Cost and Schedule Performance of Building Construction Logistics: A study of the current state of Building construction practices on project delivery in South East Nigeria [1]

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ABSTRACT

Contractors, suppliers, and trucking firms may find it difficult to communicate effectively with one another due to the logistical complexity of many projects. As a result, deliveries are delayed, deadlines are missed, and the overall profitability of the project may be jeopardized. This will eventually affect how logistics and deliveries are managed towards achieving project success. Therefore, the study explored the use of earned value analysis technique to measure cost and schedule performance indexes of building construction logistics for successful project delivery at any given milestone. The study design includes field survey and multiple case study approaches. Data were obtained through the collection of cost and schedule performance of logistics data base of the case study construction companies at two different milestone of after six months(01-03-2022 to 01-09-2022.) and after twelve months(02-09-2022 to 02-03-2023). Earned Value Analysis, factor analysis and multiple regression were tailored towards the analysis of the major issues in the study and executed with the aid of statistical tool in SPSS version 25.0. The logistics data result were computed using Cost Performance Index (CPI) and Scheduled Performance Index (SPI).Hence, the study concludes that the result was too poor thus signaling the need to developing an improved building construction logistics framework(BCLF). The study recommends the adoption of the BCLM, which is a simplified model aimed at improving time overruns, material coordination and logistical inefficiencies.

Keywords: *Construction Logistics, Factor analysis, multiple regression, Schedule performance index, Cost performance index, Milestone, South East.*

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INTRODUCTION

In recent years, more focus has been placed on the logistics activities in construction projects in order to reduce total costs. Despite its significance, the construction industry continues to experience persistent challenges relating to project delays, cost overruns, inefficient resource utilization, poor coordination among stakeholders, and ineffective logistics management. Studies indicate that a significant proportion of construction projects exceed their planned budgets and schedules due to inadequate planning, poor monitoring systems, material shortages, inefficient procurement processes, and ineffective logistics coordination (Chen & Zhang, 2012; Aramali et al. 2022)

Building construction projects are characterized by high levels of complexity because they involve multiple interdependent activities that require effective coordination of labor, materials, equipment, subcontractors, and information throughout the project lifecycle. Construction logistics forms the backbone of these activities by ensuring that construction resources are delivered to the right location, at the appropriate time, in the required quantity and quality, while minimizing waste and unnecessary costs. Efficient logistics management significantly influences project productivity, safety performance, sustainability, and overall project success. Conversely, ineffective logistics planning often results in material shortages, excessive inventory, transportation delays, equipment idle time, site congestion, increased operational costs, and project schedule disruptions. Recent reviews emphasize that logistics remains an underdeveloped but highly influential component of construction management and sustainability (Haag and Junger, 2023)

Construction logistics encompasses the planning, implementation, coordination, and control of the movement and storage of construction materials, equipment, workforce, and information from suppliers to construction sites. Unlike manufacturing industries where production occurs in fixed locations, construction projects operate in dynamic and constantly changing environments. Every construction site presents unique logistical challenges arising from varying geographical conditions, limited storage spaces, changing work sequences, weather conditions, traffic restrictions, and stakeholders' requirements. These characteristics require project managers to adopt sophisticated planning and monitoring techniques capable of integrating project cost, schedule, scope, and logistics performance simultaneously. (Haag and Junger, 2023).

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Therefore, this study will examine the cost and schedule performances of building construction logistics in achieving successful project delivery in relation with the adoption of building construction logistic framework.

LITERATURE REVIEW.

