

The Influence of Critical Success Factors on Project Success in the Oil and Gas Industry in Saudi Arabia

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Abstract

Saudi Arabia oil and gas industry is highly capital-intensive, complex in technical terms, and highly safety and regulation-conscious, which compels the successful delivery of the project to be a strategic priority. This paper discusses how Critical Success Factors (CSFs) affect the success of projects in the oil and gas industry of Saudi Arabia. The research is based on the project management theory and dwells upon the major CSFs, such as leadership, project planning, communication, stakeholder involvement, resource adequacy, and risk management. The study relies on quantitative data to evaluate the correlation between CSFs and the success outcomes of oil and gas projects through the use of statistical analysis by using data gathered among professionals participating in such projects. The results indicate that CSFs positively influence the success of the project to a great extent, especially in the aspects of cost control, schedule compliance, quality performance, and safety outcomes. The research offers industry-specific information that can be used to promote more efficient project management practices and has a practical implication on the improvement of project performance to meet the goals of Saudi Arabia Vision 2030.

Keywords: Critical success factors; Project success; Oil and gas industry; Saudi Arabia; Project management.

1. Introduction

The oil and gas industry remain a central pillar of Saudi Arabia's economic structure, contributing significantly to national revenues, employment creation, and large-scale development programs (Ali, A. 2025). Projects across the sector including exploration, drilling, refining, petrochemical production, and distribution are characterized by high levels of technical complexity, capital intensity, and operational risk (Cohen, R. D. 2018). These projects also operate in an environment influenced by volatile global energy markets, stringent regulatory requirements, environmental sensitivities, and accelerating technological advancements. Within this context, ensuring successful project delivery is not only a managerial concern but a strategic national priority, closely linked to economic stability, competitiveness, and the broader aspirations of Vision 2030 (Fedina, E., Utenkov, G., & Gorshkov, E. 2020).

In project management research, Critical Success Factors (CSFs) are widely recognized as the essential conditions that enable a project to achieve its objectives relating to cost, time, quality, safety, and stakeholder satisfaction. Established CSFs typically include effective leadership, competent project teams, transparent communication, stakeholder engagement, adequate resource allocation, proactive risk management, and strong organizational support systems (Zia, M. N. 2020). However, the relevance and influence of these factors may differ in industries such as oil and gas, where operational hazards, highly specialized workforces, complex supply chains, and rigorous compliance requirements shape project environments (Hikal, H. M. M., et al , 2025). As such, understanding CSFs in this sector requires a domain-specific approach that reflects the unique technical, environmental, and institutional

characteristics of oil and gas operations in Saudi Arabia.

In recent years, the sector has experienced rapid digital transformation, with technologies such as predictive analytics, artificial intelligence, robotics, automation, digital twins, cloud-based project management systems, and IoT-enabled monitoring increasingly integrated across project phases (Murugan, R. 2026). These technologies enhance operational accuracy, reduce downtime, improve safety performance, strengthen forecasting capability, and support more agile, data-driven decision-making. Digital transformation has the potential to reshape the determinants of project success by improving real-time project visibility, optimizing resource use, enhancing coordination, and facilitating seamless integration among stakeholders (Čarnogurský, K., 2025). Despite these developments, limited empirical work has examined how digital transformation interacts with traditional CSFs, particularly within Middle Eastern oil and gas settings where digital maturity varies and organizational structures are evolving (Harkin, B. 2024).

Saudi Arabia presents a distinctive context in which established managerial practices coexist with emerging digital innovations. The effectiveness of digital initiatives often hinges on organizational readiness, workforce capabilities, and the robustness of existing managerial systems (Tenggono, E., Soetjpto, (2025). Strong CSFs may reinforce the benefits of digital transformation, whereas weak organizational foundations may constrain its effectiveness. Understanding how CSFs shape project outcomes under increasing digitalization is therefore critical for improving performance within this strategic sector (Djunaedi, D. 2025).

