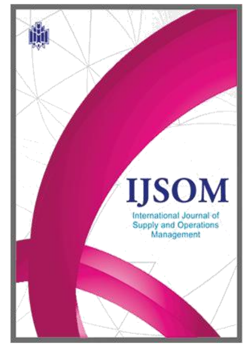
International Journal of Supply and Operations Management

IJSOM

2025, Volume 12, Issue 4, pp. 464-478
ISSN-Print: 2383-1359
ISSN-Online: 2383-2525
www.ijsom.com



Work System Synergy and Project Performance in Oil and Gas Construction: A Contingency and Dynamic Capabilities Perspective

Nsikan John [a*], Peter Nwaguru [b] and Benjamin Ameh [c]

[a] *James Hope University Business School, Lagos- Nigeria*
[b] *Department of Project Management, European Global School, Paris, France*
[c] *Department of Business Administration, Royal Roads University, British Columbia, Canada*

Abstract

Notwithstanding decades of research on project integration, limited empirical evidence exists on how internal coordination mechanisms influence performance outcomes in complex, project-based environments, particularly within developing economies. This study addresses this gap by examining how administrative integration and synergistic alignment- two dimensions of work system synergy impact project operational performance in the oil and gas construction sector. Drawing on the Contingency and Dynamic Capabilities Theories, the study develops and tests a conceptual model that links integration mechanisms to executional outcomes such as project timeliness, cost efficiency, and stakeholder satisfaction. Survey data were obtained from 33 oil and gas construction projects firms in Nigeria, and Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to test the hypothesized relationships. Findings indicate that both administrative integration and synergistic alignment positively influence project operational performance. These results highlight the role of integration as an adaptive and reconfigurable capability that enables firms to manage complexity and uncertainty effectively. This study contributes to project and operations management literature by extending the understanding of how internal integration strategies function as dynamic capabilities in resource-constrained, project-based environments. It also offers practical implications for managers seeking to improve executional outcomes through coordinated governance and aligned workflows.

Keywords: Stakeholder satisfaction; Project performance; Contingency theory; Dynamic capability; L-IoT; Oil & Gas Project.

1. Introduction

In the global energy market, oil and gas play a significant role as the world's primary fuel source. Due to its strategic importance, the management of oil and gas project continues to receive international attention as it enhances the wealth of many nations through employment generation, innovation, trade, logistics, and revenue/GDP growth (estimated at 5 trillion US Dollars annually) (IBISWorld, 2022; Stevens, 2018; Yergin, 2020). The significant position of oil and gas project therefore implies the need for the industry it to be further strengthened in order to perform in an optimal manner. In line with the above argument, Golpîra, (2022) advocated the integration of construction supply chain network (CSCN) design and vendor managed inventory (VMI) approach into managing multi-resource and multi-supplier oil and gas projects. In a similar study, Mukhtar et al., (2020) employed the probability impact matrix to

*Corresponding author email address: nsikiman5000@gmail.com
DOI: 10.22034/ijsom.2025.109496.2443

analyse the risks factors militating against the successful operations of Yemen's oil and gas construction projects. Their finding includes the less adoption of Logistics-Internet of things (L-IoT), inappropriate adoption of facility allocation model design, and poor supplier collaboration. Sekar et al., (2021) argued that size of oil and gas project firm is an important contributing factor in project performance.

The integration of CSCN, L-IoT, and VMI into oil and gas projects has gained traction in recent years, particularly as companies seek to optimize resource allocation and enhance operational efficiency (Allouch et al., 2023; Golpîra et al., 2021; Fu et al., 2022: Darmawan et al., 2021). Globally, CSCN design has been pivotal in large-scale oil and gas infrastructure projects. For instance, the Vaca Muerta gas pipeline expansion in Argentina, inaugurated in July 2023, is a prime example of how structured supply chain networks design enhance efficiency (Szymczak, 2025; Filipich et al.,2024). The project, which taps into the second-largest shale gas reserve globally, relies on optimized logistics and procurement strategies to ensure seamless operations (Global Energy Monitor, 2023; Szymczak, 2025; Filipich et al.,2024).

Similarly, L-IoT has revolutionized real-time tracking and predictive analytics in oil and gas logistics. The LNG Export Terminal in Canada, an $8 billion floating LNG plant, is leveraging IoT-driven logistics to streamline gas transportation (Energy Focus, 2025). By embedding IoT sensors in pipeline infrastructure, oil and gas construction project operators can monitor flow rates, detect leaks, and predict maintenance needs, improving safety and efficiency (Waqar et al., 2023; Erhueh et al., 2024).

