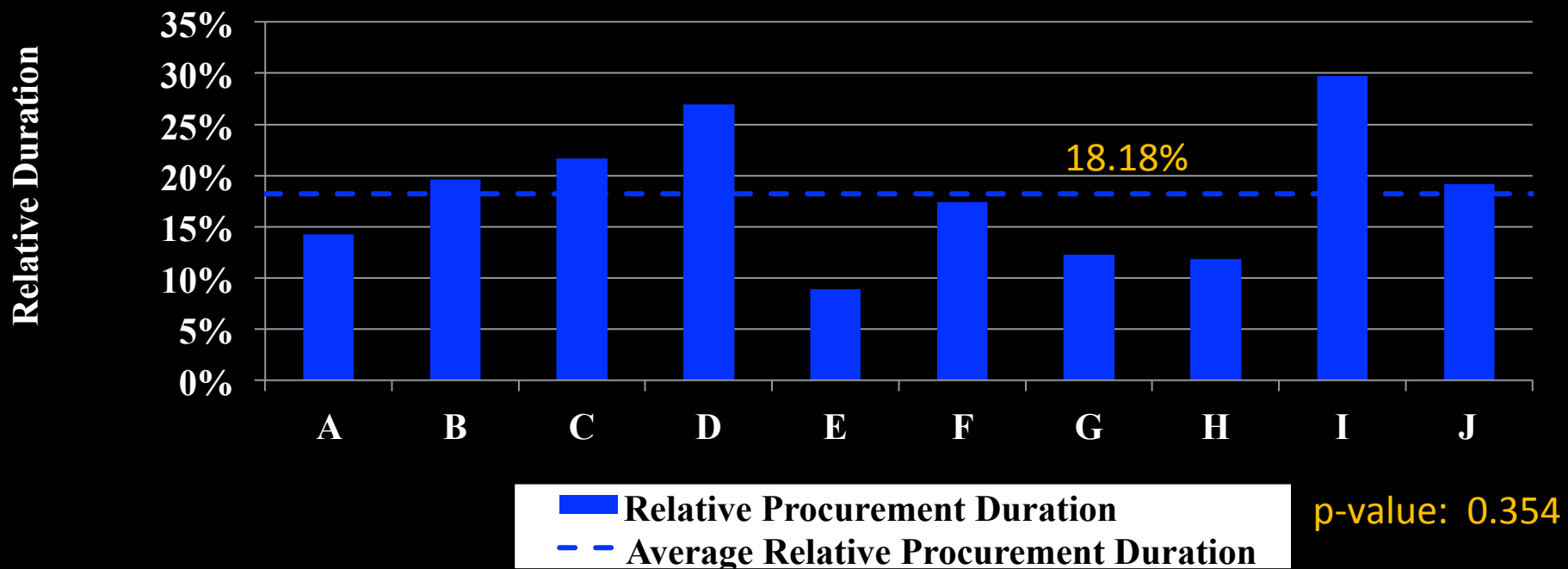
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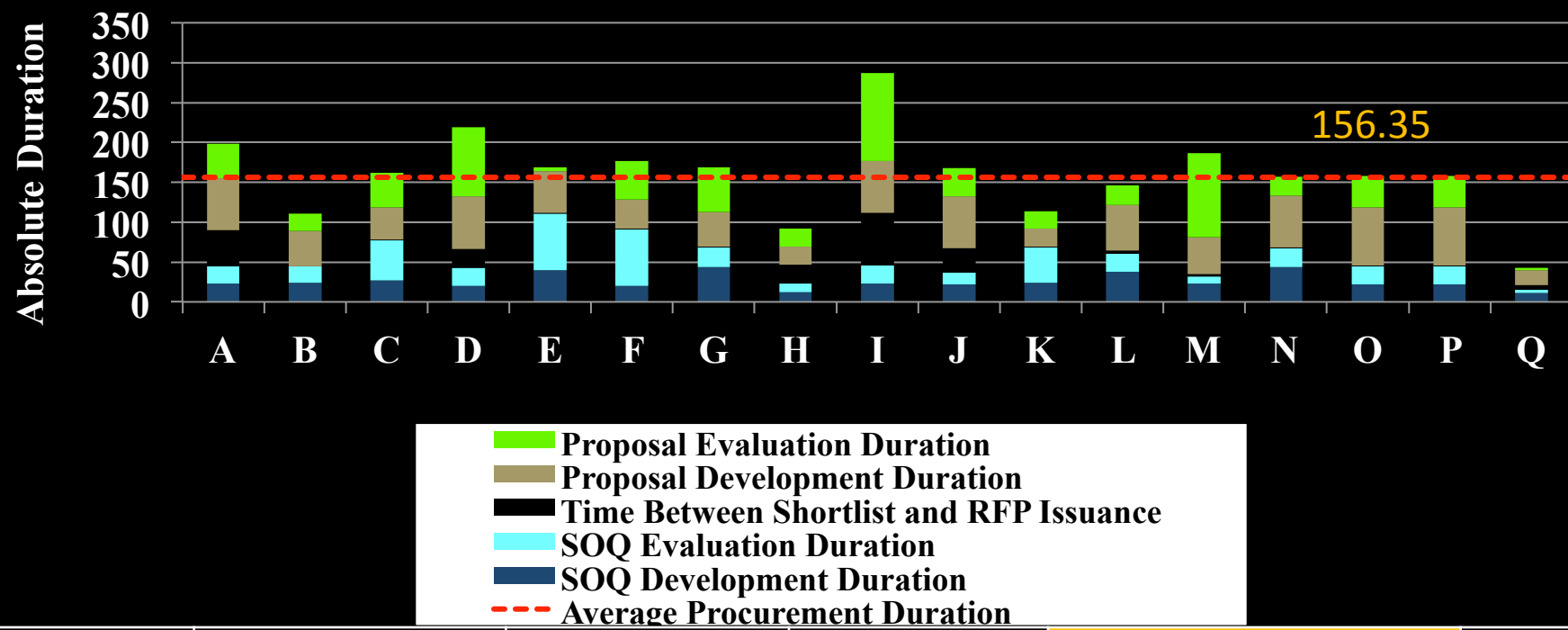
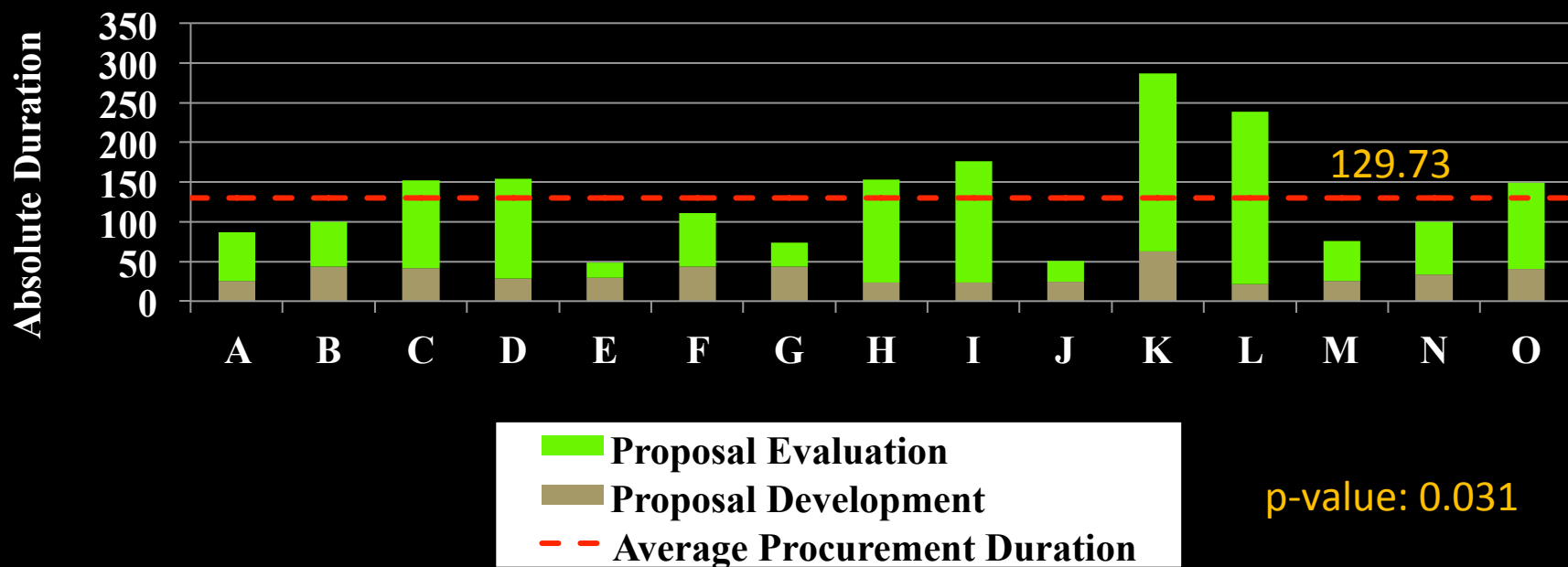
