

Mediation effects of innovative procurement practices between the determinants of non-compliance with public procurement guidelines and construction project cost performance in the Nigerian construction industry

N. Z. Abdullahi^{1,2}, A. A. Hussin¹ & A. Osmadi¹

*¹School of Housing Building and Planning,
Universiti Sains Malaysia, Malaysia*

*²Department of Quantity Surveying,
School of Environmental Technology,
Abubakar Tafawa Balewa University, Nigeria*

Abstract

As part of the effort towards achieving sustainable planning and development of public infrastructure and building projects in Nigeria, Public Procurement Guidelines (PPGs) were highlighted within the procurement policy enacted in 2007 known as PPA2007. Compliance among construction procurement professionals and project parties has been facing serious challenges. Unfamiliarity, misconception and ignorance with the PPGs are identified as the major determinants of non-compliance affecting cost performance of construction projects. The study introduced and tested mediation effects of innovative procurement practices between the identified determinants and cost performance of construction projects in Nigeria. 540 survey questionnaires were used in collecting data, PROCESS macro software was used in analysing 379 useable retrieved questionnaires. Findings indicated that innovative procurement practices have mediated the effects of the determinant of non-compliance with PPGs on construction project cost performances. The study recommends enlightening and educating procurement stakeholders and major project parties on the cost benefits



of innovative procurement practices. These may perhaps enhance compliance with PPGs, improve cost performance and sustainable development of projects.

Keywords: mediation, innovative procurement practices, determinants, compliance, public procurement guidelines, project performance, Nigeria.

1 Introduction

Construction procurement as a sub-element of public procurement is one of the key activities of the construction industry globally, which contributes immensely to the development of every nation (Inuwa and Diang'a [1] and Abdullahi *et al.* [2]). The construction industry provides infrastructure facilities in addition to job creation, wealth accumulation and general contribution to the Gross Domestic Product (GDP) of countries (Abdullahi *et al.* [2], Kamar and Hamid [3] and Inuwa *et al.* [4]).

The Nigerian construction industry contributes 1.4% to the GDP (Odediran *et al.* [5]), creates 25% of employment slots of the country's workforce (Ibrahim and Musa-Haddary [6]), and about 70% of the country's fixed capital formation is attached to the construction industry (Inuwa *et al.* [4]). PPGs is a sectional part of PPA2007, issued with the aim of transforming the public procurement sector especially the rampant irregularities in construction project delivery (Shehu [7] and Williams-Elegbe [8]). Unfortunately, construction industry professionals are recognised with selective implementation and in some cases non-compliance to the PPGs (Abdullahi *et al.* [2], Fayomi [9], Jibrin *et al.* [10]). Ademola and Ajibola [11] claims that this is affecting the performance of construction projects especially in terms of cost (Abdullahi *et al.* [2] and Ayangade *et al.* [12]). This study is aimed at achieving the following objectives: (1) To assess the causal relationship between the identified determinant of non-compliance to PPGs and construction project cost performance; (2) To examine the mediating effects of innovative procurement practices between the determinant of compliance to PPGs and cost performance of construction projects; (3) To develop compliance with PPGs mediating model based on innovative procurement practices that will improve cost performance of construction projects.

2 Public procurement guidelines (PPGs) and compliance issues

Sustainable planning and development of infrastructure projects was part of the motive of procurement sector reform initiatives in Nigeria. PPGs were issued as a section of PPA2007 to be used as a public procurement manual, and it is divided into the four main parts (Shehu [7]): (1) Monetary Guidelines; (2) Process Guidelines; (3) Responsibility Guidelines; (4) Procurement Method Guidelines.

Although PPGs were inevitably meant to regulate public procurement practices, and were prompted for best practice to align with international standard (Ademola and Ajibola [11]), but ample challenges surround its implementation especially in developing countries (Abdullahi *et al.* [2], Jibrin *et al.* [10], Hui *et al.* [13]).



2.1 Unfamiliarity with public procurement guidelines

Unfamiliarity is the main study independent construct. Familiarity with the guidelines is a strong compliance determinant or variable, for the construction procurement stakeholders to appropriately implement the PPGs they ought to be familiar with its contents (Abdullahi *et al.* [2]). Unfortunately, stakeholders including professionals are observed with unfamiliarity with the PPGs (Shehu [7], Fayomi [9], Migosi *et al.* [14]), leading to pitiable delivery of infrastructure and poor cost performance of projects in the long run (Ojo and Gbadebo [15]).

2.2 Cost performance of construction projects

Cost is as an important measurement construct that runs throughout the project management life cycle. Accordingly, cost is considered as a fundamental driving force of project success and subsequent performance (Azhar *et al.* [16]). Construction project consume huge financial resources, project delivered within budgeted cost is said to have perform well cost wise (Bima *et al.* [17]). Appropriate choice of procurement systems and rightful application of PPGs helps in keeping project within budgeted cost and time schedules (Memon *et al.* [18], Shwarka and Anigbogu [19]). Based on the effects of PPGs compliance determinants on construction cost, construction project cost performance is the independent construct of this study.