Recent developments in Nigeria's upstream sector highlight the importance of well-designed supply chain networks. For instance, the OML 13 Field Development, a $3.15 billion project, is expected to significantly expand Nigeria's crude oil reserves and daily production (Nwosi, & Ezeh, 2025; Kalu-Ulu et al., 2023).

The integration of CSCN principles ensures efficient material flow, reducing delays and cost overruns. Furthermore, L-IoT enhances real-time tracking and predictive analytics in Nigerian oil and gas logistics. The Ajaokuta-Kaduna-Kano gas pipeline project, exemplifies how IoT-driven logistics can optimize gas transportation as operators monitor flow rates, detect leaks, and predict maintenance needs; enhancing safety and operational efficiency (Habib & Congjiao, 2020; Adegun et al., 2022; Pourhassan et al., 2025). Consequently, it is essential to optimize the design of oil and gas construction project and ensure the efficient management of its supply chain network through improved digital logistics (L-IOT) in the competitive and dynamic energy sector (Fu et al., 2022; Moreno-Camacho et al., 2019; Prakash et al., 2020).

The interest of the current study is to advocate for the integration of work systems synergy into the Nigerian oil and gas project management through the prism of CSCN and L-IoT- a key area that is largely overlooked by prior oil and gas construction studies (Golpîra, 2022; Mukhtar et al., 2020). Thus, we argue that the numerous incidences of cost overrun, scheduled delays, project abandonment, contract management disputes, and quality issues associated with oil and gas construction projects requires a solution model that is built on a synergistic work system.

The management of oil and gas project in Nigeria has suffered some weakening results: increased operating costs, delays in delivery of customer's requirements, high rate of customers' complaints, poor quality production and distribution, and poorly managed work system amongst others (Mahmoud & Fateme, 2021). The sector has become victim of countless operational inefficiencies which leads to impaired quality of production and distribution and induced delinquencies of project schedule (Donwa et al., 2015). The general performance of the sector in terms of the quality and flexibility of delivery of the products to customers is also affected (Ogbonna et al., 2020). Also, it is evident that the industry is yet to fully integrated communication technologies that would enable them access to features that will mitigate delays, cut production costs and deal with work system uncertainties (Mbovu & Mburu 2018). Consequently, the individual action of the oil and gas firms is not enough to achieve efficient project management performance in terms of decreased costs, and operational flexibility.

In spite of the numerous studies (Sekar, Viswanathan, & Sambasivan, 2018; Sambasivan et al., 2017) on oil and gas project performance, the aspect of integrating a synergy in oil and gas project management work systems appear not fully considered in empirical literature. In addition, studies that investigates the performance benefits of work system synergy in Nigeria's oil and gas construction project management are rare. It is obvious that no clear empirical data has emerged in the literature that envelops the relationship between the two dimensions of synergism (administrative and alignment) on oil and gas project performance. The novelty of this study lies at this point since these aspects has not received much empirical consideration in prior studies.

The object of this study is to examine the effects of work systems synergy on operational performance of Nigeria's oil and gas construction project companies. It focuses on finding answers to the following two research questions:

i. What is the extent of relationship between administrative integration and operational performance (cost minimization and operational flexibility) of oil and gas projects companies?

ii. What is the extent of relationship between synergistic alignment and operational performance of oil and gas projects companies?

2. Literature Review and Hypothesis Development

2.1 Work Systems Synergy

Also known as synergism, Work systems synergy can be viewed as the interaction of two or more parts of a work system so that the combined effect is greater than the sum of the efforts of the parts or the combined effects produced by two or more parts, elements, or individuals (Kassem et al., 2019). A work system can be said to be synergetic when two or more independent companies work jointly to plan and execute work operations with greater success than when acting in isolation. It is the formation of close, long-lasting partnerships where members work harmoniously and share resources, information, and risk to accomplish jointly set goals such as work safety, scheduled time, and budget (Peng & Zhang, 2022; Cao & Zhang, 2011). According to Alaloul, et al., (2020), working in senergy encourages all members in the work system to participate in planning, administrative integration, forecasting, replenishment, incentive sharing and resource sharing (Hudnukar *et al.,* 2014). Work synergy can also be seen as sharing intellectual agility, joint objectives, respect, organizational structure, and commitment, to get the best outcome for each member (Khalid et al., 2022). Applying synergetic techniques can drastically reduce operating costs (Adams et al., 2014; John et al., 2015) enhance decision making (Swink et al., 2007), and strengthen time-and-place utility provision to target customers. Hence, managing resources and synergetic behavior within partnering organizations in a work system effectively is the main focus of synergetic work systems (Hudnukar *et al*., 2014). The flow of communication and cooperative efforts between departments and organizations is facilitated through synergetic efforts (Flynn et al., 2010).

