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Research Article

Moderating Effect of Active Management by Exception on Relationship Between Information Elicitation and Design-Build Quality Delivery in Fct, Abuja

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Abstract— An examination is conducted Of Design – Build delivery with a view of finding out if the relationship between inefficiently elicited stakeholders' information and Design Build quality delivery can be moderated by the intervention of active manager by exception. Data were generated using a questionnaire and analysed using Warp PLS SEM algorithm with graphical interface. Results show that there is a nonlinear relationship between elicitation and quality delivery of Design Build delivery in the study area provided the interaction of a moderator is high. The study recommends the use of moderation as an emerging resource in Design Build delivery to ensure successful delivery.

Keywords— Design-Build (DB), Design-Build Delivery (DBD), Elicitation, Validation and Active management by exception (AME).

1. Introduction

This study is anchored on [1] system theory of organization. The theory asserts that any organization is a single unified system of interrelated parts, each part is dependent on the others and cannot function optimally without them. It is argued that in client organizations, the clients requirements that form the basis for Design-Build delivery are made up of technical, financial and managerial functions [2] and that these components are the hidden forces that influence Design-Build delivery. The reason is because over 60% of DB project failures are caused by their inefficient management [3] Components of these factors that affect success in DB delivery are elicitation, analysis, specification and validation. [4]

The system theory of client's requirement management in organizations projects the idea that Design-Build is a constructive process that is influenced by a complex environment of the client's needs, priorities and expectations in a project [5]. The requirements are in a system form and so it is underscored by a 'system theory'.

This theory is predicated on [6] general system theory. The theory states that for an organization to function well, all of component needs must function well together. The theory emphasized that systems are made up of interacting components and can be applied to technical, financial and managerial requirements of the clients.

It is therefore argued that design-build quality attainment (success) is dependent on the effective management of client's information elicitation. This information is contiguous with the technical, financial and managerial requirements of the clients [7].

Client information elicitation negatively affects project delivery because over 60% of project failure is caused by inefficiencies in information elicitation [8]. Researchers [9] believe that the situation can be addressed with intervening variables. One of the intervening variables identified is Active management by exception.
If the active manager by objective (AMO) interacts with the information elicited (ELICITATION), it will create a catalyst for advancing success in Design-Build quality delivery (DBQD).

An active manager by exception uses rewards and punishment to achieve organizational goals and objectives. However, the magnitude of such influence is not known in theory or practice in Design-Build delivery, this provides the motivation for this paper.

The research question therefore is What is the role of "Active management by exception on the relationship between client information elicitation and Design-Build quality delivery.

2. Related Work

Design and Build

Design-Build (DB) method is the method in which the client prepares clients requirements and invites contractors to tender for the project [10]. The important features of the DB method are that it integrates the design phases with the construction phases under the same contract. [11] describe DB as an arrangement where the fragmented responsibilities associated with the traditional method are combined into one for a single entity who provides both the Design and the construction services of a project. He maintains that this method is widely favoured because of the growing need to involve the contractor from the projects inception.[1] observe that the method has variants. In UK, [12] used the relationship between the design and construction parities as the basis for the variants. He identifies three variants (1) Pure DB where the design and the Construction team belong to the same organization; (2) Partial DB where part of the design work are performed externally and some internally (3) Desperate DB, where the design function are subcontracted to other outside consultants but the projects is executed by the DB contractor.

[13] also identifies three variants (1) Best value where the financial and technical proposals are assessed at the same time (2) qualification based, where the technical proposal is done before inviting the financial proposal (3) sole source Design-Build where the contractor is selected through a series of negotiations with the contractors.

