

Effectiveness of the Project Delivery Methods in Construction Management. Lagos State, Nigeria

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Abstract:- Project delivery systems outline the responsibilities and tasks of the parties involved in a project. They also established a framework for how the phases of design, procurement, and construction would be carried out. the decision made when deciding on a project. The delivery system of a project affects every aspect of its execution, and it also has a big impact on how effectively the project is completed. Such analyses ought to be sufficiently complete to support decision-making. The generalized, unstructured, and too simplistic approaches that characterize subjective judgments have been proven to have a number of disadvantages compared to processes for organized, quantitative decision-making. Project managers are typically obliged to base their choice of project delivery techniques on subjective evaluations because there aren't any quantifiable criteria for project delivery systems that have been established and validated via research. The establishment of the essential quantitative values for use in a decision analysis process, which also provides a valid justification for the selection of project delivery methods for capital projects, would considerably increase the quality of the decision-making process. The research findings that are provided in this paper provide the field with the requisite quantitative values.

Keywords:- Project Delivery Methods; Design-Bid-Build; Design-Build; Construction Management Agency And Construction Management At Risk.

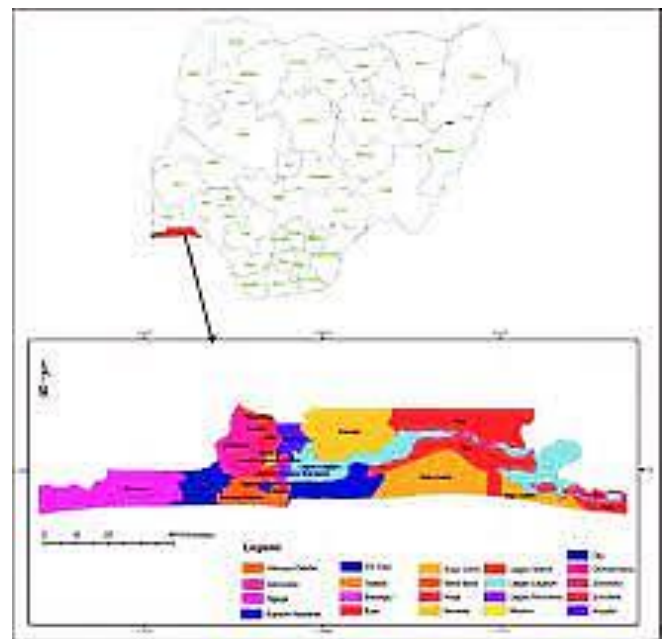
I. INTRODUCTION

The roles and duties of the stakeholders participating in a project are described in project delivery systems. They also created a framework for the management of the design, procurement, and construction phases. An alternate project delivery system is frequently taken into account during the development stage of a capital project to evaluate which delivery system would be most suitable for the project. The viability of a project is determined by the adequacy of the project delivery system chosen, which affects the efficiency with which a project is carried out. Delivery methods are currently chosen in the majority of cases based on non-quantitative methodologies, however, as the quantitative data necessary for analytical evaluation of options has not yet been made available. (Oyetunji 2001)

Compared to the holistic approach, the organized decision-making process has a number of advantages. The deconstruction of the decision problem into smaller problems that the decision-maker can concentrate on individually is a step in the decision analysis process. By combining the answers to the minor issues using tried-and-true methods, the best course of action may then be quickly assessed.

II. STUDY AREA

This study focuses on EFFECTIVENESS OF THE PROJECT DELIVERY METHODS IN CONSTRUCTION MANAGEMENT. LAGOS STATE, NIGERIA is located in southwestern Nigeria, according to its geographical profile. It is bordered in the south by Lagos State. and the Atlantic Ocean, on the north by Oyo and Osun States, on the east by Ondo State, and on the west by the Republic of Benin. Abeokuta is the capital, while Abeokuta, Ewekoro, and Ikenne are the major cities.



