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Article

Evaluation of the Effect of Contract Type on Construction Project Delivery

QS Prof. Reuben A. Okereke[1], Ekenze Munachimso Ifeanyi[2]

1. Department of Quantity Surveying, Faculty of Environmental Sciences, Imo State University, Owerri., Nigeria
2. Department of Quantity Surveying, Faculty of Environmental Sciences, Imo State University, Owerri., Nigeria

*Correspondence: reuben.a.okereke@gmail.com, ekenzemunachimsoifeanyi@gmail.com

Abstract: Construction contracts serve the dual functions of legal instruments and risk/ responsibility allocation and performance control mechanisms, and all these factors directly impact on cost, time, quality and stakeholder satisfaction during project delivery. Lump-sum, cost-plus, unit-price, design build, and similar procurement models each come with their own pros and cons, depending on the clarity of project scope, project complexity, and risk profile. This systematic literature review highlights that, despite their ubiquitous use, knowledge on the comparative impact of contract types on project delivery outcomesincluding time, cost, quality and stakeholder coordinationremains fragmented and synthesis between studies is lacking. Purpose: This study compares the effects of types of construction contracts on project delivery performance by means of a structured review of the theory, practice, and empirical evidence scored by construction professionals. The results suggest that lump-sum contracts give predictability in budget sometimes leading to dispute in the event of variations, cost-plus and time-and-material contracts offer flexibility but they are more likely to be inefficient and inflating the cost, unit-price contracts are best for uncertain quantities while incurring financial risks to clients, and design–build and EPC arrangements can be speed up, integrated, and coordinate but this may reduce the client control over the design. The statistical calculation proves that a relationship exists between contract type and project outcome delivery status. This is the first study that integrates cost, time, and quality aspects beyond the traditional cost–time–quality theory framework by linking specific contract selection to a multidimensional performance level in delivery performance instead of treating cost, time and quality as isolated performance facets. These findings highlight that none of the contract types are ideal in every circumstance; choosing the right contract type based on project complexity and embedded risk management approaches should be informed to mitigate disputes, facilitate collaboration and enhance construction project performance to a larger extent.

Keywords: Contract types, construction project delivery, risk allocation, project performance, stakeholder satisfaction

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1. Introduction

The construction business is one of the most active and complex branches connected with any economy. It requires the careful alignment of a broad range of stakeholders such as clients, contractors, consultants, suppliers, and regulatory bodies who may have different interests and expectancies that have to be carefully handled so that a project is delivered successfully. The projects in this field are often characterized by high financial investments, technical risks and the subsequent risk that is likely to be high. As a result, the choice of a suitable contractual model comes out as a critical factor in defining whether

a project would be completed on time, on a given budget, and according to the necessary quality standards [1], [2].

A construction contract is not only a legal tool but it is also a substantive tool that outlines the roles, duties and possible risk sharing mechanisms between the involved parties. It offers the much-needed clarity in relation to the obligations, sets up the expectations in advance, and provides the channels of dispute resolution. More to the point, the type of contract adopted predetermines the distribution of risk, the way in which payment operations take place, and the way in which accountability is ensured throughout the project lifecycle. In this regard, the necessity to select the right type of contract is a crucial decision that could have a direct impact on project results [3].

The industry is covered with numerous types of contracts that are regularly utilized which have different implications. Lump-sum contracts are mostly preferred in those projects where the designs are clearly defined since they provide the cost certainty, but at the same time present the parties exposed to disputed situations whenever a variation occurs. Cost plus contracts are flexible and allow adjustments but are prone to create cost overruns. Unit-price contracts are beneficial to use in projects when the quantity is uncertain but, at the same time, it makes clients vulnerable to the changes in the cost. Design-build contracts combine designing and building tasks, which can build them faster, but can limit client involvement in design.

As history proves, many construction projects have failed or succeeded in large part because of the type of contract they selected and not necessary technical inadequacies. Poorly chosen contracts often lead to conflict of disputes, rising of cost, slackening of project, and in the worst scenario, project may be abandoned. On the other hand, a cautious choice of the contract type and assessment of the project goals and risk management strategies have been proved to improve performance, encourage cooperation, and secure the efficient implementation of construction works.