Design- Build delivery

Projects involve defined objectives that must be achieved and numerous resources must be deployed efficiently in order to achieve successful delivery. [14] emphasise the need for project participants involved in construction delivery to develop and use tools for performance measurement. [15] identity 250 parameters for measuring project delivery. [6] identifies 70 potential factors for measuring project delivery. [12] classified the tools of measuring delivery into subjective and objective measures. The objective measures be captured as cost, time, and quality while subjective measures he captured as owners satisfaction and scope. [18] observed that it would be difficult to monitor and anticipate successful project delivery if there is no determinant of success. [19] believe that stakeholders have different interests and therefore their perception of successful delivery varies. The duo maintains that the conventional measures called Iron bar has been dominating delivery indicator in construction projects. They maintain that there is a distraction between project delivery success and project management success. The duo defined success as the degree to which project goals and expectations are met [2]. [15] referred to project delivery as having results compliant with expected cost, schedule, quality, safety, and scope and participant s satisfaction. [12] categorized project delivery success into objective (Tangible and Measurable) and subjective (soft, intangible and less measurable). The objective measures were categorized as cost, time, and quality. However, he maintains that objective measures such as profitability, technical compliance, completion, functionality, health and safety, productivity and environmental sustainability have become important aspects of successful delivery measurement. The subjective measures, according to him are categorized as clients' satisfaction, contractor satisfaction, project management satisfaction and scope met.

Active management by objective

There are four features of this dimension according to [3], and these are provision of assistance in efforts put in by the subordinates; transactions leader expects result from the subordinates and is ready to provide the assistance the subordinate stands in need in order to accomplish this task. For this reason the transaction leader discusses in specific term the factors responsible for achieving performance target. Furthermore, the transactional leaders make clear what the subordinate expects to receive when performance goals are achieved. The transactional leader expresses satisfaction by means of commendation letters when expectations are met. Lessons learnt from every accomplished activity helps the transactional leader to make innovative suggestions to improve the organization or to reduce the negative effects of staff behaviors in the organization. Irregularities are managed by Active management by exception [4].

Design- Build Elicitation

Elicitation means bringing forth opinions, facts and preferences of stakeholders in a project [5] identified the challenges to include unspoken or assumed requirements; difficulty in meeting with the stakeholders, resistance to change, and not enough time set for meeting with stakeholders. [11] further added that there are multiple stakeholders on a project and each of them has different priorities and the requirements themselves are complex, conflicting and changing. Other things that make requirement elicitation difficult are budgeting. Scoping and change management [7] surmised that must stakeholders do not know what they want and their requirements always conflict with users requirement. Defining clients' requirements deals with elicitation and capturing of requirements including identification of stakeholders. Analyzing the means structuring and prioritizing them according to the order of importance; translating them deals with transforming requirement into a design attributes. Managing the capturing, analysis and transforming is important however, the existing model (CRPM) fits into only the design phase and not the construction phase. Waste reduction and buildability is more certain if a moderator is used to moderate the weakness, in reworks and construction effects. They further maintain that different media such as drawings, sketches, text and other forms of communication have been used to manage clients' requirements. These they noted, include computer applications such as word processors. Spreadsheets and data-bases and the disadvantages of some of them according to [10] that they did not evolve with algorithms to manipulate requirements for Architectural design.

3. Theory

Transaction Leadership (Moderation Theory)
The Transaction leadership predicts that the clients' organizations responsible for generating clients' requirements are not self-motivated, that they are either given incentives or coerced to do their jobs properly [7].

The transactional leadership theory has three dimensions namely contingent reward, Active management by objective and passive management by objective. The theory explains the adoptive behaviour of a leader to changing behaviour of the subordinates through interaction and innovations in rewards and punishments for performance outcome [13]. Similar feat is demonstrated in the Design builder organizations to encourage efficiency. The significant problem that tends to impede the development of the D&B procurement approach is the nature of the management structure of the D&B companies in the Nigeria 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 Nigerian construction industry is characterised by the D&B organisation outsourcing consultants (expertise) to execute their projects [14]. 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. 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 briefs 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 the traditional procurement approaches [4].

According to [11] Clients requirements management are in a system form, comprising technical, managerial and financial issues relative to the project. System theory Albderi is an interdisciplinary study of system which is cohesive group of related parts. Every system Albderi is influenced by its environment and expresses synergy or emergent behavior. The theory Beven predicts that changing one part affects the other parts. This implies that the factors which affect clients' requirements management [11] have a negative ripple effect on the successful Delivery of DB projects. [12] and [9] have defined clients' requirements as objectives, needs, wishes and expectations of the client. They went on to state that these requirements are in a system form within which business strategy, building components, operations and maintenance is integrated. The problems their inefficiencies pose impact DB delivery negatively.