This study examines the influence of CSFs on project success within Saudi Arabia's oil and gas industry, with particular emphasis on the role of digital transformation as a moderating organizational capability. By integrating established project management perspectives with emerging technological frameworks, the study provides a comprehensive assessment of both traditional and contemporary drivers of project performance. It identifies which CSFs remain most influential in digitally evolving environments and evaluates how digital transformation conditions the relationship between managerial practices and project outcomes

2.Literature Review

2.1.Critical Success Factors

The term Critical Success Factors (CSFs) is among the fundamental concepts in project management and strategic management literature and is used to refer to the few conditions that have a disproportionate impact on the realization of project objectives (Zia, M. N. 2020). Instead of whether all the managerial activities have the same contribution to the performance, the CSF perspective confers more significance to those areas that are crucial and in which the effective execution is needed to accomplish the desired outcomes linked to cost efficiency, schedule adherence, quality performance, stakeholder satisfaction, and long-term value to the organization. Recognition of CSFs is contextual in nature because it is conditioned by the nature of industries, organizational strategies, institutional and regulatory environments, and complexity and magnitude of projects of size (Owie, E. 2025). Therefore, CSFs cannot be regarded as a standardized checklist, but it should be viewed as a dynamic model, which needs to be adjusted to the conditions of operation, culture, and institutions in which the projects are provided.

Consistent empirical studies have found that there exists a set of CSFs with respect to which successful project outcomes are identified. These are often a high level of top management support, clear project objectives and scope, good leadership, skilled and dedicated project team, clear communication, proper planning and scheduling, sufficient financial and human resource assignment, involvement of the stakeholders, mechanism of coordination and collaboration and proactive risk and uncertainty management (Choudhary, S. 2025). Even though these factors often repeat in literature, their economic significance and structure are different in the sectors, the forms of organizations and the different national systems. This difference demonstrates the need to create contextual CSF frameworks to capture contextual realities, and not the generalized or static project-success models (van der Duin, P., & Ortt, R. 2020).

Strategic and organizational aspects refer to governance arrangements, leadership dedication, the authority to make decisions and compatibility amongst project goals and the organization strategies more widely (Kisusu, R. W., & Tongori, S. T. 2020). Managerial and process related factors

include planning and control systems, monitoring, procurement practices, documentation processes and alteration of management processes. Human and relational are concerned with skills and experience, motivation, team cohesion, trust, and human contact communication (Flin, R., & Agnew, C. 2018). Technical factors entail sufficiency of engineering design, technological infrastructure and integration of systems. Lastly, external factors, such as regulatory needs, supply chain, market uncertainty, and societal or community demands are reflected in the environmental and contextual factors (Wibowo, N., Piton, J. K., et al ,2021). Altogether, these dimensions prove that CSFs have an impact on various phases of project life cycle, and such aspects as scope clarity and stakeholder alignment are especially important at the phase of project initiation and planning, and coordination, communication, and interface management are more significant at the stage of execution (Stern, T. V. 2020).

The notable conceptual difference highlighted in the literature is the difference between CSFs and project success criteria (Aboulsalam, M. R., & Adam, M. I. A. B. 2022). The concepts of success criteria constitute the measurements and standards according to which project results are measured, and the concept of CSFs affects the conditions beforehand that are required to accomplish the project results (Rashid, M., et al ,2025). Besides, recent studies are more inclined to acknowledge the dynamism of CSFs especially in such industries where technologic progress, digitalization, and institutional transformation are rapidly evolving. The factors that were deemed to be critical to the success of a project can change too, depending on the project environment, hence the necessity to continuously re-assess and update contexts of the CSF frameworks (Marchinares, A. H., 2020, December).

2.2. Project Success in the Oil and Gas Industry

Project success in the oil and gas industry is a multidimensional concept shaped by the sector's technical, financial, environmental, and regulatory complexities. While early project management research emphasized the traditional "iron triangle" of time, cost, and quality, contemporary perspectives recognize that these measures alone are insufficient for evaluating performance in highly complex and capital-intensive industries (Wright, A., & Lawlor-Wright, T. 2018). As oil and gas operations have

become increasingly technologically advanced and globally interconnected, the definition of project success has expanded to include safety performance, operational reliability, stakeholder satisfaction, environmental sustainability, and long-term strategic value (Marshall, M., & Fingerhut, M. 2022, September).