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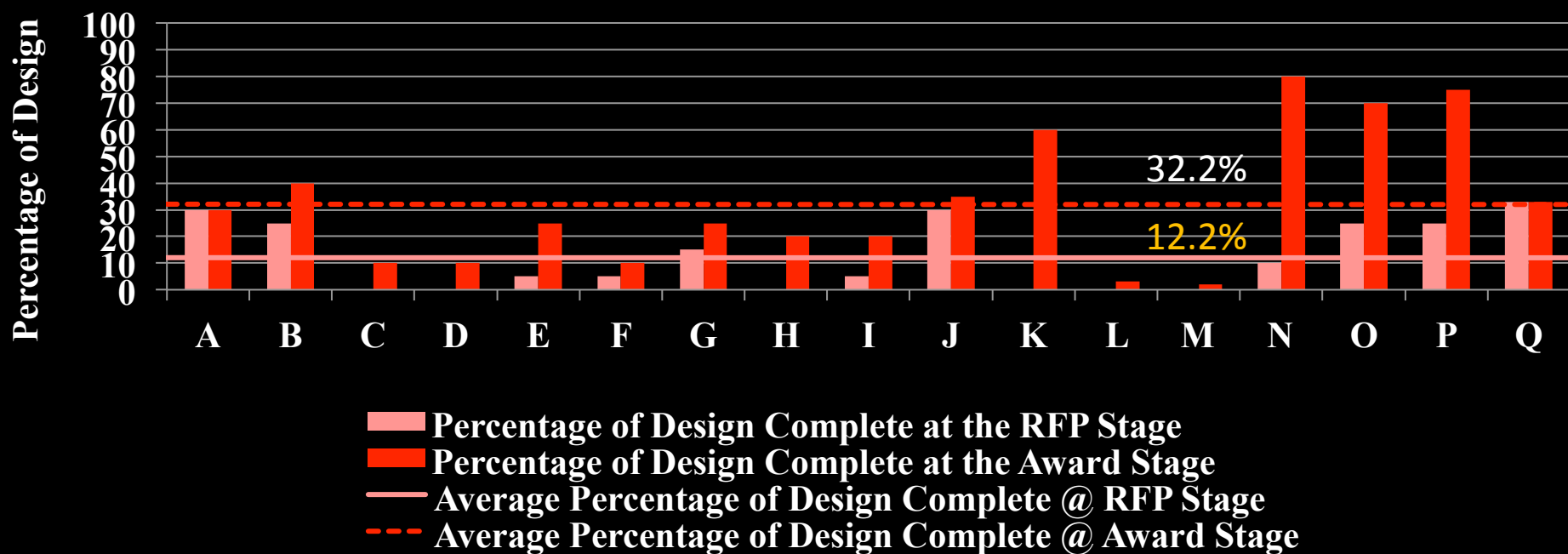
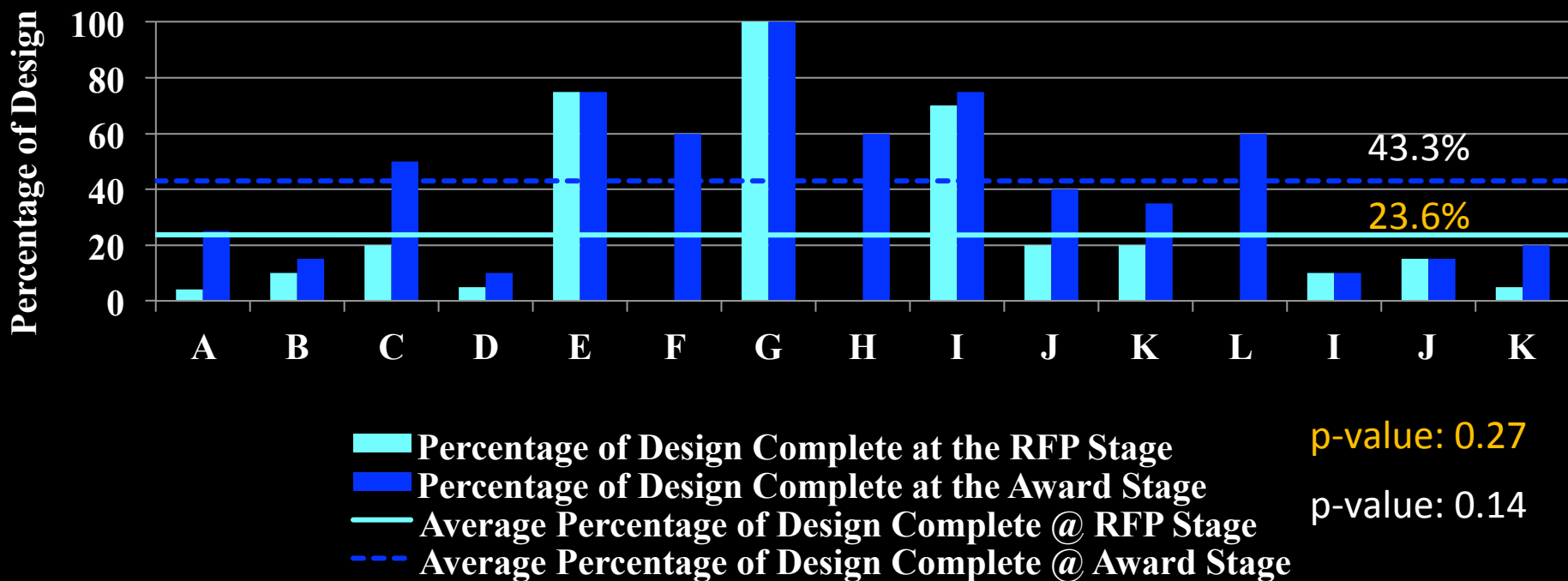
Conclusions