Source: Google map (2017)

III. REVIEW OF LITERATURE

A project delivery option is defined as a method for procurement by which the owners assignment of “delivery” risk and performance for design and construction has been transferred to another party (parties). These parties typically are a design entity who takes responsibility for the design and a contractor who takes responsibility for the performance of the construction (Anderson, Stuart D. 2003),

Various factors can influence the options for project delivery. By using a certain combination of these parts, each option can be specifically determined. As more factors are used to produce each delivery option, resulting to more distinct combinations, there will be more delivery options on the list. Three factors can be used to describe each option through the unique combinations they result in, including:

- Are the contracts for design and construction combined or separate?
- Is the price of the construction work a selection criterion?
- Is the total construction cost the lone factor in the selecting process?

The specific combination of characteristics for each choice is listed below. We provide an overview of the typical Phases of each delivery option in addition to certain traits that are typical of each.

The list of delivery options in this study include:

1. Design-build (D/B).
2. Construction management at risk (CMR).
3. Construction management agency (CMA).

❖ *Typical project delivery methods*

There are still many considerations to be made when choosing the best delivery method for a particular project, even though there are now more options accessible, assisting public agencies to accomplish more projects. Here are some examples of the most popular strategies, along with a list of benefits and drawbacks. (Gould, Frederick E. 2002)

➤ *Design-build*

Due to its rising popularity, some in the sector think that the design-build (DB) project delivery technique is the best option to overcome the drawbacks of previous strategies. The simplicity of having one party in charge of the project's development is the key benefit for an owner (Dyer, J. S., Edmunds, T., Butler, J. C., and Jia, J. 1998). With contrast to other systems where disputes between various project participants commonly occur and the owner acts as the arbiter (or party ultimately at fault), in DB many of these disputes result in internal DB team issues that do not have an impact on the owner. (Gransberg, Douglas D., Badillo-Kwiatkowski, Gayla M. and Molenaar, Keith R. (2003)

Design-build differs significantly from traditional delivery methods. Here are a few characteristics that make DB unique:

- The owner typically completes only 5–30% of the projects preliminary design before it is turned over to design-build team for completion. (Construction Industry Institute. 2003)
- With key team members from the owner's team and resource organizations, the owner conducts a risk assessment workshop to identify risks (technical, political, environmental, etc.) to the project's goals and determine whether the project scope needs to be adjusted to adequately address identified risks (Dyer, J. S., Fishburn, P. C., Steuer, R. E., Wallenius, J., and Zions, S. 1992)
- A follow-up risk assignment workshop is held by the owner with key team members from the owner's team and resource organizations to contractually assign identified risks to the party (the owner or DB team) that is most qualified to handle them.
- Both the owner and the DB team members must take on new roles as a result of DB. The owner will carry out audit and oversight obligations while retaining project control with fewer staff members since the owner and the design-builder adopt new roles. Contrarily, in order to completely fulfill their contractual duties, design-build organizations must expand the size of their employees. (Oyetunji, A. A., and Anderson, S. D. 2001)

➤ *Construction management at risk (CMR)*

The construction management at risk (CMR) delivery method is used to select an architect or engineer to design the project, and an independent construction manager at risk is selected to serve as the general contractor [8]. The construction manager (CM) takes on the risk of construction at a fixed cost and provides assistance during the design phase in evaluating costs, schedule, implications of other designs and systems, and materials both during and after the design of the facility. Following design completion, the CM assumes the risk of assigning the construction work to trade subcontractors and ensuring project completion for a fixed or negotiated price. Three important distinctions exist between this delivery method and the design/bid/build method. (Construction Industry Institute. 2001)

- A construction manager is hired to supervise the construction process, including the selection of subcontractors.
- In order to expedite delivery, the architect and construction manager can collaborate to overlap the design and building phases.
- The construction manager offers a fixed maximum price for the project and is in charge of scheduling, quality assurance, and estimating construction expenses.