Considering these observations, it is the responsibility of both practitioners and scholars to determine the impact of the type of contract on construction project delivery. Through understanding the implications of different types of contracts on the cost, schedule, quality, and stakeholder satisfaction, construction professionals and policymakers will be able to make evidence-based decisions that enhance the efficiency of operations and reduce the number of disputes. This view preconditions the formation of the full assessment of the connection between the type of contract and project results in the modern construction sector.

Literature Review

Selection of a suitable type of contract in construction project is an important factor that defines the performance of a project in terms of cost, time, quality, risk distribution as well as satisfaction of stakeholders. Construction projects are inherently complex and include different stakeholders, dynamic environments, and uncertain resource needs. The type of contract also defines the relations between the owner and the contractor, risk distribution and compensation which have a significant impact on project results [3].

Empirical research has established that improper selection of the contract could result in cost overruns, schedule delay, conflict, and even litigation. On the other hand, choosing the best type of contract may lead to increased efficiency, teamwork, and high quality and delivery in a timely manner. The review is a synthesis of literature related to the relationship between different types of contracts such as lump sum, cost-plus, unit price, design-build, and Integrated Project Delivery (IPD) and the final results of construction projects.

Categories of Construction Contracts.

Construction contracts are generally grouped in terms of risk sharing, payment basis as well as the clarity with which the scope of the project is spelt out. The different contract types have a varying impact on cost, schedule, quality and risk. Six major categories can be identified in the literature that may be subdivided.

Lump Sum (Fixed-Price) Contracts.

Definition: A lump sum contract defines a fixed price on which the whole project is going to be completed; the payments are given based on milestones or on completion.

Characteristics:

a. The contractor is the one who is mostly at risk.
b. Before commencing the project, the scope of work should be well clearly defined.

The contract normally comes with elaborate bill of quantities.

Advantages:

a. assurance of cost to the owner [4].
b. streamlining of budgeting and financing.
c. Little administrative work after contract award.

Disadvantages:

Scope changes cause claims and conflicts.

Contractors do not prioritize quality as they are likely to reduce the profit margins.

1. A decrease in adaptability of reacting to unanticipated site circumstances.

Examples:

a. Huge construction projects that have a clearly defined design like government offices in India.
b. Highway developments whereby design is done prior to tendering (Osei-Tutu et al., 2018).

Cost-Plus Contracts

Definition: It is where the owner pays the contractor for the real costs of the project and a profit fee or percentage.

Characteristics:

1. The contractor will be less exposed to financial risk.

The use of the contract is appropriate in cases where the scope is not well defined.

a. There should be close supervision of spending.

Advantages:

a. Design change and complex project flexibility.
b. Promotion of the aspect of high quality because contractors receive actual work reimbursement.

Disadvantages:

a. Threat of expense increase in case of poor monitoring [5].
b. There is risk of a lack of efficiency, as profit does not correlate to cost savings.
c. Wide record keeping and auditing are required.

Examples:

a. Renovation projects with doubtful conditions.
b. Experimental buildings and research facilities where scope is continuously changing [6].

Unit-Price Contracts

Definition: While payment is charged on an agreed price per unit of work done, e.g. cubic metres of concrete or metres of pipeline laid.

Characteristics:

a. The contractor receives payment in terms of actual amounts delivered.
b. The contract accommodates quantity fluctuations in big infrastructural projects.

Advantages:

a. Applicable in a case of uncertainty of quantities.
b. Minimizes conflicts on slight differences.
c. Promotes efficiency of contractors.

Disadvantages:

a. It needs to be measured accurately and documented.
b. It is not necessarily an incentive to quality.

Examples:

a. Road construction works where the excavation volumes are variable.

b. Water pipeline projects in which the site conditions cannot be predicted [7].

Time and Material (T&M) Contracts.

Definition Division of labour The owner pays the actual labour hours, material and equipment used, usually with a fixed fee or markup.

Characteristics:

a. Ideal to use in projects with undetermined scope or changing scope.
b. Often used on maintenance, emergency or smaller-scale construction projects.

Advantages:

a. Strong capability to change scopes.
b. Accelerated initiation without extensive design.
c. The owner is free to vary requirements during construction.

Disadvantages:

a. Low cost certainty.
b. There is the possibility of overrun in terms of costs unless there is close monitoring of the project.