2.3 Innovative procurement practices (mediating variable)

Innovation literally means compliance to significantly new or improved techniques, approaches, strategies, processes, and business practices aimed at addressing certain challenges. Prior studies found vital reasons for inducing innovative practice in public procurement as a tool for sustainable developments, for example the studies of Edquist [20], Hommen and Rolfstam [21] and Rolfstam [22] reported that innovation is promoted in public procurement by institutionalising public procurement systems which brings practical policy-making a reality because it encourages compliance with procedural manual and guidelines such as PPGs. Accordingly, this study proposed innovate procurement practice as a mediator to improve the effects of the independent and the dependent construct of the study.

2.4 Conceptual mediation model of the study

To develop the mediation model by testing the hypothesis as stated in the study objectives, a conceptual model is proposed (as shown in figure 1). The proposed framework shows the relationship between the study independent, dependent and mediating variables. Unfamiliarity is the independent variable; innovative procurement practices is the mediating variable and cost performance is the dependent or outcome variable of the study. Figure 1(a) shows the total effect portion of the model path-c, while figure 1(b) presents the direct effect and the indirect mediation effects of the proposed model path-a, path-b and path-c'.



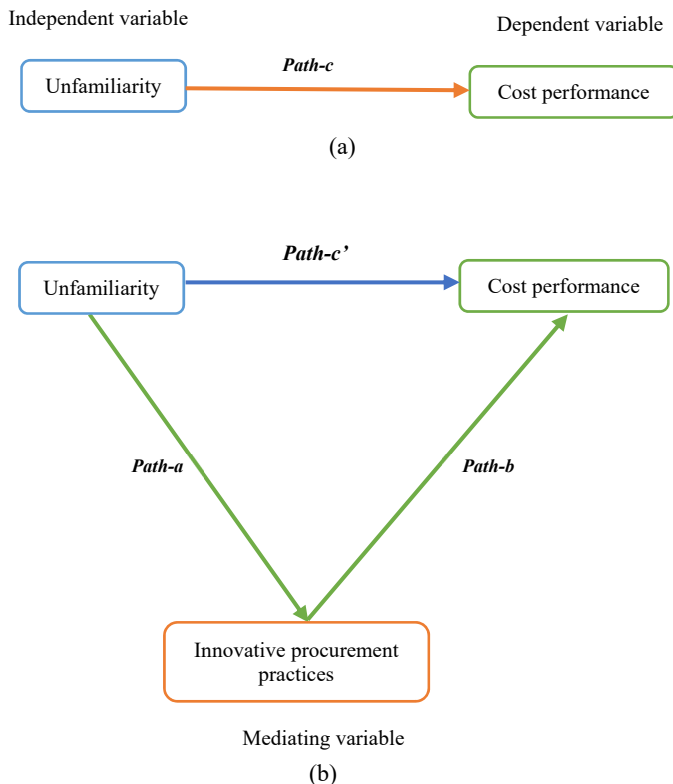


Figure 1: Conceptual mediation model of the study: (a) Total effect model and (b) Direct and indirect effects model.

3 Research methodology

Questionnaire survey been the appropriate instrument was used in collecting primary data for this study (Sekaran [23]). It was designed with the five-point Likert scale; 1 for strongly disagree and 5 for strongly agree. Giudici [24] posited that the Likert scale is the most widely used scale in measuring research variables that ensures consistency. Content of the instrument was validated, construct reliability was achieved using factor analysis as presented in table 1, the result shows good internal consistency.

Table 1: Factor analysis from pilot testing.

Construct	Dimension	Number of items	Cronbach's Alpha
Familiarity	Misconception	10	0.746
Familiarity	Ignorance	11	0.747
Mediating variable	Innovative procurement practices	10	0.789
Outcome	Cost performance	11	0.784

3.1 Data collection and analysis

A total of 540 questionnaires were randomly distributed to construction procurement stakeholders as major projects parties in procurement entities of randomly choose federal universities in northern Nigeria, selected using stratified random sampling method. 410 questionnaires were returned, while 379 were used for the analysis yielding 76% and 70% return and response rate respectively. PROCESS macro software written by Hayes [25] was used for the mediation analysis, it is one of the newest mediation tool used as a regression-based package capable of analysing more than 70 different mediation and moderation models (Preacher and Hayes [26]). Two different mediation methods were used, that is Bootstrap confidence interval and Sobel Test methods.