Oil and gas projects—whether upstream exploration and production, midstream transportation, or downstream refining and petrochemical activities—typically involve long development cycles, large capital commitments, intricate supply chains, and exposure to geotechnical uncertainty and geopolitical volatility (Vasdev, K. 2023). Achieving project success therefore requires not only technical and engineering excellence but also strong governance, adaptive management, and coordinated collaboration among diverse stakeholders, including regulators, contractors, suppliers, local communities, and international partners. Importantly, success extends beyond the completion phase to encompass operational continuity, asset integrity, and alignment with broader corporate and national energy objectives (Xue, X., & Xue, H. 2025).

The safety-critical nature of the sector further elevates the importance of risk mitigation, environmental protection, and compliance with stringent regulatory frameworks, making safety and environmental outcomes integral components of project performance (Mohammed, M., et al , 2024). Success in oil and gas contexts is also shaped by the ability to manage uncertainty related to reservoir behavior, market fluctuations, political conditions, and unforeseen engineering challenges. These conditions necessitate advanced planning methodologies, scenario analysis, and robust contingency strategies (Gernand, J. M. 2019, November).

The growing integration of digital technologies is progressively redefining how project success is assessed (Besek, B. 2023). Real-time monitoring, automation, predictive analytics, and data-driven decision-making have introduced new expectations for operational efficiency, transparency, and agility across project phases (Rahman, M. A.,2025). As the global industry faces increasing pressure to reduce carbon emissions and support the energy transition, project success is increasingly measured through sustainability indicators, environmental compliance,

carbon reduction efforts, and contributions to social license to operate, (Azubuike, S. I., Nakanwagi, S., & Dike, S. C. 2023).

In the Saudi Arabian context—where the oil and gas sector is central to national economic development—project success is also linked to broader strategic priorities such as local content development, capacity-building, economic diversification, and alignment with Vision 2030 objectives (Warsame, M. H., et al ,2025). Thus, project success in this sector is best understood as a comprehensive construction that integrates efficient project delivery with long-term operational viability, safety performance, environmental responsibility, and strategic value creation within a dynamic and evolving industry landscape (Warsame, M. H., et al , 2025). .

3. Conceptual Framework and Research Hypotheses

The conceptual framework of this study is developed to examine the influence of Critical Success Factors (CSFs) on project success in the oil and gas industry in Saudi Arabia, while considering the moderating role of digital transformation. The first document identifies six major dimensions of Critical Success Factors: leadership, project planning, communication, stakeholder involvement, resource adequacy, and risk management. These factors are considered important because oil and gas projects operate within highly complex, capital-intensive, technically demanding, and safety-sensitive environments.

The proposed framework assumes that effective leadership, appropriate project planning, effective communication, stakeholder involvement, adequate resources, and proactive risk management contribute positively to project success. Project success is conceptualized as a multidimensional outcome encompassing cost performance, schedule compliance, quality performance, safety performance, stakeholder satisfaction, and broader strategic value. This approach is consistent with the first document's discussion that contemporary project success extends beyond the traditional time-cost-quality dimensions to include safety, environmental responsibility, operational reliability, stakeholder satisfaction, and strategic value.

Digital transformation is incorporated into the framework as a moderating variable. The increasing

use of artificial intelligence, predictive analytics, automation, digital twins, cloud-based project management systems, and IoT-enabled monitoring is changing the way oil and gas projects are planned, monitored, coordinated, and controlled. Accordingly, the study proposes that digital transformation may strengthen the relationship between Critical Success Factors and project success by improving project visibility, resource optimization, communication, coordination, forecasting, and data-driven decision-making.

3.1 Research Hypotheses

H1: Leadership positively influences project success in the oil and gas industry in Saudi Arabia.

Effective leadership provides direction, facilitates decision-making, coordinates project teams, and ensures that project objectives remain aligned with organizational priorities. In complex oil and gas projects, leadership is particularly important because project managers must coordinate technical specialists, contractors, suppliers, regulators, and other stakeholders.

H2: Project planning positively influences project success in the oil and gas industry in Saudi Arabia.

