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INVESTIGATING ORGANIZATIONAL CAPABILITY VIS-À-VIS HUMAN ACTION TO MINIMIZE POST-CONTRACT TRANSACTION COSTS IN D&B PROJECTS

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Abstract: This paper examines the role of human action for benefits realization (BR) with respect to minimizing post-contract transactions costs (PTCs) in D&B construction projects. PTCs are commonly associated with monitoring and control, dispute resolution, and implementation activities during the construction phase of projects. This is also an attempt to reaffirm the innovative potentialities of the D&B procurement approach. Viewing BR as an emergent phenomenon, the relationship between the independent constructs of contractors' team-competency and team-commitment with the dependent construct PTC in Malaysian D&B projects are examined by means of hypothesis testing. Questionnaire survey data from a sample of major D&B contractors in Malaysia was analysed using SmartPLS 3 to test the two main hypothesis. The questionnaire survey was designed based on collation of past literature findings and validated using a Delphi study undertaken with D&B experts. Results indicate that contractor team-commitment has an overall positive and significant influence on minimizing PTCs whilst team-competency has a strong positive and significant influence. The findings also confirm that *affective* commitment of D&B contractors' team to be the most significant factor. These findings establish the extent to which human agency within its interplay with structure can impact on construction project performance in D&B projects.

Keywords: Benefits realization, competency, post-contract transaction costs (PTCs), design & build projects.

1 INTRODUCTION

This paper views benefits realization in construction projects as an emergent phenomenon that needs to be understood within the lens of complexity theory that accommodates the understanding of individual and social structure. In drawing attention to the capability of human action to generate value in a "structured but loose manner", we rely on structuration theory to situate this work on minimization of post-contract transaction costs (PTCs) arising within D&B projects. The unit of analysis is the construction project teams' capability, viewed as organizational capability. Management of construction projects is complex, primarily due to the level of uncertainty and the level of fragmentation. The traditional view of the project management 'team' that is taken-for-granted in terms of an Integrated Project Delivery (IPD) team needs to be

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dispelled at all levels. In recognizing this, the focus of this paper is on contractor team-competency and team-commitment in D&B projects, as latent variables affecting PTCs. The project team or contractor team is viewed as a community of legitimate individuals acting either as a tight-knit or loosely-linked group committed to value generation.

The actions aimed at minimizing PTCs are seen as being oriented towards Benefits Realization, wherein requirements capture is a key feature. PTCs have been variously described as being social waste (Koskela, 2010), a reflection of inefficient project management practice (Li et al., 2015) and a bane of the fragmented nature of construction. PTCs are commonly associated with monitoring and control, dispute resolution, and implementation activities during the construction phase of projects (see Appendix).

Although, higher levels of in-house expertise and structural efficiencies are deemed to be the cornerstone of D&B organizations, D&B as a solution to better serve client's needs seems not to have had a resounding success. It is affirmed by Jaafar & Radzi (2012) that contractors in Malaysia are often nominated based on low-bid criteria, with little emphasis on their competencies, therein often leading to the production of a failed product that does not meet the client`s needs. The practice of the D&B delivery system in the construction industry is characterized by the D&B contractor organization outsourcing consultants (expertise) to execute their projects (Gambo & Gomez, 2015; Masterman, 2002). This is referred to as the fragmented D&B, a contradiction of sorts. Hence, investigating minimization of PTCs as benefits realization (BR) within a much beleaguered but potentially rich context-specific D&B procurement environment can serve not only to address current D&B limiting practices but also to address the current over-reliance on purely functionalist notions of structural mechanisms, and allow space for the interplay between human agency and structure.

Although previous research points to an extended requirements capture process (Leite et al., 2005), however Gomez and Raji (2015) argue that the current practice is still entrenched in requirements capture mainly as a phase-static pre-construction output. They propose that the client's requirements needs to be incorporated within the scope of a benefits maximization process based on a dynamic benefits realization model. Kagioglou and Tzortzopoulos (2016) share the view that the traditional practice of measuring benefits based on initial requirements is to be rejected, and emphasize on the notion of actors as being involved both in undertaking and enacting process based on Giddens structuration principle.