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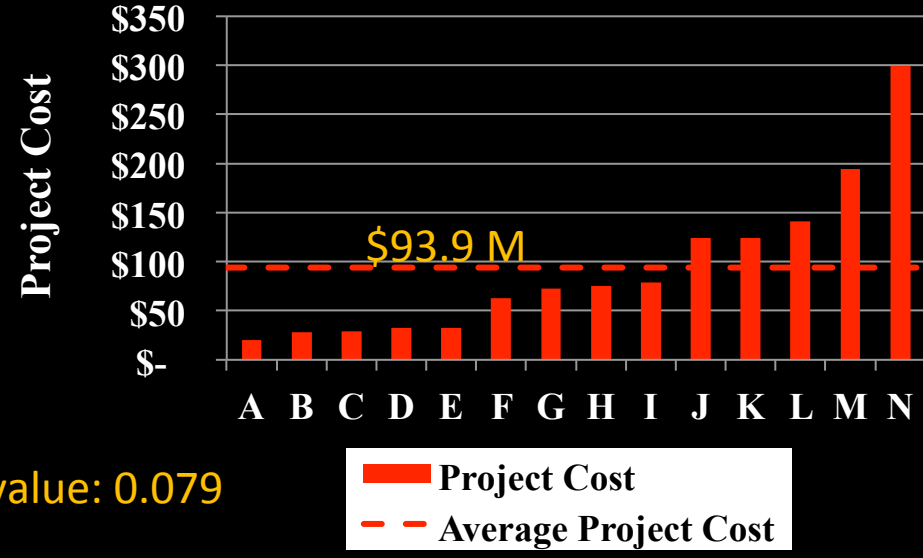
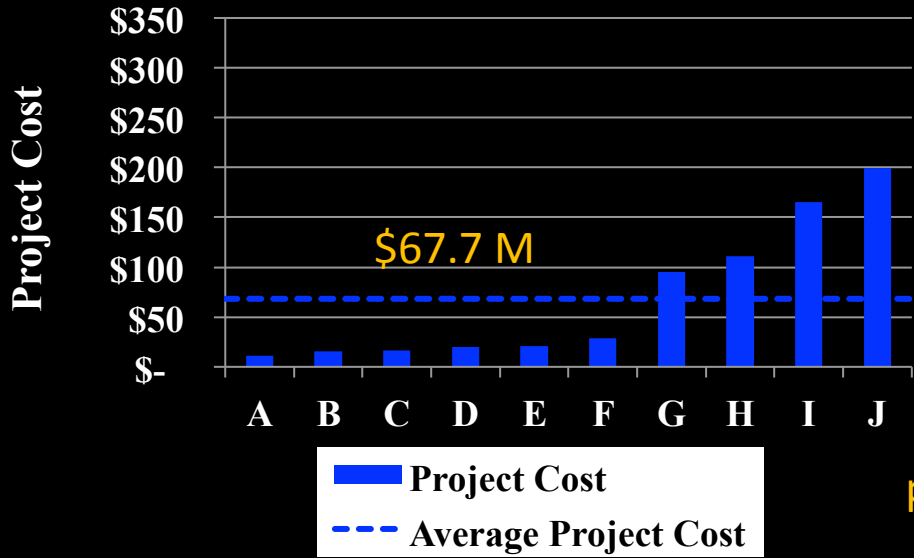