The contractor can be less efficient in his or her motivation.

Examples:

Emergency repair works [8].

Small-scale industrial rehabilitation.

Design-Build Contracts

Definition The design and construction phases are integrated where one single entity, either the contractor or a consortium undertakes both aspects.

Characteristics:

1. A cooperative model, which lessens wrangles between contractors and designers.

Application

often used in projects with speed as an important factor.

Advantages:

a. Overlapping design and construction will reduce the delivery time.
b. Design-based innovation to promote constructability.
c. One point of authority makes it easy to communicate [9].

Disadvantages:

a. The owner is not in control of design details.
b. Must be selected carefully when it comes to contractors.
c. Can prove to be more costly in simple projects.

Examples:

United States Hospital construction and university campus.

1. Mega commercial projects in China that have fast schedules [10].

Integrated Project Delivery (IPD)

Definition: IPD An IPD involves a collaborative contract, with the owner, designers, and the contractor sharing risks and rewards and operating together at the very beginning of the project.

Characteristics:

a. Great level of cooperation and collective decision-making.
b. All the parties share financial risk and reward.

Frequently backed up by lean building methods.

Advantages:

a. Marked decrease in time and cost efficiency.
b. Fostering innovation and quality improvement.
c. Reduction of antagonistic conflicts.

Disadvantages:

1. Needs mature and cooperative stakeholders.
2. Problems with contract and incentive management.

Univariate Not applicable everywhere because of regulatory limits.

Examples:

A high-end hospital construction in the United States that applied IPD had 20 per cent faster completion and quality results [11].

Large infrastructure projects in which risk is mitigated through initial collaboration (Figure 1).