To give their clients the finest design and construction experience possible should be the construction manager's goal. How can the CM strengthen the relationship based on trust with the owner by transferring some cost risk without jeopardizing the CM firm's financial security?

This can be done by offering the owner the benefit of pre-construction services, which could result in a useful change to the project.

Advantages of the CM at risk

- Earlier understanding of expenses.
- Owner is accustomed to the procedure.
- When a total cost guarantee is provided, the construction manager CMR assumes the position of a vendor rather than the owner's agent in overseeing the design process.
- Many professional CMR are wary of this shift in responsibility and object to being labeled as "At risk."
- CMR moves more quickly than conventional design-bid-build.
- Improved professional ties with the builder.
- The CMR option gives the possibility of starting construction before the design is finished.
- The CMR may submit bids and subcontract for any portion of the work at any time, frequently even when the design of unrelated portions is still in progress.

Disadvantages of the CM at risk

- A premium is placed on the correct selection of the CMR to deliver the best value to the owner because a commitment to a contractor is made earlier in the process.
- The owner still needs to handle two contracts.
- The parties' contractual objectives diverge, and objectives.
- Designer involvement from constructors is not required.
- Firm project costs are rarely known until later.
- Delivery of CMR projects is slower than design-build

➤ *Construction Management Agency (CMA)*

The delivery technique known as construction management agent (CMA) chooses an architect or engineer to design the project. At the same time, a construction manager is chosen separately to act as the client's agent and provide administration and management services. The CMA aids in the design phase but does not retain subcontracts or provide bonding for the project's construction. The CMA is chosen based on their credentials and PB Network experience(Gould, Frederick E. 2002),.

Advantages of the CMA

- The task is broken up into various packages and put out to direct bid to the trades.
- All trade agreements are held by the project's owner, and the CM represents the clients' interests in management and this work's direction.
- The CMA is typically chosen together with the Architect/Engineer or soon after and offers to deliver the project owner's help during the design phase for constructability, price, and schedule.
- The client might expedite the construction process by awarding portions of the job before the finalization of the design.

Disadvantages of the CMA

- There is no single point of responsibility (Many different trade contractors).
- No price guarantee.
- Clients must manage more contracts.
- Possibility of increased design expenses.

IV. METHODOLOGY

The research approach was divided into two sections. Through a thorough assessment of the literature, the project delivery strategies and selection criteria were established in the first phase. . A questionnaire was created to obtain the required information using open-ended questions. To guarantee the validity of the data and that the respondents comprehend all of the questions, the questionnaires were administered on-site. The efficacy matrix was developed as an average of all responders after the data was analyzed.

V. RESULTS

Respondents were asked a basic question about their thoughts on the effectiveness of each delivery method in dealing with the different project objectives (selection factors) was calculated as an average from all respondents. The set of selection factors that affect the owners' decision of the most appropriate delivery method were determined through literature review. For this research, twentyone selection factors are identified and grouped into 8 categories. The effectiveness of each delivery method in dealing with the different project objectives (selection factors) was calculated as an average from all respondents. The effectiveness values are presented in Table 1.

Owners' Objectives (Selection Factors)	Design -BidBuild	Construction Management	CM at Risk	Design Build DB
Ensures Shortest Time	0	80	90	93
Stay On Schedule	30	83	88	96
Ensures Lowest Cost	89	82	77	80
Stay Within Budget	51	88	80	86
No Defined Scope	100	94	73	5
Handles Changes	2	32	57	95
Provides Flexibility	98	75	33	5
Attains Highest Quality	20	80	83	97
No Experience	48	98	89	89
Construction Input	0	99	95	73
More Owner's Control	89	75	72	10
Single Project Contract	22	17	21	99
Single Const. Contract	100	100	100	92
Delays Expenditure	89	90	78	5
Early Estimating	0	76	83	96
Allows Financing	0	0	0	0
Essential Projects	10	80	93	99
Complex Projects	27	74	89	99
Un-familiar Projects	2	62	80	98
Reduces Risk	81	78	91	95
Minimize Adversarial Relationships	1	77	89	100

Table 1: Delivery Methods Effectiveness Values. (Source: Researchers field work, 2022)

➤ *Time & Cost Related Factors*

Time related factors are extremely important in deciding the appropriate delivery method. This is particularly true in the UAE where competition is increasing and owners desire that their products completed in a short time. The first factor is ensuring that the construction project is completed with the shortest possible time. The first factor is completing the construction project on schedule but not necessarily the shortest time.