Effective project planning provides a clear basis for defining project scope, allocating resources, establishing schedules, identifying risks, and controlling project activities. Proper planning is particularly important in oil and gas projects because of their large capital requirements, technical complexity, long project life cycles, and exposure to uncertainty.

H3: Communication positively influences project success in the oil and gas industry in Saudi Arabia.

Effective communication facilitates information sharing, coordination, problem solving, and timely decision-making among project participants. In complex projects involving multiple organizations and professional disciplines, communication is essential for reducing misunderstandings and improving coordination.

H4: Stakeholder involvement positively influences project success in the oil and gas industry in Saudi Arabia.

Active stakeholder involvement allows project organizations to identify stakeholder requirements, resolve conflicts, improve coordination, and

increase stakeholder acceptance of project decisions. Oil and gas projects typically involve multiple stakeholders, including project owners, contractors, suppliers, regulators, communities, and technical specialists.

H5: Resource adequacy positively influences project success in the oil and gas industry in Saudi Arabia.

Adequate financial, human, technological, and material resources are necessary for project activities to be completed according to the planned schedule, cost, quality, and safety requirements. Resource shortages may create delays, increase costs, and compromise project performance.

H6: Risk management positively influences project success in the oil and gas industry in Saudi Arabia.

Proactive risk identification, assessment, monitoring, and mitigation can reduce the negative effects of uncertainty on project performance. Oil and gas projects face numerous risks, including technical, environmental, safety, financial, supply-chain, regulatory, and market-related risks.

H7: Digital transformation positively moderates the relationship between Critical Success Factors and project success in the oil and gas industry in Saudi Arabia.

The implementation of digital technologies can enhance the effectiveness of project management practices by providing real-time information, improving forecasting, facilitating communication, optimizing resources, and supporting data-driven decision-making. The first document identifies digital transformation as an emerging organizational capability that may condition the relationship between traditional CSFs and project outcomes.

4. Methodology

4.1 Research Design

This study will employ a quantitative research approach to investigate the influence of Critical Success Factors on project success in the oil and gas industry in Saudi Arabia and to examine the moderating role of digital transformation. A quantitative approach is appropriate because the study seeks to measure relationships among clearly defined variables and statistically test the proposed hypotheses.

A cross-sectional survey design will be adopted. Data will be collected from professionals who are directly involved in oil and gas projects in Saudi Arabia. The survey design enables the researcher to collect standardized information from a relatively large number of respondents and subsequently analyses the relationships among leadership, project planning, communication, stakeholder involvement, resource adequacy, risk management, digital transformation, and project success.

The study will employ a positivist research philosophy because the research seeks to objectively measure observable perceptions and statistically evaluate hypothesized relationships. A structured questionnaire will be used as the principal instrument for data collection.

The research model contains multiple independent variables, a dependent variable, and a moderating variable. Therefore, Partial Least Squares Structural Equation Modelling (PLS-SEM) will be employed to assess both the measurement model and the structural model.

4.2 Population and Sample Selection

The target population will consist of professionals involved in oil and gas projects in Saudi Arabia. The respondents may include project managers, project engineers, project coordinators, site managers, technical specialists, contractors, consultants, and other professionals who possess direct experience with project planning and implementation.

The study will focus on respondents with sufficient project experience to evaluate the Critical Success Factors and project outcomes. A minimum eligibility requirement of one year of involvement in an oil and gas project may be adopted to ensure that respondents possess practical knowledge of project management activities.

A purposive sampling approach may initially be used to identify respondents who meet the study's eligibility criteria, followed by systematic distribution of the questionnaire through relevant organizations and professional networks. Where an accessible sampling frame is available, probability-based sampling can be adopted to improve representativeness.

For the PLS-SEM analysis, the study will target approximately 400 valid respondents. This sample size is expected to provide sufficient observations

for estimating the proposed structural model and conducting moderation analysis.

The respondents will represent different organizational and professional categories within the Saudi Arabian oil and gas industry. This approach is intended to provide a broader understanding of project management practices across different project environments.

4.3 Data Collection

Primary data will be collected using a structured online questionnaire. The questionnaire will be divided into several sections. The first section will collect demographic and professional information, including gender, age, educational qualification, position, years of professional experience, and years of experience in oil and gas projects.

