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**How to Reach Project Management in Mechanical Engineering for the Private Sector
in Saudi Arabia**

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Abstract

Objective

The primary objective of this study is to investigate the barriers that hinder Saudi mechanical engineers from advancing into leadership and project management positions within the private sector, particularly in the context of Saudi Arabia's Vision 2030. The research aims to identify key factors such as technical-managerial skill gaps, institutional support systems, professional networking, and the alignment between academic preparation and labor market needs. By doing so, the study seeks to provide actionable recommendations that can empower local engineering talent, enhance career development pathways, and support national efforts toward workforce localization and sustainable industrial growth.

Method

The study employed a mixed-methods research design, combining quantitative and qualitative approaches to gain a comprehensive understanding of the issue. Quantitative data were collected through structured surveys distributed to Saudi mechanical engineers working in the private sector, focusing on leadership readiness, job satisfaction, institutional support, and professional development opportunities. Descriptive statistics and correlation analyses were conducted to explore relationships among key variables. Additionally, qualitative insights were gathered through open-ended survey responses, which were analyzed thematically to capture the participants' perspectives, experiences, and recommendations regarding leadership advancement barriers and enablers.

Results

The findings revealed several critical barriers limiting Saudi mechanical engineers from advancing into leadership roles. Quantitative analysis showed positive correlations between leadership readiness, institutional support, and job satisfaction, highlighting the importance of organizational development programs and professional networks. Descriptive statistics indicated moderate levels of leadership preparedness but identified gaps in soft skills and practical management experience. Thematic analysis of qualitative data further emphasized challenges such as limited mentorship opportunities, organizational preference for expatriate leadership, and the misalignment between academic curricula and industry demands. Collectively, the results underscore the need for integrated educational, organizational, and policy interventions to enable local engineers to successfully transition into leadership positions.

Conclusion

This study concludes that while Saudi mechanical engineers possess strong technical foundations, their advancement into leadership and project management roles is hindered by multifaceted barriers, including insufficient leadership training, weak institutional support, and limited access to professional networks. Addressing these challenges requires a collaborative effort from universities, private sector organizations, and policymakers to design targeted interventions that bridge the gap between technical expertise and managerial competence. By fostering leadership development, enhancing mentorship programs, and aligning academic curricula with industry needs, Saudi Arabia can strengthen its local talent pipeline and advance the workforce localization goals outlined in Vision 2030.

Key words: Saudi mechanical engineers; leadership development; private sector; Vision 2030; career advancement; skill gaps; institutional barriers; professional networking; engineering education reform; workforce localization; project management; project leadership; strategic planning; stakeholder management; risk management; resource allocation; team coordination; performance measurement; organizational change; project success factors.

CHAPTER – 01

RESEARCH PROBLEM AND PREVIOUS STUDIES

1.1 Introduction

In recent years, the Kingdom of Saudi Arabia has undergone significant economic and developmental transformation under Vision 2030, a national strategic framework aimed at diversifying the economy and reducing dependence on oil revenues. One of the core pillars of this vision is human capital development, which includes empowering local professionals, promoting investment in non-oil sectors, advancing technology, and enhancing education and training systems.

Within this context, mechanical engineering plays a central role, as it directly contributes to industrial development through the design, operation, and maintenance of engineering systems in major projects such as factories, power plants, infrastructure, and critical facilities. Mechanical engineers are essential actors in driving industrial growth and ensuring the operational success of national mega-projects.

Despite their technical expertise, many Saudi mechanical engineers face substantial barriers when attempting to transition into leadership and managerial roles within engineering projects, particularly in the private sector. While they possess strong academic and technical qualifications, a significant portion lack the leadership and managerial competencies necessary to hold supervisory or executive positions. This gap often arises from the absence of specialized professional training programs that integrate both technical and managerial dimensions, thereby limiting their capacity for decision-making, team management, and navigating the organizational complexities of large-scale projects.

One of the primary challenges identified is the lack of training in critical management areas such as strategic planning, time management, problem-solving, budgeting, and negotiation. As highlighted by Al-Otaibi (2020) in his study *“Factors Influencing Professional Leadership Development among Engineers in Saudi Industrial Projects”*, the absence of targeted training programs leads to low professional readiness for leadership roles and reduces career advancement opportunities within industrial organizations.

Additionally, weak channels of communication between academic institutions and the industrial sector present another major hurdle. Many engineers experience isolation from decision-makers in their workplaces, lacking the networks needed to access strategic projects or influential leadership positions. As noted by Hamdi (2019) in his research *“The Impact of Professional Networks on Career Advancement of Engineers in Saudi Arabia’s Private Sector”*, the weakness of professional networks negatively impacts engineers’ career trajectories and limits their participation in strategic projects.