➤ *Scope, Changes & Quality Related Factors*

Scope related factors include the level of scope definition at the time of contract award. Each delivery method requires a different level of scope definition to achieve the desired results. The level and number of changes expected during project execution is another factor affecting the choice of delivery method. The second factor is the flexibility to make changes. Many owners desire that the delivery method should be flexible enough to allow them to make changes as needed.

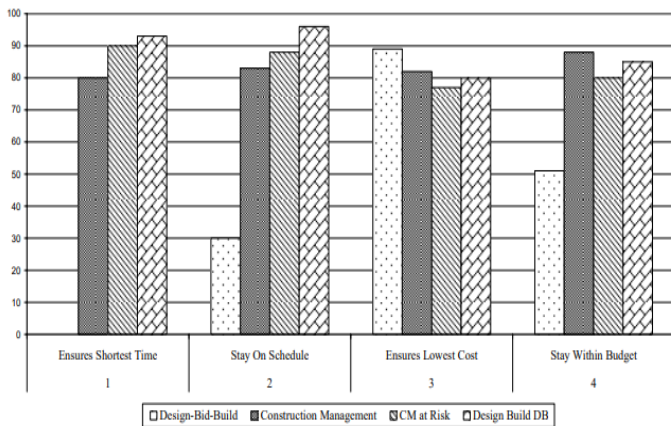


Plate 1: Delivery Methods Effectiveness Values. (Source: Researchers field work, 2022)

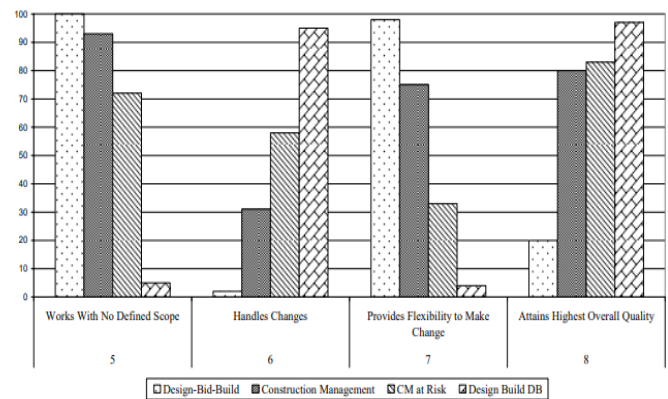


Plate 2: Delivery Methods Effectiveness Values. (Source: Researchers field work, 2022)

➤ *Cash Flow, Risk and Relationship*

Related Factors The next category is funding and cash flow factors. Some owners do not wish to commit the construction cost of the project in the early phases. Design-Build methods require that early commitment. A phased construction delivery method allows the owner to spread that commitment. This factor involves the owners’ desire for early estimating which is important for budgeting and financial planning. The methods that allow early estimating are the ones that involve construction professional input during the early phases. The third factor relates to the need for financing. If the owner desires financing, the Build-Operate-Transfer method provides that option. Figure 3 presents the comparison of the effectiveness of each delivery method with regard to these factors.

VI. CONCLUSION

According to the study's findings, design-build approaches are superior at achieving the majority of project goals, followed by construction management, construction management at risk, and classic design-bid-build procedures. Compared to construction management techniques, design-build is generally more effective in ensuring the shortest project duration. The shortest period cannot be guaranteed using the conventional delivery techniques. The best way for assuring budgetary compliance is construction management. The outcomes also demonstrate that the procedures of Design-Bid-Build offer the best flexibility for incorporating modifications during the project's design and construction. The price for this, though, might be higher. Design-Build is more capable of managing changes and ensuring the greatest level of quality.

