



Comparative Performance Analysis of Government Building Projects Using Design-Bid-Build (DBB) and Design-Build (DB) Delivery Methods

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Abstract

The performance of government building projects is an important indicator of successful infrastructure delivery. However, these projects often face delays, coordination problems, and deviations between planned and actual progress. Differences between Design-Bid-Build (DBB) and Design-Build (DB) delivery systems may influence project performance. This study aims to compare the performance of government building projects implemented under DBB and DB systems. A quantitative approach was employed to analyze planned and actual progress curves from 12 government building projects. Performance was evaluated primarily based on the alignment between planned and actual progress throughout the construction period. The results reveal considerable variation in performance across the projects. DB implementation did not consistently produce better performance in every project; nevertheless, DB projects demonstrated relatively better overall performance than DBB projects. These findings indicate that project performance is not determined solely by the delivery system but is also associated with project control, stakeholder coordination, resource management, and the ability to respond to implementation deviations. The findings provide a basis for developing an early warning framework to identify potential schedule delays and support timely corrective actions in government building projects.

Keywords: *Design-Build, Design-Bid-Build, Government Building Projects, Project Performance, Early Warning System*

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INTRODUCTION

The Indonesian government allocates 10.79% of the annual State Budget (Anggaran Pendapatan dan Belanja Negara, APBN) to infrastructure development to meet infrastructure needs and support economic growth. Therefore, infrastructure projects need to be robust,

appropriately targeted, and designed to meet long-term public needs. However, infrastructure development continues to face several challenges, including delays in project handover, construction waste, ineffective coordination among project parties, and inadequate integration among stakeholders. These challenges highlight the importance of

selecting an appropriate project delivery system to improve project implementation and performance.

In Indonesia, two project delivery systems commonly used for infrastructure development are Design-Bid-Build (DBB) and Design-Build (DB). These systems have different characteristics and applications, particularly in terms of contractual relationships and the timing of stakeholder involvement. Recent research has also identified patterns in contractual payment provisions and stakeholder selection criteria commonly associated with each delivery system [1]. A review of the literature indicates several fundamental differences between DBB and DB in their processes, implementation arrangements, coordination requirements, design-change risks, construction duration, and project control. These differences are summarized in Table 1.

Table 1. Differences between Design-Bid-Build (DBB) and Design-Build (DB)

Aspect	Design-Bid-Build (DBB)	Design-Build (DB)
Process	Design and construction are carried out separately.	Design and construction are integrated.
Implementing parties	The design consultant and construction contractor are separate entities.	Design and construction are managed by a single entity or integrated team.
Coordination	Generally more complex.	Generally more streamlined.
Design-change risk	Relatively higher.	Relatively lower.
Construction duration	Relatively longer.	Relatively shorter.
Project control	Conducted in successive stages.	Managed through an integrated process.

As shown in Table 1, DBB and DB differ in several aspects of project delivery. In DBB, design and construction are separated, requiring coordination between different contractual parties. In contrast, DB integrates design and construction within a

single delivery arrangement, potentially simplifying coordination and facilitating the management of design-related issues. Nevertheless, these general characteristics should not be interpreted as evidence that DB will consistently outperform DBB in every project, because actual performance may also depend on project conditions and management practices.

One important distinction between the two systems is the level of design readiness required before the procurement process begins. Figure 1 illustrates the difference in project readiness associated with DBB and DB, as discussed by El Ibrahim et al. [2]

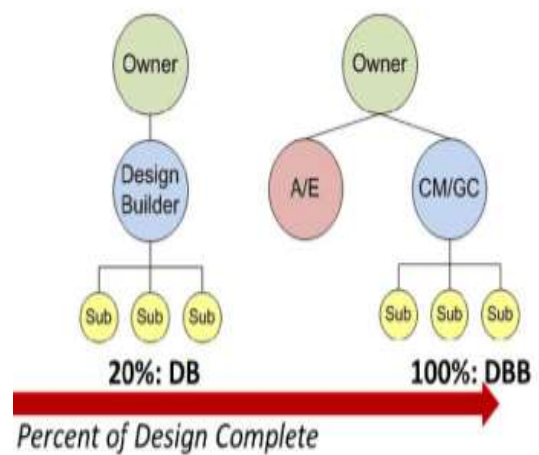


Figure 1. Differences in project readiness requirements between DBB and DB [2]

As illustrated in Figure 1, the DB approach can allow the tendering process to begin when project readiness reaches approximately 20%, whereas DBB generally requires the design to be completed before the construction tender can proceed. This distinction reflects the different sequencing of design and construction in the two delivery systems. The potential for earlier procurement under DB may provide scheduling advantages; however, the actual benefits depend on project readiness, coordination, and the effectiveness of implementation.