Another frequently cited obstacle is limited practical experience in managerial environments. While many engineers excel in technical performance and problem-solving, they are often deprived of opportunities to apply leadership skills in real-world settings. Research by Al-Rasheed (2020) titled *“The Impact of Work Environment and Institutional Motivation on Engineers’ Performance in Government and Private Projects”* shows that poor work environments and the lack of professional development programs are strongly linked to lower performance levels, limited career progression, and job dissatisfaction among engineers.

From an international perspective, Gunawan and Kusuma (2021) in their study *“Leadership Competency Development for Young Engineers in Industrial Sectors”* demonstrated that leadership training programs based on transformational leadership models significantly improved functional effectiveness and enhanced engineers’ opportunities for promotion into decision-making roles.

Lastly, the misalignment between university outputs and labor market requirements is a fundamental reason behind the current competency gap. As Al-Harithi (2018) revealed in his research *“The Reality of Engineering Education in Saudi Universities in Light of Industrial Sector Needs”*, academic programs often emphasize theoretical and technical aspects, neglecting the soft skills and administrative competencies demanded by contemporary workplaces.

Given these challenges, there is an urgent need to adopt new educational and training policies that enhance the leadership capacities of Saudi engineers and enable them to assume influential roles in projects. This requires the design of integrated training programs that combine technical knowledge with field experience, the development of clear career pathways within industrial organizations, and the establishment of stronger links between graduates and real projects through cooperative and field training programs.

This study, therefore, aims to analyze the current status of Saudi mechanical engineers in the private sector, explore the key barriers preventing their advancement to leadership positions, examine available development opportunities, and propose practical, actionable recommendations aligned with Vision 2030 goals to empower national talents, increase productivity, and achieve excellence in executing major projects.

Recommendations aligned with Vision 2030 goals to empower national talents, increase productivity, and achieve excellence in executing major projects.

Identified Challenges	Proposed Solutions
Lack of management and leadership training	Design integrated technical-management training programs
Weak university-industry collaboration	Enhance collaboration between universities and industry through internships and cooperative programs
Limited professional networks and isolation from decision-makers	Establish professional networking platforms and mentorship initiatives
Inadequate practical experience in managerial roles	Provide leadership roles and project assignments within organizations
Mismatch between academic output and labor market needs	Revise academic curricula to include soft skills, problem-solving, and leadership competencies

TABLE 1.1: SHOWS THE RELATIONSHIP BETWEEN CHALLENGES AND SOLUTIONS.

1.2 Problem Statement

Despite the substantial progress made in Saudi Arabia's industrial and economic development under Vision 2030, a significant challenge persists in the engineering sector: the underrepresentation of Saudi mechanical engineers in leadership and management positions within private sector projects. This issue is not merely a minor workforce distribution concern; rather, it is a critical gap that limits the nation's capacity to fully leverage its local talent, reduce dependency on foreign expertise, and achieve sustainable economic growth through knowledge transfer and local empowerment.

Saudi mechanical engineers graduate each year from reputable national and international universities with solid academic foundations in technical fields such as thermodynamics, fluid mechanics, HVAC systems, and mechanical design. However, upon entering the labor market, these engineers encounter a professional environment that increasingly demands multidisciplinary capabilities, where technical proficiency alone is no longer sufficient to navigate the complex challenges of project management. Instead, success in these roles requires a blend of leadership competencies, organizational awareness, decision-making skills, and the ability to coordinate diverse teams across various functional areas.

The issue is exacerbated by several underlying factors, including misaligned educational curricula that focus heavily on theoretical and technical aspects while neglecting managerial and soft skills; the absence of structured career development pathways within companies; and a lack of coordinated efforts between academia, industry, and government entities to support continuous professional development. Furthermore, organizational cultures in many private sector firms may prioritize experienced expatriate professionals for leadership roles, leaving Saudi engineers in technical positions with limited visibility and minimal opportunities for upward mobility.

This persistent leadership gap has broad implications for the country's industrial competitiveness and long-term resilience. Without empowered national leaders in mechanical engineering fields, organizations struggle to cultivate localized knowledge, foster innovation, or respond effectively to sectoral challenges. Moreover, individual engineers may experience professional stagnation, job dissatisfaction, and a sense of exclusion from strategic decision-making processes, which in turn can impact retention rates and workforce stability.