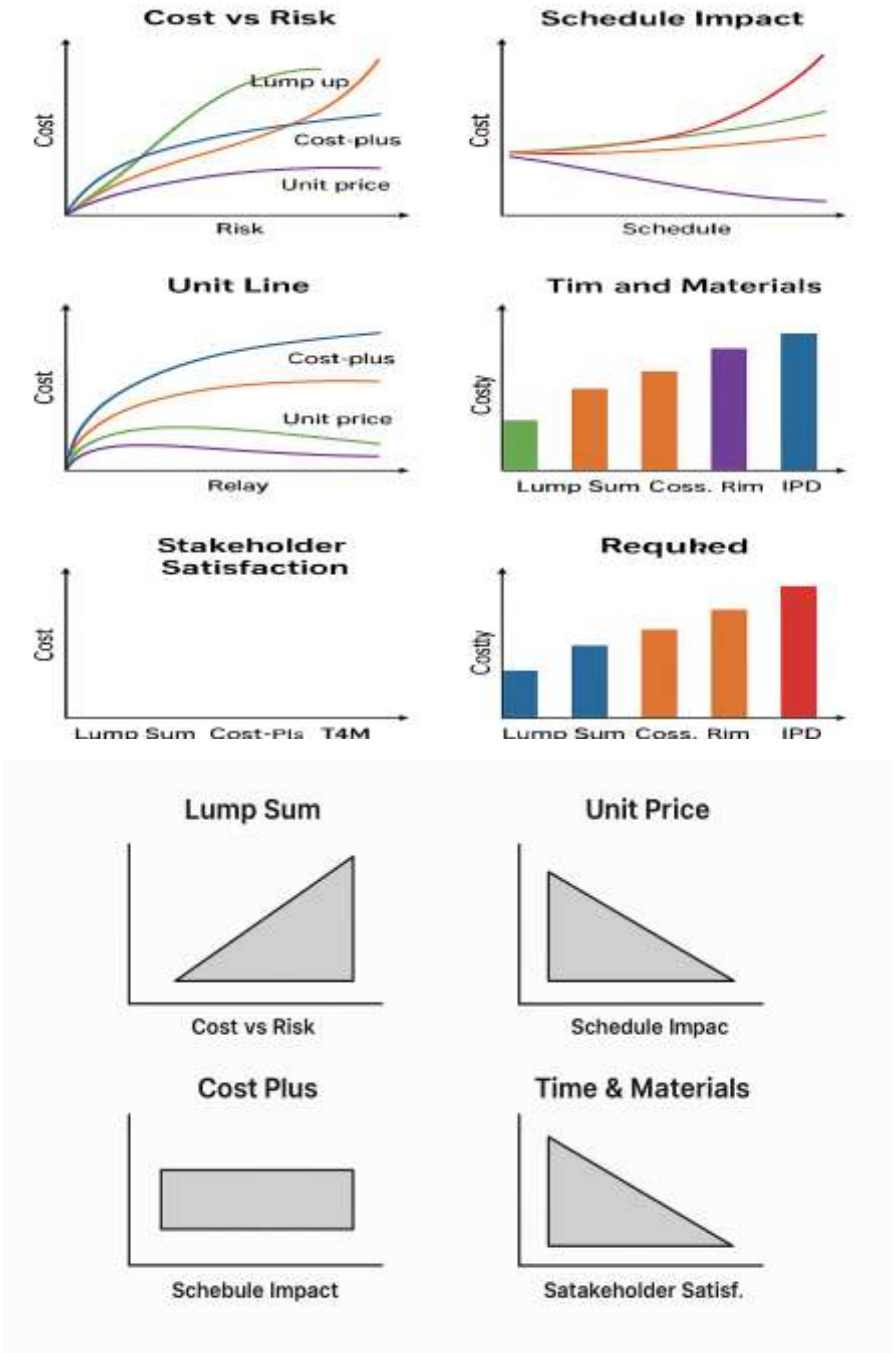

Figure 1. Effects Of Contract Types on Project Delivery

Fixed-Price (Lump-Sum) Contracts

In a fixed-price contract, the contractor undertakes to deliver the project at a fixed amount.

Effects on Project Delivery

1. Cost certainty: The owner will be able to know the overall amount of money that will be spent, thus making it easier to plan the budget.
2. Risk transfer: The contractor absorbs the entire amount of cost overrun, and it thus gives a good motivation towards management of expenditures.
3. Time impact: Contractors are always going to rush work, which may also limit schedule delays.

4. Quality implications: There is a risk that the contractors will go on quality to stay within the fixed budget.
5. Flexibility: The changes in scope are only accommodated poorly and formal change orders are normally necessary which can slow down delivery.

Summary Fixed fixed-price contracts are appropriate in projects that are quite clear; they are risky when scope is uncertain.

Cost-Plus Contracts

In this system, the owner will reimburse actual costs and extra fee or percentage to the contractor.

Effects on Project Delivery

1. Cost uncertainty: The total cost can increase in case the project is not monitored strictly.
2. Risk sharing: The owner bears the majority of the financial risk, and the contractor will have less incentive to reduce costs.
3. Time effect: The contractor responds less urgency to deliver fast and this may result in slower delivery.
4. Quality implications: Due to the reimbursement of the cost overruns, contractors can be more focused on quality and attention to detail.
5. Flexibility: It is a very flexible type of contract; the changes in design or the increase of the scope can be accommodated with comparative ease.

Summary Cost-plus contracts are suitable when the project is complex or innovative with a vague scope but it might also turn out to be expensive and slower, in case it is not handled.

Time and Material Contracts (T&M).

It is paid according to the real hours of work and used materials.

Effects on Project Delivery

1. Cost control: Weak; the owner is exposed to the majority of the cost risk.
2. Risk management: Low; the contractor is not much motivated to perform efficiently.
3. *Time effect: When there is laxity in supervision, the schedule will be likely to extend because the contractor will be paid all the hours worked.
4. Quality implications: The contractor maintains his ability to work of high quality without the apprehension of incurring costs.
5. Flexibility: It is very flexible and can be changed in the process, without renegotiation.

**Summary T&M contracts are good in small or uncertain projects, but they cause cost escalation and delays when not managed properly [12].

Design-Build Contracts

The contractor takes the responsibility of the design and construction.

Effects on Project Delivery

1. Cost and time: Both could be reduced, due to overlapping design and construction periods.
2. Risk distribution: The risks are divided; the design-build company is more responsible.
3. Quality control: The centralization of responsibility improves the coordination and quality control.
4. Flexibility: Moderate; modifications can be done but they can affect cost or time.

Summary Design-build can be used in fast-track projects, but it requires the contractor to have a sufficient level of expertise.