2.2 Administrative Integration and Project Operational Performance

Administrative integration is the level at which one member of a work system relates critical and essential information to other members of the work system, with the aim of maximizing the benefits of the entire work system (Jang et al., 2022; Premus & Sanders, 2008). It involves communicating price changes to chain members, stock level information, customer feedback, perceived risk factors, etc. By administrative integration, it is implied the level at which one member of a work system relates critical and essential information to other members of the work system, with the aim of maximizing the benefits of the entire work system (Jawad & Ledwith, 2022). According to Abdula & Usman, (2020) it involves communicating price changes to chain members, stock level information, customer feedback, perceived risk factors, etc. Lotfian et al., (2021) explores how collaborative project management enhances efficiency in oil and gas construction. Integrated Project Delivery (IPD) emphasizes early stakeholder involvement, shared risk and reward, and the use of digital tools like Building Information Modeling (BIM). The review highlights that administrative integration within IPD frameworks improves communication among project participants, leading to better cost management and reduced disputes. However, challenges such as resistance to change and the complexity of aligning multiple parties remain obstacles to full implementation.

Similarly, Olajiga et al., (2024) investigates how administrative integration plays a crucial role in mitigating risks by ensuring timely communication of critical information, such as price fluctuations, stock levels, and perceived risks. The study emphasizes that effective risk management during the construction phase enhances operational performance and reduces uncertainties that could impact project success (Adepoju et al., 2025; Hatamleh et al., 2024). Even though the administration of works system in project management is highly emphasized in the literature and acknowledged by project management researchers(Adepoju et al., 2025; Hatamleh et al., 2024; Olajiga et al., 2024), the association and direction of relationship between administrative integration and the operation of oil and gas construction performance is not adequately clear; thus more insight is needed to understand the antecedent factors or mechanism in which the integration of demonstrative functions in oil and gas construction project leads to operational performance as demonstrated in the current study.

2.3 Synergistic Alignment and Project Operational Performance

Synergistic alignment is referred to harmonizing decisions made by members of a work system. It enhances decision making which maximizes work system performance, through joint demand forecasting, inventory management, product assortment and IOT technology (Zhao et al., 2019; Qiu et al., 2024). Studies have examined the relationship between synergetic work systems and competitive advantage. For instance, Hou et al., (2023) investigated work system partners in the Indian textile industry and found positive relationship between administrative integration, organizational structure among work system partners, risk and reward system and competitive advantage. Lewis et al., (2021) examined the influence of synergetic work practices on competitiveness in oil and gas firms in Kenya and concluded that competitiveness of the oil and gas firms is affected by work system synergy. Al-Tarawneh et al. (2025) studied the effect of synergetic work system on operational performance of liquefied petroleum gas companies in Kenya. Their findings revealed that work synergy had a significant relationship with cost and quality, while flexibility and speed were insignificant but their study did not consider the interplay of alignment synergy and performance for oil and gas construction.

2.4 Theoretical Framework

This study is grounded in two interrelated theoretical perspectives (Contingency and Dynamic Capabilities) that support the proposed relationships among administrative integration, synergistic alignment and operational performance. First is *Fred Edward Fiedler* (1964) Contingency Theory which provides the foundational lens for evaluating our first hypothesis (H1) proposing the direct influence of administrative integration on operational performance The contingency theory suggests that there is no one-size-fits-all approach to management, leadership, or decision-making. Instead, it argues that the best course of action depends on various situational factors, such as the external environment, organizational structure, and individual traits of leaders and employees.

The theory emphasizes the importance of aligning organizational structures and control mechanisms with contextual project requirements. In complex oil and gas construction environments, the centralization and harmonization of administrative processes are likely to yield performance benefits when appropriately tailored to project coordination needs. In oil and gas construction, administrative integration plays a crucial role in optimizing operational performance.

