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Article

The influence of project management practices on project performance in manufacturing small and medium sized enterprises (SMEs) in the KSA

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Abstract: Throughout the course of a project cycle, the many phases of project management—including planning, execution, control and monitoring, and ending—are integrated and executed. In modern firms, project management has become the dominant tool for managing change. Best practices have emerged due to global project management practices and company evolution. The primary goal was to investigate how project management approaches affected project performance of the Saudi Arabia Small and Medium Sized Enterprises (SMEs). This study investigated the impact of various project management practices including risk management, communication, leadership, and stakeholder management, on project performance in manufacturing SMEs in Riyadh, Saudi Arabia. A quantitative research methodology was employed, with data collected from 250 employees (i.e., supply chain, finance and R&D managers/supervisors) across 8 SMEs. The results revealed that risk management, leadership practices, and stakeholder management significantly contribute to project performance. Surprisingly, no significant relationship was found between communication practices and project performance. The findings of this study emphasize the importance of effective risk management, strong leadership, and efficient stakeholder management in achieving successful project outcomes. Finance managers and R&D managers in Saudi manufacturing SMEs should lead and engage stakeholders to improve project performance. Supply chain managers must manage risk and maintain stakeholder relationships to avoid disruptions. Communication improvements, despite their small impact, are essential for departmental coordination. Global project management strategies tailored to local culture and business will improve project success.

Keywords: project performance; leadership practices; communication practices; project management practices; stakeholder management practices; risk management practices

1. Introduction

Project management is a critical component that significantly contributes to the success of any project (de Carvalho et al., 2015). The literature reveals that risk management is vital in improving project performance, and the presence of soft skills is essential to effective risk management (Carvalho and Rabechini Junior, 2015). Project performance is how well a project meets its goals within scope, time, cost, quality, and stakeholder satisfaction (Di Maddaloni and Davis, 2017). It assesses project management practices, deliverable quality, schedule and budget compliance, and stakeholder satisfaction, including local community stakeholders. On the other hand, Wideman (2022) emphasizes the necessity of project and program risk management for managing project risks and opportunities. In terms of project success, Todorović et al. (2015) propose a knowledge-based approach to project management that significantly contributes to project success. Badewi (2016),

who highlights the impact of project management and benefits management practices on project success, also supports it. The dynamic, competitive world has forced programs to adapt to shifting business situations. Project management helps an organization's competitive strategy. Linking project results to organizational objectives is a critical talent for associations (PMI, 2015).

Project management is a strategic skill that links project results. According to Kerzner (2017), project management is used to restrict a firm's resources in a particular activity by applying a fixed budget and time to ensure excellent performance and good customer relations. Project management follows a particular set of stages that define the task to be done, the person who will do the job, the milestone, and the person who will authorize, audit, monitor, and assess the milestone (PMI, 2015). The decisions project managers make about risk management and desired outcomes significantly influence the total amount of time it takes to complete the project (Seddon et al., 2014). The management and control practices used during the planning and orientation phases also influence project success (Chovichien and Nguyen, 2013). According to McLeod et al. (2012), the absence of predetermined criteria for classifying a project as successful impedes assessing its effectiveness. Even when billions of shillings are spent on development initiatives, the outcomes typically do not satisfy felt requirements, or if they do, the demands could be more sustainable (Wysocki, 2011).

Project planning, scheduling, and control affect project success across industries and countries (de Carvalho et al., 2015). Effective project management ensures resource efficiency, timeline adherence, and objective achievement, improving project outcomes (Kerzner, 2017). Benefits management practices ensure that project benefits are realized and sustained after completion, boosting project success (Badewi, 2016). These practices form a solid governance framework for project success. Risk management is another important project performance factor. Prevention of project derailments requires risk identification, assessment, and mitigation (Zwikael and Ahn, 2011). Communication and leadership skills help manage uncertainty and create a risk-aware culture (Carvalho and Rabechini Junior, 2015). Leadership sets the tone for proactive risk identification and encourages team members to raise challenges early (Dubey et al., 2015). Stakeholder engagement and collaboration improve project performance and trust (de Oliveira and Rabechini Jr., 2019). Communication skills help manage stakeholder expectations and resolve conflicts, ensuring project success and stakeholder satisfaction (Wu et al., 2017).

Bad stakeholder management, poor coordination, rising costs, shoddy project design, delays in implementation, and time lags between planning and launching are also potential sources of project failure (Gunawan and Ahsan, 2010). While focusing on other management practices, research on risk management as one of the management practices has shown the decision-making processes and project outcomes (Khan and Zsidisin, 2012). There has been researching on stakeholder practices in communication, leadership, and stakeholder management. Nevertheless, most studies show how these patterns negatively affects projects without establishing the consequences of specific practices (Campbell, 2009). This analysis was motivated by a study by Laufer et al. (2018) that presented a weak case for the relationship between project management methodologies and project performance.

Banihashemi et al. (2017) identify critical success factors for integrating sustainability into construction project management practices. They emphasize the role of effective stakeholder management in project success. Similarly, Oppong et al. (2017) review the performance attributes of stakeholder management in construction projects, while de Oliveira and Rabechini Jr. (2019) discuss how stakeholder management influences trust in a project. Leadership styles and competencies are also integral to project management. Jacobsen and Bøgh Andersen (2015) study intended and perceived leadership practices and their impact on organizational performance. Maqbool et al. (2017) emphasize the role of emotional intelligence, project managers' competencies, and transformational leadership in project success. Hazy and Uhl-Bien (2015) propose how different leadership practices can enact organizational outcomes. Communication within project teams is another vital aspect. Wu et al. (2017) investigate the relationship between communication-conflict interaction and project success among construction project teams, while Navimipour and Charband (2016) review knowledge-sharing mechanisms and techniques in project teams. Finally, Kerzner (2022) provides a support to measuring and monitoring project performance through metrics, KPIs, and dashboards. His work aligns with the enterprise risk management strategies suggested by Fraser et al. (2017), Quail and Simkins (2021) stressing the importance of a systematic approach to managing risks and improving firm performance.