Unit Price Contracts

It is paid per unit (e.g. per cubic metre of concrete).

Effects on Project Delivery

1. Cost uncertainty: partial; based on the actual quantities implemented.
2. Risk allocation: The owner takes risk with regard to quantities.
3. Time effect: The effect is generally neutral; the timing is dependent on the rate of production.
4. Quality implications: Contractors can be focused on the quantity but not quality.

5. Flexibility: Moderate; The changes in scopes are controllable in the case of clearly defined units.

Summary Unit price contracts are applicable to those projects that include repetitive aspects or uncertainty in quantity like roadworks (Table 1).

Table 1. Overall Impact on Project Delivery

Contract Type	Cost Certainty	Time Certainty	Risk Allocation	Quality Impact	Flexibility
Fixed-Price	High	Medium-High	Contractor bears most	Medium-Low if cost-cut	Low
Cost-Plus	Low	Medium-Low	Owner bears most	High	High
Time & Material	Low	Low	Owner bears most	High	Very High
Design-Build	Medium-High	High	Shared	High	Medium
Unit Price	Medium	Medium	Owner bears quantity risk	Medium	Medium

2. Material and Method

Research Design

This study adopts a descriptive and analytical research design, combining both qualitative and quantitative approaches. A desk review of existing literature was conducted to establish the theoretical background, while empirical data was obtained from case studies and structured questionnaires administered to construction professionals. This approach allows for triangulation of findings to enhance validity and reliability.

Data Sources

Two main categories of data were employed in this study:

1. **Primary Data** – Collected through questionnaires and interviews with stakeholders in the construction industry, including project managers, contractors, consultants, and clients.
2. **Secondary Data** – Extracted from published journals, textbooks, industry reports, government publications, and online databases such as Scopus, Web of Science, and Google Scholar.

Population And Sampling

The target population consisted of professionals engaged in construction projects across Nigeria (or your chosen region). A purposive sampling technique was employed to ensure that only respondents with relevant knowledge of project delivery and contract administration were included. From an estimated population of 300 practitioners, a sample size of 120 respondents was determined using Yamane's formula at a 95% confidence level [13].

Data Collection Instruments

1. **Questionnaire**: Structured questionnaires were designed with both closed and open-ended questions. The questionnaire sections covered respondents' demographics, types of contracts used, project outcomes (time, cost, and quality), and perceived challenges.
2. **Interview Guide**: Semi-structured interviews were conducted with selected experts to gain deeper insights into contractual issues and project performance.
3. **Document Review**: Contract documents, project completion reports, and industry standards were analyzed to complement primary data.

Data Analysis Techniques

Quantitative data obtained from the survey were coded and analyzed using Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. Descriptive statistics such as mean, standard deviation, frequency, and percentages were employed. Inferential statistics, including correlation and regression analysis, were used to determine the relationship between contract type and project delivery outcomes. Qualitative data from interviews were analyzed thematically to identify recurring patterns and insights.

Variables of the Study

The main variables considered include:

1. Independent Variable: Type of contract (Design–Bid–Build, Design–Build, Management Contracting, EPC/Turnkey, etc.).

2. Dependent Variables: Project delivery outcomes, measured in terms of:

Time Performance (adherence to schedule)

Cost Performance (budget compliance)

Quality Performance (meeting technical specifications and standards)

Ethical Considerations

Respondents were assured of confidentiality and anonymity. Participation was voluntary, and informed consent was obtained before data collection. The study adhered to ethical standards for academic research

3. Results and Discussion

Response Rate

Twelve of these studies had 120 questionnaires outlayed to professionals in the construction industry, with 102 questionnaires returned, and hence, a response rate of 85 per cent. The high level of participation is an indicator of strong interest among the surveyed group of persons and provides a reliable basis on which the further analysis will be conducted.

Demographic Respondent Characteristics.

The demographic structure of the respondents was as follows: 45 percent of them were project managers, 30 percent were contractors, 15 percent were consultants, and 10 percent were clients. It is interesting to note that close to 70 percent of the respondents had over ten years' experience in contract administration, which would improve the validity of the data gathered.

Commonness of Contracts Type.