1.1 Transaction Costs for Project Delivery Systems

The TCs during the construction phase are known as post-contract TCs (PTCs). For an industry that is attempting to reduce its fragmentation, obviously one clear measure to gauge its performance is the reduction in transaction costs, more importantly that of PTCs. These PTCs could be high due to disputes and litigation. It is found that the PTCs for D&B range from 3.4% to 14.7% with an average of 9.5% of the overall project value (Rajeh, 2014; Li et al., 2015). Based on a study undertaken by the authors, it is noted that the situation is not very different for D&B projects in Malaysia, with an average of 9% ranging from 3.5% to 13.5% of the project value.

1.2 Team-Commitment and Competency & Theoretical Framework

Organizational team-commitment and team-competency are two critical aspects of organizational capability that significantly impact on organizational performance. The D&B contractor team-commitment and team-competency measures were developed

using the Delphi technique. These focused measures were initially collated from extant literature under the broad category of organizational commitment and competency, and formulated as a theoretical framework (see Figure 1). Through the Delphi refinement process a final set of focused measures were identified. The Delphi study respondents consisted of D&B practitioners and academia with expertise in the execution of D&B construction projects in Malaysia. A total of 30 experts were invited to participate in the Delphi survey which served as the first round of the survey. The experts were identified based on the initial five experts having participated in a previous Delphi study on D&B projects and then using the snowballing sampling technique to obtain the rest. However, only twelve experts participated in the second round of the survey and further only ten participated in the third round of the survey, which is considered to be acceptable in using the Delphi technique. The responses of the experts through the three rounds of Delphi were facilitated and the final consensus view of the D&B experts constituted the questionnaire measurement constructs (see Appendix).

The epistemological basis for this work is embedded within Lean Production Theory (Koskela, 2000), wherein knowledge or action in production is to be premised on principles related to minimizing waste and maximizing value. In this paper construction project performance is addressed in terms of minimizing PTCs in order to maximize benefits for D&B clients in the construction industry.

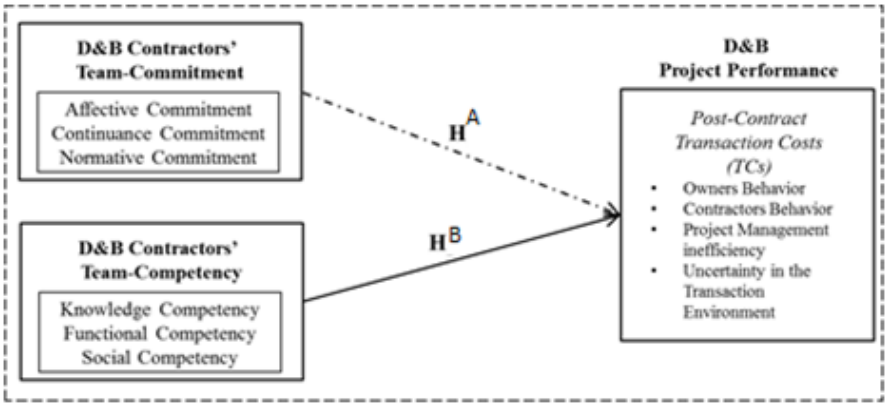

Figure 1: Theoretical framework

The fundamental presumption is that D&B clients rely on the attitude and behaviour of the team to act in the client's best interest. Hence, in the absence of such behaviour or commitment from the contractors' team, the D&B clients' benefits would be plagued by uncertainties, thus lowering the performance level and increasing transaction costs (TCs). The conceptualization of the theoretical framework (see Figure 1) is based on the Theory of Action and Job Performance (Boyatzis, 2008). According Boyatzis (2008) theory of performance is the basis for the concept of competency. As maximum performance is believed to occur when the person's capability or talent is consistent with the needs of the job demands and the organizational environment. The framework was further developed using Williamson's (1981) analysis of the key contributors of TCs, namely: the economic actors' behavioral assumptions, the lack of competency resulting in bounded rationality and opportunism; and transaction characteristics such as asset specificity, uncertainty, frequency and complexity of the construction projects. Competency is operationalized by using three dimensions: knowledge, functional and social competencies (Delamare Le Deist & Winterton, 2005; Sarmawa et al., 2015). Whilst organizational commitment is taken to be an attitude which is characterized by favourable positive cognitive and affective components about the organization. Attitude

and behavioural aspects of 'commitment' are considered as antecedents to performance (Mohyin, 2011).