Recent studies highlight how contingency-based approaches improve efficiency in complex environments. Chen et al., (2023) undertook a study on contingency estimation methods for overseas oil and gas acquisitions, emphasizing the importance of risk assessment in administrative decision-making. They found that by quantifying uncertainties, firms can tailor administrative structures to mitigate project risks effectively. Jain et al (2023) research on institutional pressures in the oil and gas sector suggests that firms must adapt their administrative frameworks to regulatory and environmental demands. This aligns with contingency theory's premise that organizational success depends on external conditions (Jain et al., 2022; Kassem et al., 2020).

The second hypothesis (H2) is anchored on the Dynamic Capabilities Theory proposed by Teece, Pisano & Shuen, (1997). According to this theory, organizations in dynamic environments must continuously reconfigure their internal and external resources to maintain competitiveness. According to Aldrighetti et al., (2021) synergistic alignment represents such reconfigurable capabilities that translate integration mechanisms into tangible performance improvements through better supply responsiveness, vendor coordination, and logistics coordination. Hermundsdottir et al., (2024) investigated technological environments in oil and gas firms to demonstrate how dynamic capabilities such as technology adoption drive sustainability and operational efficiency. Their findings support the idea that synergistic alignment fosters adaptability in volatile markets.

Similarly, Rahnamay et al, (2020) research on dynamic capabilities in the oil and gas sector highlights how firms leverage institutional pressures to enhance sustainability performance. Their findings affirm that integrating synergistic alignment mechanisms, companies can improve logistics coordination and vendor relationships. Thus, administrative integration, guided by contingency principles, ensures that firms align their structures with project demands. Meanwhile, synergistic alignment, rooted in dynamic capabilities, enables organizations to adapt to evolving market conditions through improved supply chain responsiveness and vendor coordination.

These theories collectively justify the two hypothesized relationship of this study as follows:

Hypothesis 1

Administrative integration is significantly and positively related to successful management of oil and gas project operations.

Hypothesis 2

Synergistic alignment is significantly and positively related to successful management of oil and gas project operations.

3. Methodology

We adopted a survey research design to collect data from 83 project managers and engineers working in 33 registered oil and gas project firms in the Niger Delta region of Nigeria. We randomly selected six participants from each firm, covering the following functional departments: a) procurement/purchasing, b) production, c) R&D, d) facility maintenance, e) quality assurance, and f) customer service. We administered a structured questionnaire with 12 items (see Appendix), measured on a 5-point Likert-type scale, through emails. Before questionnaire was mailed to potential respondents, we explained the purpose of the study, sought their consent, and assured them of anonymity and confidentiality of their response and identity. The survey lasted for 6months between February and August, 2023. Out of 128 copies of the questionnaire distributed, 83 valid responses were received, resulting in 64.8% response rate. The variables of this study consisted of two independent predictor variables: Administrative integration (*Admin.Int*), and Synergistic alignment (*Syn.Align*), while Project operational performance (*Proj.Perf*) constituted the dependent or respond variable. Two project-specific control variables that could impact operational performance, separate from integration mechanisms were also included in the model: project size and project duration. Project size was determined by the total number of contractors engaged in both onshore and offshore activities, as larger-scale projects generally demand more intricate coordination and face greater execution challenges (Yang et al., 2021). Project duration was defined by the planned timeframe of the project, measured in months or years, based on the assumption that extended project timelines tend to be more vulnerable to risks and scheduling uncertainties (Martinsuo & Geraldi, 2020). We measured the reliability of the primary data instrument using the Cronbach alpha coefficient, a method suitable for Likert measurement scales with a threshold value of 0.7(Nunally, 2004).

We deployed confirmatory factor analysis (CFA) to validate the data and test the links between the items and the constructs. CFA is a multivariate tool that tests a concept with multiple indicators. An indicator is convergent if its standard regression weight is above 0.5, its composite reliability (CR) is above 1.96, or its p-value is below 0.05. We also used the partial least square-structural equation modelling technique to test the structural model hypotheses and examine the structural relationships. We analysed the robustness of structural model through the average variance extracted (AVE), and the Chi-square (χ^2) tests.

The decision to adopt PLS-SEM was due to several reasons, namely: First, its effectiveness for modeling complex relationships involving multiple latent variables and indirect effects, making it ideal for exploring interactions between administrative integration, synergistic alignment, and operational performance. Second, unlike Covariance-Based SEM (CB-SEM), PLS-SEM works well with small to moderate sample sizes, allowing researchers to derive reliable insights even when large datasets are unavailable. The sample size of our study (128) was considered moderate compared to other studies of same nature, therefore considered appropriate to analyse data using the PLS-SEM. Third, PLS-SEM is best suited for studies focused on prediction and explanation, particularly when assessing how administrative integration and synergistic alignment influences project efficiency in oil and gas construction. Finally, PLS-SEM employs bootstrapping to assess statistical significance, ensuring the reliability of path coefficients and relationships among constructs (Hair et al., 2021; Hair et al., 2019; Rigdon et al., 2017; Sarstedt et al, 2022). Given these advantages, PLS-SEM was considered appropriate for studying the effect of administrative integration and synergistic alignment on performance of oil and gas construction projects, providing reliable results even under small/moderate sample constraints and complex structural relationships.

