

Mediating Effect of Benefits Realization Management on Contractor's Team Competency and Post-Contract Transaction Costs in Design-Build Projects

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Abstract

The current approach to understanding client's needs have progressed from a lower level of engagement viewed as a cross-sectional attempt to formulate a client's brief, to a higher level systematic extraction of client's requirements that is longitudinal in nature. It is evident that dissatisfaction of clients with the finished product and construction process has prompted many researchers to address the issue of client's requirements. This very much needed emphasis to improve construction project performance has however been plagued by the lack of a coherent methodology or framework as a structuring mechanism, except to include requirements capture within an extended boundary of process protocols. Taking a systems view, the aspect of improving project performance by tackling parts of the system allows for a more focused and systemic solution to performance improvement. The much neglected aspect of Post-Contract Transaction Costs (PTCs) that affect project performance, viewed as a sub-system that needs to be minimized for projects to have a clear benefits realization potential. This is mediated by the effect of having in place a benefits realization management (BRM) strategy that can markedly reduce PTCs. The particular context of developing this Benefits Realization Model is framed within the Design-Build (D&B) project delivery method that is very much maligned by its inability to secure better performance. Questionnaire survey data from a sample of major D&B contractors in Malaysia was analysed using SmartPLS 3 to test the research 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 BRM partially mediate the relationship between D&B contractor team competency and post-contract TCs whilst team-competency has a strong positive and significant influence on minimizing PTCs. The findings also indicate that proactive management and learning; stakeholder engagement 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 management strategy, competency, post-contract transaction costs (PTCs), design and build projects.

INTRODUCTION

The construction industry has been struggling with the issue of inconsistent performance with respect to cost of projects, completion time and the delivery of a quality product. These challenges have been addressed by researchers with some success, however in contrast with other industries, construction is still seen to be lagging. One strategy that has evolved amongst construction practitioners and researchers is the adoption and adaptation of ideas and techniques developed within other industries. The major ones being the Manufacturing and the Information and Communication Technology fields. The concept of Best Value, Value Maximization and Benefits Realization are a few notable concepts adapted from these sister industries but as yet to have been realized as being significant. This paper provides an introduction to the subject of Benefits Realization in the process of procurement of building

projects, in relation to addressing the issue of low achievement of client satisfaction on construction projects. The initial attempts to draw attention to the potential for a Benefits Realization Management approach in construction was proposed by Rooke *et al.* (2010) and Tillman *et al.* (2012), who emphasised on value generation of agreed outcomes based on a knowledge management perspective. However, there has been no further attempt to identify positive influence factors and mechanisms that can leverage on this concept within construction projects. The practicality of such theoretical perspectives often end up in the backburner. This paper is an attempt to address this issue by focusing on minimization of post-contract transaction costs (PTCs) as a measure of project performance based on a Benefits Realization Management Strategy rather than relying on the traditional requirements capture of client's needs.

The actions aimed at minimizing PTCs are seen as being oriented towards Benefits Realization. The attempt here is to provide a basis to realize benefits for the client by focusing on key existing project organizational capabilities, viewed as "promises" within contractual relationships, focusing on the soft human factors component. Taking Design-Build (D&B) project delivery system as being best suited to test this principle of targeting benefits maximization for the client, an analysis of D&B contractor team-competence and BRM strategy is undertaken to evaluate their significance in reducing Post-Contract Transaction (PTCs). PTCs have been variously described as being social waste (Koskela, 2010), reflection of inefficient project management practice (Li *et al.*, 2015) and is deemed here as being compounded by the fragmented nature of construction.

Based on comprehensive literature review it is clear that mainstream research on construction project performance has neglected the aspect of skills and competencies of key project participants towards minimizing Transaction Costs (TCs). This aspect is further compounded by the lack of attention to the behavioural component of project team participants - a clear gap within the research literature. The traditional strategy with respect to achieving client satisfaction for project success is currently being addressed primarily through the conventional requirements capture process (viewed as the precursor to benefits maximization). Based on the understanding that the Design-Build (D&B) project delivery system was developed primarily as an attempt to overcome the shortcomings of the traditional procurement strategies in relation to client satisfaction, a critical review of the current D&B approach is presented with respect to transaction costs.

The initial aim of having the one-stop shop D&B approach is primarily to reduce fragmentation, focusing on being more process efficient and minimizing process waste. However, it is the view of the researchers that there is a trend in D&B organizational structures to subscribe to Transaction Cost Economics theory and aim at making the buy or make decision focusing on minimizing production costs. The aim of a context-specific D&B contractors' team-competency and BRM approach is argued for (and tested) as a driver in order to Maximize Benefits with respect to clients' needs for D&B projects. The D&B project environment is viewed as potentially providing the most conducive platform for achieving benefits maximization, however it is evident from extant literature that it is failing to achieve the highly acclaimed advantages in comparison to traditional procurement.

Seeking Out Value Delivery Systems

It is without doubt that the needs of society and demands of clients will not remain stagnant - requiring greater competency acquisition, commitment and better benefits realization

management (BRM) strategies that will transform the way the built environment is designed, built and maintained to generate better value. This is framed as having to seek out new techniques and tools to be able to deliver construction projects within the context of developing (in terms of product and process) a more sustainable built environment. This is evident in the growing concern and commitment to be more ecologically productive. It is in this sense that the concept of value is aligned, with the aim of achieving project success from a sustainability perspective. Additionally, the overarching concept of BRM is seen as being able to address issues within the broad spectrum of sustainable development.