According to Wegelius-Lehtonen (2001) argues that construction logistics requires systematic performance measurement because construction firms simultaneously manage different projects, material groups, suppliers and subcontractors. Construction logistics therefore involves coordinating material flows from suppliers to the construction site and subsequently to the location where materials are required for installation. Construction logistics is therefore not merely a transportation activity. It is a coordination mechanism connecting procurement, suppliers, contractors, site operations, subcontractors and project scheduling. Ineffective coordination among these activities can result in material shortages, excessive inventory, double handling, idle labour, equipment downtime, waste, congestion and ultimately increased project cost and duration. Even with technology advancements, construction logistics management has grown more difficult at project sites due to increased construction volume, despite the expansion of the industry (Ibrahim & Usman 2015). As a result, construction logistics management is still highly inefficient in developing countries like Nigeria. Construction sites require the proper materials in the right quantity, quality, and time, and logistics is a crucial component of supply chain management that helps to meet these needs (Janné, 2018)

Poor cost performance may occur when actual expenditure exceeds the original project estimate. Cost overruns can originate from changes in scope, inaccurate estates, inflations, poor procurement practices, material price fluctuations, rework, inefficient labour utilization, delays and ineffective logistics. Kar and Jha (2020) provided empirical evidence of this relationship in construction project in India identified six material –management factors that significantly disrupted cost and schedule performance. Improper material delivery as the most critical factor, followed by inadequate material planning, lack of information and communication, financial problems in procurement changes in material requirement and transportation difficulties. Karkkainen (2006) observed that modern construction management approaches require greater transparency regarding material availability and shorter response times in the supply chain. They identified material delivery problem as an important challenge for construction operations.

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The increasing complexity of modern building construction projects has further strengthened the relevance of Earned Value Analysis. Contemporary construction projects frequently involve multiple contractors, advanced construction technologies,

Building construction logistics directly influences the variables measured by Earned Value Analysis. Material procurement delays, transportation inefficiencies, poor warehouse management, equipment shortages, labor productivity issues, and inadequate site coordination affect project schedules and increase project costs. Consequently, logistics performance becomes an essential determinant of earned value indicators. When logistics activities are effectively coordinated, construction operations proceed according to schedule, minimizing idle resources and reducing unnecessary expenditures. Conversely, logistics failures often manifest as negative schedule variance and cost variance within the Earned Value framework. Therefore, integrating logistics management with Earned Value Analysis enables project managers to identify operational inefficiencies and implement timely corrective actions before significant project overruns occur (Haag and Junger,2023).

Several studies have demonstrated that organizations implementing Earned Value Analysis experience improved project visibility, better financial control, enhanced schedule management, and more effective risk mitigation. Chen and Zhang (2012) stated that EVA provides reliable performance information that assists project managers in identifying deviations between planned and actual project performance at an early stage. Similarly, Aramali et al. (2022) concluded that successful implementation of Earned Value Management requires not only technical knowledge but also organizational commitment, leadership support, effective communication, and integration with existing project management systems.

METHODOLOGY

The study adopted a field survey and multiple case study approaches applied to building construction projects in South East Nigeria. Data was collected through structured questionnaire, interviews, site visits, check list and logistics data base of the case study construction companies. The respondents that were used in the study were one hundred and eight (108), which included project manager, project coordinator, site managers, Civil Engineers and building technicians.

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Questionnaire Structure

The questionnaire structure of the survey was divided into two parts. The first section aims to collect background information or profile analysis of the respondent e.g. educational qualification, building categories and professional background. The second section seeks to identify Earned Value Analysis (EVA) practices within selected construction companies by investigating real- life project performance.

The survey questionnaire was designed and formulated by looking through the relevant literature in the area of building construction logistics and then a pilot study was conducted with fifty(50) respondents and analyzed using the reliability coefficient of cronbach's alpha(Aiyetan,2010,Amade,2016). The pilot survey responses formed the basis for modifying the questionnaire for subsequent full-scale survey and therefore, new inputs raised by the respondents were incorporated into the final full scale survey questionnaire. The data collected were analyzed using factor analysis and multiple regression analytical techniques. This was done using the Statistical Package of Social Studies (SPSS) software 25.0. Earned Value Management was used analyse project performance of the case study companies. The indicator/metrics includes:

Questionnaire Design.