4. Results and Discussion

In this section, we analyze the data collected from respondents, present the results and discuss the findings with relevant implication for theory and practice.

4.1 Demographic Profile

The demographic analysis (Table 1) of the oil and gas construction sector provides key insights into the composition of the workforce and project characteristics. The gender distribution reveals that the industry is predominantly male, with a significant 65.1% representation. Education levels suggest that the majority of professionals hold a bachelor's degree, accounting for 62.7% of respondents. Regarding industry experience, most professionals have been in the sector for 5 to 10 years, making up 73.5% of respondents. The most common job designation is engineers, who make up 51.8% of the workforce. This aligns with the technical nature of oil and gas construction, where engineering expertise is essential for project execution. Employment type data shows that full-time employment is dominant at 67.5%, reflecting the industry's reliance on permanent workforce structures. In terms of departmental distribution, construction takes the lead with 44.6%, reinforcing its central role in oil and gas projects. Safety and procurement/logistics departments also play crucial roles, ensuring smooth operations and regulatory compliance. The company size data indicates that most professionals work in medium-sized firms, comprising 54.2% of the total. The analysis of project duration shows that most projects last between one and three years, making up 45.8%. Finally, offshore projects dominate the project types, accounting for 51.8%. Overall, this demographic analysis underscores key industry trends, including the predominance of engineering roles, mid-level professionals, medium-sized firms, and offshore construction projects.

Table 1. Demographic Characteristics (N=83)

Variable	Indicator Item	Number	Percent
Gender	Male	54	65.1
	Female	23	27.7
	Prefer not to say	06	7.2
Educational Level	Diploma	15	18.1
	Bachelor's	52	62.7
	Master's	14	16.9
	PhD/DBA	02	2.3
Years of Experience in Oil and Gas	Less than 5 years	16	19.3
	5-10 years	61	73.5
	11-20 years	06	7.2
	Above 20 years	-	-
Job Designation	Engineer	43	51.8
	Technician	18	34.0
	Project Manager	05	6.02
	Safety Officer	13	15.7
	Data Analyst	04	4.80
	Procurement, Logistics & Supply Officer	07	8.40
Employment Type	Full Time	56	67.5
	Contract	17	20.5
	Freelance/Temporary	10	12.1
Department	Procurement & Logistics	14	16.9
	Construction	37	44.6
	Safety	19	22.9
	Production	09	10.8
	R&D and IT	07	8.4
Company Size	Small	18	21.7
	Medium	45	54.2
	Large	20	24.1
Project Duration	Less than 1 year	23	27.7
	1-3years	38	45.8
	Above 3years	22	26.5
Project Type	Onshore	18	21.7
	Offshore	43	51.8
	Refinery	14	16.9
	Pipeline	08	9.6

4.2 Measurement model Analysis

Table 2 present the outcome of measurement model evaluation. This aspect of analysis is crucial to ensure credibility of results. We present the following reliability and validity indicators: CFA items loadings (lk), Cronbach's Alpha (α), composite reliability (CR), and average variance extracted (AVE) in line with Gannon et al., (2017). The results of the measurement model evaluation demonstrate that the constructs used in the study exhibit strong psychometric properties. All factor loadings for the reflective indicators exceed the recommended threshold of 0.70, indicating adequate item reliability and supporting the convergent validity of the constructs. Specifically, the items measuring Administrative Integration loaded between 0.750 and 0.839, those for Synergistic Alignment ranged from 0.747 to 0.796, and the two indicators for Project Operational Performance demonstrated very high loadings of 0.888 and 0.890. Similarly, the control variables—Project Size and Project Duration—recorded satisfactory loadings of 0.786 and 0.722, respectively.