The D&B procurement method is one of the systems advocated to overcome inadequacies of the traditional procurement method. The basic concept of D&B approach is for the client requiring the project to be contracted with a single organization (one-stop shop total solution) that would be responsible for design, procurement and engineering as well as commissioning, allowing for integrated project delivery. D&B, as originally intended, was meant to be a panacea to many of the problems faced by clients and other stakeholders in the construction industry. This delivery system has been used around the globe extensively and its popularity has grown substantially over the years. It is noted by Chan (2000) and Lam *et al.*, (2003) that D&B has been used extensively to help deal with the problems associated with the traditional system. They however point out that the implementation of D&B is not without its problems, wherein clients and other stakeholders have increasingly shown concerns regarding the benefits of the D&B method in actual practice.

In Malaysia, not all the D&B projects are being successfully delivered as designed and planned. The D&B concept has been labelled to be 'designed to fail' by the then Malaysian Second Finance Minister as reported by the New Sunday Times, February 4, 2007. This is due to the fact that, some of the D&B mega projects have failed to effectively deliver benefits as to client's requirements (Jasri, 2011). It is noted by Gambo & Gomez (2015) and Abdul Rahman *et al.* (2006) that clients' expectations in the D&B delivery system are not adequately met and the system is not being practiced in the ideal way in the Malaysian construction industry. It is identified in the literature that constraints such as lack of management expertise attribute to the D&B project failure. This paper, therefore, seeks to explore the effects of BRM on D&B contractors' team-competency and PTCs in D&B project structured within a strategy for optimizing performance, in the special case of minimizing PTCs. The aspect of transaction cost economics has not been explored fully within the construction industry and the causal links between D&B delivery system and TCs are rather an ambiguous unexplored dynamic within the Malaysian construction industry. In summary, due to the obvious relatively large extent of the D&B contractors' team failing to meet the primary needs of clients and the consistent increase of PTCs in D&B projects, the need to address the benefits to be gained through D&B contractors' team-competency and BRM, especially the much ignored aspect of the mediating effect of BRM on contractors team-competency to minimize PTCs can have a great significance to productivity performance.

Firstly, the significant problem that tends to impede the development of the procurement approach is the nature of the management structure of the D&B companies in the Malaysian construction industry, wherein a fragmented approach still persists in the industry in spite of the supposedly one-stop shop practice. The practice of the D&B delivery system in the Malaysian construction industry is characterized by the D&B organization outsourcing consultants (expertise) to execute their projects (Gambo & Gomez, 2015). This type of management structure is referred to here as the fragmented D&B. It is characterized by the nomination of external design consultants by the contractor to carry out the designs of the

project (Masterman, 2002). These external consultants are coordinated by the in-house project managers who manage their activities in order to ensure, what seems to be, the client's interest with regards to traditional client's brief and requirements capture. Such management structures are likely to result in various problems during project execution. This is due to the structure's inherent separated feature, which makes the system vulnerable to the problems that have long been associated with traditional procurement approaches (Masterman, 2002).

It is clear that the development of the D&B concept, referred to as a mode of prime contracting, was well intended to improve coordination and communication in project delivery through a flatter organization structure with less fragmentation. However, this was not realized due to the dominant product outcome performance and activity-based organization principles embedded within the industry. It is premised (hypothesized), in terms of situating this research, that the option of resorting to D&B as a total solution for project delivery seems not to have had a resounding success as the D&B benefits realization management strategies, core competencies and commitment are not embedded within the project delivery system to match the opportunities for benefits realization of the client's needs. 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. These failed projects have influenced the perception of the society and the industry, that D&B will generate more problems rather than provide benefits, as most of these failures are attributed to poor performance by the D&B contractor and the other sub-contractor teams involved. Within this current state of decline in the integrity of the D&B procurement approach, this research aims to re-establish the benefits of D&B project delivery by framing it within a Benefits Realization framework in terms of minimizing post-contract transaction costs by leveraging on the potential of the construction project team.

Benefits Realization Management and Team-Competency

The D&B organization relies heavily on project team-commitment and team-competency in order to be able to deliver construction projects faster and cheaper. Essentially, this comes down to the crucial element of cost. It cannot be denied that projects delivered faster and cheaper, implies greater value. Although value is difficult to be measured, one direct measure that relates to value, viewed from a waste minimization perspective and not compromising on quality, is cost minimization. Thus, these twin components of organizational capability of team-competency and team-commitment that can influence post-contract TCs (PTCs) were earlier (Gomez & Raji, 2017) examined and found to have significant influence on minimizing PTCs in D&B projects. However, the primary focus of this paper is to evaluate the mediating effect of BRM on D&B contractor's team-competency to minimize PTCs.

The D&B "benefits realization Management" strategies and "team-competency" for minimizing PTCs are measures that were developed using the Delphi technique. These focused measures were collated from extant literature under the broad category of competency and benefits realization management. Through the Delphi refinement process a final set of focused measures were identified and finalized to formulate the research questionnaire.