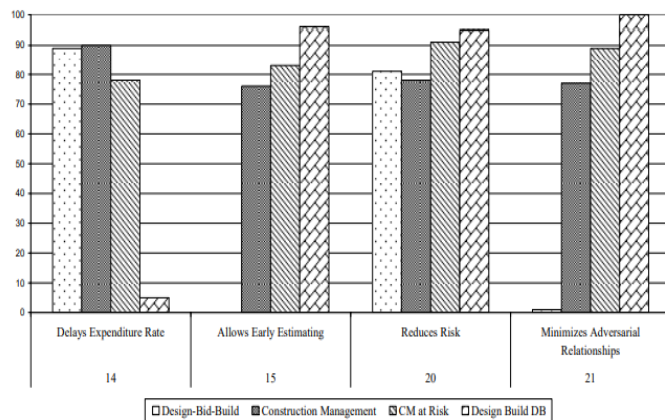


Plate 3: Delivery Methods Effectiveness Values. (Source: Researchers field work, 2022)

➤ *Project Characteristics Related Factors.*

Project characteristics factors relate to the importance of the project to achieving organizational objectives, the project complexity and the familiarity of the owners’ staff with the type of project. Management based and design-build methods are more suited to handle important, complex and unfamiliar projects. Figure 4 presents the comparison of the effectiveness of each delivery method with regard to these factors.

Organizations with little experience needed a delivery approach with a construction expert present throughout the initial stages. Owner engagement cannot be very strong with design-build methodologies. Utilizing alternative delivery techniques and reducing the number of contracting parties’ aid in reducing antagonistic interactions. When handling vital, difficult, and unknown projects, design-build method is more efficient than construction management at risk, construction management, and design-bid-build (in that order).

A crucial choice that needs to be taken in the early stages of the project is the best approach for delivering the project. Any project can utilize one of the several distribution mechanisms available. The selection is typically based on a few elements that are significant to the owner. Owners are frequently persuaded to use the delivery method they are most accustomed to. However, since tried-and-true techniques may not always work, this could be a serious error. Depending on the conditions, the delivery techniques' efficacy varies. Owners must prioritize their goals and select the approach that will be most effective in accomplishing the project's goals.

REFERENCES

- [1]. Anderson, Stuart D. (2003), Owner’s Tool for Project Delivery and Contract Strategy Selection User’s Guide 165-2, 2nd Edition, Construction Industry Institute, USA
- [2]. Bai, Yong and Hezam Adel A. (2003), Integrating Innovative Project Delivery Methods into the Construction Curriculum. ASC Proceedings of the 39th Annual Conference, Clemson University – Clemson, South Carolina, ASC, 119-128.
- [3]. Borchering, K., Eppel, T., and Von Winterfeldt, D. 1991. “Comparison of weighting judgments in multiattribute utility measurement.” *Manage. Sci.*, 37(12), 1603–1
- [4]. Construction Industry Institute. 2001. “Owner’s tool for project delivery and contract strategy selection.” Research Summary Rep. No. 165-1, The Univ. of Texas at Austin, Austin, Tex.

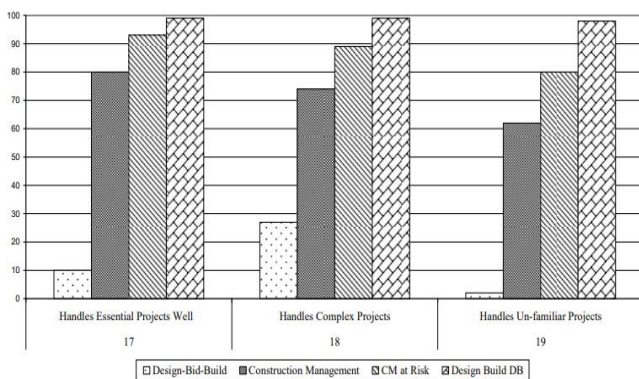


Plate 4: Delivery Methods Effectiveness Values. (Source: Researchers field work, 2022)