Hence, it is hypothesized that D&B PTCs can be minimized by emphasising on the different dimensions of contractors' team-competency and team-commitment as shown in Figure 1. The main and sub-hypothesis of the framework are:

The main hypothesis: *H^A: D&B contractors' Team-Commitment positively influences PTCs*
H^B: D&B contractors' Team-Competency positively influences PTCs

Sub-hypothesis: *H1: D&B contractors' Affective team-commitment positively influences PTCs*
H2: D&B contractors' Continuance team-commitment positively influences PTCs
H3: D&B contractors' Normative team-commitment positively influences PTCs
H4: D&B contractors' Knowledge team-competency positively influences PTCs
H5: D&B contractors' Functional team-competency positively influences PTCs
H6: D&B contractors' Social team-competency positively influences PTCs

2 METHODOLOGY

The population of study consisted of 4,625 G7 contractors (highest grade of registered contractors, eligible to bid for value of work above RM10million) registered with CIDB Malaysia based on the CIDB website directory as of December 2015. Based on Saunders et al. (2012) sampling table, 357 G7 contractors were selected with 3% margins of error and 95% confidence level. Structural Equation Modelling (SEM) using SmartPLS (3) was used for the data analysis. A total of 248 questionnaires were returned with 17 considered as invalid. The collated data was tested for missing data and Monotone Response Pattern. The data from the 231 questionnaires was analysed using SPSS version 21.

3 DATA ANALYSIS

3.1 Assessment of Outer Model

Analysis of the measurement model (or outer model), was carried out to determine the appropriateness of the theoretically defined constructs. The measurement model extracted from the theoretical framework was examined to ensure the reliability of the questionnaire. The three key aspects considered were factor loadings, composite reliability (CR) and average variance extracted (AVE).

CR is calculated from the factor loadings of the observed variable. The composite reliability values obtained lie in the range of 0.88 to 0.914, all of which exceeds the recommended value of 0.70. The complete amount of variance in the observed variable accounted by the latent variable relative to measurement error measured by the AVE was between 0.589-0.726 for all constructs, and all greater than 0.50.

Figure 2 is the measurement model analysis of D&B contractor team-commitment and team-competency on PTCs. D&B contractor team-commitment on the whole reported R^2 0.758, a positive but not significant relationship with PTCs, with continuance commitment being not significant (β= 0.014, t-value (0.211) <1.96) as shown in Table 1. D&B contractor team-competency reported R^2 0.849, with all constructs indicating a strong positive and significant relationship with PTCs as shown in Model B.

Table 1: Measurement model results

Model	Dependent Construct	Independent Constructs	Path Coefficient	T Statistics	R^2
Model-A	D&B Contractor Team Commitment	*Affective Commitment*	0.596	9.614	**0.758**
		Continuance Commitment	0.014	0.211	
		Normative Commitment	0.333	5.282	
Model-B	D&B Contractor Team Competency	*Knowledge/Cognitive*	0.375	7.207	**0.849**
		Functional/Technical	0.268	6.706	
		Social/Behavioral	0.354	6.256	

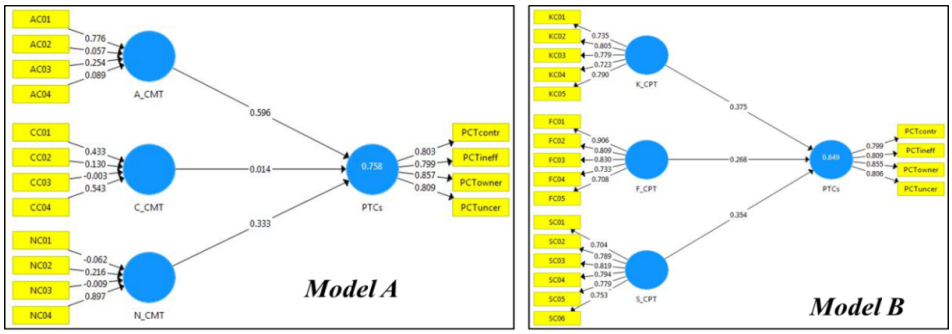

Figure 2: Measurement model

3.1.1 Construct Validity

The construct validity was confirmed by examining the respective cross loadings and factor loadings, wherein all the constructs attained values greater than 0.50. The 32 observed variables had factor loadings between 0.708 - 0.908 (cut-off value for factor loadings is 0.60) and all the values are positive and greater than the recommended value.