Internal consistency reliability was also assessed using both Cronbach's Alpha and Composite Reliability (CR), and the values for all constructs surpassed the commonly accepted benchmark of 0.70. Administrative Integration reported a Cronbach's Alpha of 0.742 and a CR of 0.830. Synergistic Alignment yielded values of 0.766 for Alpha and 0.852 for CR, while Project Operational Performance recorded the highest reliability with an Alpha of 0.851 and CR of 0.883. The control variables were also internally consistent, with Project Size having an Alpha of 0.741 and CR of 0.861, while Project Duration showed an Alpha of 0.782 and CR of 0.767.

In terms of convergent validity, all Average Variance Extracted (AVE) values were above the 0.50 threshold, further confirming that the latent constructs explain a substantial portion of the variance in their respective indicators. Specifically, the AVE values were 0.64 for Administrative Integration, 0.67 for Synergistic Alignment, and 0.62 for Project Operational Performance. The AVE values for the control variables were also satisfactory, with 0.61 for Project Size and 0.63 for Project Duration.

Taken together, the results confirm that the measurement model is both reliable and valid. Each construct demonstrates adequate indicator reliability, internal consistency, and convergent validity, providing a solid foundation for subsequent structural model evaluation.

Table 2. Validity & Reliability Statistics

S/N	Construct	Construct Code	CFA Loading (lk)	Cronbach's Alpha (α)	Composite Reliability	AVE
1	Administrative integration (Admin. Int)			0.742	0.830	0.64
		ADI1	0.839			
		ADI2	0.750			
		ADI4	0.769			
2	Synergistic alignment (Syn. Align)			0.766	0.852	0.67
		SQ1	0.772			
		SQ2	0.747			
		SQ3	0.796			
		SQ4	0.759			
3	Project Operational Performance (Proj. Perf)			0.851	0.883	0.62
		POP1	0.890			
		POP2	0.888			
4	Control- Project Size	Size	0.786	0.741	0.861	0.61
	Control-Project Duration	Dura	0.722	0.782	0.767	0.63

4.3 Analysis of Structural Model- Hypothesis Testing

Table 3 present the hypothesis testing results on the impact of work system synergy operationalised as (Admin.Int and Syn. Align) on performance of oil and gas project firms. It includes key statistical metrics such as the correlation coefficient (r), path coefficients (β), along with P-values and t-values. As outlined by Hair et al. (2017), predictor variables must exhibit a β value exceeding 0.1 to be considered influential on the response variable. Furthermore, a t-value above 1.645 is necessary to confirm a positive relationship between independent and dependent variables.

The results indicate that administrative integration (r: 0.465, β: 0.289 and t-value: 4.012) and synergistic alignment (r: 0.340, β: 0.310 and t-value: 4.369) have a significant positive impact on project operational performance (Proj.Perf). Both independent variables show strong statistical significance, as demonstrated by their T-statistics (above 4.0) and P-values (0.000), confirming that these relationships are not random. In addition, the control variables (project size and project duration) also show a significant positive relationship with project operational performance, meaning that larger and longer-duration projects tend to influence performance outcomes. Figure 1 further demonstrates the visual results through the path diagram.

Table 3. Structural Model Results

Structured Path	Path Coefficient (β)	R Values	T Statistics	P Values	Remark
Admin.Int -> Proj. Perf	0.289	0.465	4.012	0.000	Significant
Control Variable -> Proj. Perf	0.241	0.301	3.961	0.000	Significant
Syn. Align -> Proj. Perf	0.310	0.340	4.369	0.000	Significant

Table 4 also contains values for R Square (0.613) and R Square Adjusted (0.603) for project performance (Proj. Perf.). The R Square (0.613) indicates that 61.3% of the variance in project operational performance can be explained by the independent variables in the model, including administrative integration and synergistic alignment. A higher R Square suggests a strong predictive power. R Square Adjusted (0.603) is a modified version of R Square that accounts for the number of predictors in the model. It adjusts for the possible inflation of R Square when more variables are included, providing a more accurate measure. The 60.3% value suggests that even after accounting for complexity, the independent variables still significantly predict project performance. The implications are that the model demonstrates that integration mechanisms and alignment strategies have a considerable impact on project performance. Managers should strengthen communication, coordination, and synergy among project participants.

Table 4 also shows the model fitness indicators. The indicators provide crucial insights into the overall adequacy of the proposed model in explaining the underlying relationships among variables. The Standardized Root Mean Square Residual (SRMR) value of 0.008 suggests a strong model fit, as values below 0.08 indicate minimal residual error. This low SRMR confirms that the discrepancy between the observed and predicted values is negligible, reinforcing the model's robustness in capturing the variance in the data.