- In EVA, let BCLP = Budgeted cost of logistics performed.
- BCLS =Budget cost of logistics scheduled
- ACLP = Actual cost of logistics performed
- CV = Cost Variance
- SV = Schedule variance
- Cost Variance =BCLP – ACLP
- Schedule variance (in terms of cost) = BCLP - BCLS
- Cost Performance Index (CPI) = BCLP/ACLP X 100/1
- Scheduled Performance Index (SPI) = BCLP/BCLS X 100/1

RESULTS AND DISCUSSION

Earned Value Analysis is an important tool that measures project performance by integrating cost, schedule and scope to determine if work progress matches with budget. In construction logistics,

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EVA, is particularly useful for tracking and controlling the costs, schedule, and scope of a project. EVA involves three primary metrics;

- Planned value (PV): This is the budgeted amount for the work that was supposed to have been completed by a specific point in time. It represent the baseline of how much work should have been done by a certain date according to the project schedule.
- Earned Value (EV): This is the value of the work actually performed up to a specific point in time, expressed in terms of the approved budget .It represent the real progress in terms of both cost and work completed.
- Actual cost (AC): This is the actual cost incurred for the work performed up to that point. It includes all the expenses for labour, materials, equipment and overhead associated with completed work.

Table 1and 2 shows Earned Value Analysis of Logistics Performance of First Milestone of after six (6) months and second milestone of twelve months in case study construction companies.

Table 1: Earned Value Analysis of Logistics Performance
(First Milestone = after (6) months: 01 – 03 – 2022 to 01 – 09 – 2022)

Case study companies	BCLP (₦M)	BCLS (₦M)	ACLP (₦M)	CV(-)	SV(-)	CPI (%)	SPI (%)	Rank on quality
BBA	150	205.8	295.5	145.5	55.8	50.7	72.8	Low
BBB	138	215.7	312.1	174.1	77.7	44.2	63.9	Low
BBC	129	222.2	320.5	191.5	93.2	40.2	58.0	Low
BBD	121	239.9	335.7	214.7	118.9	36.0	50.4	Low

Table 2 Earned Value Analysis of Logistics Performance (After 12 month)

(Second Milestone = after (12) months: 02 – 09 – 2022 to 02 – 03 – 2023)

Case study companies	BCLP (₦M)	BCLS (₦M)	ACLP (₦M)	CV(-)	SV(-)	CPI (%)	SPI(%)	Rank on quality
BBA	165	288.5	250.2	85.2	123.5	65.9	57.1	Moderate
BBB	170	300	220.8	50.8	130	76.9	56.6	High
BBC	155	250	210.5	55.5	95	73.6	62.0	Moderate
BBD	180	340	245.6	65.6	160	73.2	52.9	High

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The first six month milestone, the building construction logistics performance from the case study companies indicates significant deviations from the planned cost and schedule baselines. The earned value analysis revealed a negative Cost Variance (CV), a negative Schedule Variance (SV) for the four (4) case study companies. The Cost Performance Index (CPI) of 0.5 (representing approximately 51% below the expected performance level), and a Schedule Performance Index (SPI) of 0.72 (approximately 28% below the planned schedule**,** or interpreted as operating at only 72% schedule efficiency) which is specifically for BBA company. Other case study companies all got much lower in values of SPI and CPI respectively. Collectively, these indicators demonstrate that the project is experiencing substantial financial inefficiencies and schedule delays that require immediate management intervention.

The negative Cost Variance indicates that the actual expenditure on the project exceeds the value of work accomplished. In Earned Value Management, Cost Variance is calculated as the difference between Earned Value (EV) and Actual Cost (AC). A negative result signifies that the project is over budget because more resources have been consumed than the value generated. Such a condition is often associated with poor cost control, inefficient resource utilization, and inaccurate cost estimation, inflation in material prices, excessive labor costs, equipment breakdowns, or unanticipated project risks. The observed negative cost variance suggests that project managers have not been able to maintain expenditures within the approved budget, thereby threatening the project's financial sustainability. Some factors that may contribute to this poor cost performance in this six months milestone. One possible cause is inaccurate initial cost estimation during the planning stage, resulting in an unrealistic project budget. Another factor is low labor productivity arising from inadequate skills, insufficient supervision, or ineffective coordination among project teams. Rising prices of construction materials, equipment, transportation, or subcontractor services may also have contributed to increased project costs. However, project rework resulting from design errors, quality defects, or scope changes often leads to additional expenditures that were not included in the original budget. Delays in decision-making, procurement bottlenecks, and inefficient allocation of resources can equally increase operational costs while slowing project progress.