Transaction Costs and Project Delivery Systems

There are a multitude of measures to assess a construction project's success. However, one that is significant but seldom addressed in a direct sense is that of transaction costs (TCs). 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 post-contract

transaction costs - this being more pertinent in the case of D&B projects. Based on extensive literature review the various factors influencing transaction costs were grouped into four latent variables: predictability of owner's behaviour, predictability of the contractor's behaviour, project management inefficiency and uncertainty in the transaction environment. It is clear that the TCs incurred at the pre-contract (procurement) phase for D&B range from 0% to 5.7% with an average of 2.2% (Whittington, 2008), and is not seen as a major concern. Although, the TCs in the construction phase are much higher than the transaction costs in the procurement phase (Hughes *et al.* 2006), for D&B projects this increase should be able to be kept to a relatively much lower difference. The TCs during the construction phase are known as post-contract TCs. These post-contract TCs (PTCs) could be high arising from disputes and litigation, as conflict and disputes do occur in construction industries of many countries and inflicts a high cost to the industry both in terms of direct and indirect costs. 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). In Malaysia, the situation is not much different with an average of 9% ranging from 3.5% to 13.5% of the project value based on the pilot study conducted as part of this research.

In the traditional project delivery system, the PTCs incurred range between 8.9% and 14.7% with an average of 12.6% of the total project value (Whittington, 2008; Li *et al.*, 2015). Based on the two delivery systems, there is a 3.1% reduction on average for the D&B procurement approach compared to the traditional delivery system. However, there is a need for further PTCs reduction in order to improve project performance in terms of value, represented in this study as that of minimization of PTCs. PTCs include the costs of contract administration, administering claims, change orders, dispute resolution, and managing relationships with other parties; as well as additional costs incurred for inability to make payment on time, organizational inefficiency, material substitution and quality of communication. In this research, the costs incurred due to quality of decision making and uncertainty in the transaction environment are also considered as post-contract TCs. According to Williamson (2005b), complexity, uncertainty, frequency and assets specificity are some of the characteristics of TCs that makes the project more costly. He associates these specific characteristics of TCs with bounded rationality and opportunistic behaviors. Here, bounded rationality refers to the limited competence of human actors in solving complex problems and their processing of information (Simon, 1991). On the other hand, opportunistic behavior refers to human actors' behavior with self-seeking guile and applying false threats or promise to take advantage of others if an opportunity to gain more profits arise (Williamson *et al.*, 1975).

The Organizational Context for Delivering Reduced PTCs

It is within the framing of the issues related to project performance with respect to minimizing post-contract transaction costs (PTCs) of current D&B projects, that the competence and benefits realization management strategies (BRM) of the contractors' team is being brought to question, as to whether clients are getting better value in D&B projects. In this research D&B contractors' team-competencies and BRM are hypothesized as potential operational drivers towards optimizing benefits delivery through the engagement of a competent project team right from the onset of the project. Hence, the issues to be addressed in this study include: D&B projects currently not performing as expected as a result of hybridization and fragmentation of the concept in practice (Jaafar & Radzi, 2013); and issues related to productivity and performance (Abdul Rahman *et al.*, 2010) from a value perspective. The aim of the research is then to explore the mediating effects of BRM and D&B contractors' team-competency and D&B project performance as both direct and indirect causal link to minimizing PTCs.

Research Framework

Based upon literature review, using Content Analysis and theoretical basis, a research framework was designed to address research gaps. A significant number of related studies were identified and the findings analyzed to identify the factors that affect PTCs. In developing the framework, the possible relationships between the research constructs were identified. Along with evidence generated from the previous literature, the proposed research framework for examining the relationship between the research constructs "PTCs", D&B contractor "team-commitment" and "team-competency" is presented as shown in Figure 1, indicating the relevant research hypotheses.

The epistemological basis for this work is embedded within Lean Production Theory (Koskela, 2000), wherein knowledge in production is to be premised on principles related to minimizing waste and maximizing value - and this relates to sustainable development in a wider sense. It is on this basis that, this paper is seen to be in line with the principles and philosophies of Lean theory, targeting construction project performance by minimizing post-contract TCs in order to maximize benefits for D&B clients in the construction industry. The conceptualization of the research framework 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.

In order to identify contractors' team competency related to D&B delivery system, a Content Analysis of the factors that influences D&B post-contract TCs was conducted. The analysis reveals that the D&B delivery system competencies are suitable constructs that influence post-contract TCs and performance. Based on the literature, competency in this research is framed within three dimensions; knowledge, functional and social competencies (Delamare Le Deist & Winterton, 2005; Sarmawa *et al.*, 2015). The operationalization of these constructs are based on the Delphi study conducted with D&B experts.

However, Benefits Realization Management (BRM) is an aspect of project management that has received increasing attention in the past few years. The literature on the topic is developing rapidly with authors addressing it from different backgrounds, including consultants, practitioners and academics. Benefit Realization Management (BRM) is now seen as central to project, programme and portfolio management, as it is even being suggested that BRM is the glue that binds together all the other management techniques' (Breese, 2012). Bradley (2006) defines benefit as an outcome of change which is perceived as positive by a stakeholder. Therefore benefits realization could be defined as one becoming fully aware of the positive impact as a result of a change. Reiss *et al.* (2006) define benefits realization management as the process for the optimization of benefits from organization change programs. Similarly, Farbey *et al.* (1999) define it as the process that realizes the benefits that are achieved and manages the unexpected ones.