3.1.2 Discriminant Validity (DV)

The correlations between the measures of potential overlapping constructs was assessed for DV. The measurement model demonstrated adequate DV as all the square roots of AVE (values in bold, off-diagonal in Table 2) are greater than the correlations in the respective columns and rows.

Table 2: Discriminant Validity

	A_CMT	C_CMT	F_CPT	K_CPT	N_CMT	PTCs	S_CPT
A_CMT	**0.804**						
C_CMT	0.764	**0.846**					
F_CPT	0.725	0.660	**0.800**				
K_CPT	0.734	0.697	0.712	**0.767**			
N_CMT	0.585	0.667	0.634	0.718	**0.852**		
PTCs	0.774	0.618	0.816	0.755	0.679	**0.818**	
S_CPT	0.709	0.600	0.717	0.719	0.701	0.715	**0.774**

3.1.3 Hypothesis Testing

Table 3 presents the path coefficient (β) and their significance values in testing the various hypothesis. Five of the six relationships were found to be significant except C_CMT -> PTCs. Figure 2 shows the graphical representation of the inner model R^2 coefficients.

Table 3: Hypothesis Testing

Hypothesis	Relationships	Path Coefficient	T Statistics	P-value	Decision
H1	A_CMT -> PTCs	0.596	9.614	0.000	Supported
H2	C_CMT -> PTCs	0.014	0.211	0.833	Not supported
H3	N_CMT -> PTCs	0.333	5.282	0.000	Supported
H4	K_CPT -> PTCs	0.375	7.207	0.000	Supported
H5	F_CPT -> PTCs	0.268	6.706	0.000	Supported
H6	S_CPT -> PTCs	0.354	6.256	0.000	Supported

Level of significance: * p<0.10 **p<0.05 ***p<0.01

The findings indicate that D&B contractor team-commitment overall has a positive and significant relationship with PTCs (see Figure 3), path coefficient shows (β= 0.310, t-value (4.220)>1.96). Whilst D&B contractor team-competency indicates a strong positive and significant relationship with PTCs (β= 0.577, t-value (8.258) >1.96).

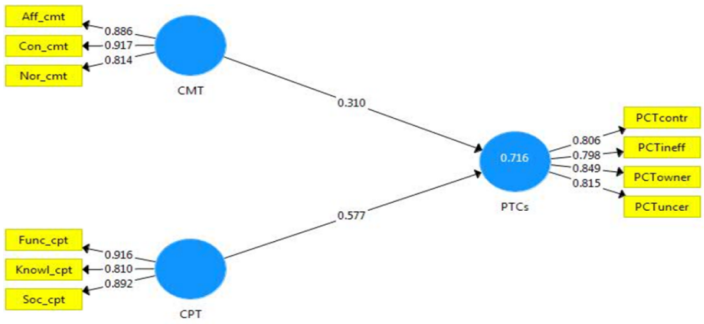

Figure 3: Final measurement model

4 Conclusion

It is evident that the "innovative" D&B organizational structures have a tendency to "degenerate" into hybrid forms apparently to take advantage of markets and avoid hierarchies so as to minimize costs. However, this can compromise on process efficiencies and "trigger" additional TCs. Viewing the problem from an analytical socio-technical perspective and focusing on organizational capability vis-à-vis human action to minimize PTCs, two latent constructs were identified from literature as components of organizational capability namely: team-commitment and team-competency.