Therefore, the central problem this study aims to investigate can be summarized as follows:

“What are the main barriers preventing Saudi mechanical engineers from advancing to project management and leadership roles in the private sector, and how can these challenges be effectively addressed through targeted interventions at the educational, organizational, and policy levels?”

This problem statement serves as the foundation for a broader inquiry into the structural, educational, and institutional obstacles that limit leadership opportunities for local engineers, as well as the exploration of best practices, successful models, and actionable recommendations that can contribute to building a stronger, more dynamic national engineering workforce aligned with Saudi Arabia’s Vision 2030 goals.

1.2.1 Skills Gap

One of the most critical barriers preventing Saudi mechanical engineers from advancing into leadership roles is the clear and persistent skills gap that exists between their technical training and the managerial competencies demanded in the workplace.

Mechanical engineering curricula in most Saudi universities focus heavily on core technical subjects, such as thermodynamics, heat transfer, mechanical design, and manufacturing processes. While these provide essential foundations for engineering practice, they rarely integrate formal training in soft skills or leadership development. As a result, graduates enter the workforce with strong technical expertise but limited exposure to project management, strategic thinking, team leadership, financial management, or stakeholder communication.

This gap becomes particularly evident in large-scale private sector projects where engineers are expected not only to deliver technical solutions but also to coordinate multidisciplinary teams, negotiate with suppliers and clients, manage timelines and budgets, and contribute to decision-making processes. Without adequate training in these areas, many Saudi mechanical engineers find themselves confined to purely technical roles, unable to move into supervisory or managerial positions.

Research supports this concern. For example, Gunawan and Kusuma (2021), in their study on *Leadership Competency Development for Young Engineers*, emphasized that the absence of leadership training reduces engineers' functional effectiveness and limits their upward mobility within organizations. Similarly, Al-Otaibi (2020) found that engineers with access to administrative and management skill development programs were significantly more likely to transition into leadership roles.

Moreover, the skills gap is not only a matter of formal training but also of practical application. Many young engineers report that even when they are exposed to management concepts during their studies, they lack opportunities to apply these in real-world settings. As Al-Harithi (2018) highlighted, engineering education in Saudi Arabia is often detached from industry realities, creating a disconnect between theoretical knowledge and professional practice.

The cumulative effect of this skills gap is a bottleneck in career progression. Engineers may remain in junior or mid-level technical roles for extended periods, while leadership positions are often filled by foreign professionals with more diverse or interdisciplinary training backgrounds. This not only limits the professional development of local engineers but also undermines national goals of local workforce empowerment and knowledge transfer.

Addressing the skills gap requires a multifaceted approach: revising university curricula to incorporate leadership and management modules, creating partnerships between academic institutions and private companies to offer cooperative training programs, and establishing in-house leadership development pathways within organizations. Without these systemic changes, the leadership potential of Saudi mechanical engineers will remain underutilized, posing a significant challenge to the realization of Vision 2030 objectives.

1.2.3 Weak Institutional Support

1.2.3.1 Lack of Career Development Programs

One of the most pressing institutional challenges faced by Saudi mechanical engineers is the absence of structured career development programs within private sector organizations. While engineers are often valued for their technical expertise, few companies have formal systems to help them transition into leadership roles. Promotion pathways are frequently unclear, and opportunities for leadership training are scarce or non-existent. As a result, local engineers may find themselves stuck in mid-level technical positions without a clear roadmap for professional growth, which leads to frustration, decreased job satisfaction, and even talent attrition. Companies that prioritize short-term project delivery over long-term talent development inadvertently limit their own ability to build a robust pipeline of future leaders.

1.2.3.2 Dependence on External Leadership

Another contributing factor is the persistent dependence on expatriate leadership in many private companies. Organizations often recruit foreign professionals for senior positions, citing their diverse experience and international management exposure. While such hires may bring valuable perspectives, they also create a bottleneck for local engineers

who aspire to advance. This practice not only undermines efforts to localize the workforce in line with Vision 2030 but also reduces the incentive for companies to invest in developing local leadership capabilities. Without deliberate policies to balance internal talent promotion with external recruitment, institutional practices will continue to disadvantage Saudi engineers.

1.2.3.3 Absence of Mentorship and Support Systems

The lack of formal mentorship and support systems is another institutional shortfall that hinders engineers' leadership progression. In many companies, young engineers do not have access to senior mentors or coaching resources that can help them navigate organizational dynamics, develop management skills, or prepare for supervisory responsibilities. Without mentorship, engineers are left to learn leadership skills through informal or ad hoc means, which can be inefficient and discouraging. Establishing mentorship programs, leadership workshops, and structured feedback mechanisms are critical steps for organizations seeking to empower their local talent and align with national workforce development goals.