This research reflects on three distinct dimensions on BRM, proactive management and learning; stakeholder engagement; and strategy deployment (Sapountzis, 2013). Recently, some scholars (Bradley, 2010; Jenner, 2014; Melton *et al.*, 2011) have suggested that BRM makes the value and the strategic relevance of each project clear, enabling an increased effectiveness of project governance. However, after performing and in-depth literature review on the subject, it was found that only one study attempted to investigate the relationship between BRM and project performance empirically (Serra & Kunc, 2015). Their findings

indicate that BRM has a significant relationship with performance. Whilst the study of Sapountzis (2013) on BRM within the construction industry only establishes a conceptual model for benefits realization in healthcare construction projects. Whilst it is evident from having reviewed extant literature that no previous study seems to have tested the mediating or moderating effect of BRM between D&B contractors' team-competency and project performance (post-contract TCs) in the construction sector.

Hence, D&B PTCs potentially can be minimized by addressing the different dimensions of contractors' team-competency and BRM strategies as shown in Figure 1 below. The framework of this study suggests a direct relationship between independent and dependent constructs: D&B contractors' team-competency and BRM strategies with PTCs. Additionally, as represented in Figure 2 a framework is presented to indicate the possible mediating effect of BRM strategy.

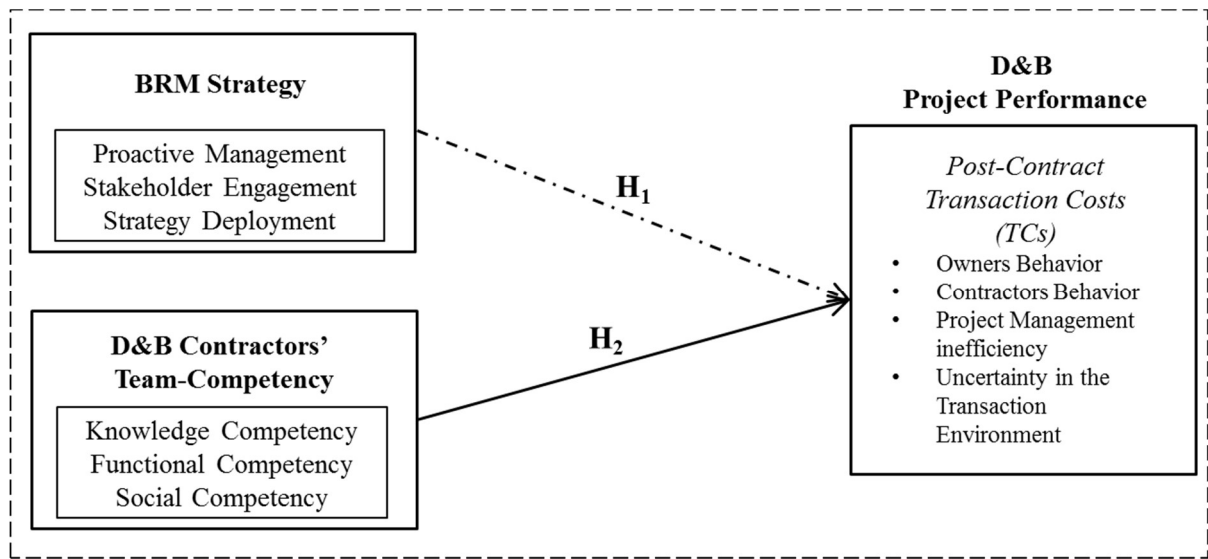


Figure 1: Research framework

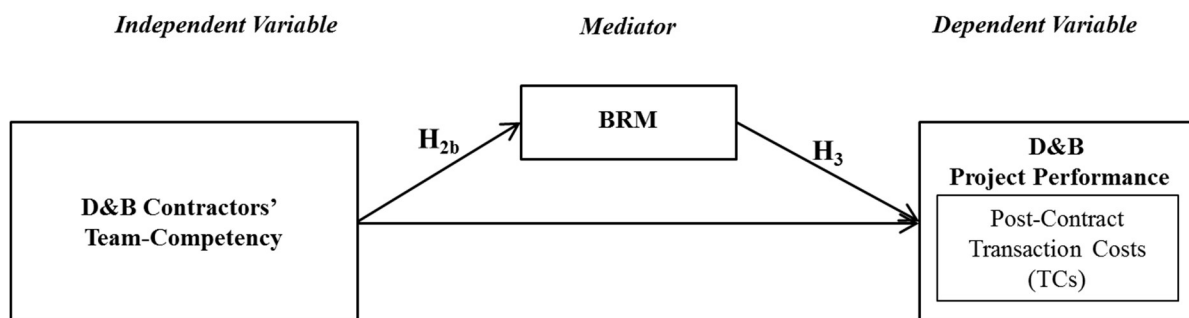


Figure 2: The hypothetical mediation effect of BRM

METHODOLOGY

A deductive research method that relies on the quantitative research approach for systematic empirical investigation of social phenomenon using statistical techniques was utilized as the research methodology. Systematic sampling of total number of 4,625 Grade 7 (G7) contractors registered with CIDB Malaysia based on the CIDB website directory as at December, 2015 was undertaken. The G7 population of contractors were targeted because they are considered to have greater financial capabilities and more likely to be engaged in D&B projects. Based

on Saunders *et al.* (2012) sampling table, 357 samples were decided upon, with 3% margin of error and 95% confidence level. Hence, 357 questionnaires were administered through survey monkey (online survey). Thus, the total questionnaires retrieved from the online survey monkey were 248. Seventeen (17) out of 248 questionnaires were considered as invalid because they were partially completed. Hence, only 231 questionnaires were considered valid and were inserted into Statistical Package of the Social Science (SPSS version 21). Thereafter, the data was tested for missing data and Monotone Response Pattern.

