Determinants of Project Performance in Ras Lanuf Oil and Gas Manufacturing Company

Mustafa Almabrouk Mustafa[1]; Farhana Tahmida Newaz[2]

[1]*business Administration, Universiti Tun Abul Razak, Malaysia. E-mail: (Almabrouk1964@gmail.com)*
[2]*Graduate School of Business, Universiti Tun Abul Razak, Malaysia. E-mail: (farhana@unirazak.edu.my)*

Information of Article	ABSTRACT
	This study investigates the determinants of project performance at Ras Lanuf Oil and Gas Manufacturing Company, focusing on the impact of communication breakdown, technology adoption, occurrence of delay, and team collaboration on project outcomes. Using regression analysis on data collected through a structured questionnaire from 250 employees, the research highlights significant factors influencing project success in the oil and gas industry. The findings indicate that effective communication and technology adoption positively influence project performance, while delays and poor collaboration have a detrimental effect. The study underscores the importance of integrating advanced technology, fostering effective communication, managing project timelines strictly, and enhancing teamwork to improve project outcomes. The adjusted R-square value of 54.8% suggests a moderate to strong model fit, pointing to these factors as critical determinants of project success, though additional variables may also play a role. This research provides actionable insights for project managers and industry practitioners aiming to optimize project management practices in similar settings.

1. Introduction

In today's rapidly evolving industrial landscape, understanding the factors influencing project performance is crucial for organizational success. This is particularly relevant in sectors like oil and gas, where projects are complex, capital-intensive, and strategically significant. The Ras Lanuf Oil and Gas Manufacturing Company provides a pertinent context for studying these dynamics due to its pivotal role in the energy sector and its operational challenges. Many factors influence project performance in such contexts, ranging from internal management practices to external environmental conditions. A significant body of research has highlighted the importance of benchmarking and innovation culture in enhancing organizational performance. For instance, Alosani and Al-Dhaafri (2021) demonstrated through structural equation modelling that benchmarking practices are closely linked to fostering an innovation culture, significantly boosting organizational performance. This relationship underscores the potential benefits of benchmarking in improving project outcomes in the oil and gas sectors by promoting innovative practices and solutions (Alosani & Al-Dhaafri, 2021).

Furthermore, adopting sustainability practices and performance measurement systems is crucial in shaping project outcomes. Alsaid and Ambilichu (2024) emphasize the significance of sustainability Key Performance Indicators (KPIs) in urban development projects. These KPIs provide a framework that can be adapted to the oil and gas industry to enhance transparency and accountability, ensuring that projects meet economic goals and adhere to environmental and social governance standards (Alsaid & Ambilichu, 2024). Lean thinking and quality management are additional determinants that contribute to project performance. Argiyantari, Simatupang, and Basri (2022) illustrate how lean thinking methodologies can be applied to improve transportation performance by eliminating waste and enhancing efficiency. Such methodologies directly apply to the logistics and supply chain aspects of oil and gas projects, potentially leading to significant improvement in project timelines and cost efficiency (Argiyantari, Simatupang, & Basri, 2022).

Similarly, Bishop and Reeves (2021) discuss the development of a quality management climate in small to medium enterprises through action research, suggesting that similar strategies could be beneficial in larger, project-based environments like Ras Lanuf to enhance overall project quality and performance (Bishop & Reeves, 2021). Lastly, Blais and Agbodoh-Falschau (2023) explore performance criteria in new product development projects, highlighting the importance of managing and controlling project variables. Their findings are relevant to the oil and gas industry, where new project development often involves high stakes and necessitates meticulous management to achieve desired outcomes (Blais & Agbodoh-Falschau, 2023). By integrating these diverse perspectives and methodologies, this paper aims to comprehensively explore the determinants of project performance at Ras Lanuf Oil and Gas Manufacturing Company, contributing valuable insights that may guide future strategies and implementations within the industry.