The negative Schedule Variance similarly reflects poor project progress. Schedule Variance compares the Earned Value with the Planned Value (PV). A negative Schedule Variance indicates that the amount of work completed is less than what was scheduled to be completed by the reporting date. Consequently, the project is behind schedule. Delays of this nature may result from inadequate planning, resource shortages, and unfavorable weather conditions, delayed

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procurement of materials, equipment failures, labor disputes, or unforeseen technical challenges. Persistent schedule delays increase project risks and often contribute to further cost overruns because project overheads continue to accumulate while productive work progresses slowly.

The Schedule Performance Index provides additional evidence regarding project timing. An SPI of 0.72 for BBA Company indicates that the project is progressing at only 72% of the planned rate. Practically, this means that for every unit of work that was scheduled to be completed, only 72% has actually been achieved. The remaining 28% represents delayed work that must either be recovered through accelerated project execution or accepted as an extension to the project completion date. An SPI below 1.0 consistently signals schedule inefficiency and reduced productivity. Although an SPI of 0.72 is less severe than the CPI of 0.49, it still represents substantial underperformance that may significantly affect project delivery if corrective actions are not implemented.

The combined negative Cost Variance and Schedule Variance demonstrate weaknesses in project planning, monitoring, and control. Effective project management requires continuous comparison between planned and actual performance so that emerging deviations can be identified early. The present results imply that performance monitoring may not have been sufficiently proactive to detect problems before they became significant. Delayed identification of budget overruns and schedule slippages reduces management's ability to implement timely corrective measures and often increases the overall cost of recovery.

The Earned Value Management (EVM) analysis conducted at the twelve-month milestone indicates that all four case study company experienced both negative cost variance (CV**)** and negative schedule variance (SV)**.** These results suggest that the projects were simultaneously operating over budget and behind schedule. In Earned Value Management, a negative cost variance means that the Actual Cost (AC) exceeded the Earned Value (EV), indicating cost overruns, while a negative schedule variance implies that the Earned Value was less than the Planned Value (PV), meaning that less work had been completed than originally planned. The Cost Performance Index (CPI) and Schedule Performance Index (SPI) further confirm the poor project performance, as all recorded values are below the benchmark value of 1.0, which represents satisfactory project performance.

For BBA company recorded a CPI of 65.9% (0.659) and an SPI of 57.1% (0.571**)**. These values indicate severe inefficiencies in both cost and schedule performance. A CPI of 0.659 means that for every monetary unit spent, the project generated only 65.9% worth of planned work, implying

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substantial cost inefficiency. Likewise, an SPI of 0.571 indicates that the project completed only 57.1% of the work that was expected at the twelve-month milestone. This combination of poor cost and schedule performance suggests that project resources were not being utilized efficiently. Possible contributing factors include inaccurate cost estimation during project planning, poor productivity, resource shortages, inflation in material costs, inadequate supervision, delays in procurement, and ineffective project coordination. If corrective measures are not implemented, the project is likely to experience significant budget overruns and completion delays.

For BBB company achieved a CPI of 76.9% (0.769) and an SPI of 56.6% (0.566)**.** Although the CPI is higher than that of the first scenario, indicating relatively better cost efficiency, it remains well below the acceptable threshold of 1.0 and therefore still reflects cost overruns. The SPI of 0.566 shows that the project was progressing at only 56.6% of the planned rate, making schedule performance slightly worse than in the BBA Company. This suggests that improvements in cost control alone were insufficient to enhance overall project performance because schedule delays remained significant. Delays may have resulted from labor shortages, equipment breakdowns, design modifications, approval delays, or disruptions in the supply chain. These findings demonstrate that effective project management requires simultaneous attention to both cost and schedule control, as improvements in one performance indicator cannot fully compensate for weaknesses in the other.