3.2 Result presentation

3.2.1 Effects of unfamiliarity on innovative procurement practices (*path-a*)

Result of the effects of unfamiliarity (IV) on innovative procurement practices (MV) is presented in table 2. The coefficient obtained on *path-a*, is 0.4113 and the test of statistical coefficient $t = 31.8749$, while $p = 0.0000$ ($p < 0.05$). The lower limit confidence interval (LLCI) is 0.3859 and the upper limit confidence interval (ULCI) is 0.4367, the output based on the p -value ($p < 0.05$), and both LLCI and ULCI values $\neq 0$ indicates significant effects between the unfamiliarity (IV) and innovative procurement practices (MV) thus satisfying first condition of mediation (Hayes [27] and Baron and Kenny [28]).

Table 2: Effects of the relationship along a-path.

Outcome: innovative procurement practices						
R	R-sq	MSE	F	df1	df2	p
0.8556	0.7230	0.0414	1016.0087	1.0000	372.0000	0.0000
Main model						
	Coeff	se	t	p	LLCI	ULCI
Constant	0.4329	0.0740	5.6192	0.0000	0.2814	0.5843
Unfamiliarity	0.4113	0.0129	31.8749	0.0000	0.3859	0.4367

3.2.2 Direct and indirect effects of the study model (*path-a* and *path-b*)

The mediation coefficient along *path-b* is 0.0262, $p = 0.0001$ ($p < 0.05$), test of statistical significance $t = 0.5732$ while lower and upper confidence interval (LLCI and ULCI) obtained along *path-b* are 0.0635 and 0.1159 respectively. The result indicates significant effects and has fulfilled second condition of mediation (Baron and Kenny [28]). In addition, the second result as presented in table 3 provides *path-c'* coefficient as 0.3384, $p = 0.3718$ ($p > 0.05$), LLCI and ULCI obtained are 0.2952 and 0.3815 respectively. P -value < 0.05 which insignificant effects along *path-c'*, Consequently, the result obtained has fulfilled the fourth condition of mediation by obtaining insignificant effects between IV and DV after adding MV in the model as presented in table 3 (Hayes [27] and Baron and Kenny [28]).



Table 3: Direct and indirect effects (*path-b* and *path-c'*).

Main model, outcome: cost performance						
	Coeff	Se	t	P	LLCI	LLCI
Constant	0.8157	0.0706	11.5463	0.0000	0.6768	0.9546
Innovative procurement practices	0.0262	0.0451	0.5732	0.0001	0.0636	0.1159
Unfamiliarity	0.3384	0.0219	15.4175	0.3718	0.2952	0.3815

3.2.3 Total effects between unfamiliarity and cost performance (*path-c*)

The coefficient for the total effect in the model obtained is 0.3391 p-value = 0.0000 ($p < 0.05$) and a test of statistical significance t (30.7561) while LLCI and ULCI are 0.3268 and 0.3714 respectively. The result indicates significant effects; thus, the model satisfies the third condition of the mediation model as presented in table 4 (Baron and Kenny [28]).

Table 4: Total effects between IV and DV (*path-c*).

Outcome: cost performance						
R	R-sq	MSE	F	df1	df2	p
0.8472	0.7177	0.0320	945.9355	1.0000	372.0000	0.0000
Main model						
	coeff	Se	T	p	LLCI	ULCI
Constant	0.8270	0.0678	12.2044	0.0000	0.6938	0.9603
Unfamiliarity	0.3491	0.0114	30.7561	0.0000	0.3268	0.3714

3.3 Discussion of findings

In recent times, mediation analysis and confirmation of mediation effects' occurrence in a model is judged based on indirect effects i.e. effects along *path-a*, and *path-b* (Hayes [29]). Statistically, indirect effects are the difference between total effects (*path-c*) and direct effects in the model, and the result should be equal to the product of *path-a*, and *path-b* (Hayes and Preacher [30]).

i.e. mediation or indirect effects $c - c' = (0.3491 - 0.3384) = 0.0108$.

Then again mediating or indirect effects = $a * b = (0.4113 * 0.0262) = 0.0108$

Equally the mediating or indirect effect automatically generated by the PROCESS macro software is 0.0108 (as shown in table 5).

The occurrence of mediation effects in the study model is further confirmed with Sobel-Test method, this was intended to further confirm and validate the first result obtained via Bootstrap Confidence Interval method as statistically recommended (MacKinnon *et al.* [31] and Hayes [32]). The indirect effect from the Sobel Test result is 0.0108 which is the same value of the indirect effects

obtained via Bootstrap confidence interval method i.e. (a -path * b -path) and (c - c'). This shows consistency between two results obtained via different approaches, and the value is different from zero which further confirm mediation occurrence in the study model with $Z = 0.5728$ and $p = 0.0012$ ($p < 0.05$) (as shown in table 6).

Table 5: Total, direct and indirect effects of the study model.