This study adds to the body of knowledge by examining how project management practices affect Saudi Arabia SMEs' project performance. Based on a variety of literature, it extends de Carvalho et al. (2015) and Kerzner's (2017) findings that project management practices improve project success. It builds on Carvalho and Rabechini Junior (2015), Zwikael and Ahn (2011) by emphasizing risk management and soft skills' importance in project success. This study supports Wu et al. (2017) by showing how communication practices affect conflict resolution and project success. It also emphasizes stakeholder management and leadership in building trust and navigating uncertainties, like de Oliveira and Rabechini Jr. (2019) and Dubey et al. (2015). This study examines how these key project management practices improve project performance, providing practitioners and scholars with valuable insights. Thus, the study develops the research questions:

1) How do risk management practices affect the project performance of small and medium-sized businesses in Saudi Arabia?
2) How do communication practices affect the project performance of small and medium-sized businesses in Saudi Arabia?
3) In what ways do project leadership practices influence the project performance of small and medium-sized businesses in Saudi Arabia?
4) What is the effect of stakeholder management practices on the project performance of small and medium-sized businesses in Saudi Arabia?

This study is the initial attempt to examine Saudi Arabia SMEs' project management practices and effects. The country's strategic economic transformation under Vision 2030 aims to diversify and improve SME performance. Understanding how project management practices affect project outcomes in this context helps local practitioners implement tailored strategies that match regional business dynamics and cultural considerations.

2. Literature review

2.1. Risk management practices and project performance

According to Kinyua et al. (2015), there was a positive correlation between small-scale enterprise performance and risk management strategies in the study on the impact of risk management strategies on enterprise project management. To lessen the impact of the risk, the businesses identified their sources, quantified them, and created risk reduction strategies. The risk assessment revealed that most businesses prefer to avoid risk, communicate about the danger they are experiencing, and evaluate the time they have to lower the risk to succeed in web design. Zwikael et al. (2012) assert that the importance of knowing the project environment, considering the industry's and country's levels of project risk, is connected with the success of risk management. The authors stress the importance of even modest levels of risk management planning in minimizing risk's detrimental effects on project success. Their research indicates that how this method is implemented frequently misses events and situations that threaten the project's performance. The inefficiencies significantly influence the failure of complicated projects in the risk detection process.

Risk management practices are instrumental in influencing project performance. Carvalho and Rabechini Junior (2015) highlight that effective risk management significantly enhances project performance. The literature emphasizes project management's performance impact. Kerzner (2022) emphasizes how structured project management practices help achieve project goals by monitoring and improving project performance with metrics, KPIs, and dashboards. Pereira et al. (2022) emphasize strategic planning, risk management and stakeholder engagement as project management success factors that directly affect performance outcomes. Magagan and Ngugi (2021) show that effective project management practices, such as clear communication and leadership, improve project performance in Unilever Kenya Ltd., demonstrating their universal applicability across regions and industries. Wideman (2022) also focuses on the importance of risk management, pointing out its role in managing project risks and opportunities. This work suggests that managing risks is about mitigating potential issues, identifying, and capitalizing on opportunities that arise during the project life cycle. The effective management of both risks and opportunities can lead to improved project performance and outcomes. Florio and Leoni (2017) also reflect the importance of risk management in project performance in the work. They studied Italian firms and found a positive correlation between enterprise risk management and firm performance. This study suggests that a systematic approach to risk management can help organizations perform better, not just in isolated projects but also across the entire firm. Fraser et al. (2021) discuss the current best practices and research on enterprise risk management. They suggest that adopting these practices can lead to improved organizational performance. This work aligns with Florio and Leoni (2017) and Wideman (2022), advocating for a holistic and comprehensive approach to risk management. Kerzner (2022) provides the practical insights into measuring and monitoring project performance through metrics, KPIs, and dashboards. Finally, the study offers a research hypothesis:

H_1. Risk management practices significantly influence project performance.

2.2. Communication practices and project performance

Campbell and Cohost (2014) surveyed a global organization by hosting a series of seminars for project managers for a petroleum services company with operations practically everywhere. Five hundred project managers from 500 nations were surveyed about the elements that made some projects succeed, and others fail. According to the findings, communication was the key to success. More information revealed that projects inside energy firms were always successful when there was strong communication between team members and between the project team and its customers. However, ineffective communication is a factor leading to project failure. Using ICT to improve project communication management was the focus of Lofgren's (2016) investigation of a site north of Stockholm. In 2016, he spent half a year conducting the research by conducting regular on-the-ground inspections, interviews, and document reviews. As a result of his research, he now understands the importance of having on-site production supervisors and construction managers to organize and oversee daily operations and ensure the site's safety, environmental sustainability, and quality of work in progress and completion.

Starting with the work of Navimipour and Charband (2016) conducted a comprehensive review of knowledge-sharing mechanisms and techniques in project teams. They found effective communication is integral to knowledge sharing, improving teamwork, increased efficiency, and better project outcomes. Wu et al. (2017) investigated the relationship between communication-conflict interaction and project success among construction project teams. They discovered that open, regular, and constructive communication could effectively manage and resolve conflicts, improving project success. Turkulainen et al. (2015) present a case study of the Qstock festival to discuss managing project stakeholder communication. They found that effective communication with stakeholders could significantly influence project success. This case highlights the importance of stakeholder communication in project performance, emphasizing that stakeholders must be kept informed and engaged to ensure their support and cooperation.

Liu et al. (2017) examined the effects of building information modeling (BIM) on collaborative design and construction in China. BIM is a communication tool that enables all project stakeholders to access, share, and use project information. Their study found that BIM could enhance communication, collaboration, and coordination among project team members, improving project performance. In a broader sense, Jacobsen and Bøgh Andersen (2015) emphasized the role of leadership in effective communication practices. Their research found that leaders' ability to communicate their intended practices clearly and effectively could influence organizational performance. Similarly, Maqbool et al. (2017) underscored the importance of emotional intelligence in communication, significantly affecting project success. Finally, the study offers a research hypothesis:

H_2. Communication practices significantly influence project performance.

