Impact of Procurement System on Transaction Costs: Future Organisational Structure in Construction

Research Proposal/Completed Research

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OUTLINE

- Introduction
- Research Motivation/ Problem Statement
- Research Objectives/ Research Questions
- Research Method
- Research model/ Conceptual framework
- Results
- Benefits to the industry
- Conclusions
INTRODUCTION/BACKGROUND

- Actual total cost
- Production: manufacturing, logistics
- Value: quality, environmental, CSR
- Transaction costs (TCs): pre and post-contract

BACKGROUND/TCs THEORY

**TCs in Construction**

TCs is the cost of acquisition/procurement

- **Pre-contract phase**
  
  *information gathering, project procurement*

- **Post-contract phase**
  
  *contract administration and enforcement*

In the US, UK

- Pre-contract phase,
  TCs up to 2-3% of contract value in infrastructure projects

- Post-contract phase,
  TCs up to 9-13% of contract value in infrastructure projects
In New Zealand?

TCs borne every time the client procure service

Increase productivity since it is a function of cost versus revenues
“Transaction cost is unknown, and the links between procurement system and transaction costs is ambiguous in the NZ construction industry”
RESEARCH OBJECTIVES

- To develop a conceptual relationship between procurement system and TCs
- To assess the extent to which TCs is influenced by pre and post-contract cost, and procurement system
- To determine TCs for different procurement systems, specifically for the Traditional and Design-Build systems
- To develop a model for the procurement selection based on TCs

Main Questions

- **What** is the link between procurement system and TCs in construction?
- **How** can TCs be minimized so that the productivity of the construction industry is improved in NZ?

Research Questions

Sub-questions

- What are the common types of TCs in the pre and post-contract phases?
- What are the links between pre and post-contract costs, procurement system, and TCs?
- How can a client’s procurement selection be improved?
- Why different procurement systems have different magnitude of TCs?

CONCEPTUAL MODEL

Empirical data to be sourced from:

- Construction Professionals in the main city councils
  Auckland, Wellington, Christchurch, Dunedin, Hamilton
- Members of construction institutions in NZ
  BRANZ, PMINZ, CIC, CIOBNZ, NZIOB, NZIA, IPENZ, RMBF, NZIQS
- Construction professionals in the top 30 construction firms in NZ

Empirical data gathering stages:

- **Stage 1:** Qualitative data from *pilot questionnaire*
- **Stage 2:** Quantitative data from *wide industry questionnaire survey*
- **Stage 3:** Quantitative data from *model test survey using “real life” cases*

Using time-spent as a surrogate for cost:

- Professionals time-spent in procurement (using a Likert-scale 1-5 for evaluation)
Method of data analysis

- Data Entry *(using SPSS 20)*
- Data screening of variates
  - Normality, Linearity, Validity tests
- Data Characteristics
  - Respondents, Organisations
- Analysis of TCs issues
  - Bar-charts
- Structural Equation Modelling *(using Amos 21)*
  - Models developments, testing

**Data Analysis: Data Characteristics**

**Professionals role in the construction operation**

- Architect: 4%
- Engineer: 21%
- Surveyor: 17%
- Construction Manager: 32%
- Project Manager: 26%
- Contractor: 4%
- Client: 17%
- Others: 32%

**Participants experience in construction**

- 0-5 years: 4%
- 6-10 years: 21%
- 11-20 years: 17%
- 21-30 years: 33%
- 30+ years: 26%

**Organisations main area of activity**

- Housing: 6%
- Commercial: 33%
- Industrial: 12%
- Infrastructure: 27%

**Project Value**

- Less than $1 million: 33%
- $2 - $5 million: 12%
- $6 - $10 million: 6%
- $11 - $20 million: 12%
- $21 - $30 million: 8%
- $30+ million: 6%

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Data analysis: Pre-TCs issues

**Data Analysis: Post-TCs Issues**

DATA ANALYSIS: THE TRADITIONAL MODEL

Model Fit Statistics

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<th>$\chi^2/df$</th>
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<th>SRMR</th>
<th>GFI</th>
<th>AGFI</th>
<th>PGFI</th>
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DATA ANALYSIS: DESIGN-BUILD MODEL

Model Fit Statistics

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<td>$\chi^2$/df</td>
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<tr>
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<th>Hypothesis</th>
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<td>Q1 01 02 03  H1 Project procurement cost (PPROC) would have a positive effect on transaction costs (TCs).</td>
<td>Supported</td>
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<td>Q1 01 02 03  H2 Information gathering cost (INFO) would have a positive effect on transaction costs (TCs).</td>
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<td>Q1 01 02 03  H4 Administration cost (ADMIN) would have a positive effect on transaction costs (TCs).</td>
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<td>Q1 01 02 03  H5 Enforcement cost (ENFORC) would have a positive effect on transaction costs (TCs).</td>
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<tr>
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<td>Q1 01 02 03  H11a Information cost (INFO) would mediate the relationship between procurement system (SYSTM) and transaction costs.</td>
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RESULTS: THE TRADITIONAL MODEL

- Predicted time-spent in information search
  \[INFO = B + 0.81*CM + 0.73*IG\]

- Predicted time-spent in procurement
  \[PPRO = B + 0.66*AM + 0.81*TN + 0.38*TR + 0.42*PD + 0.49*TZ + 0.77*SV\]

- Predicted time-spent in contract administration
  \[ADMIN = B + 0.73*AD + 0.81*DM + 0.6*CR\]

- Predicted time-spent in contract enforcement
  \[ENFO = B + 0.59*VC + 0.71*EN\]

- Predicted total time-spent with mediation and moderation effects
  \[TS = B + 0.36*INFO + 0.3*PPRO + 0.08*INFO*PPRO + 0.19*ENFO + 0.38*ADMIN + 0.25*ENFO*ADMIN\]

- Predicted Transaction costs
  \[TCs = TS*HR\]
RESULTS: DESIGN-BUILD MODEL

- Predicted time-spent in information search
  \[ INFO = B + 0.81 \times CM + 0.75 \times IG \]

- Predicted time-spent in procurement
  \[ PPRO = B + 0.65 \times AM + 0.87 \times TN + 0.63 \times TR + 0.69 \times PD + 0.65 \times TZ + 0.75 \times SV \]

- Predicted time-spent in contract administration
  \[ ADMIN = B + 0.73 \times AD + 0.79 \times DM + 0.76 \times CR \]

- Predicted time-spent in contract enforcement
  \[ ENFO = B + 0.66 \times VC + 0.69 \times EN \]

- Predicted total time-spent with mediation & moderation effects
  \[ TS = B + 0.29 \times INFO + 0.45 \times PPRO + 0.17 \times INFO \times PPRO + 0.09 \times ENFO + 0.18 \times ADMIN + 0.21 \times ENFO \times ADMIN \]

- Predicted Transaction costs
  \[ TCs = TS \times HR \]

RESULTS BENEFITS

- Improving construction productivity by developing and understanding of the basis of costs.
- Improving Procurement practices
- Determining the appropriate procurement systems based on relational evaluative tools (TCs being one such tool).

CONCLUSIONS

- A conceptual relationship between procurement system and TCs has been developed.
- TCs is influenced by pre and post-contract cost, and procurement system.
- TCs for the Traditional is higher than that Design-Build system.
- Two models for the Traditional and Design-Build systems based on TCs have been developed.

“THANK YOU FOR ATTENDING”

Any Questions ??