BBC Company recorded a CPI of 73.6% (0.736**)** and an SPI of 62.0% (0.620**)**. Compared with the previous scenarios, this project demonstrated moderate improvement in schedule performance while maintaining cost performance between the BBA and BBB companies. An SPI of 0.620 indicates that the project completed approximately 62% of the planned work, representing the highest schedule efficiency among the four companies. Although still behind schedule, this comparatively better SPI suggests that project managers may have implemented effective schedule recovery measures, improved workforce productivity, or optimized resource allocation. However, the CPI of 0.736 indicates that the project continued to experience considerable cost overruns. This pattern illustrates that accelerating project activities often requires additional resources, overtime work, or increased equipment utilization, which can raise project costs if not carefully managed. Therefore, while schedule recovery appears to have been partially successful, cost efficiency remained below acceptable standards.

The BBD Company recorded **a** CPI of 73.2% (0.732**)** and an SPI of 52.9% (0.529**)**. Although its cost performance was similar to the third scenario, it exhibited the poorest schedule performance among all four cases. An SPI of 0.529 means that only slightly more than half of the planned work

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had been completed after twelve months, indicating substantial schedule slippage. Such a low SPI may reflect serious project execution challenges, including poor planning, ineffective scheduling, insufficient resource availability, adverse weather conditions, contractual disputes, or technical difficulties. Despite maintaining a moderate CPI relative to the BBA Company, the extremely low SPI suggests that the project requires immediate corrective actions to prevent further schedule deterioration and additional indirect costs associated with prolonged project duration.

However, comparative analysis of the four (4) case study companies reveals several important trends. The BBB Company demonstrated the best cost performance with the highest CPI (0.769), while the BBC Company achieved the best schedule performance with the highest SPI (0.620). Conversely, BBA Company exhibited the poorest cost efficiency, whereas the fourth scenario experienced the greatest schedule delay. None of the projects achieved the desired CPI or SPI value of 1.0, indicating that all projects failed to meet both cost and schedule expectations at the twelve-month milestone. This overall trend suggests systemic weaknesses in project planning, monitoring, and control rather than isolated performance issues.

Furthermore, project management perspective based on the findings highlight the importance of continuous Earned Value Management monitoring throughout the project lifecycle. Regular calculation of CPI and SPI enables project managers to identify performance problems early and implement corrective measures before deviations become unmanageable. Such corrective actions may include revising project schedules, reallocating resources, improving procurement efficiency, strengthening contractor supervision, enhancing productivity, reviewing risk management strategies, and implementing stricter cost-control measures. Early intervention is particularly important because persistent negative cost and schedule variances generally become more difficult and expensive to correct as projects progress.

Factor Analysis and Component Groups.

The method used to carry out this extraction is principal component analysis as shown in table 3 .and twelve components were extracted. The findings from the results shown above indicate that 50 factors can be grouped into twelve (12) decision matrix (components) for success factors of construction logistics. However, twelve principal components were later extracted for effectiveness. In the first component, 9 factors in that order loads positively maximally, 8 factors, loads positively maximally in the second component, while 5 factors load positively maximally in the third component. In the fourth component, 7 factors load, positively maximally. While in the fifth, sixth, seventh and twelve components, 4, 4, 7, and 1 factor respectively load positively

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maximally. From this result, the components that emerged could be the dominant underlining success factors for construction logistics. The factors with positive coefficients were subjected to multiple regression analysis to determine their effects.