2.3. Project leadership practices and project performance

The International Centre for Complex Project Management convened a series of global round tables in 2014 to explore the causes behind the failure of large-scale initiatives. The challenge, it was recognized, is dealing with uncertainty as social, organizational, and innovation dynamics and delivery time's increase. To increase performance in a setting that is getting more complicated and competitive, project teams need to have the necessary abilities (Remington, 2016). Cloutier et al. (2016) have provided valuable insights into project leadership based on a survey of 500 project leaders from various industrial enterprises in the UK. In 2016, a study evaluated the best leadership style for effective project managers. Between 1994 and 2016, Prakash (2016) conducted a study to determine the effect of project leadership and team-related characteristics on the success of 153 operations covering 28 nations. The study discovered that leadership actions are adaptable and that leadership philosophies should change depending on the context. The findings also demonstrated that project managers prioritizing building relationships are better equipped to use the transformational leadership strategy.

Jacobsen and Bøgh (2015) investigated the effects of leadership practices on organizational performance. They found that leadership is not just about the actions taken by leaders but also about how team members perceive these actions. Their findings suggest that effective project leadership practices can significantly improve project performance when the team clearly communicates and understands those practices. Maqbool et al. (2017) further explored the role of project leaders, focusing on emotional intelligence, project managers' competencies, and transformational leadership. Their findings indicate that these three aspects significantly affect project success. They highlighted that leaders with high emotional intelligence better understand and manage their teams, improving project outcomes. Moreover, transformational leadership, characterized by inspiring and motivating team members towards a common goal, was particularly effective in enhancing project performance.

Dubey et al. (2015) looked at leadership within the green supply chain management context. They found a positive relationship between effective leadership, operational practices, and environmental performance. Although this study focused on supply chain management, the findings can be extrapolated to project management, indicating that effective leadership can lead to improved operational practices and, ultimately, better project outcomes. DuBois et al. (2015) explored the leadership styles of effective project managers. They found that effective project managers demonstrated a blend of leadership techniques and traits that resulted in high-performance teams. They posited that the right blend of leadership traits and techniques could significantly improve project performance. Finally, Hazy and Uhl-Bien (2015) discussed complex leadership involving generative, administrative, and community-building leadership practices. Therefore, the study offers a research hypothesis:

H_3. Project leadership practices significantly influence project performance.

2.4. Project performance and stakeholder management practices

Eskerod and Huemann (2014) state that for a project to be successful, there must be communication in both directions amongst the various parties involved. Any endeavor-requiring minimum on no involvement runs the risk of inadequate growth and execution. According to stakeholder theory, the performance's success depends on the involvement of project stakeholders. Involving stakeholders decreases the likelihood of surprise and dissatisfaction. Eskerod et al. (2015) investigated stakeholder inclusion to improve project management. This from research emerged from a case study that followed its subjects from 2012 to 2014. The critical incident technique was established after observing people's actions in the midst of the crisis. Stakeholders who were more involved in the process of the organization were more engaged, according to the data collected on stakeholder inclusion. Stakeholders in the organization can increase the project's viability thanks to the branding approach the company employs. The research revealed that organizations with active participation had a better success rate than those without. After analyzing the difficulties of stakeholder management and their effect on project performance in Ghana's Upper East, the same researcher concluded that stakeholder management is crucial to a project's success. It was discovered that unhealthy competition, competing interests, a lack of support, and anti-stakeholder leadership, beliefs, and practices had a significant impact on project outcomes (Ayatah, 2012).

Oppong et al. (2017) reviewed project stakeholder management performance attributes. They found that effective stakeholder management significantly affected project performance, including identifying key stakeholders, understanding their expectations, and managing their influence. Xia et al. (2018) conducted a systematic literature review to explore the intersection of construction risk management and stakeholder management. They found that integrating these two areas could improve project performance. Understanding and managing stakeholders' perceptions and reactions to project risks can improve project outcomes. De Oliveira and Rabechini Jr. (2019) conducted a quantitative study on stakeholder management's influence on trust in a project. They found that effective stakeholder management could foster trust, a critical component for successful collaboration and project execution.

Di Maddaloni and Davis (2017) rethought the inclusiveness of local community stakeholders in megaprojects. They found that including local community stakeholders could improve project performance. Their work indicates that broadening the definition of stakeholders and including often-overlooked groups, such as the local community, lead to better project outcomes. Yang and Shen (2015) proposed a framework for stakeholder management in construction projects. The framework includes processes such as stakeholder identification, analysis, and engagement, and they found that following this systematic approach could improve project performance. Lastly, Nguyen and Mohamed (2019) investigated stakeholder management in complex projects. They found that proper stakeholder management could help to handle the complexity of projects, thus improving project performance. Therefore, the study offers a research hypothesis:

H_4. Stakeholder management practices significantly influence project performance.

Conceptual framework:

After reviewing the literature pieces of evidence and theory supports, the study develops a conceptual framework. **Figure 1** shows how risk management, communication, project leadership, and stakeholder management affect project performance. Each hypothesis (H_1–H_4) examines how these practices affect project performance. H_1 suggests risk management practices improve project performance, H_2 suggests communication practices do, H_3 suggests project leadership practices do, and H_4 examines stakeholder management. This model evaluates how these critical project management practices affect Saudi Arabia SMEs' project success and outcomes, revealing which practices are most effective.