2. Literature Review

2.1 Communication Breakdown

Effective communication is paramount in project management, especially in complex environments like the oil and gas industry. Communication breakdowns can severely hinder project performance, leading to mismanaged expectations, delays, and increased costs. The literature provides multiple insights into how communication issues affect project outcomes and how they can be mitigated through various organizational practices. Kharub et al. (2023) explore the role of supervisor behavior in the success of Kaizen events and its impact on employee performance. Their study suggests that effective communication from supervisors can significantly enhance the outcomes of continuous improvement events by fostering a more collaborative and responsive environment. This finding underscores the importance of supervisory roles in preventing communication breakdowns, which can be critical in managing large-scale projects in industries like oil and gas (Kharub, Gupta, Rana, & McDermott, 2023).

Similarly, Khattak and Mustafa (2019) highlight management competencies as crucial for addressing the complexities inherent in engineering infrastructure projects. They identify effective communication skills as a key competency that helps managers navigate project challenges and enhance overall performance. The study emphasizes that management's ability to clearly communicate goals, expectations, and feedback is vital for successfully executing complex projects (Khattak & Mustafa, 2019). Garengo, Sardi, and Nudurupati (2022) delve into the intersection of human resource management (HRM) and performance measurement and management (PMM). They argue that HRM practices that emphasize clear and effective communication can significantly enhance performance metrics by ensuring that all team members are aligned with the project's objectives and performance standards (Garengo, Sardi, & Nudurupati, 2022).

Manurung and Kurniawan (2022) investigate the impact of agile project management and networking capability on organizational agility, noting that agile methodologies often prioritize high-bandwidth and effective communication channels. Their findings suggest that agile practices can mitigate communication breakdowns by promoting regular and structured interactions among team members and stakeholders, thus supporting better project outcomes (Manurung & Kurniawan, 2022). Finally, Mellado, Lou, and Becerra (2020) synthesise performance factors in the construction industry, identifying communication as a critical determinant of project success. Their research synthesizes various studies to argue that structured communication processes can significantly reduce errors and delays, thereby improving project delivery (Mellado, Lou, & Becerra, 2020). In summary, the literature strongly supports the view that effective communication is critical to project management, particularly in complex and dynamic environments like the oil and gas industry. Addressing communication breakdowns through improved supervisory communication, management competencies, agile methodologies, and structured communication processes is essential for enhancing project performance.

2.2 Technology Adoption

Adopting technology within project management, particularly in the energy sector, is increasingly recognized as a crucial factor for improving project performance and navigating the complexities of modern engineering demands. This literature review segment examines various studies that have explored the impact of technology adoption on project outcomes, specifically focusing on how different technological strategies and innovations can enhance efficiency and success. Odabashian, HassabElnaby, and Manoukian (2019) emphasize the success of innovative renewable energy projects through partnerships that leverage technological advancements. Their research underscores the importance of integrating new technological solutions within traditional energy sectors, suggesting that such integration can significantly improve project outcomes by fostering innovative practices and sustainable solutions (Odabashian, HassabElnaby, & Manoukian, 2019). Similarly, Panizzon and Barcellos (2019) explore the cultural readiness for adopting strategic foresight technologies in project management. They propose a three-level evaluation process that helps organizations assess their readiness to implement new technologies, highlighting that cultural alignment is critical to successfully adopting technological innovations. This process ensures that technology adoption is a strategic decision and culturally compatible with the organization (Panizzon & Barcellos, 2019).