4. Experimental Method

Research Setting and Data
This study is conducted in FCT, Abuja; being a nation's capital many new projects are ongoing there and data for the study is readily available.

Sampling and data collection
The study purposively drew sample of 400 respondents from 50 completed Design-Build projects between 2015 and 2023 Presidency Media Publicity Unit, 2023. Data was collected using a structured questionnaire, after subjecting it to validity reliability tests.

Measures
The data collected were subjected to data cleaning, missing data tests, and missing values tests, normality tests and regression assumption tests before measurements. All the study constructs (costs, CRM, contingent reward, demographics were measured).

Analysis
Correlation between the dependent & independent variables was tested in 2D graph.

The demographic Information
In order to test the effect on independent variable on the dependent variable, the demographic information was entered into the Warp PLS software in Step 1.

Regression (IVS)
The effect terms (independents variables) were entered in step 2.

Hierarchical Regression (Moderation)
In order to test the moderating effect of active management by exception, on the relation between independent & dependent variable, a three step hierarchical regression was conducted.

Step 1: Control variables
2. Predictor variable
3. Interaction term
4. Centered values.

5. Results and Discussion

Table 1: Effect of elicitation on Design Build Delivery

	Validation	Mean	Std. Deviation	Severity
1.	Data storage was structured for ease of validation (Confirming true or correct)?	2.87	2.272	
2.	The objectives of the project met the actual outcome?	2.84	1.216	
3.	Validations ensure validity, reliability sufficiency, currency and authenticity of samples?	2.79	1.269	
4.	It was possible to update design changes with the original briefing documents?	2.75	1.205	Moderate Severity (2.71)
5.	It was easy to trace design changes to the needs of the initial stakeholder?	2.73	1.123	
6.	Validation tools (Board|) charts. Tolerance Analysis, effect analysis, mistake proofing) were used to define client problems and identify the core solutions?	2.72	1.260	

7.	All materials testing met the benchmarks and operational needs of the users on the drawings and the initial brief?	2.64	1.215
8.	The validation process ensured the quality improvement of the product output?	2.59	1.211
9.	All validation processes, namely prospective, retrospective and concurrent validations were satisfactory?	2.50	1.214
Cumulative Mean and Std. deviation		**2.714**	**1.332**

Table 1 show the level of severe impact of CRM validation of Design Build delivery

Scale: Interval scale
Level of measurement
1 - 1.50 Very Low Severity
1.51 – 2.49 Low Severity
2.50 – 3.49 Moderate Severity
3.50 – 4.49 High Severity
4.50 – 5.00 Very High Severity (Rakhshani & Rahati, 2017).
Result: The highest rating is 2.87 while the lowest is 2.74 with an average of 2.71.
Implication: This implies that the level of severity of validation is average or moderate.

Table 2: Level of severity of elicitation on design-Build delivery

	Elicitation	Mean	Std. Deviation	Severity
1.	Information on estimated costs, time, schedule and benefits were free of any misinterpretation?	2.70	1.263	
2.	There was support from the project team whenever an approved information on change order was implemented on the project?	2.65	1.270	
3.	It was possible to suspend, terminate or cancel the project upon discovering that the desired information was not given?	2.63	1.254	Moderate Severity (2.56)
4.	There was high level of confidence that the information elicited was captured on the project plan?	2.57	1.316	
5.	Stakeholders managers could sufficiently read their minds for information?	2.57	1.187	
6.	There was high degree of confidence in the estimate information to complete the (ETC) for the project?	2.55	1.293	
7.	Different stakeholders and their information preferences were not conflicting?	2.55	1.145	
8.	There was consistency between what the clients communicated and what the clients actually needed?	2.53	1.260	
9.	No stakeholders requirements were assumed?	2.51	1.231	
10.	Stakeholders locations and meeting them for information when required posed no problem?	2.46	1.163	
11.	Stakeholders managers could sufficiently read their minds for information?	2.43	1.187	
Cumulative Mean and Std. deviation		**2.56**	**1.118**	