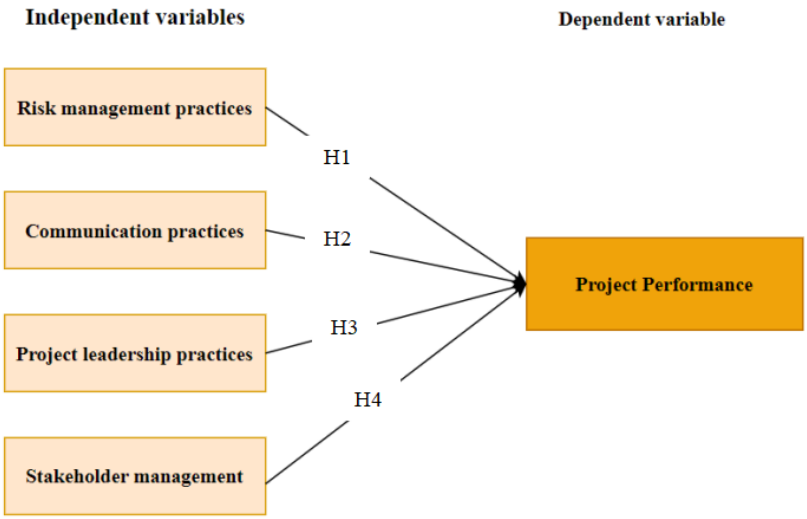

Figure 1. Conceptual framework.

3. Research methodology

3.1. Research method

This study employed a quantitative research methodology to explore the impacts of risk management practices, communication practices, leadership practices, and stakeholder management practices on project performance in small and medium-sized enterprises (SMEs) in Riyadh, Saudi Arabia. The rationale for choosing a quantitative approach is its suitability for producing numerical data that can be subjected to rigorous statistical analysis, enabling a deeper understanding of the relationships between variables (Carvalho and Rabechini Junior, 2015). There is another evidence of using a quantitative survey method as de Carvalho et al. (2015) recommended to use survey method. The study targeted SMEs in the Saudi Arabia. Saudi Arabia prioritizes SMEs because they are crucial to economic development and diversification, especially under Vision 2030. SMEs drive innovation, employment, and GDP growth in Saudi Arabia. Sustainable growth and competitiveness require an understanding how project management can improve performance. This study provides targeted insights and practical strategies to help Saudi SMEs overcome project management challenges and achieve strategic goals.

3.2. Data collection procedure

The study population consisted of 250 employees (including managers and supervisors) working on eight different SME projects implemented between 2015 and 2022 in Riyadh, Saudi Arabia. The study only targeted the managers and supervisors who were acting as supply chain managers, finance managers or R&D managers. Other types of managers were withdrawn from the sampling distribution. These employees were from various departments, including finance, supply chain, and research and development, and also included department leaders. This diverse group of respondents was chosen to provide a comprehensive view of the project environment from multiple perspectives. Data was collected using a structured questionnaire, which the researcher filled out individually with each participant. This data collection method was chosen because it allows for standardized data collection, making comparing and analyzing responses easier. The questionnaire included questions about the participants' perceptions of risk management practices, communication practices, leadership practices, stakeholder management practices, and project performance.

To ensure the reliability and validity of the questionnaire, a pilot study was conducted before the primary survey. This pilot study helped refine the questionnaire, ensuring the questions were clear, unambiguous, and relevant to the study. The questionnaire was then administered to the participants, and their responses were recorded for analysis. A cluster sampling technique was employed in this study (Gay and Diehl, 1992), which involved including all employees in the Department of Research and Development and all department heads, as well as all projects implemented since 2015. This approach was chosen to reduce selection bias that might have arisen from a more selective sampling technique. Data collected from the survey was then analyzed using various statistical methods to identify patterns, relationships, and trends. The statistical software used for data analysis allowed the researcher to conclude the impacts of management practices on project performance.

3.3. Measurement scales

Table 1 summarizes the measurement scales and items used in this study to assess project management practices and their effects on project performance. The table has five measurement scales: communication practices, project leadership practices, project performance, risk management practices, and stakeholder management practices. Each scale lists the number of items used to measure it, their sources, the measurement statements, and their item codes. This structured approach assesses all project management practices to get a complete picture of how they affect project outcomes.

Four items adapted from Carvalho and Rabechini Junior (2015) and Wu et al. (2017) assess communication channel effectiveness, clarity, stakeholder information dissemination, and feedback incorporation for communication practices. Dubey et al. (2015) and Jacobsen and Bøgh Andersen (2015) use four items to measure project leadership practices (PLP), including leadership skills, team collaboration, conflict management, and goal alignment. Four items from de Carvalho et al. (2015) and

Kerzner (2017) assess project performance: deadlines, budget adherence, goal achievement, and outcome quality. Five items from Carvalho and Rabechini Junior (2015) and Zwikael and Ahn (2011) assess risk identification, assessment, mitigation, contingency planning, and monitoring. Finally, four items from Eskerod and Di Maddaloni and Davis (2017) and Human (2016) measure stakeholder management practices: identification, engagement plans, feedback, and communication.

Table 1. Measurement scales and items.

Measurement scale	Items No.	Sources/references	Items	Codes
Communication practices (CP)	4	Carvalho and Rabechini Junior (2015); Wu et al. (2017)	Effective communication channels are established and maintained within the project team.	CP1
			Timely and clear communication of project objectives and updates is ensured.	CP2
			Stakeholders are kept informed about project progress and any changes.	CP3
			Feedback from team members and stakeholders is actively sought and incorporated.	CP4
Project leadership practices (PLP)	4	Dubey et al. (2015); Jacobsen and Bøgh Andersen (2015)	The project leader demonstrates strong leadership skills in guiding the team.	PLP1
			The project leader fosters a collaborative and supportive team environment.	PLP2
			The project leader effectively manages conflicts and motivates the team.	PLP3
			The project leader ensures the alignment of team goals with project objectives.	PLP4
Project performance (PP)	4	de Carvalho et al. (2015); Kerzner (2017)	The project meets its scheduled deadlines and milestones.	PP1
			The project stays within the allocated budget.	PP2
			The project achieves its defined objectives and goals.	PP3
			The project delivers high-quality outcomes that meet stakeholder expectations.	PP4
Risk management practices (RMP)	5	Carvalho and Rabechini Junior (2015); Zwikael and Ahn (2011)	Potential project risks are identified and documented early in the project.	RMP1
			Risk assessment and prioritization are conducted regularly throughout the project.	RMP2
			Risk mitigation strategies are developed and implemented effectively.	RMP3
			Contingency plans are in place for managing identified risks.	RMP4
			The project team is proactive in monitoring and controlling project risks.	RMP5
Stakeholder management practices (SMP)	4	Di Maddaloni and Davis (2017); Eskerod and Huemann (2016)	Stakeholders are identified and their needs are analyzed at the start of the project.	SMP1
			Stakeholder engagement plans are developed and executed effectively.	SMP2
			Stakeholder feedback is regularly gathered and acted upon throughout the project.	SMP3
			Effective communication and collaboration are maintained with all stakeholders.	SMP