Total effect of unfamiliarity (IV) on cost performance (DV)					
Effect	SE	t	p	LLCI	ULCI
0.3491	0.0114	30.7561	0.0000	0.3268	0.3714
Direct effect of unfamiliarity (IV) on cost performance (DV)					
Effect	SE	t	p	LLCI	ULCI
0.3384	0.0219	15.4175	0.0000	0.2952	0.3815
Indirect effect of unfamiliarity (IV) on cost performance (DV)					
	Effect	Boot SE	Boot LLCI	Boot ULCI	
Innovative procurement practices	0.0108	0.0223	0.1330	0.5561	

Table 6: Sobel Test confirmatory result for the study model.

Preacher and Kelley [34] Kappa-squared				
	Effect	Boot SE	Boot LLCI	Boot ULCI
Innovative procurement practices	0.5371	0.0378	0.4570	0.6066
Normal theory test for indirect effects				
Effect	Se	Z	P	
0.0108	0.0188	0.5728	0.0012	

Decisively, innovative procurement practice has partially mediated the effects of unfamiliarity with the application of public procurement guidelines (PPGs) among major construction procurement stakeholders which will subsequently improve cost performance of construction projects, and enhance sustainable planning and development of infrastructure and building projects.

Prior studies found vital reasons for inducing innovative practice in public procurement as a reliable tool for sustainable planning and developments of projects, these includes the studies of Edquist [20], Hommen and Rolfstam [21] and Edquist [20]. In contrast, the findings of Uyerra and Flanagan [33] disputed on the potentiality of innovative practices for sustainable development of public infrastructure, claiming that objectives of innovation might not appropriately tally with public interest. Accordingly, the findings of this study contradict that of Uyerra and Flanagan [33] and argues that innovativeness is promoted in public procurement by institutionalising public procurement systems which brings practical policy-making a reality and positively affects cost performance of construction projects based on the mediation result as above. The developed



mediation model of the study is presented in figure 1 showing all the coefficients along the paths that makes up the model.

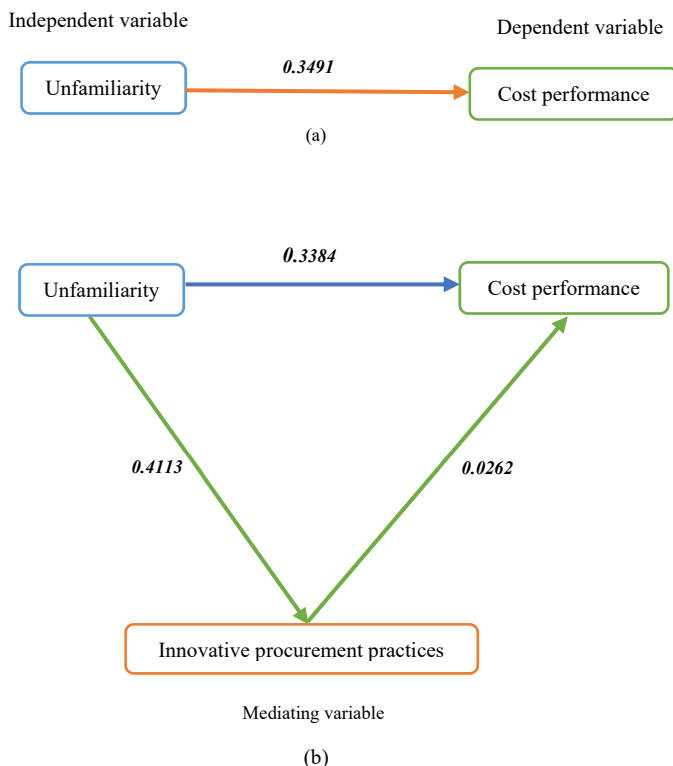


Figure 2: Final mediation model of the study: (a) Total effect model and (b) Direct and indirect effects model.

4 Conclusion and recommendation

This study aimed to ascertain the mediation effects of innovative procurement practices on non-compliance with public procurement guidelines (PPGs) for improving cost performance of construction projects. Unfamiliarity with PPGs inform of misconception and total ignorance with the guidelines were identified as the barriers to compliance and referred to as the independent construct of this study affecting cost performance as the dependent construct of the study. The mediation effects obtained indicates that, innovative procurement practice has mediated the effects of unfamiliarity with the PPGs on cost performance of construction projects. Therefore, by encouraging innovative procurement practices among major construction procurement stakeholders and project parties they will tend to be more familiar with the appropriate procurement procedural

requirement (PPGs) and how to comply with the whole procurement procedural guidelines. This will possible yield reasonable level of compliance and will conceivably improve performance of construction projects cost-wise. In the long run, the resultant effects will lead to sustainable planning and development of public projects in most developing economies especially Nigeria. The research recommends that future researchers should focus on testing the developed model for moderating effects.

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