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

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Traditional vs. Design-Build

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
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

Public Sector Design-Build Evolution and Performance
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
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

Cost
Schedule
Quality

10 Pages
Unique surveys for Owners
and DB Teams

Definitions and Motivation
Literature and Problem Statement
Objectives and Methodology
Data Characteristics
Research Results
Conclusions
Data Characteristics

12 States
32 Projects
$2.4 Billion
Project Size

Number of Projects

Project Cost ($ Millions)

0 - 20
20 - 60
60 - 100
100 - 200
>200

Single-Step
Two-Step

Definitions and Motivation
Literature and Problem Statement
Objectives and Methodology
Data Characteristics
Research Results
Conclusions
Relative Cost to Develop All Proposals

Relative Proposal Development Cost

Average Proposal Development Cost

Relative Cost to Develop All SOQs and Proposals

Relative Proposal Cost (No Stipend)

Relative Proposal Cost (Stipend)

Average Proposal Development Cost

5.43%

p-value: 0.026

1.12%

SOQ Development Cost

Definitions and Motivation

Literature and Problem Statement

Objectives and Methodology

Data Characteristics

Research Results

Conclusions
Definitions and Motivation | Literature and Problem Statement | Objectives and Methodology | Data Characteristics | Research Results | Conclusions
Defininitions and Motivation

Literature and Problem Statement

Objectives and Methodology

Data Characteristics

Research Results

Conclusions

Percentage of Design Complete at the RFP Stage

Percentage of Design Complete at the Award Stage

Average Percentage of Design Complete @ RFP Stage

Average Percentage of Design Complete @ Award Stage

p-value: 0.27

p-value: 0.14

23.6%

43.3%

32.2%

12.2%
Project Schedule

- Definitions and Motivation
- Literature and Problem Statement
- Objectives and Methodology
- Data Characteristics
- Research Results
- Conclusions

- Project Duration
  - Average Project Duration

- Schedule Growth
  - Average Schedule Growth

Project Schedule

- Schedule Growth
  - Average Schedule Growth

- p-value: 0.140
- p-value: 0.382

- Project Duration
  - Average Project Duration

- Schedule Growth
  - Average Schedule Growth

- p-value: 0.140
- p-value: 0.382
Project Changes

Percentage Change

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%

63.79%
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
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