Table 2 shows the rating of severity impact on Design Build used in the study area

Scale: Interval scale
Level of measurement
1 - 1.50 Very Low Severity
1.51 – 2.49 Low Severity
2.50 – 3.49 Moderate Severity
3.50 – 4.49 High Severity
4.50 – 5.00 Very High Severity (Rakhshani & Rahati, 2017).
Result: The highest rating of severity impact on Design Build delivery is 2.70 while the lowest is 2.43 with an overall average rating of 2.56.
Implication: This implies that the impact level; is at the moderate level of 2.56.

Design Model

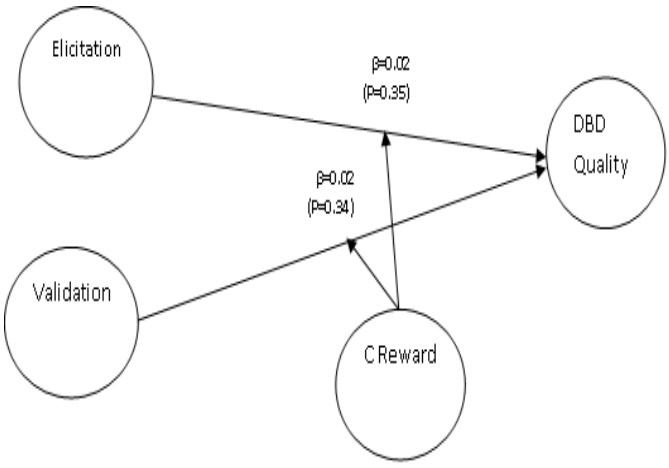

Figure 1

Figure 1 presents the structural model for the moderating effects of contingent reward on the relationship between information elicitation and Design-Build quality delivery in Abuja, Nigeria. The clients' requirement management being the independent constructs comprising of elicitation (ELT) and validation (VALID). The Design Build Delivery (DBD) was the dependent construct. The structural model beta coefficient value between elicitation (ELT) and design build delivery (DBD) was $\beta = 0.02$ at p-value < 0.35 which was insignificant at p-value = 0.05 level of significance. The structural model beta coefficient between validation (VALID) and design build delivery (DBD) was $\beta = 0.25$ at p-value < 0.01 which was significant at p-value = 0.05 level of significance. The structural model shown shows that the beta coefficients between the independent constructs and dependent construct were all significant at p = 0.05 level of

significance except for elicitation (ELT) and design build delivery (DBD) was insignificant.

Result Discussion

The graph indicated that a non-linear relationship exists between Design Build Delivery (DBD) and elicitation (ELT) constructs. The relationships impliedly indicated a positive relationship which means that an increase in Design Build Delivery (DBD) would lead to an increase in elicitation (ELT). The coordinates' points (x0, y0 and x1, y1) and the regression line of the graph were (–3.17, –0.02 and 1.24, 0.00).

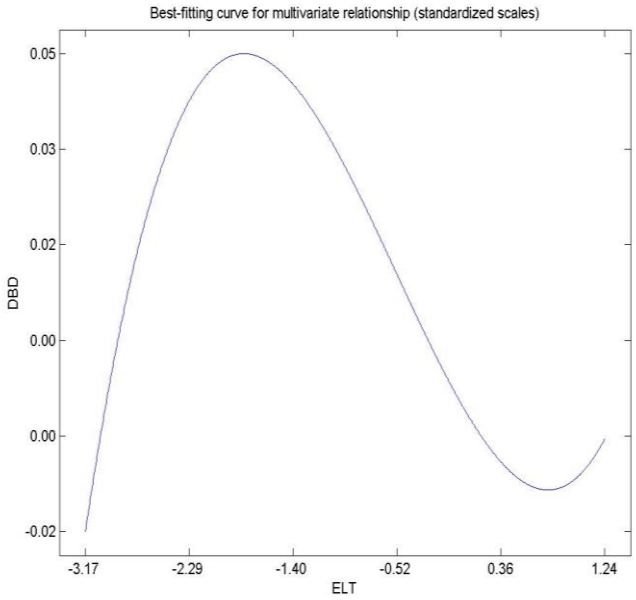

Figure 2 presents a graph of Design Build Delivery (DBD) and analysis (ANAL).