As illustrated in Figure 1, the DB approach can allow the tendering process to begin when project readiness reaches approximately 20%, whereas DBB generally requires the design to be completed before the construction tender can proceed. This distinction reflects the different

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Previous studies have examined the performance of alternative project delivery systems using various indicators. Ibrahim et al. [2] compared traditional and alternative delivery approaches, including integrated construction and partnering arrangements. Their assessment considered schedule growth, cost growth, design deficiencies, and project modifications. Partnering projects performed best in terms of schedule growth, whereas DB projects performed better in terms of cost growth and design deficiencies. Hybrid delivery arrangements performed better in terms of project modifications. Traditional DBB projects showed comparatively weaker performance in schedule growth, modifications, and design deficiencies. The study also highlighted the relationship between team integration and project performance.

Bennett et al., as reported by El Asmar et al. [3] compared the cost, schedule, and quality performance of DB and DBB projects in the United Kingdom. Their findings indicated that DB projects achieved a 30% improvement in delivery speed and a 12% improvement in construction speed, together with a 13% reduction in unit cost. Similarly, research by Sanvido and Konchar (1998), as discussed in the literature, indicated that DB performed better than Construction Manager at Risk (CMR), which in turn performed better than DBB. The performance measures included unit cost, construction speed, and delivery speed, with statistically significant differences reported for the measures examined.

investigated DB performance in the public sector by considering several project-related variables, including owner experience, design completion level, design-builder selection, contract type, procurement method, and variations in the DB process. Their performance measures included quantitative indicators, such as cost growth and schedule growth, and qualitative indicators, such as quality relative to user expectations, construction administration burden, and overall owner satisfaction. Their quantitative findings indicated that 59% of DB projects experienced cost

growth of less than 2%, while 77% experienced schedule growth of less than 2%. The qualitative findings also indicated that most owners were satisfied with DB project performance [4], [5].

Katar [6] evaluated DBB and DB projects and reported a performance score of 3.96 for DB and 2.81 for DBB. The evaluation covered labor-cost impacts, cost variation from original estimates, design integration, and engineering integration. These findings provide further evidence of differences between the two delivery systems across several project performance dimensions. Meanwhile, Sari et al. [7] concluded that stronger integration and more extensive partnering are needed to improve the performance of DBB projects.

Taken together, previous studies indicate that Design-Build (DB) may offer advantages over Design-Bid-Build (DBB) in several performance dimensions, including delivery speed, construction speed, cost, and integration. However, the findings also indicate that project delivery performance can vary according to project characteristics, design readiness, stakeholder coordination, and project-control practices. Although previous studies have compared DB and DBB using various performance indicators, the performance patterns observed in selected Indonesian government building projects remain important to examine within their specific implementation context. In particular, a descriptive comparison of planned and actual progress curves can provide insight into how schedule performance varies across projects implemented under the two delivery systems. Such an analysis does not establish the causal effect of the delivery system, but it can identify differences in observed progress patterns and highlight potential schedule deviations that warrant further investigation.

Accordingly, this study compares the schedule performance of 12 government building projects implemented using DBB and DB delivery systems in Indonesia. Its contribution lies in presenting a comparative

description of the distribution of schedule-performance classifications and the patterns of deviation between planned and actual progress across the selected projects. The study also discusses how periodic progress monitoring may provide a basis for developing an early warning framework for potential schedule delays. The findings are intended to provide context-specific descriptive evidence rather than to establish the universal superiority of one delivery system or validate an early warning system.

METHOD

A. Research Design and Project Selection

This study employed a quantitative descriptive approach to compare the schedule performance of government projects implemented using the Design-Bid-Build (DBB) and Design-Build (DB) delivery systems. The study focused on projects financed through Indonesia's State Budget (Anggaran Pendapatan dan Belanja Negara/APBN). The comparison was based on planned and actual progress curves available for each selected project. Rather than assuming that the projects had identical characteristics, the study considered their common public-sector context and delivery-system classification while acknowledging differences in project functions and implementation conditions.

The projects were selected using purposive sampling based on the availability of planned and actual progress curves, the delivery system applied, and the availability of project implementation information required for descriptive comparison. The selection criteria also included a contract value exceeding IDR 100 billion, as specified in the study design. The final sample consisted of 12 projects, comprising four DBB projects and eight DB projects. Comparability was considered in terms of their public-sector context, funding source, contract-value criterion, and availability of progress information. However, the projects differed in their functional purposes, locations, and implementation years. Consequently, the analysis was descriptive and focused on observed schedule-progress patterns rather than assuming equivalent technical complexity or implementation conditions across all projects. The selected projects, including their

locations, implementation years, and delivery systems, are presented in Table 2.