Table 3 Component Matrix

Factors	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
Transit time	.782											
Respondent	.672											
Trucking companies	.655											
Plan for traffic flow	.642											
Just in time	.641											
Efficient tracking of companies	.622											
Procurement management	.570											
Extra space for the compound	.552											
Municipal policy priorities	.542											
Capacity to know physical environment		.662										
Documentation		.632										
Communication network configuration		.652										
Good access for equipment delivery		.622										
Accurate inter team competition		.612										
Training		.602										
Knowledge and skill management		.532										
Development of standard procedure		.530										
Information and communication technology			.736									
Communication and network configuration			.672									

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Client understanding of logistics services			.662									
Cost transparency			.652									
Schedule effectiveness												
Cooperation among suppliers			.536									
Qualitative capacity of suppliers				.609								
Innovation in cost saving				.608								
Logistics capacities				.603								
Public- private partnership				.508								
Trust				.507								
Rationale supply base				.503								
Supplier transportation influence on project delivery				.501								
Time influence on supplier transportation					.679							
Quality influence on supplier transportation					.667							
Cost influence on supplier transportation					.647							
Inventory and procurement management					.517							
Time on inventory and procurement management						.701						
Quality on inventory and procurement management						.680						
Cost on inventory and procurement management						.651						
Logistics planning on project delivery						.640						
Time on logistics planning							.709					
Quality on logistics planning							.708					
Cost on logistics planning							.697					
Information and control management							.668					

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Time on information and control management							.659					
Quality on information and control management							.648					
Cost on information and control management							.639					
Supply chain management influence on project delivery								.709				
Time on supply chain management								.708				
Quality on supply chain management									.689			
Cost on supply chain management											.608	
Cost influence on supplier transportation												.648

3.3 Multiple Regression Analysis Result

The multiple regression coefficient are shown in table 3

Table 4. Coefficients of Multiple Regression

Coefficients											
		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
Model(CSFs)		B	Std. Error	Beta	T	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.718	.747		3.638	.000					
	Regulatory Compliance	-.305	.109	-.247	2.803	.006	-.039	-.270	-.224	.822	1.217

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2	Continuous Improvement and Adaptability	.622	.092	.575	6.796	.000	.513	.562	.542	.889	1.124
3	Execution Efficiency	.233	.091	.212	2.574	.012	.210	.249	.205	.937	1.067
4	Technology Integration	-.081	.086	-.080	.948	.346	-.089	-.094	-.076	.894	1.119
5	Site Management	.053	.096	.045	.555	.580	-.004	.055	.044	.950	1.053
6	Resource Management	.005	.093	.004	.052	.959	-.015	.005	.004	.879	1.137
7	Strategic Planning and Coordination	-.184	.091	-.172	2.031	.045	-.046	-.199	-.162	.883	1.132

Table 4 shows the beta coefficients of all seven (7) independent variables versus the contributing factors of construction logistics. Regulatory compliance and sustainability had a coefficient of 0.109, which is more than zero. The t statistic is 2.803 with a p-value of 0.006, implying that the coefficient is significant at the 0.05 threshold of significance. This demonstrates that regulatory compliance and sustainability have a considerable positive influence on contributing factors in construction logistics. Continued improvement and adaptability were 0.092, which was greater than zero. This coefficient's t- statistic is 6.796, with a p - value of 0.000 that is less than 0.050. This means that the coefficient is significant. Because the coefficient is significant, continued improvement and adaptability have a significant effect on the contributing factors of construction logistics.

Execution efficiency has a coefficient of 0.091, which is more than zero, according to the coefficient table. The t- statistic is 2.574, and the p-value is 0.012, which is less than 0.05, implying that the coefficient is significant at the 0.05 level of significance. This demonstrates that the contributing factors of construction logistics are significantly influenced by execution efficiency. The table 3 further reveals that technology integration had a coefficient of 0.086 with a T-statistic of 0.948 and a p-value of 0.346 (greater than 0.05). This means that the coefficient is not significant at the 0.05 threshold of significance. This demonstrates that technology integration has a considerable negative influence on the contributing factors of construction logistics.