Data analysis

The hypothesized model was tested using Structural Equation Modelling - Partial Least Squares (SEM-PLS) in Smart PLS M3 version 3.0.

BRM mediation analysis

In order to establish the mediating effect of BRM, the following steps were followed: Step one is concerned with the assessment of the significance of the direct effect between the independent and the dependent construct without including a mediator construct. The findings were extracted from PLS-SEM by conducting bootstrapping procedure with 231 observations per subsample, for a total of 5000 subsamples with no sign changes as recommended by Hair Jr *et al.* (2014). Path coefficient and t-value is provided by PLS-SEM bootstrapping procedure. If the direct effect without a mediator is not significant, it is indicative of no mediating effect. On the other hand, if the direct effect is significant, further assessment will be conducted by following Step two.

Table 4 Steps for testing mediation effect

Steps	Result	Interpretation
Step one: Test significance of the direct effect without inclusion of the mediator	Not significant	No mediating effect
	Significant	Proceed to step two
Step two: Test significance of the indirect effect due to inclusion of the mediator	Not significant	No mediating effect
	Significant	Proceed to step three
Step three: Test the strength of the mediation by calculating variance account for VAF	VAF > 80%	Full mediation
	20% ≤ VAF ≤ 80%	Partial mediation
	VAF < 20%	No mediation

After proving the significance of the direct relationship between the constructs, the indirect effect relationship due to the mediator is assessed as Step two. Again, the findings were extracted from PLS-SEM by conducting bootstrapping procedure with 231 observations per subsample, 5000 subsamples, and no sign changes, as recommended by Hair Jr *et al.* (2014). Path coefficients for the two paths: path 'a', which is independent construct -> mediator construct and path 'b', which is mediator construct -> dependent construct as presented in Figure 5, analysed by PLS-SEM bootstrapping procedure. Whilst the significance of the indirect effect is calculated manually following Sobel’s Formula (Sobel, 1982):

$$z = \frac{a \times b}{\sqrt{a^2 Sb^2 + b^2 Sa^2}}$$

'a' is the path coefficient between the independent construct and the mediator, and 'b' is the path coefficient between the mediator and the dependent construct, (Sa) represents standard deviation error of path 'a', and Sb represents standard deviation error of path 'b' (see Figure 5).

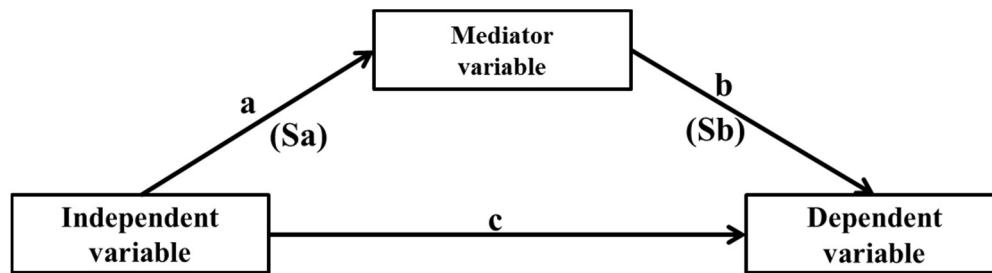


Figure 5: Mediation path

As part of the final step in conducting the bootstrapping procedure, if the indirect effects are reported as not significant, this indicates that no mediating effect occurred. But, if it is significant, further assessment will be conducted using Step three.

After confirming the significance of the direct effect (Step one) and indirect effect (Step two), testing the strength of the mediating construct is the last step. This method of assessment can be done using variance accounted for by VAF (Hair Jr *et al.*, 2014), which can be calculated by dividing indirect effect over total effect:

$$VAF = \frac{\text{Indirect effect}}{\text{Total effect}} = \frac{a \times b}{a \times b + c}$$

'a' represents the path coefficient between the independent construct and the mediator, 'b' represents the path coefficient between the mediator and the dependent construct, while 'c' represents the path between the independent construct and the dependent construct, as illustrated in Figure 5.

According to Hair Jr *et al.* (2014), one can interpret VAF values in the following way: $VAF > 80\%$ indicates full mediation, $20\% \leq VAF \leq 80\%$ means partial mediation, and $VAF < 20\%$ indicates no mediation.

In order to test H3, PLS-SEM bootstrapping procedure was conducted by using PLS-SEM (231 observations per subsample, 5000 subsamples, and no sign changes). Table 5 summarizes the effect values in addition to t-values and p values as provided by SmartPLS 3.0 for the hypotheses paths.

Hypothesis findings

The main objective of this section is to empirically test research hypotheses H₅ and H₆, which are concerned with analyzing the mediation effect of BRM between team-competency and post contract TCs.