Similarly, the Normed Fit Index (NFI) of 0.921 demonstrates the model's ability to improve upon a baseline model. Given that NFI values above 0.90 are generally considered indicative of strong fit, this result confirms the structural model's capacity to explain substantial variance, validating its suitability for empirical analysis.

Lastly, the Chi-Square statistic (χ^2) of 1365.442 serves as a measure of overall model discrepancy. While Chi-Square values tend to increase with larger sample sizes, it remains a fundamental criterion for assessing model fitness (Hair et al., 2021). Given the accompanying fit indices, this Chi-Square value, despite its magnitude, does not detract from the model's acceptability. Instead, our model fit should be interpreted within the context of the SRMR and NFI, which collectively affirm its reliability.

Overall, these goodness-of-fit indicators validate the robustness of the structural equation model, confirming its adequacy for hypothesis testing and further empirical analysis.

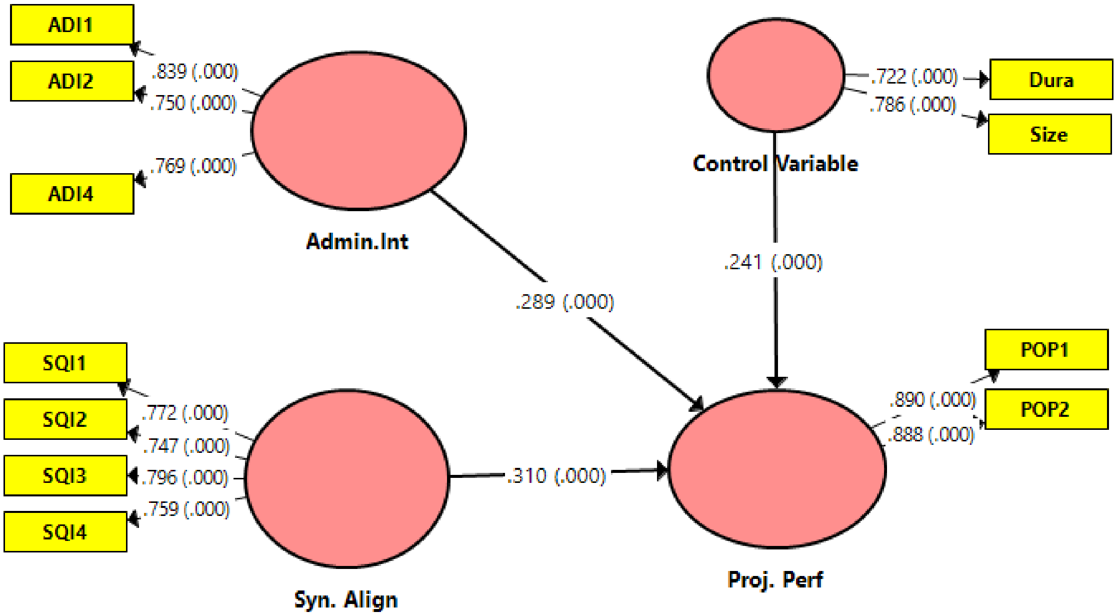


Figure 1. Structural model path diagram

5. Discussion of Findings

The findings of this study offer significant insights into how work system synergy operationalised through administrative integration and synergistic alignment affects project operational performance in the Nigerian oil and gas construction sector. Both integration mechanisms were found to positively influence performance metrics, particularly in areas such as project timeliness, cost efficiency, and stakeholder satisfaction.

Administrative integration demonstrated a strong positive relationship with operational performance. This finding suggests that when project stakeholders harmonize administrative elements such as reporting structures, policy coordination, and decision-making hierarchies, execution efficiency improves. This finding is consistent with prior studies such as (Peng & Zhang, 2022; Ma et al., 2022; Zhao et al., 2019) which link administrative consistency to improved safety compliance, timeliness, and cost control in large-scale industrial projects. Essentially, this implies that structuring communication channels and ensuring policy alignment across different units is not just essential but has a direct influence on project success. These results align with contingency theory, which posits that organizational configurations must fit contextual demands to be effective. In complex and dynamic project environments like oil and gas infrastructure development, administrative integration becomes essential for strategic alignment and swift disruption response.

Synergistic alignment was also shown to significantly impact project performance. This supports the idea that coordinated sequencing of tasks, workflow synchronization, and collaborative scheduling enhance project execution. This finding reinforces previous studies (Al-Tarawneh & Al-Badawi, 2025; Martinsuo & Anttila, 2022) which associated coordinated work structure and scheduling to risk and reward system and competitive advantage. From the perspective of dynamic capabilities theory, synergistic alignment serves as a reconfigurable organizational resource that enables firms to adapt to operational complexities. The ability to align tasks in real-time through collaborative processes ensures that execution remains consistent with strategic objectives, even under fluctuating conditions.