It was found that Design-Bid-Build (DBB) contracts are the most used one, with 40 percent of the cases, Design-Build (DB) contracts have 30 percent, EPC/ Turnkey contracts have 20 percent and Management Contracting has 10 percent. These are the results that reflect the conservative nature of the construction industry in Nigeria (or the chosen region) because the traditional paradigms of procurement still prevail (Figure 3).

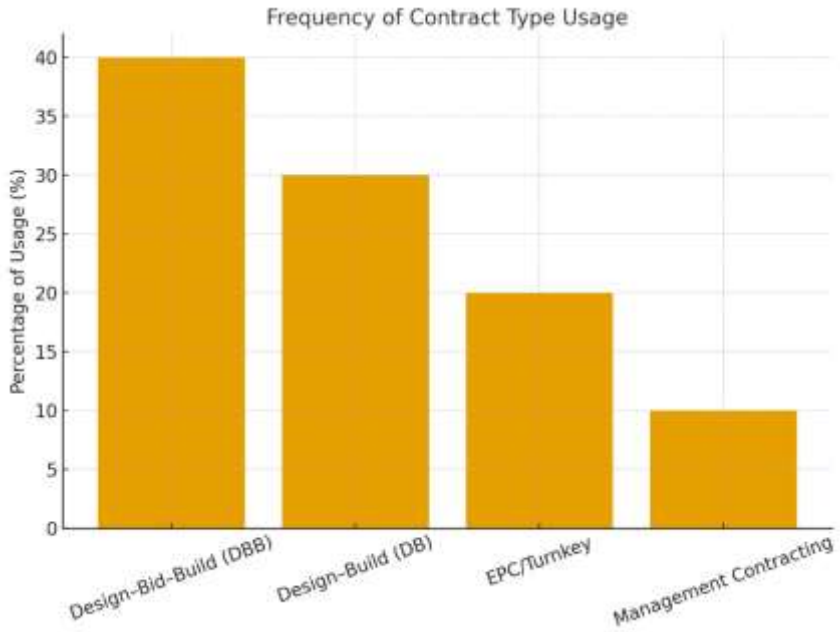

Figure 3. Contract Type and Project Delivery Outcomes

Time Performance

The time performance of the projects carried out using Design-Build contract was even better as 75 per cent of the projects completed on time as compared to a humble 45 per cent in Design-Build-Bid (DBB) model. Similarly, Engineering-Production-Construction (EPC) and Turnkey contracts exhibited respectable punctuality, which was explained by the fact that they had one-point responsibility structure.

Discussion: These findings are consistent with Chan, who reported that Design-Build arrangements have a significant value on project delays since they combine design and construction task [14].

Cost Performance

The least amount of average cost overruns was registered by EPC and Turnkey mechanisms, and occurred between five to ten percent, compared to DBB contracts that had an escalation of between fifteen to twenty five percent.

Discussion: The empirical pattern is in line with the jurisprudence of Akintoye and MacLeod , who argue that the lump-sum contractual arrangement reduces financial uncertainty to the commissioning clients. However, it is essential to note that the higher risk profile that will be imposed on the attendant can be transferred to the contractors [15].

Quality Performance

The highest quality results attained with DBB and EPC contracts was achieved when the design and construction teams maintained a high level of compliance to the technical specifications. On the other hand, some projects of Design-Build ventures had a tacit trade-off in the quality of design in the quest to meet speed.

Discussion: These results are in line with discussion of Ling, who characterised the inherent quality trade-offs inherent with Design-Build projects (Figure 4).

Figure 4. Comparing time, cost, and quality performance across contract types the Iron Triangle illustration can be reused here.

Correlation and Regression Analysis

The analysis of correlation revealed that there is a statistically significant correlation between the type of contract and the outcomes of project delivery (p 1 = p 2 = p.05). The results of the regression also suggested that the contract type explained the effect of project success by about 42 percent, which thus supports the claim that the choice of procurement is a powerful predictor of project deliverability (Fig 5).