Keeping in mind that in order to explore the impact of different independent constructs on the dependent constructs via mediating constructs, it is important to evaluate the total effect, which is the criteria representing the sum of direct and indirect effects. By exploring

Table 01, it can be concluded that among the two independent constructs that influences the post-contract TCs, D&B contractor team-competency and BRM all have effect, with CPT->BRM having the strongest effect 0.84.

Table 01 Significance test results of the total effects

	Path coefficient	t-values	Significance level	P values
BRM --> PTCs	0.624	8.469	***	0.000
CPT --> BRM	0.847	39.284	***	0.000
CPT --> PTCs	0.296	3.980	***	0.000

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

Legend: BRM: Benefits Realization Management, CPT: Competency, PTCs: Post-contract TCs

In this section, the results of the test for the hypotheses H₅ and H₆ that propose a causal relationship between D&B team competency, BRM and post-contract TCs is presented. Thus, H₅ proposes that BRM mediates the relationship between the independent constructs D&B contractor team-competency and the dependent construct post-contract TCs, while H₇ proposes that BRM positively influences the relationship between the independent constructs contractor team competency and the dependent construct post-contract TCs. To test the BRM mediating effect, three steps were followed as presented in Table 4 as recommended by Hair Jr *et al.* (2014).

Table 6 BRM mediation analysis

	H ₅ : CPT-> BRM-> PTCs		
	Effect value	t value	p value
Without mediator			
<i>Direct effect</i> (CPT->PTCs)	0.903	33.051	0.000
With mediator			
<i>Direct effect</i> (CPT->PTCs)	0.296	3.980	0.000
Indirect effect (CPT->BRM->PTCs)	0.528	3.391	0.000
Total effect (CPT->BRM->PTCs)	0.824	32.387	0.000
Variance accounted for (VAF)	64% Partial mediation		

Legend: BRM: Benefits Realization Management, CPT: Competency, PTCs: Post-contract TCs

H₅ tests Benefits Realization Management (BRM) mediating effect between D&B contractor team-competency (CPT) and post-contract transaction costs (PTCs). The results showed that the direct effect of the relationship between contractor team-competency and post-contract TCs without the presence of contractor team-commitment is positive and significant ($\beta = 0.903$, t-value (33.051)>1.96). In addition, the indirect effect which is the product of the direct effect

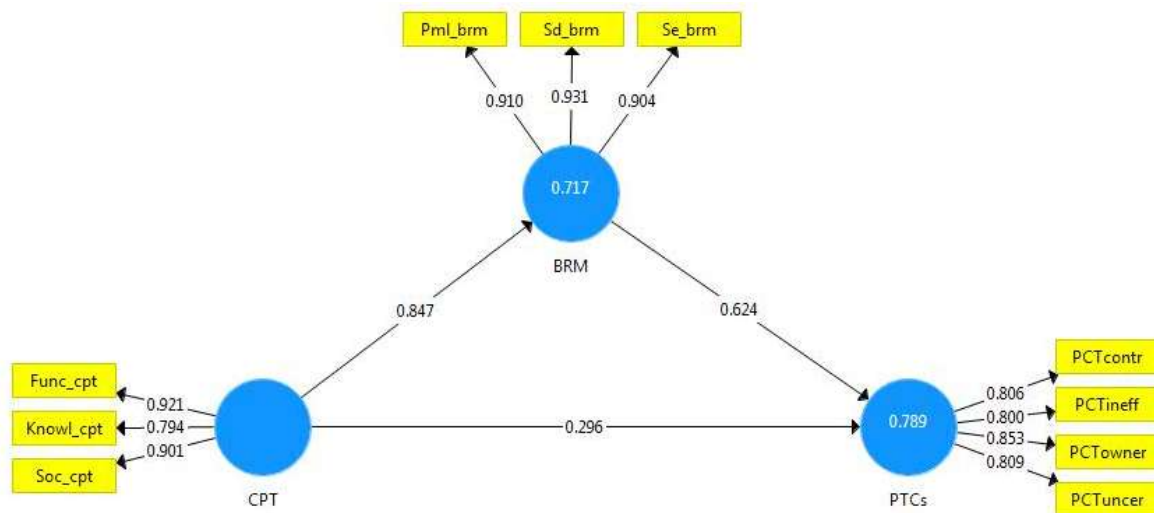


Figure 6 BRM mediation model

between D&B contractor-competency and BRM, as well as between BRM and post-contract TCs, and the results reveal that the indirect effect of D&B contractor team-competency, via the BRM mediator construct, on post-contract TCs is significant ($\beta= 0.528$, t -value (3.391) >1.96). To test the strength of the mediating effect, variance accounted for by VAF value was calculated and showed a value of 64%, which indicates that about 64% of the total effect of D&B contractor team-competency onto post-contract TCs is explained by the indirect effect. In other words, BRM partially mediated the relationship between D&B contractor team competency and post-contract TCs (see Figure 6) below. Consequently, H₇: BRM positively influence post-contract TCs.

The summary of the hypothesis and their findings is presented in Table 7 below. It is evident that the entire hypotheses were supported, and this reaffirm that benefits realization management strategy mediates the relationship between contractor’s team-competency and post-contract transition costs.