3.4. Data analysis

SEM, one of the best statistical methods for social research, allows for concurrently assessing several links (Hair et al., 2017). However, prior studies have mainly concentrated on covariance-based approaches (CB-SEM), such as SMART PLS (Hair et al., 2017); a variance-based approach, or PLS-SEM, with a unique methodological feature, may be a practical alternative. The hypotheses were tested and confirmed using structural equation modelling. The data were evaluated using structural equation modelling, factor analysis, and confirmatory factor analysis (SEM). The measurement model has overall fit, construct reliability, and convergent and discriminant validity were examined using SEM.

Table 2 shows that 39.2% of study participants were from supply chain, 31.6% from Finance, and 29.2% from R&D. Participation was higher among men (58.8%) than women (41.2%). In the age distribution, 38.4% of participants are 25–34 and 40.8% are 35–44, with 20.8% being 45–54. These findings indicate that the studied SMEs have a young, male-dominated workforce with an even distribution across key departments. This demographic profile helps interpret the study's results and understand these organizations' dynamics, emphasizing the need for targeted strategies that meet this workforce's needs.

Table 2. Demographic analysis.

Demographics	Categories	Frequency	Percentage (%)
Departments			
	Supply chain	98	39.2
	Finance	79	31.6
	R&D	73	29.2
Gender			
	Male	147	58.8
	Female	103	41.2
Age			
	25–34	96	38.4
	35–44	102	40.8
	45–54	52	20.8

4. Results

4.1. Convergent validity and reliability

Table 3 presents the results of reliability and validity tests for the constructs used in the study. Cronbach's alpha and Rho_A are reliability measures that determine the internal consistency of the items in each construct (Hair et al., 2016; 2017). All constructs exhibit Cronbach's alpha and Rho_A values greater than 0.70, indicating good internal consistency (Tavakol and Dennick, 2011). The highest reliability is for stakeholder management practices (α = 0.869, ρ = 0.872), while project leadership practices have the lowest (α = 0.730, ρ = 0.759). This suggests that the items within each construct consistently measure the same underlying concept

(Hair et al., 2017). In addition, composite reliability (CR) is another measure of internal consistency. Values above 0.70 are considered acceptable, indicating that the constructs are reliable (Hair et al., 2016). In this case, all constructs exceed the threshold, with stakeholder management practices having the highest CR (0.911) and project leadership practices having the lowest (0.833).

Table 3. Convergent validity and reliability.

Constructs	Cronbach's alpha	Rho_A	CR	AVE
Communication practices	0.815	0.828	0.879	0.646
Project leadership practices	0.730	0.759	0.833	0.560
Project performance	0.827	0.834	0.885	0.658
Risk management practices	0.785	0.786	0.853	0.537
Stakeholder management practices	0.869	0.872	0.911	0.719

On the other hand, average variance extracted (AVE) is a measure of convergent validity that shows how much variance in the items is captured by the construct. AVE values above 0.50 indicate good convergent validity (Hair et al., 2016). Again, all constructs meet this threshold, suggesting that each construct captures more than half of the variance in its items. Stakeholder management practices have the highest AVE (0.719), while risk management practices have the lowest (0.537).

Finally, the constructs used in this study exhibit good internal consistency and convergent validity, as evidenced by Cronbach's alpha, Rho_A, CR, and AVE values. This indicates that the constructs are reliable and valid for measuring communication practices, project leadership practices, project performance, risk management practices, and stakeholder management practices in the context of this study.

4.2. Discriminant validity

Throughout the design, both convergent and discriminant construct validity have been assessed. Convergent validity is the degree to which indicator variables load together (Hair et al., 2016). This validity is established when the loading of related variables exceeds 0.50. If their correlation with the construct they are designed to evaluate is greater than 0.70, insightful entity measurements are always considered (Hair et al., 2016, 2017). The factor codes represent different measurement items for each variable in the study. For example, CP1 to CP4 are the items measuring communication practices and assessing various aspects of effective communication within project management. Similarly, PLP1 to PLP4 are items evaluating project leadership practices, focusing on leadership behaviors and strategies. PP1 to PP4 measure project performance, capturing the overall success and outcomes of the projects. RMP1 to RMP5 assess risk management practices, examining how risks are identified, assessed, and mitigated. Lastly, SMP1 to SMP4 are items for stakeholder management practices, evaluating the effectiveness of engaging and managing project stakeholders. As indicated in **Table 4**, most loadings for the six constructions were larger than 0.70. Once indicator parameters do not

cross-load at two or more concepts, each idea is presumed to demonstrate discriminant validity. In PLS, researchers have utilized two distinct methods to assess the reliability of a given discriminant function. The square root of the average variance (AVE) for each construct can be found by first examining the cross-loadings of the construct and the measures (**Table 4**), and then by correlating each construct with another construct in the model (Fornell and Larcker, 1981).

Table 4. Cross-loadings and loadings.