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Site management had a coefficient of 0.096 with a t-statistic of 0.555 and a p-value of 0.580 (greater than 0.05). This means that the coefficient is not significant at the 0.05 threshold of significance. This demonstrates that site management has a considerable negative influence on the contributing factors of construction logistics. Resource management had a coefficient of 0.093, a t-statistic of 0.052, and a p-value of 0.959 (greater than 0.05). This means that the coefficient is not significant at the 0.05 threshold of significance. This demonstrates that resource management has a considerable negative influence on the contributing factors of construction logistics. Strategic planning and coordination had a coefficient of 0.091 with a t-statistic of 2.031 and a p-value of 0.05 (equal to 0.05). This means that the coefficient is significant at the 0.05 threshold of significance. This demonstrates that strategic planning and coordination have a considerable positive influence on the contributing factors of construction logistics.

The regression model summary on contributing factors in construction logistics is presented in Table 4. The table displays the values of the coefficient value, i.e. R-squared value which denotes that 36.4% of the variance in the contributing factors of construction logistics can be accounted for by the fluctuations in the contributing factors of construction logistics. The table 4.4 displays the values of the coefficient of determination R squared and R, which are 0.36 and 0.60, respectively. The coefficient of determination (R squared) indicates a suboptimal fit of the model. The coefficient of determination, adjusted for the number of predictors in the model, is 0.319, indicating a higher value than the unadjusted R square. This suggests that there may be further potential for enhancing the model's adequacy by incorporating an additional factor that affects the outcome variable. The inclusion of an extra independent variable would result in an increase in the R square value to that of the adjusted R square.

Table 5 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.603[a]	.364	.319	1.06051

The analysis of variance (ANOVA) outcomes pertaining to the regression coefficients reveal that the F- value is 0.00, indicating statistical significance at a level below 0.05. This suggests that the predictor coefficient is not equivalent to zero at the minimum. This also suggests that the model is well-suited for the task. It has a P-value of 0.00, indicating all the factors of construction logistics put together will contribute to successful project delivery. Table 4 below presents the outcomes of an analysis of variance (ANOVA) conducted on the contributing factors of construction logistics.

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Table 6. Summary of ANOVA

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.300	7	9.186	8.167	.000[b]
	Residual	112.468	100	1.125		
	Total	176.769	107			

Project Performance and its Influence on Building construction Logistics Model.

Project performance plays a significant role in determining the effectiveness of building construction logistics project. In construction industry, logistics focuses on planning, coordination, movement, storage and management of materials, equipment, labour and information throughout the project life cycle. The building construction logistics model provides a structured framework for ensuring that these resources are delivered to the right place, at the right time, in right quantity and at the lowest possible cost. The success of such logistic flow model depends largely on the overall performance of the project.

However, project performance is a critical determinant of the success of a building construction model. Strong performance in planning, scheduling, communication, resource management and risk controls enables efficient logistics in construction project

Therefore. Construction companies should prioritize performance measurement and continuous improvement to optimize logistics systems and in order to achieve successful project delivery