Popaitoon (2020) examines the moderating effects of job design on the relationship between human capital and new product development (NPD) performance. The study finds that technology plays a pivotal role in enhancing the efficacy of job design, boosting the performance of human capital in projects. This insight is critical for project managers in the energy sector, where the complexity of projects often requires highly specialized skills and innovative technological tools (Popaitoon, 2020). Sane (2019) focuses on the effectiveness of project management tools and techniques on the performance of small and medium-sized enterprises (SMEs) in developing countries. Adopting modern project management technologies, such as software and online collaboration tools, has significantly improved SMEs' performance by enhancing communication, planning, and execution of projects (Sane, 2019). Lastly, Sekar, Sambasivan, and Viswanathan (2021) discuss the impact of project factors and organization-factors on project performance, focusing on the size of construction firms. They highlight that technological adoption tailored to the specific needs of a project and firm size can lead to better-managed and more successful projects. This finding is particularly relevant for large-scale projects in the energy sector, where the scale of operations can benefit greatly from customized technological solutions (Sekar, Sambasivan, & Viswanathan, 2021). In conclusion, the reviewed literature strongly suggests that successful technology adoption in project management enhances project performance and facilitates better management of project

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complexities and uncertainties. This is particularly relevant in industries like oil and gas, where the stakes and scales of projects demand the most efficient and innovative approaches to project management.

2.3 Occurrence of Delay

Delays in project management, particularly in construction and infrastructure, are a pervasive issue that can severely impact project performance, leading to cost overruns and compromised project quality. The literature on this topic offers a variety of perspectives on the causes of delays and strategies for mitigating their impact on project performance. Sulayem Saleh Musallam Saeed and Md Nor Hayati (2019) investigate the influence of Intellectual Capital (IC) on project performance in the United Arab Emirates. Their study highlights that effective management of intellectual resources, such as human capital, organizational knowledge, and relational capital, can significantly reduce project delays by enhancing decision-making processes and problem-solving capabilities (Sulayem Saleh Musallam Saeed & Md Nor Hayati, 2019). Tetteh (2019) applies the Lean Six Sigma framework to evaluate leadership performance in university settings, suggesting that the principles of Lean Six Sigma, such as waste reduction and process optimization, effectively minimise delays in any project environment. By applying these methodologies, leaders can enhance operational efficiency and, thus, reduce the likelihood of delays in project timelines (Tetteh, 2019). Tuffaha et al. (2021) present a framework for assessing the performance of construction contractors in Saudi Arabia, emphasizing the role of thorough contractor evaluation in preventing project delays. Their framework considers multiple performance metrics, including the ability of contractors to meet deadlines, which is crucial for reducing delays in large-scale construction projects (Tuffaha, Assaf, Zaben, & Hadidi, 2021).

Wamba-Taguimdje et al. (2020) explore the influence of artificial intelligence (AI) on firm performance, focusing on AI's capacity to transform business processes. They argue that AI technologies can significantly enhance project management by predicting potential delays and optimizing processes. This proactive approach enables firms to address issues before they lead to significant delays, thereby improving overall project performance (Wamba-Taguimdje, Fosso Wamba, Kala Kamdjoug, & Tchatchouang Wanko, 2020). Lastly, Willar et al. (2021) discuss sustainable construction practices and their impact on the execution of infrastructure projects. They find that integrating sustainable practices can lead to more efficient resource management and streamlined processes, reducing the risk of delays. This approach supports environmental and social goals and enhances project delivery timelines (Willar, Waney, Pangemanan, & Mait, 2021). In summary, the reviewed literature identifies various strategies for mitigating project delays, including effective intellectual capital management, application of Lean Six Sigma principles, rigorous contractor performance assessments, utilization of AI technologies, and adoption of sustainable construction practices. These strategies collectively contribute to improved project performance by reducing the occurrence and impact of delays.