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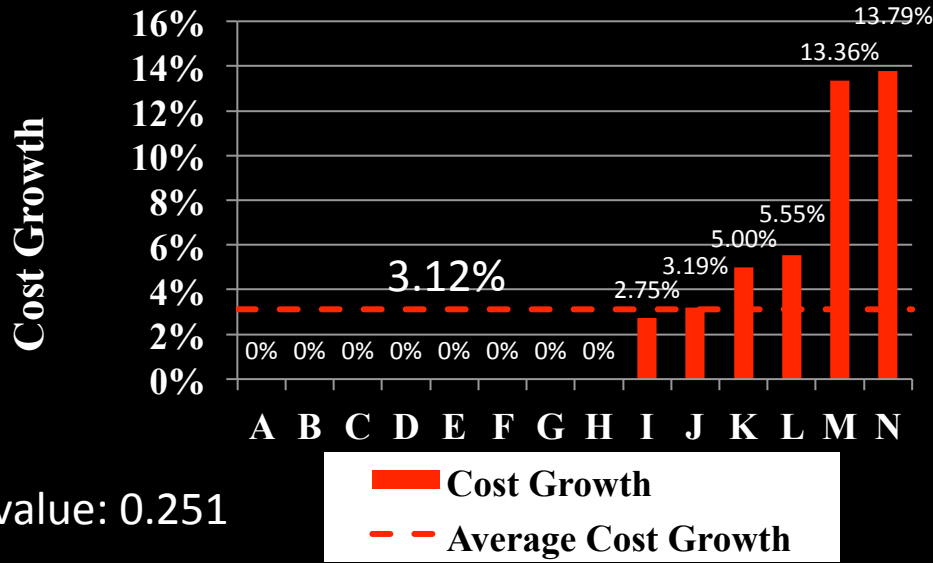
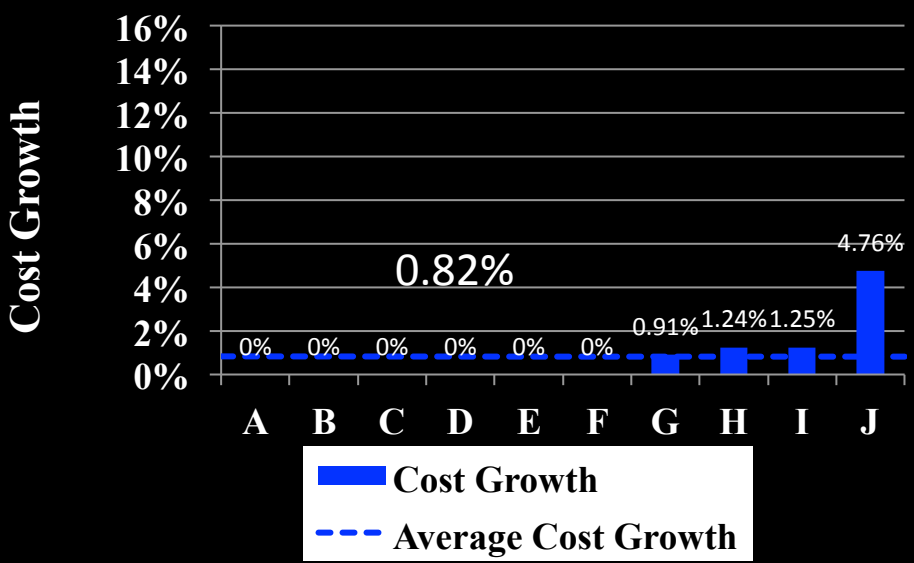