Table 2. Government Building Projects Selected for the Study

No.	Project Name	Project Location	Implementation Year	Delivery System
1	Cakung Barat	DKI Jakarta	2022	DBB
2	Ujung Menteng	DKI Jakarta	2022	DBB
3	Pasar Atas Bukittinggi	West Sumatra	2024	DBB
4	Taman Mini Indonesia Indah (TMII)	DKI Jakarta	2022	DBB
5	Haji Deli Serdang General Hospital	North Sumatra	2024	DB
6	North Sumatra Main Stadium	North Sumatra	2024	DB
7	BPKP Building	DKI Jakarta	2023	DB
8	Wisma Atlet	DKI Jakarta	2018	DB
9	Permanent Housing (Huntap), Cianjur	West Java	2023	DB
10	Integrated Waste Processing Facility (TPST), IKN	East Kalimantan	2023	DB
11	IKN Axis 1	East Kalimantan	2023	DB
12	IKN Axis 2	East Kalimantan	2024	DB

B. Data Analysis Procedure

The project evaluation was conducted by comparing planned construction progress with actual progress for each selected project. This comparison was used to assess the extent to which project implementation followed the established schedule. The analysis focused on the relationship between planned and actual

progress throughout the construction period.

Projects were evaluated according to the deviation between planned and actual progress. When actual progress remained below planned progress, the condition was interpreted as an indication of implementation delay. Conversely, when actual progress remained close to or aligned with planned progress, the project was considered to have relatively good schedule performance. This comparison provided a basis for identifying differences in schedule performance among the selected government building projects.

Based on the progress evaluation, project performance was classified into three categories: good, moderate, and delayed. The classification was used to summarize the performance of projects under the DBB and DB delivery systems and to compare the overall distribution of outcomes between the two groups. The resulting classifications were then examined to identify differences in performance patterns and to discuss the potential relevance of project control, stakeholder coordination, resource management, and implementation conditions.

The Good, Moderate, and Delayed categories were assigned through visual inspection of the planned and actual progress curves. The assessment considered the proximity between the two curves, the persistence of deviations during implementation, and the apparent progress gap toward the end of the observation period. These criteria were applied qualitatively rather than through predefined numerical thresholds. Because the original monthly numerical progress records were unavailable, the classifications could not be recalculated using explicit quantitative cutoffs. Therefore, the categories should be interpreted as descriptive assessments of the observed progress patterns rather than as standardized quantitative measurements of schedule performance.

The analysis was primarily based on planned and actual progress patterns. Accordingly, the interpretation of the results emphasizes schedule performance and observed deviations rather than assuming that the progress curves alone establish performance in cost, quality, occupational health and safety, or environmental management. The findings were used to provide a basis for discussing potential improvements in project monitoring and the development of an early warning framework

for identifying schedule deviations.

RESULTS & DISCUSSION

A. Planned and Actual Project Progress

The performance of the 12 government building projects was evaluated by comparing planned and actual progress curves over a ten-month implementation period. The planned curve represents the expected cumulative progress, whereas the actual curve indicates the cumulative progress achieved during implementation. The relative position of the two curves provides a descriptive indication of schedule performance. When actual progress closely follows planned progress, the deviation from the planned schedule is relatively small. Conversely, when actual progress remains below planned progress, the pattern indicates a potential schedule delay.

The results reveal variations in schedule performance across the projects implemented under the Design-Bid-Build (DBB) and Design-Build (DB) delivery systems. Some projects maintained close alignment between planned and actual progress, while others experienced increasingly large deviations toward the end of the observation period. Based on the performance classifications used in this study, the projects are discussed in three groups: good, moderate, and delayed performance.

B. Projects with Good Performance

Four projects were classified as having good performance: Haji Deli Serdang General Hospital, BPKP Building, IKN Axis 1, and IKN Axis 2. Their actual progress curves generally remained close to or exceeded the planned curves during several implementation stages.

Haji Deli Serdang General Hospital. Figure 2 shows that actual progress closely followed planned progress throughout the ten-month period. Minor differences appeared during some implementation stages, but the two curves remained closely aligned. Both curves reached approximately 100% at the end of the period. This pattern indicates relatively consistent schedule performance, with no substantial cumulative deviation visible in the graph.