- H¹: D&B contractors’ Team-Competency positively influences PTCs
- H²: D&B contractors’ Benefits Realization Management Strategies positively influences PTCs
- H³: D&B contractors’ Benefits Realization Management Strategies positively influences PTCs

Table 72 Hypothesis testing

Hypothesis	Relationships	Path coefficient	t-values	Significance level	P values	Decision
H ₁	BRM --> PTCs	0.624	8.469	***	0.000	Supported
H ₂	CPT --> BRM	0.847	39.284	***	0.000	Supported
H ₃	CPT --> PTCs	0.296	3.980	***	0.000	Supported

Level of significance: * $p<0.10$ ** $p<0.05$ *** $p<0.01$ **Legend:** BRM: Benefits Realization Management, CPT: Competency, PTCs: Post-contract TCs

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.

The objective of this research was driven by the desire to appreciate the extent to which benefits realization management strategy influence post-contract TCs in D&B delivery system. The finding of this research provides evidence that benefits realization management (BRM) mediates the relationship between D&B contractor team competency and post-contract TCs. The findings implies that D&B contractor teams with greater level of competencies have a positive influence on minimizing post-contract TCs in D&B projects, particularly in the cases where they make use of effective benefits realization management practice to deliver the outline client objectives. It may also enable D&B contractor teams to cope with the phenomena of constantly changing potential benefits in the delivery process, which currently is missed as the approach is to focus on a static requirements capture perspective that has little potential for benefits maximization. Hence, it is proposed that in order to minimize PTCs, team-competency and BRM 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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References

- Abdul Rahman, H., Rahim, F.A.M., & Low, W. (2006). A study on the quality management during the pre-construction stage of design and build projects. In: Quantity Surveying National Conference. Kuala Lumpur.
- Abdul Rahman, H.A., Wang, C. & Yap, X.W. (2010). How professional ethics impact construction quality: Perception and evidence in a fast developing economy, *Scientific Research and Essays*, 5 (23), 3742-3749
- Boyatzis, R. E. (2008). Competencies in the 21st century. *Journal of Management Development*, 27(1), 5–12.
- Chan, A. P. (2000). Evaluation of enhanced design and build system—a case study of a hospital project. *Construction Management & Economics*, 18(7), 863-871.
- Cohen, A. (2003). *Multiple Commitments in the Workplace: An Integrative Approach*. London: Lawrence Erlbaum Associates Publishers.
- Delamare Le Deist, F., & Winterton, J. (2005). What is Competence? *Human Resource Development International*, 8(1), 27–46.
- Gambo, M. M. & Gomez, C.P. (2015). Project Characteristics for Design and Build Procurement Approach in the Malaysian Construction Industry. *Journal of Engineering and Technology (JET)*, 6(1), 144-154.
- Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2014). *A primer on partial least squares structural equation modeling (PLS-SEM)*: SAGE Publications, Incorporated.

- Howell, G., Laufer, A., and Ballard, G. (1993). Interaction between Subcycles: One Key to Improved Methods. *ASCE J. Constr. Eng. Manage.*, 119(4), pp. 714–728, doi:10.1061/(ASCE) 0733-9364(1993)119:4(714), 714-728.
- Hughes, W., Hillebrandt, P., Greenwood, D. & Kwawu, W. (2006). *Procurement in the Construction Industry: The Impact and Cost of Alternative Market and Supply Processes*, Taylor and Francis, London and New York, NY.
- Jaafar, M., & Radzi, N. M. (2012). Building procurement in a developing country: a comparison study between public and private sectors. *International Journal of Procurement Management*, 5(5), 608-626.
- Jaafar, M., & Radzi, N. M. (2013). Level of satisfaction and issues with procurement systems used in the Malaysian public sector. *Australasian Journal of Construction Economics and Building*, 13(1), 50–65.
- Jasri, S. A. A. (2011). *Disputes in design and build construction contract* (Master dissertation, Universiti Teknologi Malaysia, Faculty of Built Environment).
- Koskela, L. (2000). *An exploration towards a production theory and its application to construction*. VTT Technical Research Centre of Finland.
- Lam, E. W., Chan, A. P., & Chan, D. W. (2003). Potential problems of running design-build projects in construction. *HKIE Transactions*, 10(3), 8-14.
- Li, H., Arditi, D., & Wang, Z. (2015). Determinants of transaction costs in construction projects. *Journal of Civil Engineering and Management*, 139(1), 60–68.
- Masterman, J. W. E. (2002). *An Introduction to Building Procurement Systems*, 2nd ed., Spon Press, London.
- Meyer, J. P., Allen, N. J. & Gellatly, I. R. (1990). Affective and continuance to the organization: Evaluation of measures and analysis of concurrent and time-lagged relations. *Journal of Applied Psychology*, 75, 710 – 720.
- Mohyin, N. A. (2011). *Managing commitment in small construction professional services firms*. (Doctoral thesis, University of Loughborough). UK.
- Rajeh, A. J. M. (2014). *Comparative Analysis of Construction Procurement Systems Based on Transaction Costs*. (Doctoral thesis, Auckland University of Technology, Australia).
- Rooke, J. A., Sapountzis, S., Koskela, L. J., Codinhoto, R., & Kagioglou, M. (2010). Lean knowledge management: the problem of value. In: *Proceedings of the 18th Annual Conference of the International Group for Lean Construction* (pp. 12-21). Technion-Israel Institute of Technology Printing Services.
- Sarmawa, I., Suryani, N., & Riana, I. G. (2015). Commitment and competency as an organizational citizenship behavior predictor and its effect on the performance. *International Journal of Economics, Commerce and Management*, 3(1), 1-13.
- Simon, H. A. (1991). Organizations and Markets. *The Journal of Economic Perspectives*, 5(2), 25-44.
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological methodology*, 13(1982), 290-312.
- Tillmann, P., Tzortzopolous, P., Sapountzis, S., Formoso, C., & Kagioglou, M. (2012). A case study on benefits realization and its contributions for achieving project outcomes. *Proceedings of the 20th International Group for Lean Construction (IGLC)*.
- Whittington, J. (2008). *The transaction cost economics of highway project delivery: Design-Build contracting in three states*. University of California, Berkeley, CA.
- Williamson, O. E. (1975). *Markets and hierarchies, analysis and antitrust implications: A study in the economics of internal organization*. New York: Free Press.
- Williamson, O. E. (2005b). Transaction cost economics and business administration. *Scandinavian Journal of Management*, 21(1), 19-40.