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Project Cost

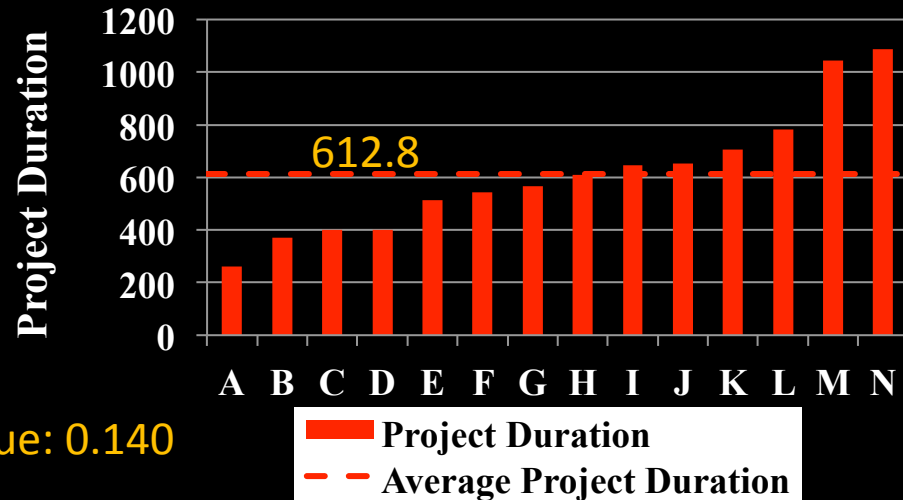
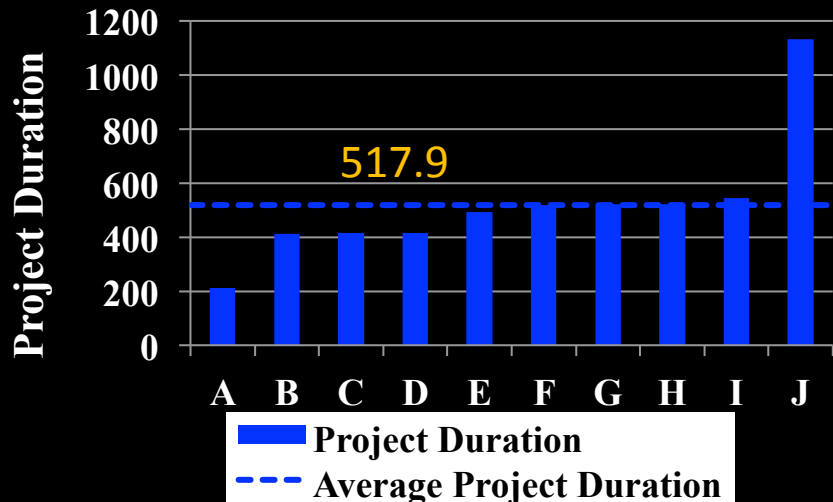