This section presents a 2D graph interpretation of Design - Build delivery (DBD) over elicitation (ELT).

The graph indicates that a non- linear relationship exists between the two constructs. The interpretations present similarities, differences and reasons with a conclusion.

Similarities: As information elicitation increases, (x-axis), the DB delivery deviation increases.
Reason: Managers could not read the minds of their stakeholders' information at (2.43)

Differences: As elicitation increases, DBD deviation decreases.

Reason: There was confidence that information elicited on ELT were no longer conflicting at 2.56

Conclusion: Information at this point were free of misinterpretations and stands out at 2.70 according to the regression line output

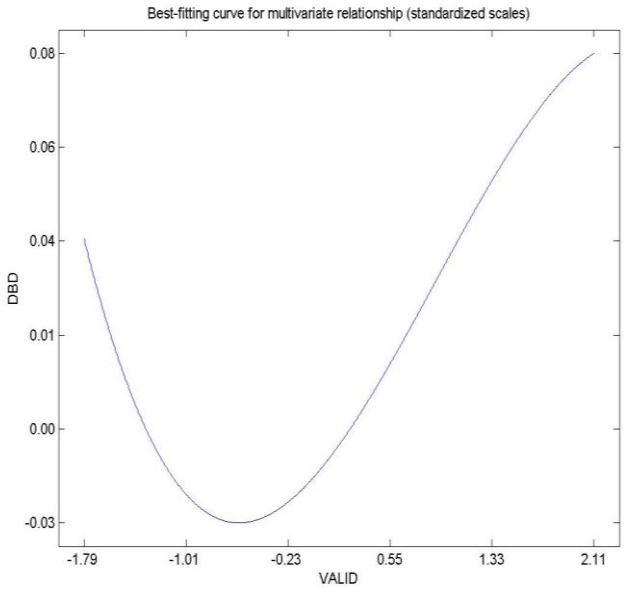

Figure 3: Presents a 2Dgraph of DBD delivery (y) over information validation (x)

Similarities: As validation decreases(x), DBD delivery decreased (y)
Reason: Introspective, prospective and concurrent validation were not practiced at (2.50)
Differences: As information validation increased DBD deviation increased
Reason: validation tools, charts and tolerance analysis, effect analysis were not used to identify client's core solutions at (2.71)
Conclusion: At (2.87), data were not hundred percent structured for ease of validation.

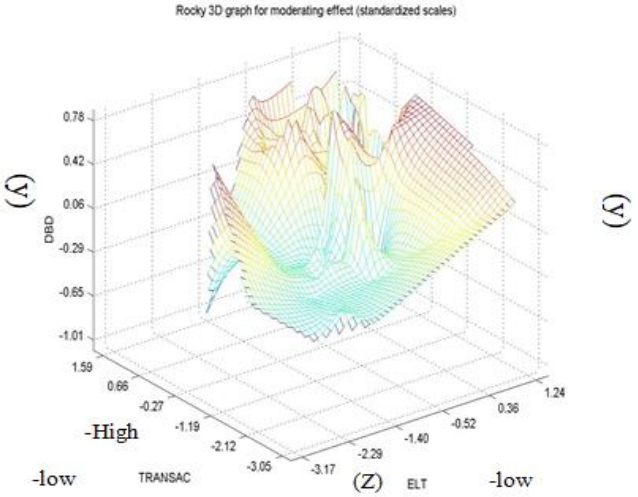

Figure 4: Design build delivery and Transactional leadership and Elicitation

Interpretation of figure 14 3D Rocky graph

i. Low interaction of moderation activities of Transactional Leadership (Z) with elicitation ELT (x) results in low DBD.
ii. High interactions of moderation activities of Transactional Leadership (z) with elicitation (ELT, x) results in high DBD

iii. The variance in the DBD delivery is explained by the structural model output of $\beta = 0.67$ $p = 0.011$
iv. Theoretical implications is that elicitation influences cost delivery.
v. Practical implication is that DB delivery increases if transactional leadership (z) interaction is high.