	Communication practices	**Project leadership practices**	**Project performance**	**Risk management practices**	**Stakeholder management practices**
CP1	0.704	0.610	0.396	0.581	0.556
CP2	0.856	0.535	0.515	0.670	0.764
CP3	0.799	0.512	0.452	0.540	0.712
CP4	0.847	0.631	0.512	0.621	0.788
PLP1	0.570	0.806	0.493	0.504	0.548
PLP2	0.519	0.746	0.433	0.529	0.504
PLP3	0.591	0.843	0.524	0.600	0.535
PLP4	0.422	0.568	0.343	0.433	0.418
PP1	0.439	0.400	0.787	0.434	0.473
PP2	0.517	0.509	0.853	0.504	0.544
PP3	0.521	0.555	0.821	0.510	0.529
PP4	0.414	0.489	0.783	0.447	0.401
RMP1	0.690	0.540	0.460	0.742	0.700
RMP2	0.491	0.505	0.447	0.767	0.480
RMP3	0.516	0.488	0.400	0.693	0.531
RMP4	0.502	0.495	0.409	0.733	0.468
RMP5	0.543	0.510	0.430	0.728	0.525
SMP1	0.760	0.585	0.479	0.633	0.862
SMP2	0.700	0.574	0.535	0.636	0.856
SMP3	0.729	0.497	0.540	0.622	0.857
SMP4	0.817	0.631	0.488	0.621	0.815

In addition to the cross-loading matrix and the Fornell-Larcker criterion, the discriminant validity of the test is also evaluated using these tools. The measured items' outer loadings on the associated construct must be greater than those of the measured items' outer loadings on the other constructs for the cross-loading test to be successful. According to our study's cross-loading matrix, all assessment items have higher loadings on their respective target constructs. According to the Fornell-Larcker criterion, the maximum construct-to-construct correlation should be lower than the square root of the AVE of any individual construct (Fornell and Larcker, 1981). Since this is the case, the Fornell-Larcker condition holds. Together, the results of cross-loading and Fornell-Larcker demonstrate that the data meet the criteria for discriminant validity. The discriminate validity metric measures the link between reflective variables and their indicators. The operationalization of the group of predominantly exhibited or estimated variables may be tied to or unconnected

from the case study in some way. A useful and frequently applied measurement is the Fornell-Larcker discriminating validity measure. This serves as the basis for the current study's evaluation of the discriminatory validity. There must be a number greater than 0.70 for the reliability index. The current study assessed discriminating validity, as shown in **Table 5**. The outer loadings and the cross-loading values were identical because they matched. Cross-loadings contrast, however, when the notions are correlated.

Table 5. Discriminant validity.

Constructs	1	2	3	4	5
Communication practices	0.804				
Project leadership practices	0.707	0.748			
Project performance	0.587	0.606	0.811		
Risk management practices	0.751	0.693	0.587	0.733	
Stakeholder management practices	0.884	0.672	0.604	0.741	0.848

4.3. Path analysis

The *b*-value was used to evaluate the significance of the ideas. Beta value indicated the estimated dissimilarity in the dependent construct meant for a unit variant in the independent constructs (Hair et al., 2016, 2017). For each path, the path coefficient is determined for the theoretical model. With increasing route coefficient, the impact on the endogenic latent component increased. Nonetheless, the *t*-statistics test corroborated the route coefficient's level meaning. An evaluation is carried out to determine the hypothesis's importance (Chin and Newsted, 1995). A bootstrapping execution with 1000 sub-samples was carried out for the study without much change to examine the importance of the path coefficient and the *t*-statistical values. **Table 6** summarizes the situation.

Table 6. Path coefficient also has an effect on the *t*-statistics values.

	Hypotheses testing	Beta value	*t*-value	*p*-values
H_1	Risk management practices → project performance	0.177	1.744	0.082
H_2	Communication practices → project performance	0.009	0.066	0.948
H_3	Project leadership practices → project performance	0.301	2.569	0.010
H_4	Stakeholder management practices → project performance	0.262	2.057	0.040

Figure 2 illustrates the structural model's outcome using path coefficients. As hypothesis testing, we investigated standardized estimates, typical errors, and elevated levels for the entity theory from our suggested model. **Table 6** shows the results of the studied theories; for the supported theories, H_2 and H_4, H_1 and H_3 have been eliminated. By the critical level and subsequent path coefficient. In H_2, we projected that communication techniques would suggestively impact project performance among SMEs in KSA. The findings in **Table 6** confirm that the communication had no discernible effects on the project's performance (b = 0.009, t = 0.066, p = 0.948). H_2 is, therefore, not accepted. The study found no significant impact of communication on project performance (β = 0.009, t = 0.066, p = 0.948),

contradicting Campbell and Cohost (2014), who emphasize its importance in project success. Due to the unique context of Saudi Arabia SMEs, communication practices may not be as standardized or effectively implemented, highlighting the need for further investigation into these communication challenges. According to Ayatah (2012), stakeholder management may be more important than communication in some situations. In H_3, we hypothesized that project leadership methods significantly affect project performance among SMEs in KSA. **Table 6**'s findings demonstrate that project leadership methods have a significant impact on project performance with (b = 0.301, t = 2.569, p = 0.010); therefore, H_3 is true. We hypothesized in H_1 that effective risk management techniques considerably affected project performance. There is no statistically significant correlation between risk management techniques and project performance, as shown by the results in **Table 6** and **Figure 2** (b = 0.177, t = 1.744, p = 0.082). H_1 is, therefore, invalid. We postulated in hypothesis 4 that stakeholder management had a substantial influence on project performance among SMEs in KSA. Stakeholder management has a significant impact on project performance, giving to the results in **Table 6**, with (b = 0.262, t = 2.057, p = 0.040). Therefore, H_4 is true.