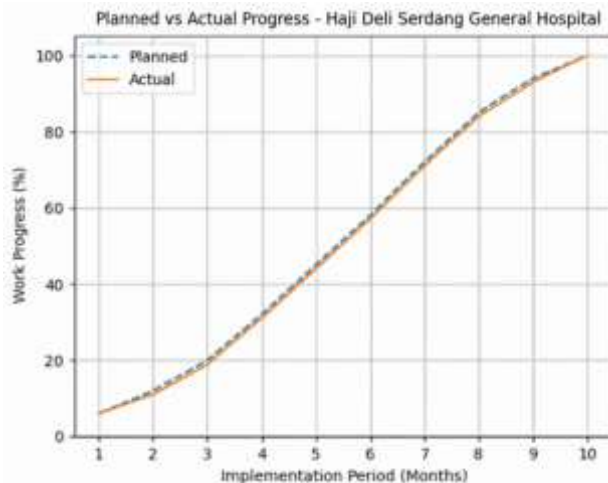


Figure 2. Planned and Actual Progress of Haji Deli Serdang General Hospital

BPKP Building. As shown in Figure 3, actual progress was initially below planned progress, particularly during the early and middle implementation stages. The gap narrowed as construction progressed, and the actual curve converged with the planned curve toward the end of the period. Actual progress reached approximately 100% by month 10. This pattern suggests that the initial schedule deviation was progressively recovered during the later stages of implementation.

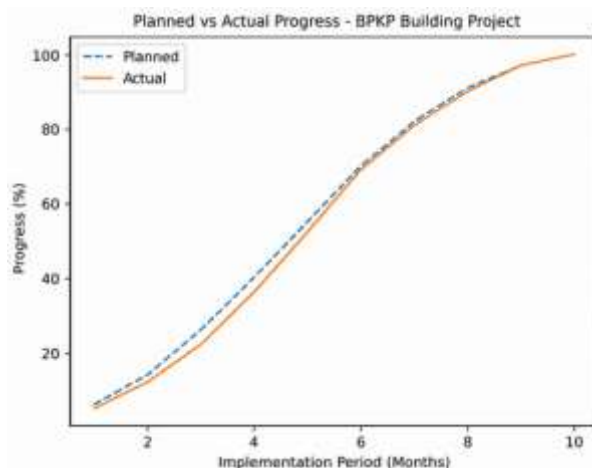


Figure 3. Planned and Actual Progress of BPKP Building

IKN Axis 1. Figure 4 indicates that actual progress exceeded planned progress during several implementation stages, particularly in the middle portion of the period. The difference was visible before the two curves converged near completion. Both curves reached approximately 100% by month 10. This pattern indicates that cumulative

actual progress was ahead of the planned schedule during part of the construction period.

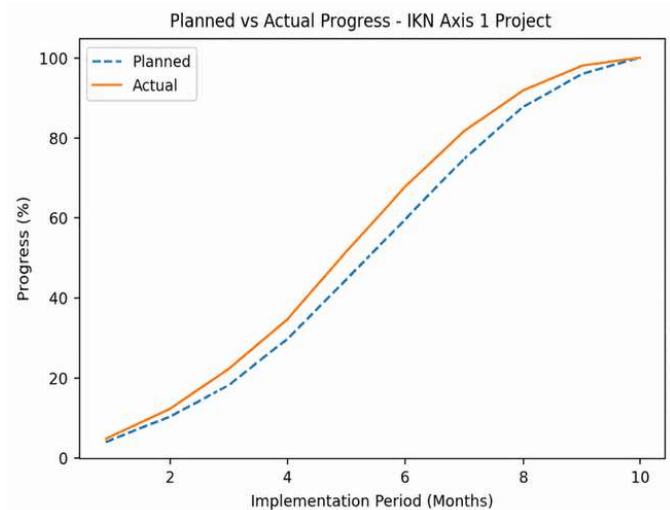


Figure 4. Planned and Actual Progress of IKN Axis 1

IKN Axis 2. Figure 5 shows a relatively close relationship between planned and actual progress. Actual progress was slightly below the planned curve during parts of the middle implementation stage, but the gap narrowed in subsequent periods. Both curves approached 100% at the end of month 10. Compared with projects showing persistent and widening deviations, this pattern indicates relatively controlled schedule performance.