1.2.4 Limited Professional Networks

A significant barrier hindering the leadership advancement of Saudi mechanical engineers in the private sector is the limited development of professional networks. Many engineers, especially early in their careers, operate within technical silos, focusing solely on their immediate job responsibilities and technical deliverables, without engaging in broader organizational interactions or external professional communities. This isolation prevents them from building relationships with key stakeholders, such as senior managers, project owners, clients, and industry leader's relationships that are often critical for accessing

leadership opportunities, project assignments, and career advancement. As highlighted by Hamdi (2019), the absence of strong professional networks reduces engineers' visibility within their organizations, limiting their chances of being considered for strategic roles or high-profile projects, and contributing to a sense of exclusion from decision-making circles.

Moreover, the lack of institutional mechanisms to facilitate networking such as professional associations, industry forums, or mentorship programs exacerbates the problem. While many international engineering communities emphasize the importance of leadership development through peer interaction, conferences, and cross-industry collaborations, similar structures in Saudi Arabia are still underdeveloped or lack active participation from young engineers. Studies such as that of Fahad Al-Ahmadi (2019) recommend the creation of effective engineering associations and professional networks to connect engineers with decision-making centers, enhance their exposure to strategic industry issues, and improve their chances for promotion. Without access to such platforms, engineers are less likely to gain soft skills, reputational capital, and sponsorship needed to ascend into leadership positions.

1.2.5 Misalignment Between Education and Market Needs

One of the underlying structural issues contributing to the leadership gap among Saudi mechanical engineers is the persistent misalignment between the outputs of academic institutions and the evolving needs of the labor market. While Saudi universities provide a solid technical foundation, many of their curricula remain predominantly theoretical, with limited emphasis on practical, industry-relevant skills. Subjects such as leadership development, project management, financial literacy, negotiation, entrepreneurship, and innovation are often overlooked or offered only as elective courses, leaving graduates underprepared for the realities of the private sector. According to Al-Harithi (2018), this

misalignment stems not only from outdated course content but also from a lack of active collaboration between academia and industry, which leads to educational programs that fail to reflect the dynamic challenges and opportunities engineers encounter in real projects.

Additionally, many students graduate without having completed cooperative training, internships, or capstone projects linked to industry partners, which deprives them of valuable exposure to practical problem-solving, cross-disciplinary collaboration, and workplace leadership dynamics. The absence of institutionalized pathways that connect graduates directly to the labor market such as graduate development programs or structured onboarding initiatives further widens the gap. Internationally, the best practices have shown that integrating industry feedback into academic program design, incorporating experiential learning modules, and embedding professional certification options can significantly improve the career readiness of engineering graduates. Without such systemic reforms, Saudi engineers will continue to face difficulties when attempting to assume leadership positions, and companies will remain reliant on external expertise to fill managerial gaps a situation that contradicts the national vision of local capacity building and economic diversification.

1.3 Importance of the Study

The importance of this study stems from its comprehensive, multi-dimensional, and critically timed investigation into the systemic, educational, institutional, organizational, and professional barriers that have historically limited, and continue to limit, the ability of Saudi mechanical engineers to transition from purely technical roles into leadership, project management, and executive positions within the private sector, particularly in light of the Kingdom of Saudi Arabia's transformative Vision 2030 agenda that places human capital development, workforce localization, and economic diversification at the forefront of national priorities, as this study not only provides a theoretical framework for understanding

the nature and scope of the leadership gap affecting mechanical engineers but also offers a practical blueprint for policymakers, educational institutions, industry leaders, and professional associations to design, implement, and evaluate integrated solutions that address skill gaps, strengthen professional networks, foster mentorship and sponsorship relationships, align educational curricula with labor market demands, embed leadership training into academic and workplace environments, and create clear and performance-based career advancement pathways, thereby ensuring that local engineering talent is fully empowered to contribute to national development goals, technological innovation, industrial competitiveness, and knowledge transfer, while simultaneously enhancing individual career satisfaction, job performance, employee retention, organizational resilience, and national economic self-sufficiency, with the broader significance of this research extending beyond its immediate sectoral focus to inform cross-sectoral debates on leadership development, human resources management, institutional reform, and capacity building, all of which are critical pillars for ensuring that the mechanical engineering sector, as a vital engine of industrial and economic activity, evolves into a dynamic, inclusive, and globally competitive domain led by highly skilled, strategically minded, and future-ready Saudi professionals whose success stories will serve as models for other sectors, ultimately positioning the Kingdom as a regional and international leader in engineering excellence, innovation-driven growth, and sustainable human development.