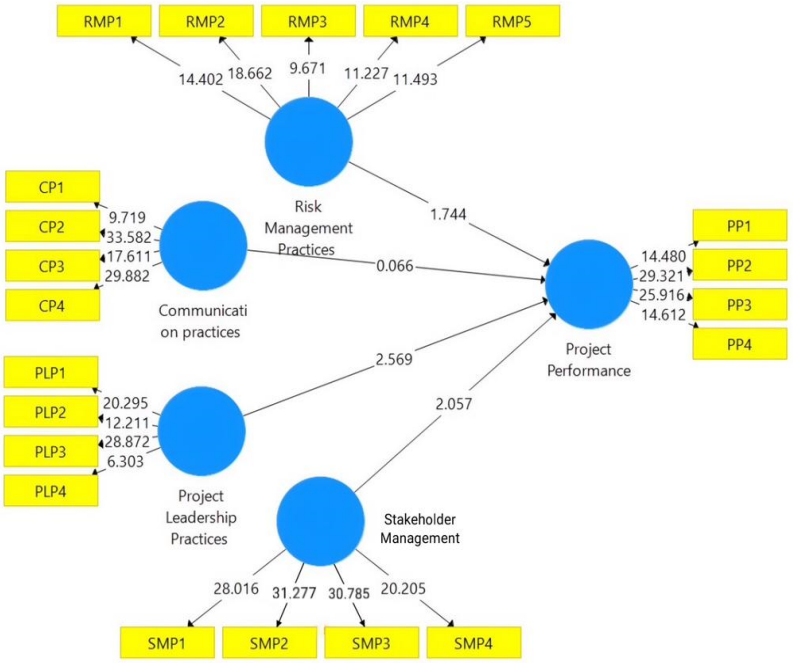

Figure 2. Path coefficients.

A comprehensive analysis of the structural and measurement models (**Figure 3**) has concluded that every model has been disclosed. Two hypotheses were accepted since the hypothesis was statistically significant, while the other two were rejected.

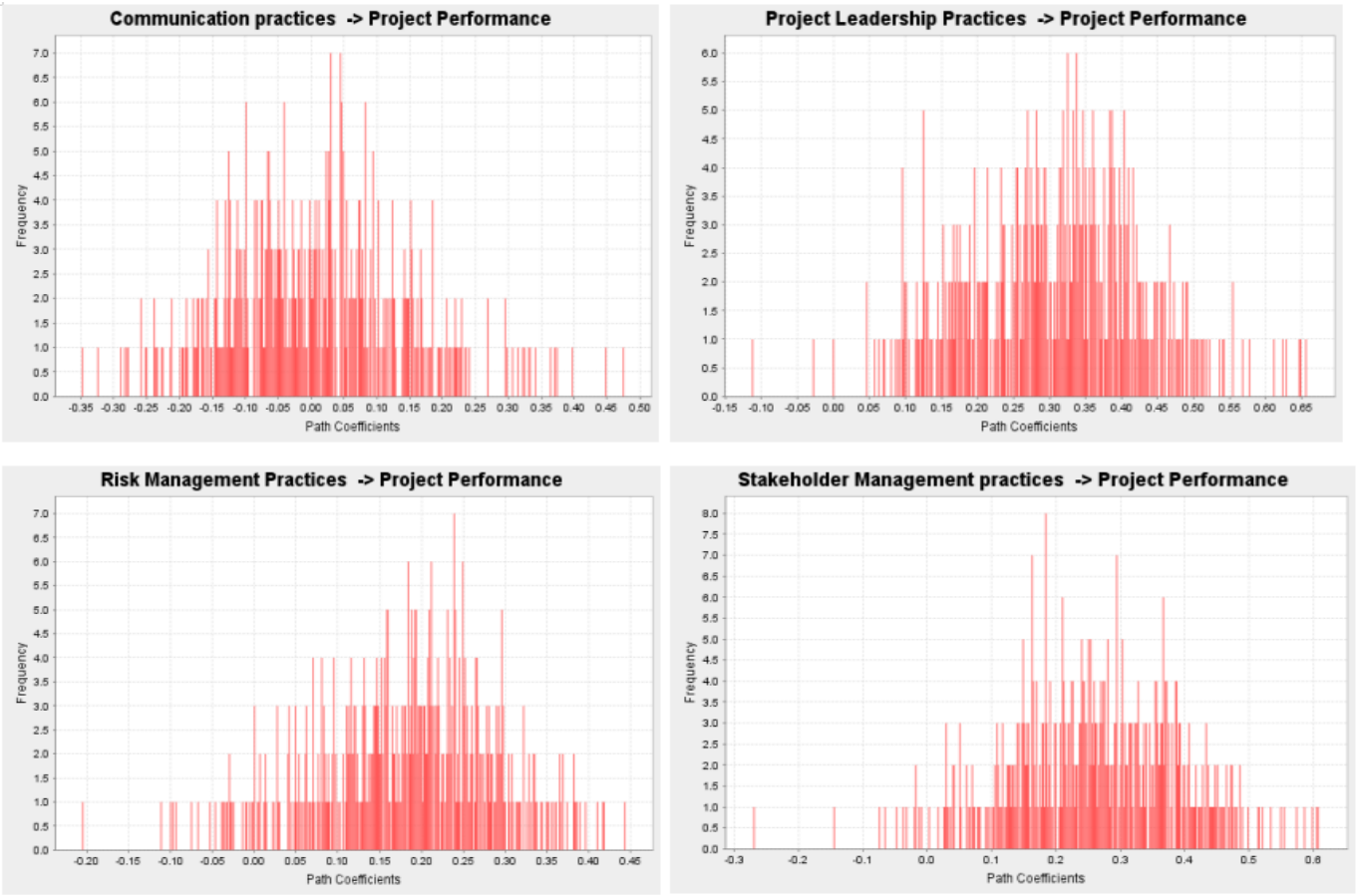

Figure 3. An in-depth examination of the structural and measurement models.

5. Discussion

The study has been conducted in the Saudi Arabia by targeting the manufacturing SMEs. The findings of the hypotheses testing show how project management practices affect Saudi Arabia SMEs' project performance. The analysis indicates that risk management practices (H_1) positively affect project performance but not statistically significantly ($\beta = 0.177$, $t = 1.744$, $p = 0.082$). This suggests that risk management may help projects succeed but not as much as other factors. Carvalho and Rabechini Junior (2015) emphasize the importance of soft skills in risk management, suggesting that project team interpersonal and communication skills affect risk management effectiveness. Interestingly, communication practices (H_2) have a negligible impact on project performance ($\beta = 0.009$, $t = 0.066$, $p = 0.948$). This contradicts Campbell and Cohost (2014), who argue that project success depends on good communication. This may be due to Saudi Arabia SMEs' context-specific communication practices, which may not be as standardized or effective as in other regions or larger organizations. This suggests further research into these SMEs' unique communication challenges.