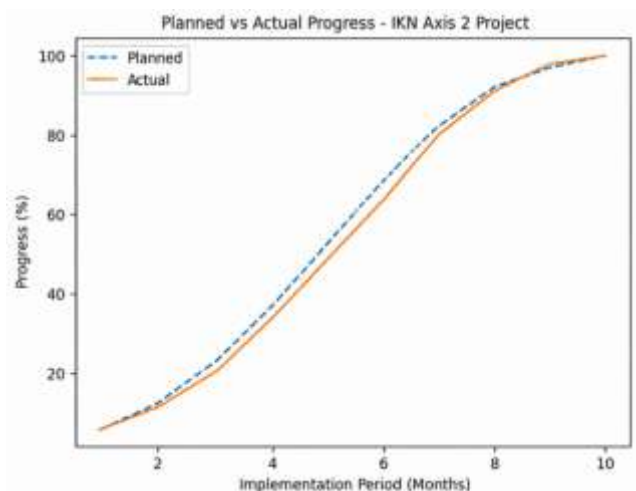


Figure 5. Planned and Actual Progress of IKN Axis 2

Overall, the four projects classified as having good performance displayed either close alignment between planned and actual progress or periods in which actual progress exceeded the

plan. These observations support the descriptive classification of their schedule performance. However, the progress curves alone do not establish which managerial or technical factors contributed to these outcomes.

C. Projects with Moderate Performance

Four projects were classified as having moderate performance: North Sumatra Main Stadium, Huntap Cianjur, Taman Mini Indonesia Indah (TMII), and Pasar Atas Bukittinggi. Their actual progress generally followed the planned trajectory, although differences between the curves became visible during particular implementation stages or toward project completion.

North Sumatra Main Stadium. Figure 6 shows that actual progress remained below planned progress during much of the implementation period. The difference became more apparent during the middle and later stages, particularly from approximately month 5 onward. By month 10, actual progress was close to, but still slightly below, the planned completion level. This pattern indicates a schedule deviation that persisted toward the end of the observed period.

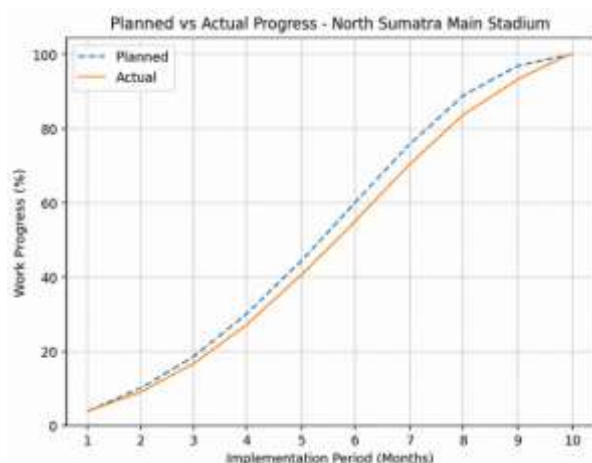


Figure 6. Planned and Actual Progress of North Sumatra Main Stadium

Huntap Cianjur. As illustrated in Figure 7, actual progress initially followed a trajectory relatively close to the planned curve. The gap became more pronounced during the middle implementation stage, particularly around months 4–7, when actual progress remained below the plan. The difference narrowed toward the end of the period, although actual progress finished slightly below the planned curve. This pattern indicates partial recovery from

the mid-period deviation without complete convergence by month 10.

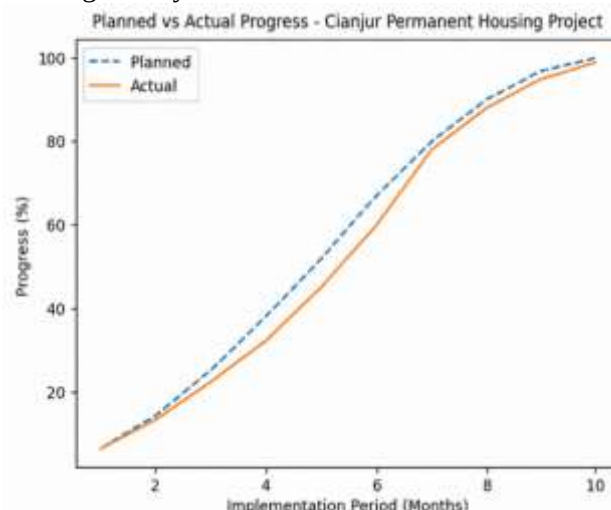


Figure 7. Planned and Actual Progress of Huntap Cianjur

Taman Mini Indonesia Indah (TMII). Figure 8 presents a relatively consistent relationship between planned and actual progress. The two curves were close during the early implementation stages, while actual progress fell slightly below planned progress during parts of the middle and later stages. The difference remained comparatively limited, and actual progress approached the planned completion level by month 10. The observed pattern is consistent with moderate schedule performance, characterized by relatively small but persistent deviations.