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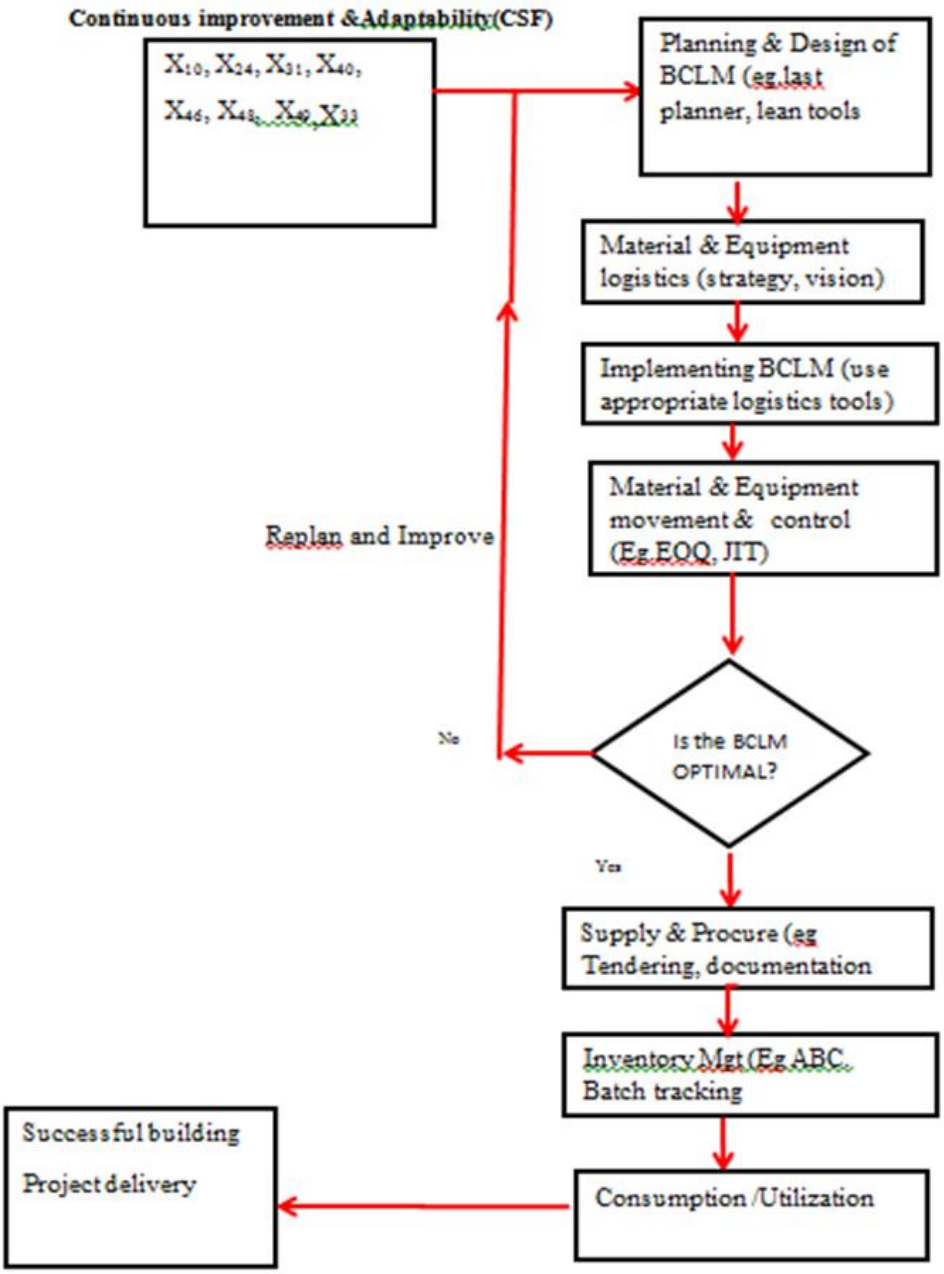

Fig 1. Framework for successful project delivery of BCLM

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CONCLUSION AND RECOMMENDATIONS

Earned Value Analysis was used to ascertain the cost and schedule performance indexes of building construction logistics at any given milestone, and the result was too poor thus signaling the need to developing an improved Building Construction Logistics Framework. To improve project performance, several corrective actions should be considered. The project manager should conduct a detailed cost analysis to identify the primary drivers of budget overruns and eliminate unnecessary expenditures wherever possible. Resource allocation should be reviewed to ensure that labor, equipment, and materials are deployed efficiently. The introduction of schedule recovery techniques such as fast-tracking or crashing may be applied where technically feasible to reduce delays while carefully evaluating their financial implications. The use of stronger procurement planning and supplier management should be implemented to minimize material shortages and delivery delays. Finally, project risk management processes should be strengthened to identify emerging risks early and develop appropriate mitigation strategies before they significantly affect project performance.

Continuous monitoring using Earned Value Management should remain a central component of project control. Regular calculation of Cost Variance, Schedule Variance, CPI, and SPI enables management to assess trends in project performance rather than relying solely on periodic financial reports. Monitoring these indicators throughout the project lifecycle facilitates informed decision-making, supports timely corrective actions, and improves the likelihood of successful project delivery. The developed framework is anticipated to help contractors in planning, designing, tracking, managing and controlling materials and equipment, ensuring that necessary improvement in building construction are realized.

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