6. Theoretical Implications

Theoretically, this study contributes to operations and project management scholarship by applying contingency theory and dynamic capabilities theory to the domain of work system integration in complex project environments. Previous literature has often addressed integration in terms of supply chain structures or governance models. This research, however, highlights the internal relational and process-based mechanisms that enable integration to translate into performance.

More specifically, the study empirically validates the idea that administrative integration and synergistic alignment are not just complementary managerial concepts but essential constructs with distinct and measurable effects on performance. The findings strengthen the theoretical foundation for understanding integration-performance linkages and offer a multidimensional perspective that incorporates governance, coordination, and adaptability in project-based systems.

7. Practical Implications

From a practical standpoint, this study offers actionable insights for project managers, policymakers, and construction firms operating in high-stakes environments. First, the significance of administrative integration implies that firms should not treat governance and policy alignment as compliance tasks but rather as performance enablers. Standardized decision-making procedures, centralized communication protocols, and integrated reporting systems should be prioritized to reduce friction and improve visibility across project tiers.

Second, synergistic alignment should be institutionalized through digital and collaborative platforms that facilitate seamless task coordination. This may include project management software, shared scheduling tools, or integrated digital dashboards that align engineering, procurement, and construction activities. In doing so, firms can minimize schedule disruptions, reduce rework cycles, and improve resource utilization, thereby enhancing stakeholder trust and satisfaction.

8. Conclusion

This study affirms that administrative integration and synergistic alignment are critical enablers of project operational performance in the oil and gas construction sector. These two constructs, when effectively embedded in project work systems, form a synergistic configuration that enhances execution reliability and strategic coherence. By explaining a substantial proportion of the variance in project performance, the findings demonstrate that integrated and adaptive work systems are essential for delivering complex projects successfully, particularly in emerging economies.

9. Limitations and Future Research

Despite its contributions, this study has several limitations that warrant consideration. The use of a cross-sectional design restricts the ability to infer causality between work system integration mechanisms and project performance outcomes. Moreover, reliance on self-reported data from project professionals introduces the possibility of subjective bias, especially in the assessment of performance variables. Another limitation is the geographic concentration of the sample within Nigeria's Niger Delta region. While this location is significant due to its concentration of oil and gas projects, the findings may not be readily generalizable to other regions or industry contexts.

Future research could address these limitations through longitudinal research designs that track integration-performance dynamics over time, thereby offering stronger causal insights. Incorporating more objective performance indicators—such as project financials, milestone completion rates, or third-party audits—would also help strengthen the validity of findings. Furthermore, it would be beneficial to explore the moderating influence of contextual variables such as regulatory constraints, organizational culture, or digital maturity, which may condition the effectiveness of integration strategies.

Although CSCN and L-IoT were conceptually introduced in this study, they were not empirically tested within the current model. Future studies should explicitly model and test the mediating or moderating roles of Construction Supply Chain Networks and Logistics Internet of Things in the integration–performance relationship. This would not only enhance the explanatory power of the model but also align more closely with ongoing discussions on digital transformation and supply chain connectivity in project-based industries. Comparative studies across different emerging economies or industrial sectors would further enrich the theoretical and practical understanding of how integration mechanisms and enabling technologies interact under varying institutional and environmental conditions

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Appendix

Survey Constructs: 5-Point Likert Scale Questionnaire

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Administrative Integration

Item	1	2	3	4	5
Our project teams follow a common set of administrative procedures.					
Decision-making processes are well coordinated between departments and the operations team.					
Communication between the head office and field units follows standard protocols.					
Our health, safety, and environmental (HSE) policies are consistently applied across the project functions.					

Synergistic Alinement

Item	1	2	3	4	5
Material and equipment procurement and deliveries are aligned with operational schedules.					
There is a clear sequence of tasks from exploration to processing.					
On-site activities follow a predefined work schedule.					
Delays in one task are minimised through proactive scheduling coordination.					

Operational Performance

Item	1	2	3	4	5
Project milestones are consistently met as scheduled.					
Our oil and gas project stays within the budgetary capital expenditure (CAPEX).					
Project activities comply with industry safety and quality benchmarks.					
Resource deployment is improved to reduce non-productive time (NPT).					