The findings indicate that D&B contractors' team-competency has a strong and positive significant impact on minimizing PTCs, whilst team-commitment has a significant but weaker impact. It is also evident that *affective* commitment is the most significant factor towards minimizing PTCs, wherein the observable sub-factors are viewed as indicators of project performance. Hence, it is proposed that in order to minimize PTCs, team-competency and team-commitment needs to be given greater emphasis in order for D&B projects to leverage on its full potential with respect to permitting a greater interplay of structure and agency. The results of this investigation also affirms the role of human agency in the benefits realization process.

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6 APPENDIX

	MEASUREMENT ITEMS – D&B CONTRACTOR TEAM-COMPETENCY
	Project knowledge competency
KC01	*Project orientation*: As part of the contractor team we understand the rationale for the project and we are aware of the organizational context of the project
KC02	*Program orientation*: As part of the contractor team we are capable of aligning program goals to business strategy and develop new proposals for new projects supporting this strategy
KC03	*System, products & technology*: As part of the contractor team we understand and manage the causes and effects of actions in the project effectively
KC04	*Finance*: As part of the contractor team we have adequate knowledge of and insight in the financial and administrative processes of the project and integrate these aspects in our actions
KC05	*Legal*: As part of the contractor team we are aware of legal, compliance and liability aspects of the project
	Project functional competency
FC01	*D&B project requirement & objectives*: As part of the contractor team we recognize and clearly understand the goals, client requirements and conditions of the project
FC02	*Quality*: As part of the contractor team we understand the quality aspects at project execution and manage the realization of these aspects
FC03	*Changes*: As part of the contractor team we are able to handle requests for change efficiently and effectively taking into account the scope of the project and the impact of the changing client's requirements
FC04	*Communication*: As part of the contractor team we are skilled in communication and deploy our skills efficiently and effectively
	Project Social competency
SC01	*Leadership*: As part of the contractor team we stimulate and motivate team members and interested parties to act in the interest of the project and show efficient and effective behavior
SC02	*Engagement*: As part of the contractor team we are personally committed and reflect the personal buy-in from all individuals associated with the project
SC03	*Results orientation*: As part of the contractor team we do not lose focus on the project goals and the interests of the client
SC04	*Consultation*: As part of the contractor team we analyze issues and situations, seek advice and new insights on different alternatives
SC05	*Conflict & crisis*: As part of the contractor team we recognize potential conflicts of interest or crisis at an early stage and help proffer solutions that will solve the issue
SC06	*Ethics*: As part of the contractor team we clearly understand ethics and moral values and act accordingly

	MEASUREMENT ITEMS – PTCS
PTC1 PTC2	*Owner Behaviour* – Late payment, Change orders, Organizational inefficiency, Relationship with other parties *Contractor Behaviour* – Frequency of claims, Material substitution (variation order)
PTC3	*Project Management Efficiency* – Quality of decision making, Quality of communication, Leadership, Conflict Management, Technical competency
PTC4	*Uncertainty in Transaction Environment* – Project uncertainty, Opportunistic behaviour of contractor, Project complexity, Completeness of design

	MEASUREMENT ITEMS – D&B CONTRACTOR TEAM-COMMITMENT
	Affective Commitment
AC01	As part of the contractor team we would be generally happy to spend the rest of our career in this organization
AC02	As part of the contractor team we really feel as if this organization's problems are our own
AC03	As part of the contractor team we do not feel emotionally attached to this organization
AC04	As part of the contractor team the organization has a great deal of personal meaning for us
	Continuance Commitment
CC01	As part of the contractor team it would be very hard for us to leave this organization right now, even if we wanted to
CC02	As part of the contractor team we feel that we have a few options to consider leaving this organization
CC03	As part of the contractor team one of the few negative consequences of leaving this organization would be the scarcity of available alternatives
CC04	As part of the contractor team one of the major reasons we continue to work for this organization is that leaving would require considerable personal sacrifice; another organization may not match the overall benefits we have here
	Normative Commitment
NC01	As part of the contractor team we do not feel any obligation to remain with our current employer
NC02	As part of the contractor team even if it were to our advantage, we do not feel it would be right to leave this organization now
NC03	As part of the contractor team this organization deserves our loyalty
NC04	As part of the contractor team we would not leave our organization right now because we have a sense of obligation to the people in it