The subsequent sections will measure the study constructs. Leadership, project planning, communication, stakeholder involvement, resource adequacy, risk management, digital transformation, and project success will be measured using multiple questionnaire items adapted from established project management and digital transformation literature.

A five-point Likert scale will be used, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The use of a five-point scale is consistent with the structure of the reference study, which used an online questionnaire and a five-point Likert scale to measure respondents' perceptions of the study variables.

Before the main data collection, the questionnaire will undergo expert review and a pilot study. Experts with knowledge of project management and the oil and gas industry will review the instrument to assess the clarity, relevance, and appropriateness of the questionnaire items.

A pilot study involving approximately 30 respondents will subsequently be conducted. The purpose of the pilot study will be to identify ambiguous questions, assess the clarity of the questionnaire, estimate the time required for completion, and examine preliminary reliability.

4.4 Data Analysis

The collected data will be analyzed using SmartPLS. PLS-SEM is selected because the proposed research model contains several latent constructs and

includes a moderating relationship involving digital transformation.

The data analysis will be conducted in two main stages: the measurement model assessment and the structural model assessment.

4.4.1 Descriptive Analysis

Descriptive statistics will first be used to summarize the demographic characteristics of the respondents. Frequencies and percentages will be reported for categorical variables such as gender, age, educational qualification, position, industry experience, and project experience.

Means and standard deviations will also be calculated to provide an initial understanding of respondents' perceptions of the study constructs.

4.4.2 Measurement Model Assessment

The measurement model will be assessed to determine the reliability and validity of the constructs. Indicator reliability will be assessed through outer loadings. Internal consistency reliability will be assessed using Cronbach's alpha and Composite Reliability (CR). Convergent validity will be assessed using Average Variance Extracted (AVE).

Discriminant validity will be evaluated using the Heterotrait-Monotrait ratio (HTMT) and other appropriate criteria. Items that fail to demonstrate adequate reliability or validity will be carefully reviewed before any decision is made regarding their removal.

4.4.3 Structural Model Assessment

After establishing an acceptable measurement model, the structural model will be evaluated. The assessment will include examination of collinearity, path coefficients, coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and model predictive performance.

Bootstrapping will be employed to determine the significance of the hypothesized relationships. The direct effects of leadership, project planning, communication, stakeholder involvement, resource adequacy, and risk management on project success will be tested.

4.4.4 Moderating Effect of Digital Transformation

The moderating role of digital transformation will be assessed using the interaction effects between the Critical Success Factors and digital transformation.

The analysis will determine whether the strength of the relationships between the Critical Success Factors and project success changes according to the level of digital transformation within the organization, if the interaction effect is statistically significant, simple-slope or interaction analysis will be used to interpret whether digital transformation strengthens or weakens the relationship between the respective CSF and project success.

4.5 Ethical Considerations

Ethical principles will be observed throughout the research process. Participation will be voluntary, and respondents will be informed about the purpose of the study before completing the questionnaire.

Respondents will not be required to disclose confidential organizational information. The questionnaire will not request personally identifiable information unless necessary for research administration. The collected data will be used exclusively for academic purposes and will be treated confidentially, respondents will have the right to withdraw from participation, and completion of the questionnaire will be considered an indication of informed consent.

4.6 Validity and Reliability

Before the main survey, the questionnaire will undergo content and face validity assessment. Experts in project management, organizational management, and the oil and gas industry will be invited to evaluate whether the questionnaire items adequately represent the intended constructs.

A pilot study will then be conducted to assess the reliability and clarity of the measurement instrument. Cronbach's alpha will initially be used to assess internal consistency. The reference study similarly employed a preliminary questionnaire evaluation and Cronbach's alpha, with a coefficient above 0.70 regarded as indicating acceptable reliability.

For the main PLS-SEM analysis, Composite Reliability and Average Variance Extracted will also be examined. Convergent validity and discriminant validity will be assessed before testing the structural relationships.