p-value: 0.079

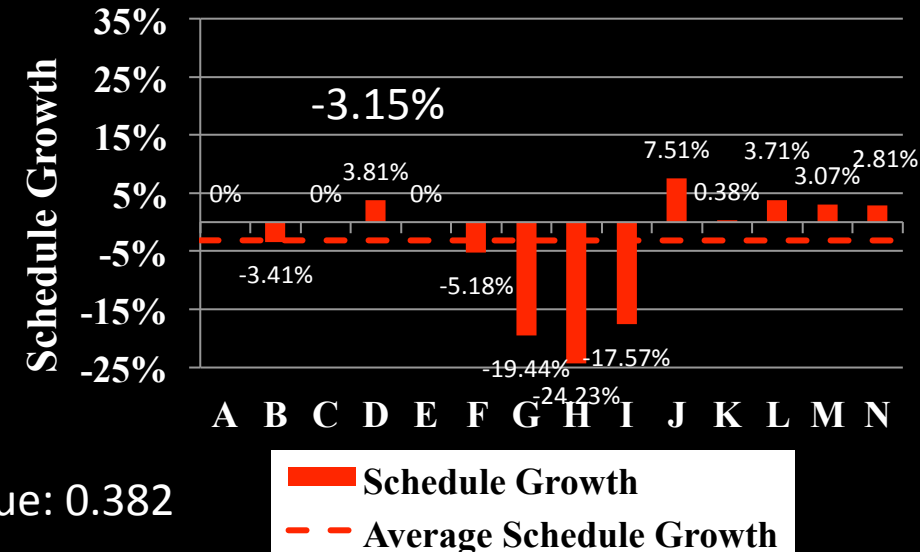
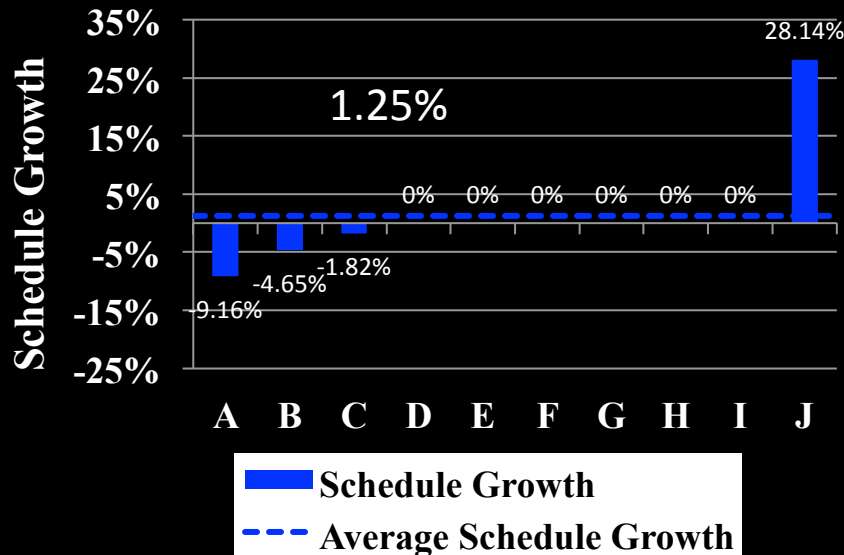


p-value: 0.251

Project Schedule



p-value: 0.140



p-value: 0.382

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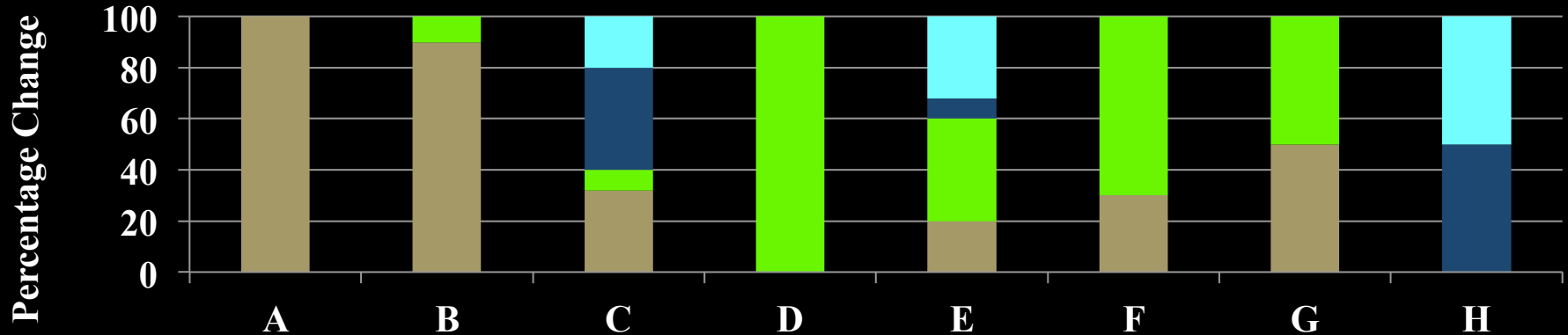
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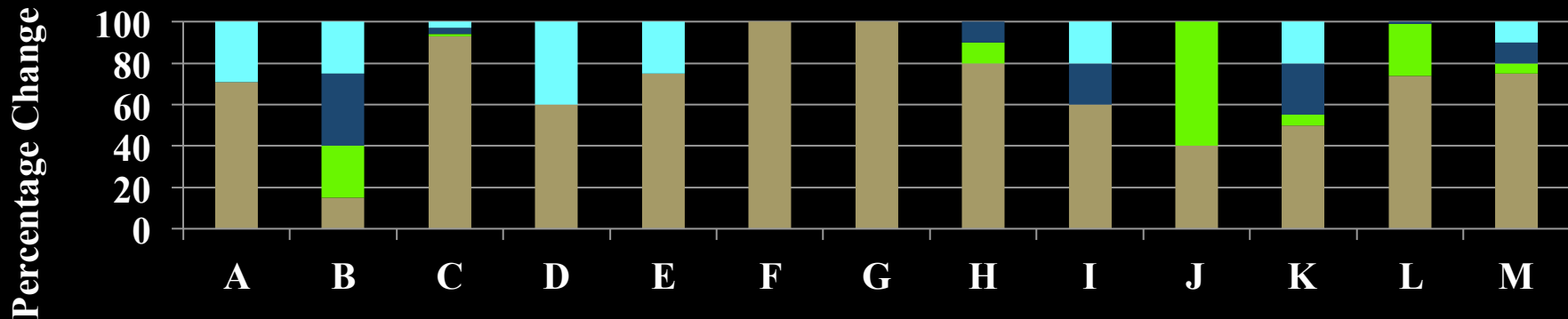
Project Changes