2.4 Team Collaboration

Team collaboration is a fundamental element in enhancing project performance across various sectors. Effective collaboration not only improves project outcomes but also facilitates innovation and efficiency. The selected studies explore different aspects of team collaboration, from management styles to organizational frameworks, highlighting their impact on project success. Wuni, Shen, and Osei-Kyei (2021) focus on the construction industry, particularly prefabricated prefinished volumetric construction projects, and evaluate the critical success criteria. Their findings suggest that team collaboration, facilitated by clear communication and shared objectives, is crucial for the success of these projects. Effective collaboration among team members leads to better coordination, faster problem resolution, and more efficient project delivery (Wuni, Shen, & Osei-Kyei, 2021). Yazdani (2021, 2022) examines the relationship between Total Quality Management (TQM) and employee outcomes, considering the contingency effect of environmental uncertainty. The research indicates that TQM practices promoting collaboration and open communication can improve employee performance and overall project success. This is particularly significant in uncertain environments where flexible and adaptive team collaboration is necessary to navigate challenges (Yazdani, 2021, 2022).

Zavyalova, Sokolov, and Lisovskaya (2020) compare agile versus traditional project management approaches, highlighting that agile methodologies inherently promote higher levels of team collaboration. Their study shows that agile teams perform better in dynamic and complex project environments because these methodologies facilitate continuous communication and cooperation among team members, leading to more responsive and adaptable project processes (Zavyalova, Sokolov, & Lisovskaya, 2020). Zia (2020) discusses the impact of knowledge-oriented leadership on knowledge management behavior and innovation performance in project-based SMEs. The study highlights the role of leadership in fostering an environment where knowledge sharing and team collaboration are prioritized. This approach supports innovation and enhances team effectiveness and project outcomes (Zia, 2020). The literature emphasizes that effective team collaboration is essential for project success. Whether through structured approaches like TQM and agile methodologies, leadership styles that promote knowledge sharing, or specific project management strategies, fostering a collaborative environment is key to achieving optimal project outcomes. These findings are applicable across various project contexts, demonstrating the universal importance of teamwork in project management.

3. Methodology

The study adopts an explanatory research design, ideal for clarifying the causal relationships between variables—specifically, how various project management strategies affect project outcomes at Ras Lanuf. This design facilitates a deep understanding of the interrelations among the variables based on a quantitative approach, using primary data collected through surveys. The study's explanatory nature helps pinpoint the effects of specific project management practices on project performance (Flemming et al., 2009). Primary data collection is conducted using a survey administered via Google Forms, targeting employees at Ras Lanuf Oil and Gas Manufacturing Company. Secondary data sources include academic journals, books, and other relevant publications, providing a theoretical foundation for the study (Driscoll & Brizee, 2018). The survey comprises both closed and open-ended questions, designed to capture detailed information on the variables under study. This approach allows for a nuanced understanding of the project management dynamics at Ras Lanuf. The study is conducted at Ras Lanuf, specifically targeting the Ras Lanuf Oil and Gas Manufacturing Company due to its significance in Libya's oil and gas industry. The location is strategic for directly accessing relevant data and insights from the field. The sample size of 250 employees is determined using the Krejcie and Morgan formula, ensuring a representative cross-section of the company's workforce engaged in capital projects (Krejcie & Morgan, 1970). Data obtained from the surveys are analyzed using SPSS, employing multiple regression analysis to examine the relationships between the variables. This approach provides a clear, empirical basis for understanding the impacts of various project management strategies on performance.

4. Result and Discussion

The Ras Lanuf Oil and Gas Manufacturing Company survey involved a diverse group of 250 respondents, predominantly aged over 35 years, accounting for 65.2% of the total participants. Younger age groups were less represented, with those between 20-25 years constituting only 6.4% of the sample. The gender distribution was highly skewed towards males, who made up 99.6% of respondents, highlighting a significant gender imbalance within the workforce. In terms of educational attainment, the largest group of respondents held a Bachelor's degree (37.6%), followed by those with high school diplomas (24.8%) and attendees of intermediate technical institutes (23.6%). A smaller fraction of the workforce had advanced degrees, with 12.8% holding Master's degrees and 1.2% earning a PhD. Regarding work experience, a significant portion of the participants (38%) had more than eight years of experience, suggesting a highly experienced workforce. Those with less than one year of experience comprised 28% of the respondents, indicating a mix of seasoned and newer employees within the company.