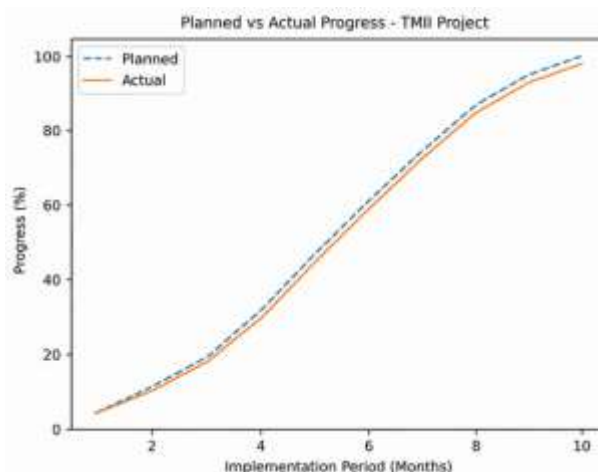


Figure 8. Planned and Actual Progress of Taman Mini Indonesia Indah (TMII)

Pasar Atas Bukittinggi. Figure 9 shows that actual progress closely followed planned progress during the early and middle

implementation stages. A more noticeable gap emerged from approximately month 7 onward, with actual progress remaining below the planned curve through the end of the period. Actual progress reached approximately 90%, compared with planned progress of approximately 100%. This difference indicates that the project experienced a more substantial deviation near the end of the observed schedule.

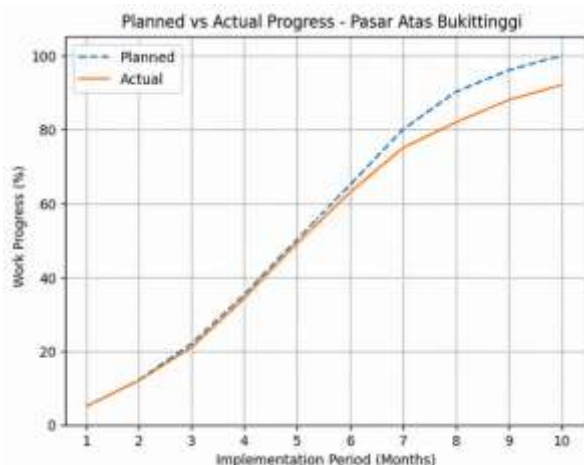


Figure 9. Planned and Actual Progress of Pasar Atas Bukittinggi

Taken together, the four projects in this category showed varying degrees of divergence from their planned schedules. Some maintained close alignment for most of the implementation period, while others experienced more visible deviations during the later stages. The moderate classification therefore reflects the overall patterns recorded in the study rather than an identical level of deviation across all four projects.

D. Projects with Delayed Performance

Four projects were classified as delayed: Ujung Menteng, TPST IKN, Wisma Atlet, and Cakung Barat. Their graphs show that actual progress remained below planned progress, with the gap becoming particularly evident during the middle or later stages of implementation.

Ujung Menteng. Figure 10 shows an increasing gap between planned and actual progress as implementation advanced. The difference became more pronounced from approximately month 4 and continued to widen through month 10. At the end of the observation period, actual progress was approximately 90%, whereas planned progress had reached 100%. This persistent and widening

deviation indicates that the project did not achieve its planned cumulative progress by the end of the observed period.

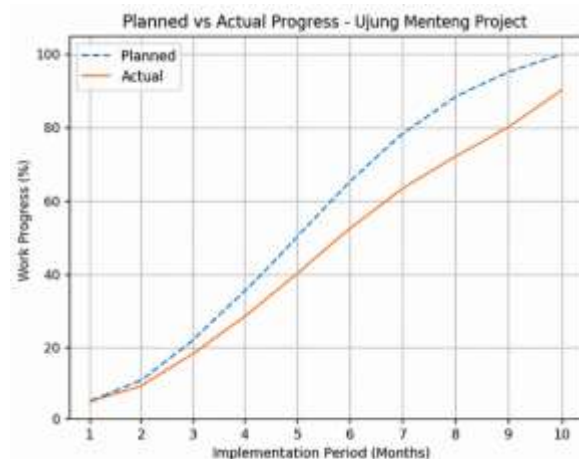


Figure 10. Planned and Actual Progress of Ujung Menteng

TPST IKN. As shown in Figure 11, actual progress followed the planned trajectory during the early stages but remained below the planned curve during much of the subsequent implementation period. The difference became more visible in the middle and later stages. By month 10, actual progress was approximately 93–95%, while planned progress was close to 100%. The remaining gap indicates that the project had not fully reached its planned cumulative progress at the end of the observation period.