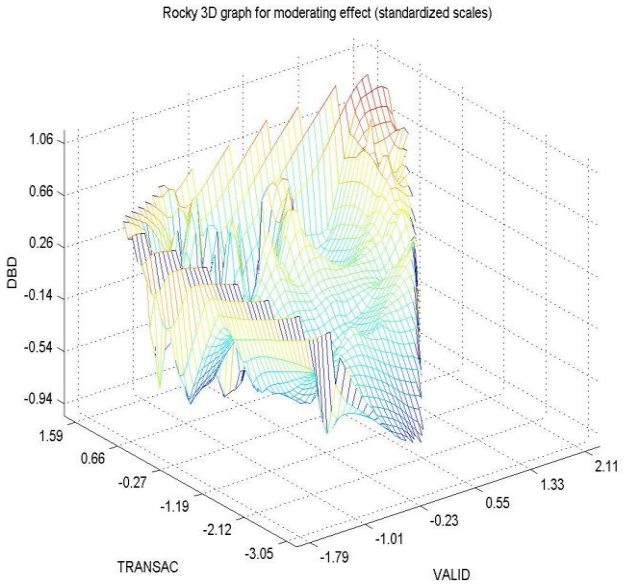

Figure 5: Design build delivery and Transactional leadership and Validation

i. Low Transactional leadership (z) interacting with high validation (x) results in low DB delivery (y). (Data is not structured at this point)
ii. High Transactional Leadership (z) interacting with validation (x) results in minimal DB delivery
iii. The variance in DB delivery increase is explained by the Spss output $\beta = 0.02$, $p < 0.34$
iv. The theoretical implication is that validation is not influential to DB delivery. (Traceability (validation x) is not done in real life; contractors do not apply traceability).
v. Practical implication is that Transactional Leadership moderation is statistically insignificant.

6. Conclusion and Future Scope

The study also concludes that there is a non-linear relationship between design-build delivery and information elicitation constructs. This means that the relationship between these two variables is not straightforward. As design-build delivery increases, elicitation may increase at a certain rate, but then the rate of increase may slow down or even stop. Therefore it is recommended that construction project professionals should enhance communication and collaboration, foster open and transparent communication channels among all project stakeholders, including clients, design-build firms, subcontractors, and consultants. Encourage regular meetings, collaborative workshops, and proactive communication to address issues promptly and maintain alignment throughout the project. The level of delivery were moderate among DB contractors in the study area, there were confidence that the information elicited for the project were captured on the project plan. The implications are materials & labours were efficiently managed. The severity of CRM on DBD were moderate, the information elicited were moderately free of misinterpretation. While drawing visualization were moderately understood in defining scope. There is generally a weak relationship between CRM and DBD. It called for moderation as reported by the studies of (Keegan & Hartog, 2004). It implies that moderation boosted or its reduced weak relationship and reduced the moderate impact. The influence of CRM on DBD takes place at high intervention of a moderator.

Recommendations

1. There was confidence that information elicited for the project were moderately captured on the project plan. More attention should be focused on reconciling the elicited information with the project plan.
2. Information elicited from drawings was moderately free of misinterpretation. It is recommended that drawing visualization requires training for improvement
3. The weak relationship is weak in terms of project success. It is recommended that a moderating intervening variable should be used to moderate a negative relationship.
4. Moderation should be enshrined in the standard form of building contract in Nigeria when considering the utilization of Design-Build in the study area.

Area for Further Research

Conduct longitudinal studies to track the evolution of design-build project performance in Abuja Metropolis over time. This could provide insights into the effectiveness of current practices, identify areas for improvement, and inform future policy decisions. Level of severity is average, further study should use measure. Correlation is weak, further study should use qualitative analysis Moderation is weak, further study should use mediation.

Conflict of Interest

This unique replica is not being considered for publishing anywhere and has not been disseminated. There are no conflicts of interest to declare as a result.

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Author Contributions

Each author made an equal contribution to this research dissertation. They all looked over and verified the original manuscript's final draft.

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