■ Portion Due to RFP Design Issues and Deficiencies
■ Portion Due to Risk Mitigation
■ Contractor Driven Added/Deleted Project Scope or Quality
■ Owner Driven Added/Deleted Project Scope or Quality

p-value: 0.023

32.2%

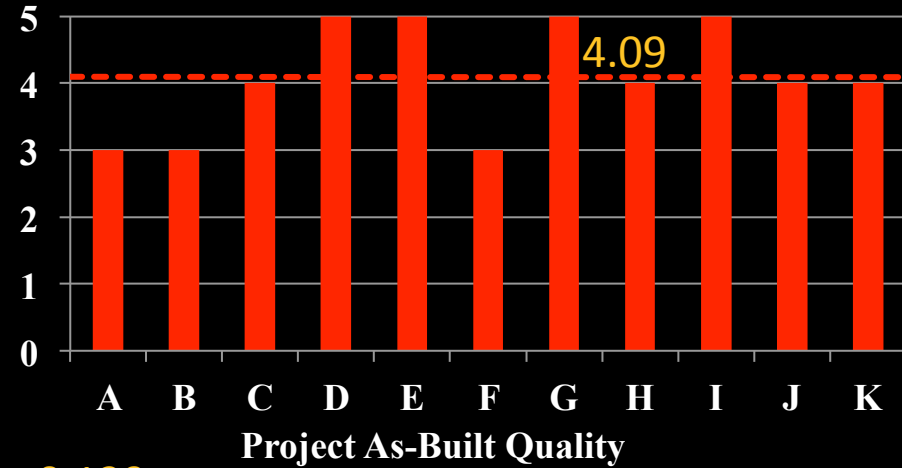
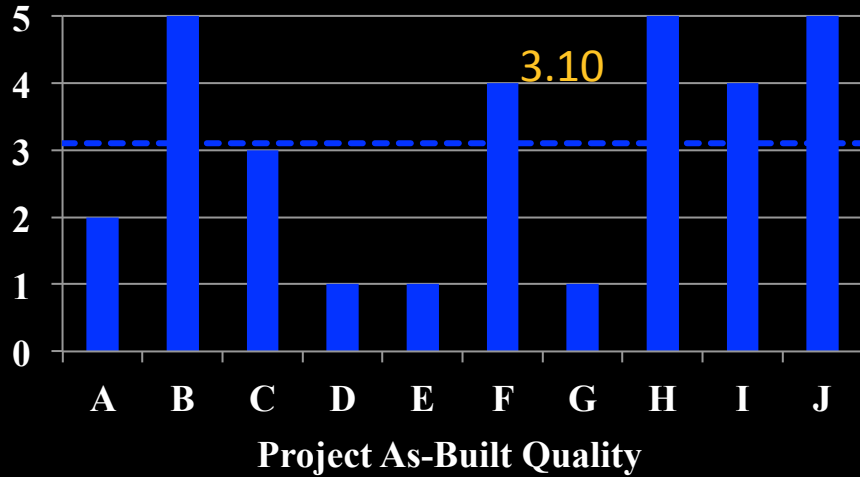


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■ Contractor Driven Added/Deleted Project Scope or Quality
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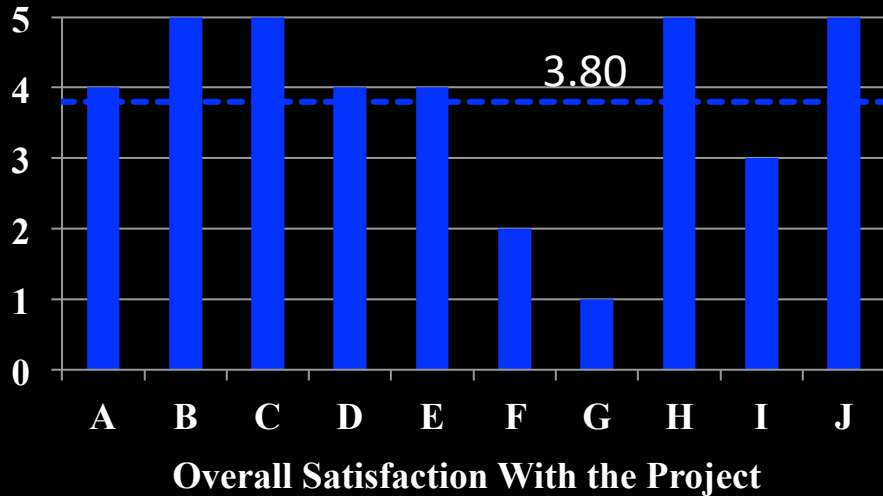
63.79%