- [5]. Construction Industry Institute. 2003. "Project delivery and contract strategy selection: A tool for owners," Implementation resource 165-2, 2nd Ed., The Univ. of Texas at Austin Press, Austin, Tex.
- [6]. Dell'Isola, Michael D. (2002), Impact of Delivery Systems on Cost Management . AACE International Transactions, PM 3.1 - 3.6.
- [7]. Dyer, J. S., Fishburn, P. C., Steuer, R. E., Wallenius, J., and Zionts, S. 1992. "Multiple criteria decision making, multiattribute utility theory: The next ten years." *Manage. Sci.*, 385, 645–652.
- [8]. Dyer, J. S., Edmunds, T., Butler, J. C., and Jia, J. 1998. "A multiattribute utility analysis of alternatives for the disposition of surplus weapons-grade plutonium." *Oper. Res.*, 466, 749–761.
- [9]. Edwards, W. 1977. "How to use multiattribute utility measurement for social decision-making." *IEEE Trans. Syst. Man Cybern.*, SMC-75, 326–337. Edwards, W., and Barron, F. H. 1994. "SMARTS and SMARTER: Improved simple methods for multiattribute utility measurement." *Org. Behav. Hum. Decis. Process.*, 603, 306–325.
- [10]. Gould, Frederick E. (2002), *Managing the Construction Process: Estimating, Scheduling and Project control*. 2nd Ed., Prentice Hall. New Jersey.
- [11]. Gould, Frederick E. and Joyce, Nancy E. (2003), *Construction Project Management*. 1st Ed., Prentice Hall. New Jersey
- [12]. Gransberg, Douglas D., Badillo-Kwiatkowski, Gayla M. and Molenaar, Keith R. (2003), *Project Delivery Comparison Using Performance Metrics*. AACE International Transactions, CSC 2.1 – 2.5
- [13]. Halpin, Daniel W. and Woodhead, Ronald W. (1998), *Construction Management*. 2nd Ed., John Wiley & Sons. New York
- [14]. Hartman, Francis T. (2003), *Ten Commandments of Better Contracting*. 1st Ed., ASCE Press. Virginia.
- [15]. Ibbs, William, Kwak, Young H., Ng, Tzyu, and Odabas, Murat (2003), *Project Delivery Systems and project change: Quantitative Analysis*. *Journal of Construction Engineering and Management*, 129 (4), 382-387
- [16]. . Konchar, Mark and Sanvido, Victor (1998), *Comparison of U.S. Project Delivery Systems*. *Journal of Construction Engineering and Management*, 124 (6), 435-444.
- [17]. Kumaraswamy, Mohan M., Morris, David A. (2002), *Build-Operate-Transfer Type Procurement in Asian Mega Projects*. *Journal of Construction Engineering and Management*, 128 (2), 93-102.
- [18]. LaValle, I. H. 1990. *Fundamentals of decision analysis*, Holt, Rinehart, and Winston, New York.
- [19]. Ling, Florence, Chan, Swee, Chong, Edwin and Ee, Lee Ping (2004), *Predicting Performance of Design-Build and Design-Bid-build Projects*. *Journal of Construction Engineering and Management*, 130 (1), 75-83.
- [20]. Oyetunji, A. A. 2001. "Methodology for selecting project delivery system and contract strategies for capital projects." PhD dissertation, Texas A&M Univ., College Station, Tex.
- [21]. Oyetunji, A. A., and Anderson, S. D. 2001. "Project delivery and contract strategy selection," *Research Rep. 165-12*, Construction Industry Institute, The Univ. of Texas at Austin, Austin, Tex.