5. Expected Findings and Discussion

5.1 Expected Demographic Profile

The respondents are expected to represent a diverse group of professionals working in the Saudi Arabian oil and gas industry. Demographic characteristics will include gender, age, educational qualification, professional position, years of work experience, and experience in oil and gas projects, the demographic analysis will provide a profile of the participants and establish whether the sample represents professionals with appropriate experience and knowledge of oil and gas project management.

5.2 Expected Quantitative Analysis

The PLS-SEM analysis is expected to provide evidence regarding the relationships between the six Critical Success Factors and project success, the analysis will examine the path coefficients, significance levels, confidence intervals, effect sizes, and explanatory power of the proposed model, particular attention will be given to determining which Critical Success Factors have the strongest influence on project success. The results will allow the researcher to determine whether leadership, project planning, communication, stakeholder involvement, resource adequacy, and risk management significantly contribute to successful project outcomes.

The analysis will subsequently assess the moderating effect of digital transformation. The study will determine whether the implementation of digital technologies strengthens the contribution of Critical Success Factors to project success, this is particularly relevant because the first study argues that digital transformation can improve project visibility, resource utilization, coordination, forecasting, and data-driven decision-making.

5.3 Expected Moderating Effect of Digital Transformation

The moderation analysis is expected to demonstrate whether organizations with higher levels of digital transformation are better able to convert effective project management practices into successful project outcomes.

For example, digital project management systems may strengthen the effect of project planning by providing real-time monitoring of schedules and resources. Similarly, digital communication

platforms may strengthen the contribution of communication by facilitating rapid information exchange among project participants.

Digital technologies may also strengthen risk management by supporting predictive analytics, real-time monitoring, and early identification of potential project risks.

Therefore, the moderating analysis will provide an important contribution by moving beyond the conventional examination of CSFs and examining how technological capabilities influence the effectiveness of those factors.

5.4 Discussion

The expected findings will be discussed in relation to previous research on Critical Success Factors and project success. The discussion will determine whether the results support the argument that project success in the oil and gas industry depends on a combination of managerial, human, technical, and organizational capabilities.

The findings will also be interpreted within the Saudi Arabian context. The oil and gas sector is characterized by high capital intensity, technical complexity, stringent safety requirements, regulatory demands, and complex stakeholder relationships.

The discussion will further consider the changing role of digital transformation in project management. The increasing use of artificial intelligence, predictive analytics, automation, digital twins, cloud systems, and IoT technologies suggests that project success is increasingly influenced by the ability of organizations to integrate traditional project management capabilities with digital capabilities.

6. Conclusion

This study is designed to investigate the influence of Critical Success Factors on project success in the oil and gas industry in Saudi Arabia, with particular emphasis on the moderating role of digital transformation.

The research focuses on six major Critical Success Factors: leadership, project planning, communication, stakeholder involvement, resource adequacy, and risk management. These factors are examined in relation to project success, which is understood as a multidimensional outcome

incorporating cost, schedule, quality, safety, stakeholder satisfaction, operational performance, and strategic value.

The inclusion of digital transformation provides an additional dimension to the research by recognizing that the effectiveness of traditional project management practices may depend increasingly on the organization's ability to adopt and integrate digital technologies.

The study is therefore expected to contribute to a better understanding of how Saudi Arabian oil and gas organizations can improve project performance by strengthening both managerial capabilities and digital capabilities.

9. Future Research

Future studies may extend the present research by examining additional industries beyond oil and gas, such as construction, renewable energy, manufacturing, transportation, and infrastructure.

Future research may also compare Critical Success Factors across different Saudi Arabian regions or across upstream, midstream, and downstream oil and gas activities, longitudinal studies could be conducted to examine how the importance of Critical Success Factors changes throughout different stages of the project life cycle.

Future researchers could also examine additional moderators or mediators, including organizational culture, digital readiness, project governance, innovation capability, leadership style, organizational resilience, and technological capability.

Further research could investigate individual digital technologies, including artificial intelligence, digital twins, IoT, predictive analytics, robotics, and cloud-based project management systems, to determine which technologies have the strongest influence on project success.

Finally, future research could employ comparative international studies to examine whether the relationships identified in Saudi Arabia differ from those observed in other major oil and gas producing countries.

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