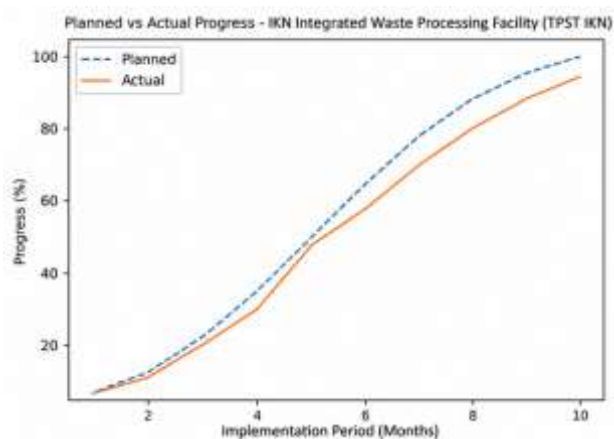


Figure 11. Planned and Actual Progress of the IKN Integrated Waste Processing Facility (TPST IKN)

Wisma Atlet. Figure 12 shows that actual progress was consistently below planned progress during much of the ten-month period. The deviation became more apparent from the middle stages onward and remained visible until the end of the graph. Actual progress reached approximately 95% by month 10, while planned progress approached 100%. This pattern indicates that the project experienced a cumulative schedule deviation that was not fully recovered during the observed period.

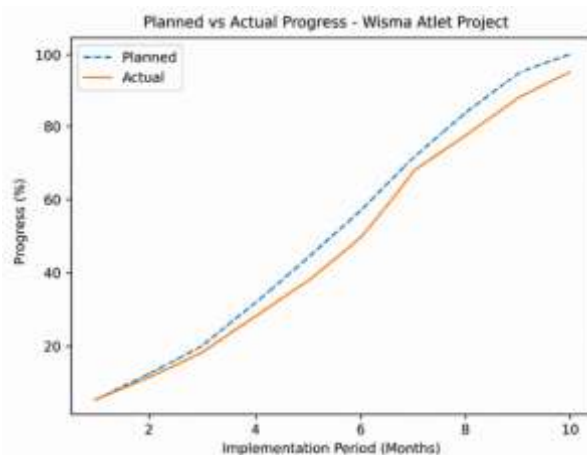


Figure 12. Planned and Actual Progress of Wisma Atlet

Cakung Barat. Figure 13 presents the most pronounced divergence among the four projects in this category. The planned curve accelerated during the middle and later implementation stages, whereas actual progress increased at a slower rate. The gap widened substantially after approximately month 4 and remained large through month 10. At the end of the observation period, actual progress was approximately 85%, compared with planned progress of 100%. This difference indicates a substantial shortfall relative to the planned schedule.

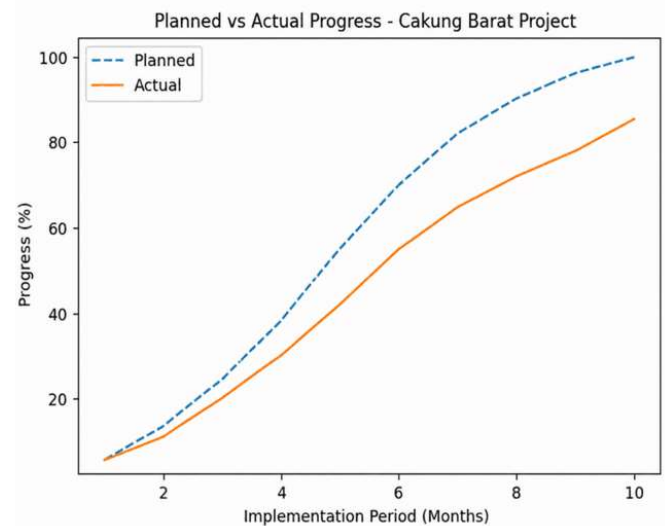


Figure 13. Planned and Actual Progress of Cakung Barat

The four graphs demonstrate that the delayed projects did not achieve the cumulative progress specified in their planned schedules within the observed period. The magnitude and development of the deviations differed across projects, with Cakung Barat showing the largest visible gap at the end of the period. Potential explanations, such as resource availability, material procurement, coordination, or implementation constraints, require additional project records to verify and cannot be established from progress curves alone.

E. Comparative Performance of DBB and DB Projects

The performance classifications were compared to describe the distribution of outcomes under the DBB and DB delivery systems. Table 3 summarizes the classification of each project based on the study data.

Table 3. Schedule Performance Classification of Government Building Projects

No.	Project	Delivery System	Performance Classification
1	Cakung Barat	DBB	Delayed
2	Ujung Menteng	DBB	Delayed
3	Pasar Atas Bukittinggi	DBB	Moderate
4	TMII	DBB	Moderate

5	Haji Deli Serdang General Hospital	DB	Good
6	North Sumatra Main Stadium	DB	Moderate
7	BPKP Building	DB	Good
8	Wisma Atlet	DB	Delayed
9	Huntap Cianjur	DB	Moderate
10	TPST IKN	DB	Delayed
11	IKN Axis 1	DB	Good
12	IKN Axis 2	DB	Good

The distribution of performance classifications is summarized in Table 4.