The roles of the respondents varied widely across the company. Supervisors formed the largest group (32%), reflecting the survey's focus on capturing insights from mid-level management. Managers and division heads were also well-represented, indicating that the survey likely captured a comprehensive view of the managerial perspective on project management effectiveness. Positions like engineers, marketing managers, and specialists like vibration analysts and senior polyethylene laboratory specialists accounted for a minimal portion of the sample, highlighting a broad representation across different job functions within the organization. Overall, the respondent profile suggests that the survey encompassed a broad range of ages, educational backgrounds, and job roles within Ras Lanuf Oil and Gas Manufacturing Company. This diversity is instrumental in providing a holistic view of the project management practices and their effectiveness across different levels of the organization.

Table: 1 Profile of respondents

	Frequency	Percent		Frequency	Percent
20-25 years old	16	6.4	Male	249	99.6
26-30 years old	22	8.8	Female	1	0.4
33-35 years old	49	19.3	Total	250	100
Over 35 years old	163	65.5		Frequency	Percent
Total	250	100	Executive	9	3.7
	Frequency	Percent	Manager	28	11.2
High School	62	24.9	Supervisor	80	32.1
Bachelor's degree	94	37.8	Team Member	27	10.8
Master's degree	32	12.9	Operator	20	8
PhD	3	0.12	Employee	41	16.5
Intermediate technical institute	59	23.7	Division Head	22	8.8
Total	250	100	superintendent	1	0.4
	Frequency	Percent	Engineer	1	0.4

Less than one year	70	29.8	Senior Polyethylene Laboratory Specialist	1	0.4
1-3 years	46	19.6	Engineering Consultant	1	0.4
4 – 7 years	39	16.6	Vibration analyst	1	0.4
Above 8 years	80	34.1	Marketing manager at Lerco	1	0.4
Total	235	100	Senior Operator Control Panel	1	0.4
			Senior Operator	1	0.4
			Total	250	100

In the regression analysis conducted to assess the impact of various factors on project performance at Ras Lanuf Oil and Gas Manufacturing Company, four primary variables were examined: communication breakdown, technology adoption, occurrence of delay, and team collaboration. The analysis results provided significant insights into how these factors influence project outcomes. Firstly, the hypothesis that communication breakdown negatively impacts project performance was supported, as indicated by a beta value of 0.049 with a standard error of 0.017, achieving a T value of 2.875 and a significance level of 0.022. This suggests that inefficiencies in communication are detrimental to the successful execution of projects. Similarly, the analysis supported the positive impact of technology adoption on project performance, with a beta value of 0.083 and a standard error of 0.028, resulting in a T value of 2.976 and a significance level of 0.004. This finding underscores the benefits of integrating advanced technologies in project management to enhance productivity and outcomes.

The occurrence of delays was found to have a substantial negative effect on project performance, evidenced by a beta value of 0.326, a standard error of 0.078, and a T value of 4.182, with a very significant p-value of 0.002. This result highlights the critical impact of delays on project completion's overall success and timeliness. Additionally, team collaboration significantly boosted project performance, as demonstrated by a beta value of 0.104, a standard error of 0.026, and a T value of 3.986, with a significance level of 0.003. Effective teamwork and collaborative efforts are crucial for overcoming challenges and achieving project goals efficiently. The regression model's adjusted R-square value of 54.8% indicates that these four factors combined explain approximately 55% of the variation in project performance, suggesting a moderate to strong model fit. This comprehensive analysis confirms the significant roles that communication, technology, delay management, and collaboration play in shaping project outcomes at Ras Lanuf Oil and Gas Manufacturing Company. The insights from this testing are invaluable for guiding future project management strategies to optimize performance and mitigate risks associated with delays and poor communication.