Appendix A: Measurement Model

Constructs	Items	Loadings	AVE	CR
Proactive Management	PML01	0.831	0.688	0.897
	PML02	0.722		
	PML04	0.923		
	PML05	0.829		
Stakeholder Engagement	SE02	0.912	0.810	0.927
	SE03	0.908		
	SE04	0.878		
Strategy Deployment	SD01	0.851	0.673	0.911
	SD02	0.822		
	SD03	0.784		
	SD04	0.820		
	SD05	0.822		
Functional Competency	FC01	0.906	0.640	0.898
	FC02	0.809		
	FC03	0.830		
	FC04	0.732		
	FC05	0.708		
Knowledge Competency	KC01	0.735	0.589	0.877
	KC02	0.806		
	KC03	0.778		
	KC04	0.723		
	KC05	0.790		
Social Competency	SC01	0.703	0.599	0.899
	SC02	0.789		
	SC03	0.820		
	SC04	0.793		
	SC05	0.779		
	SC06	0.753		
PTCs	PCTcontr	0.802	0.668	0.899
	PCTineff	0.807		
	PCTowner	0.858		
	PCTuncer	0.802		

Appendix B: Measurement Items

#	Measurement items – D&B contractor team-competency
Project knowledge competency	
KC1	<i>Project orientation:</i> As part of the contractor team we understand the rationale for the project and we are aware of the organizational context of the project
KC2	<i>Program orientation:</i> 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
KC4	<i>System, products & technology:</i> As part of the contractor team we understand and manage the causes and effects of actions in the project effectively
KC7	<i>Finance:</i> 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
KC8	<i>Legal:</i> As part of the contractor team we are aware of legal, compliance and liability aspects of the project
Project functional competency	
FC1	<i>D&B project requirement & objectives:</i> As part of the contractor team we recognize and clearly understand the goals, client requirements and conditions of the project
FC2	<i>Quality:</i> As part of the contractor team we understand the quality aspects at project execution and manage the realization of these aspects
FC6	<i>Changes:</i> 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
FC7	<i>Communication:</i> As part of the contractor team we are skilled in communication and deploy our skills efficiently and effectively
Project Social Competency	
SC1	<i>Leadership:</i> 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
SC2	<i>Engagement:</i> As part of the contractor team we are personally committed and reflect the personal buy-in from all individuals associated with the project
SC4	<i>Results orientation:</i> As part of the contractor team we do not lose focus on the project goals and the interests of the client
SC5	<i>Consultation:</i> As part of the contractor team we analyze issues and situations, seek advice and new insights on different alternatives
SC6	<i>Conflict & crisis:</i> 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
SC7	<i>Ethics:</i> As part of the contractor team we clearly understand ethics and moral values and act accordingly
Post-Contract Transaction Costs (PTCs)	
PTC1	<i>Owner Behaviour – Late payment, Change orders, Organizational inefficiency, Relationship with other parties</i>
PTC2	<i>Contractor Behaviour - Frequency of claims, Material substitution (variation order)</i>
PTC3	<i>Project Management Efficiency - Quality of decision making, Quality of communication, Leadership, Conflict management, Technical competency</i>
PTC4	<i>Uncertainty in Transaction Environment - Project uncertainty, Opportunistic behaviour of contractor, Project complexity, Completeness of design</i>
Proactive Management and Learning	
PML1	As part of the contractor team we search for opportunities to minimize transaction costs
PML2	As part of the contractor team we proactively manage changes
PML4	As part of the contractor team we review and evaluate performance and feed-forward into next process
PML5	As part of the contractor team we continuously review the list of expected benefits to check strategic fit
PML1	As part of the contractor team we search for opportunities to minimize transaction costs
Stakeholder Engagement	
SE2	As part of the contractor team we are committed in minimizing transaction costs
SE3	<i>Challenges:</i> As part of the contractor team we are aware of disbenefits
SE4	As part of the contractor team we are engaged throughout the entire process
Project Social Competency	
SD1	As part of the contractor team we ensure outcomes are related to strategic (client requirements) objectives
SD2	As part of the contractor team we drive the process based on measurements
SD3	As part of the contractor team we track and report realization of benefits and other achievements as well as minimize transaction costs
SD4	As part of the contractor team we translate objectives into measurable benefits that can be tracked
SD5	As part of the contractor team we measure things that really count