Table 4. Distribution of Project Performance by Delivery System

Performance Classification	DBB (n = 4)	DB (n = 8)
Good	0 (0%)	4 (50%)
Moderate	2 (50%)	2 (25%)
Delayed	2 (50%)	2 (25%)
Total	4 (100%)	8 (100%)

The results presented in Table 4 indicate that the DB projects generally exhibited a more favorable distribution of schedule performance classifications than the DBB projects in the observed sample. None of the DBB projects was classified as having good performance, with 50% classified as moderate and 50% as delayed. In contrast, 50% of the DB projects were classified as good, 25% as moderate, and 25% as delayed. These findings suggest a relatively more favorable schedule performance distribution for DB in this sample, although the outcomes varied among individual projects.

Sullivan [3], in their review of project delivery performance over two decades, reported that Design-Build demonstrated advantages over Design-Bid-Build in several performance dimensions, including cost, quality, and schedule. Similarly, Katar [6] highlighted the coordination capabilities of DB and its potential to reduce design changes. El Asmar [8] also compared DB and DBB delivery systems and found that DB

performed better in several aspects. These previous findings provide a broader context for interpreting the relatively favorable distribution of DB project performance observed in the present study. However, the current analysis focuses primarily on planned and actual progress curves and does not independently evaluate cost, quality, occupational health and safety, or environmental performance.

Despite the relatively favorable distribution, 25% of the DB projects in the present sample were classified as delayed. This finding indicates that an integrated delivery arrangement does not automatically eliminate schedule deviations during implementation. Effective operational control and continuous monitoring remain necessary to identify deviations and support timely corrective action [9], [10], [11], [12], [13]. In this context, the planned and actual progress curves provide a practical basis for identifying potential schedule risks, particularly when the gap between the two curves persists or widens over time.

This interpretation is consistent with Bigwanto et al.[14], who emphasized the importance of a shared vision and coordination throughout project implementation when applying lean construction principles to improve project performance and recover schedule delays. Previous literature has also identified cost, quality, schedule, health and safety, environmental considerations, and organizational culture as relevant dimensions in construction project performance assessment [15]. These dimensions, however, should be distinguished from the variables directly evaluated in the present study, which are based on planned and actual schedule progress.

Furthermore, Sari et al. [16], [17] emphasized the importance of establishing a shared vision at the beginning of a project under both integrated and non-integrated project delivery systems. Taken together, these studies suggest that delivery-system selection should be accompanied by appropriate coordination, monitoring, and project-control practices. Accordingly, the present findings support the use of progress monitoring as a basis for developing an early warning framework to identify potential schedule deviations. Further research using additional project records would

be required to determine the causes of delays and validate the effectiveness of such a framework.

The comparison should also be interpreted in light of the unequal sample sizes, comprising four DBB projects and eight DB projects. Because the groups were small and unbalanced, the observed distribution of schedule-performance classifications may be sensitive to the characteristics of the individual projects included in the sample. Therefore, the differences reported in this study describe the selected projects and should not be generalized to all government building projects or interpreted as evidence of the inherent superiority of either delivery system.

CONCLUSION

This study compared the schedule performance of 12 government building projects implemented using Design-Bid-Build (DBB) and Design-Build (DB) delivery systems by examining planned and actual progress curves. The results show that the DB projects had a more favorable distribution of performance classifications than the DBB projects in the observed sample. Of the eight DB projects, 50% were classified as having good performance, 25% as moderate, and 25% as delayed. In comparison, none of the four DBB projects was classified as having good performance, while 50% were moderate and 50% were delayed. These findings indicate that DB was associated with a relatively more favorable distribution of schedule performance in the projects examined; however, DB did not consistently ensure that projects achieved their planned progress.

The comparison also highlights the importance of monitoring deviations between planned and actual progress. Persistent or widening gaps between the two curves can serve as an initial indication of potential schedule delays and provide a basis for further investigation and corrective action. Accordingly, the findings support the potential use of periodic progress monitoring as a basis for developing an early warning framework. Nevertheless, this study is descriptive, is based on a limited sample of 12 projects, and does not establish statistical significance or identify the causal factors underlying project performance. The unequal group sizes (DBB, $n = 4$; DB, $n = 8$) further limit the comparability of the observed distributions and the extent to which the findings can be generalized beyond the selected projects.

Further research using a larger and more diverse project sample, original numerical progress records, and explicitly defined classification thresholds is required to improve the reproducibility of schedule-performance assessments and investigate the factors associated with schedule deviations.

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