Table: 2 Regression test

Independent Value	Beta	Stanrd error	T Value	Sig. Value	Result
Communication Breakdown	0.049	0.017	2.875	0.022	Accepted
Technology Adoption	0.083	0.028	2.976	0.004	Accepted
Occurrence of Delay	0.326	0.078	4.182	0.002	Accepted
Team Collaboration	0.104	0.026	3.986	0.003	Accepted
Adjusted R-sqaure		54.8%			

5. Discussion

The regression analysis findings from Ras Lanuf Oil and Gas Manufacturing Company underscore the significant impact of communication breakdown, technology adoption, occurrence of delays, and team collaboration on project performance. These variables are intricately linked to the broader themes discussed in the literature on project management and organizational effectiveness. The negative impact of communication breakdown on project performance is well-supported in the literature. Alosani and Al-Dhaafri (2021) emphasize the critical role of effective communication in fostering an innovation culture that enhances organizational performance. This aligns with the observed detrimental effects of communication breakdowns in the current study, highlighting the need for robust communication strategies to mitigate misunderstandings and align team efforts. The positive influence of technology adoption on project performance resonates with findings from Wamba-Taguimdje et al. (2020), who document the significant business value generated from AI-based transformation projects. This suggests that technological advancements can streamline project management processes, enhance efficiency, and contribute to superior project outcomes, consistent with the positive beta value observed in the present study.

The analysis revealed that delays significantly undermine project performance. This is echoed in the work by Tuffaha et al. (2021), who advocate for effective performance assessment frameworks to minimize delays and improve contractor

performance in construction projects. Effective management of project timelines is crucial, as delays not only increase costs but also affect the overall timeline and quality of the project. The positive impact of team collaboration found in this study is supported by Zia (2020), who discusses how knowledge-oriented leadership and collaborative behaviors enhance innovation performance in project-based settings. Collaborative teams can leverage diverse skills and perspectives, leading to innovative solutions and more effective problem-solving, thereby improving project outcomes. The adjusted R-square value of 54.8% indicates that while significant, the variables included in the model do not capture all factors influencing project performance. This suggests additional variables such as organizational culture or external environmental factors, as discussed by Yazdani (2021, 2022), could also play a role in shaping outcomes, highlighting the complexity of project management.

6. Conclusion

The regression analysis conducted on the determinants of project performance at Ras Lanuf Oil and Gas Manufacturing Company has provided valuable insights into the factors that significantly impact project outcomes in the oil and gas industry. The study specifically focused on four key variables: communication breakdown, technology adoption, occurrence of delay, and team collaboration. The findings revealed that communication breakdown negatively affects project performance, underscoring the critical importance of effective communication channels and practices within project teams. This suggests that organizations should invest in robust communication training and tools to ensure a clear, consistent, and efficient exchange of information across all levels of the project management process. Technology adoption emerged as a positive influencer of project performance, highlighting the benefits of integrating advanced technologies into project management practices. This indicates that companies should continue to embrace technological innovations that help streamline operations, enhance data accuracy, and improve overall project tracking and management. Delays were found to have a detrimental effect on project performance, emphasizing the need for meticulous project planning, risk assessment, and management strategies. Organizations must develop comprehensive risk mitigation plans to address potential delays and proactively maintain project schedules and budgets. Team collaboration also positively influenced project performance, indicating the importance of fostering a collaborative work environment. Effective teamwork, supported by strong leadership and clear goals, can lead to more innovative solutions and successful project outcomes. Thus, building teams with complementary skills and encouraging a culture of collaboration are vital for achieving project objectives efficiently and effectively.

In conclusion, the study highlights the multifaceted nature of project management within the oil and gas sector. It clearly indicates areas where targeted improvements can lead to better project outcomes. By addressing the identified factors communication, technology, delay management, and collaboration—organizations like Ras Lanuf Oil and Gas Manufacturing Company can enhance their project performance significantly. Moving forward, companies need to adopt a holistic approach to project management that focuses on technical skills and tools and emphasizes the human and organizational aspects of project success.

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