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Project Quality



p-value: 0.129



p-value: 0.096

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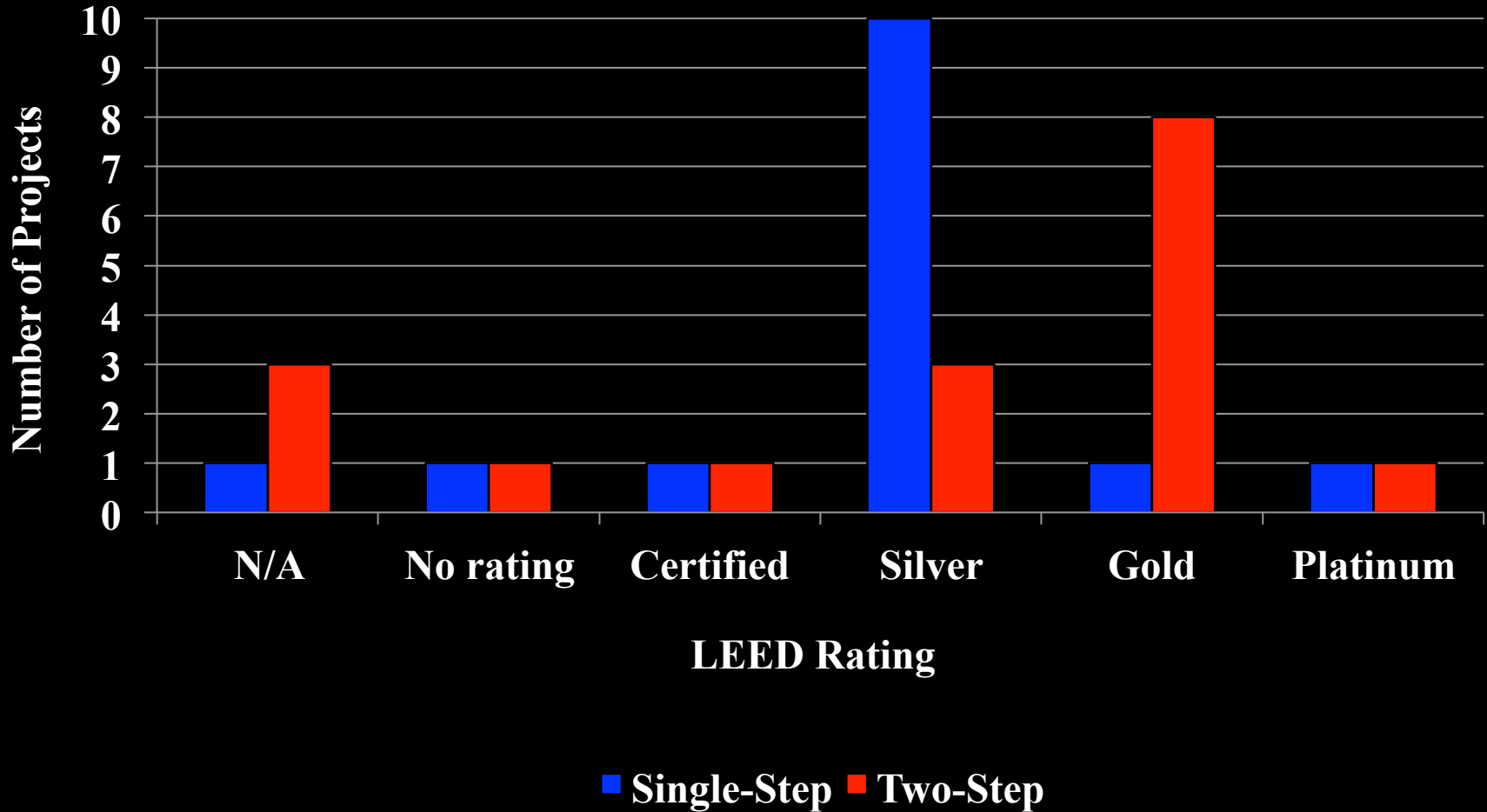
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Limitations

Results may not be representative of the whole population of DB projects

- Non-random sample size: 32 projects
- Combination of purposive and convenience sampling methods to collect project data

Conclusions

- Relative proposal development costs are **five times larger** for single-step DB
- All other metrics investigated lead to inconclusive results

Acknowledgements





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