Project leadership practices (H_3) significantly improve project performance ($\beta = 0.301$, $t = 2.569$, $p = 0.010$). This study supports Dubey et al. (2015) and Jacobsen and Bøgh Andersen (2015), emphasizing the importance of effective leadership in guiding teams and achieving project goals. Leadership practices that promote collaboration, resolve conflicts, and align team goals with project goals are essential

for project success. Project managers in Saudi Arabia SMEs need strong leadership skills to improve project outcomes. Stakeholder management practices (H_4) significantly improve project performance ($\beta = 0.262$, $t = 2.057$, $p = 0.040$). Ayatah (2012) and Eskerod and Huemann (2016) agree that stakeholder management is crucial to project success. Improving project performance requires engaging stakeholders, meeting their needs, and communicating and collaborating. These findings emphasize the importance of stakeholder management in Saudi Arabia SMEs and the need for customized strategies to engage and satisfy diverse stakeholders.

Saudi Arabia SMEs' context-specific insights enhance project management knowledge. Some results match the literature, but others, like communication practices' insignificant impact, show the context's unique challenges and dynamics. This suggests that global project management best practices are helpful but must be adapted to local contexts. This study emphasizes the complexity of project management and the need to tailor practices to organizational needs and challenges. This research provides a framework for improving Saudi Arabia SME project performance by focusing on risk management, communication, leadership, and stakeholder management.

5.1. Managerial implications

The findings of this study carry several important implications for managers in manufacturing SMEs in Riyadh, Saudi Arabia. The study found a positive relationship between risk management practices and project performance. Managers should therefore prioritize the development of effective risk management strategies. The findings suggest that Saudi manufacturing SMEs' finance departments need good project leadership and stakeholder management to improve project performance. Finance managers should develop leadership skills to lead their teams and promote collaboration that aligns financial goals with project goals. Regular leadership training can help finance managers manage their teams and ensure robust, project-adaptive financial planning and control processes. Effective stakeholder management can also boost investor and financial partner transparency and trust, making project funding more reliable. The importance of project leadership practices in R&D shows the need for strong leadership to drive innovation and project success. R&D managers should develop leadership skills that foster creativity, resolve conflicts, and motivate researchers to meet project goals. Stakeholder management also suggests that engaging with academic institutions, industry experts, and regulatory bodies can improve research relevance and application. Regular stakeholder meetings and feedback can align R&D projects with market needs and regulatory requirements, improving product development.

The study stresses risk and stakeholder management for supply chain managers. Risk management helps identify and mitigate supply chain disruptions like supplier issues and logistical issues. For proactive risk management, supply chain managers should implement comprehensive risk assessment frameworks and contingency plans. For supply chain efficiency, suppliers, logistics providers, and customers must have good relationships. Communication and collaboration with stakeholders can

help supply chain projects finish on time and under budget by anticipating and resolving issues.

The study found that communication practices had little effect on project performance, but effective communication is still essential to project management. Manufacturing SMEs should improve communication to clearly and timely convey project objectives, updates, and feedback. Investment in communication tools and platforms that enable team and stakeholder information exchange can improve coordination and reduce misunderstandings. In complex projects with multiple departments like finance, R&D, and supply chain, good communication can streamline processes and boost project efficiency. Saudi manufacturing SMEs must adapt global project management best practices to local challenges. Project managers should consider their organizations' needs and dynamics when implementing strategies. Project management should reflect Saudi Arabia's hierarchical leadership and decision-making culture. By adapting project management frameworks to local cultural and business environments, Saudi manufacturing SMEs can improve project outcomes and boost growth and competitiveness.

5.2. Limitations and future directions

The study's findings are based on a sample of 250 employees from 8 SMEs in Riyadh, Saudi Arabia. While this provides insight into these specific organizations, the findings may only represent some manufacturing SMEs in Saudi Arabia or other regions. The study utilizes a cross-sectional design, which provides a snapshot of the situation at a specific point in time. It needs to account for changes over time or the dynamic nature of project management. The study relies on self-reported data, which might be subject to social desirability or recall bias. For instance, respondents might have provided answers they deemed socially acceptable rather than their true opinions or experiences.

Future research should consider a larger and more diverse sample that includes SMEs from other regions and industries. This would enhance the generalizability of the findings. A longitudinal study design could provide insights into how project management practices and performance evolve. This could reveal causal relationships and the long-term effects of various management practices. While this study provides a quantitative analysis, future research might benefit from a qualitative approach. In-depth interviews or case studies could provide a deeper understanding of the relationship between project management practices and performance. The study focused on four key project management practices. Future research could explore other potentially important factors, such as organizational culture, team dynamics, or project management software and tools. Given the unexpected finding regarding communication practices in this study, future research should investigate this area more thoroughly, perhaps by examining different types of communication or aspects of communication effectiveness.

6. Conclusion

The major purpose of this study was to examine the effects of various project management approaches on the project outcomes of Saudi Arabia small and

medium-sized enterprises (SMEs). The following four objectives were used to investigate the influence of stakeholder management techniques, assess the value of leadership, and analyze the relationship between communication and project performance. Data collection involved using a questionnaire. Each question was addressed separately by the researcher. The study's target audience consisted of 250 Saudis working on 8 SME projects between 2015 and 2022. The data were analyzed using confirmatory factor analysis, factor analysis, and structural equation modeling (SEM). The measurement model's overall fit, convergent and discriminant validity, and construct reliability were further assessed using confirmatory factor analysis (CFA). The hypotheses were put to the test using structural equation modeling. The findings demonstrate that while communication tactics and risk management processes do not affect project performance, leadership methods and stakeholder management do.

Conflict of interest: The author declares no conflict of interest.

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