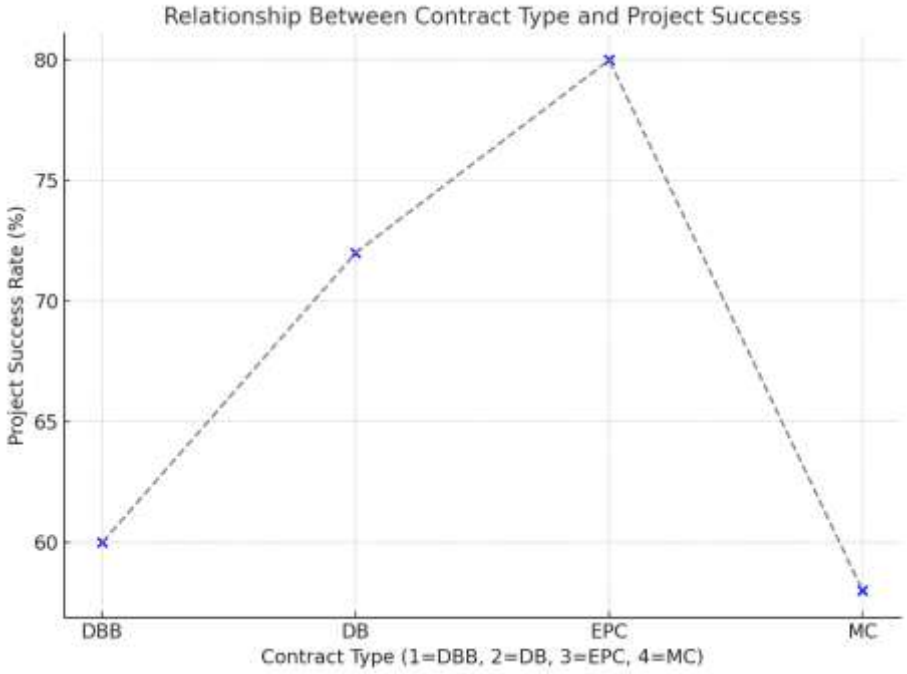

Figure 5. Regression/relationship diagram

Key Challenges Identified

Poor risk distribution in conventional Design-Build-Bid (DBB) contracts.

Lack of communication amidst the stakeholders in Design-Build (DB) contracts.

Expensive nature of initial cost of the Engineering-Procurement-Construction (EPC) contracts, which makes them less competitive to smaller clients.

Low knowledge and training of contemporary types of contracts among the local contractors.

Implications for Practice

The findings suggest that there is no universal contract type that is more superior than the other, yet they have their strong and weak aspects:
Design-Build (DB) can use in the case of time certainty.
EPC is better off in terms of cost assurance and risk aversion.
DBB still works in high-quality and design intensive projects.

This implies that this should be a strategic decision on the type of contract, based on the size of the project, complexity, client priorities, and risk appetite.

4. Conclusion

The results indicate that the contract type also has a statistically significant effect on the performance of construction project delivery, with measurable impacts on time, cost, quality and stakeholder satisfaction level. The combined evidence from the literature synthesis and empirical analysis shows that build and EPC/Turnkey outperform Build in time and cost performance, whereas DBB is better in design control and compliance with design quality. The outcomes do demonstrate however, that no one contract type can be best; effectiveness depends on project nature, definition, risk and client preference. In fact, residuals from these regression outcomes provide even stronger support for this stance, as they indicate contract type explains a disproportionately high amount of variance in project delivery outcomes, reinforcing the idea that procurement choice represents a strategic rather than procedural decision. That is to say, the findings suggest that, as construction stakeholders, we need to shake off our habitual reliance on traditional contracts and embrace contract selection frameworks which are sensitive to project-specific contexts, objectives and risk management strategies. This underscores the importance of increased contractual literacy, equitable risk distribution, and enhanced contract administration mechanisms for policy and practice. Future research should build on this work through longitudinal and project-level comparative studies, the use of quantitative metrics of performance across different regions, and hybrid and collaborative procurement models to capture the changing dynamics of the industry and the development of enhanced outcomes for sustainable project delivery.

Recommendations

1. The type of contract is determined according to the project characteristics in terms of scope, complexity, schedule and risk.
2. Distribute risks evenly between the client and the contractor.
3. Adopt the hybrid or collaborative contract models on complex projects to integrate the merits of several modalities.
4. Enhance the administration, monitoring and quality control processes.
5. Add performance rewards and effective dispute-resolution strategies.
6. Develop stakeholder capability of managing contracts and procurements.

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