1.4 Objectives of the Study

The primary objective of this study is to comprehensively explore, analyze, and understand the key challenges, barriers, and structural constraints that prevent Saudi mechanical engineers from advancing into project management and leadership roles within the private sector, focusing specifically on identifying the multidimensional factors including

technical-managerial skill gaps, lack of practical leadership exposure, weak institutional support systems, limited professional networks, and the misalignment between academic outputs and labor market requirements that collectively hinder career progression, while also aiming to investigate the perceptions, attitudes, and lived experiences of engineers themselves regarding their career development journeys, professional aspirations, and organizational environments, in order to formulate actionable, evidence-based recommendations for educational institutions, corporate employers, industry regulators, professional engineering associations, and national policymakers to collaboratively design and implement targeted interventions such as curriculum reform, leadership training programs, structured mentorship schemes, industry-academia partnerships, and performance-based career advancement frameworks, with the ultimate goal of empowering local mechanical engineering talent to assume leadership responsibilities, drive innovation, enhance industrial competitiveness, contribute meaningfully to national development strategies, and support the broader realization of Saudi Arabia's Vision 2030 ambitions, thereby ensuring that the country's mechanical engineering workforce evolves into a globally competitive, highly skilled, and strategically impactful sector that exemplifies excellence in both technical execution and organizational leadership.

1.5 Research Questions

This study seeks to explore, in a comprehensive and multidimensional manner, the key research questions that revolve around understanding the underlying barriers, challenges, and systemic factors that prevent Saudi mechanical engineers from advancing into project management and leadership roles in the private sector, beginning with the fundamental inquiry into what the primary obstacles are that hinder these engineers' upward career progression and how factors such as the mismatch between academic training and labor

market demands, the absence of leadership-oriented curricula, and the lack of exposure to real-world management scenarios collectively contribute to limiting their readiness for leadership, followed by investigating how the availability (or lack thereof) of practical opportunity including internships, mentorship programs, cooperative projects, and rotational leadership assignments affects the ability of engineers to build leadership capacity and transition from technical to administrative roles, alongside examining the extent to which institutional support mechanisms, such as structured training programs, defined career development pathways, succession planning strategies, and performance-based promotions, play a role in either facilitating or obstructing engineers' access to senior roles, while also addressing how limited professional networks, insufficient engagement with industry associations, and the absence of sponsorship relationships further isolate engineers from leadership opportunities, and ultimately aiming to answer the critical question of what specific, actionable interventions can be implemented by educational institutions, private sector companies, policymakers, and professional organizations to systematically close the leadership gap, empower local engineering talent, and align the national mechanical engineering workforce with the broader strategic goals of Saudi Arabia's Vision 2030, ensuring a future-ready, resilient, and globally competitive sector led by Saudi professionals.

1.6 Research Hypotheses

This study aims to investigate the factors influencing the advancement of Saudi mechanical engineers into leadership positions in the private sector. It provides a comprehensive analysis that integrates educational background, institutional support, practical exposure, and leadership readiness, with particular emphasis on the alignment between academic outputs and labor market demands. To achieve this, a quantitative

measurement tool has been designed based on a five-point Likert scale to assess participants' agreement with the core hypotheses underpinning the study.

1.6.1 Detailed Explanation of the Scale

The study employs a five-point Likert scale, one of the most widely used tools in social, educational, and management research, designed to quantify subjective opinions, attitudes, and perceptions into analyzable data. The scale allows participants to express varying levels of agreement or disagreement with specific statements, avoiding binary “yes/no” answers and capturing nuanced differences in perceptions.

The scale is structured as follows:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

By using this scale, the study aims to accurately capture participants' perceptions of the importance of management training programs, practical leadership experience, institutional support mechanisms, professional networking, and the alignment of education with labor market needs in enhancing their leadership readiness. This approach enables a robust statistical analysis of the relationships between key variables and the identification of targeted interventions.

1.6.2 Measurable Hypotheses

H1. Providing management and leadership training programs enhances the readiness of Saudi mechanical engineers to assume project management and supervisory roles.

Measurement question: To what extent do you agree that such programs are essential for preparing engineers for leadership roles?

H2. Exposure to practical leadership experiences, such as internships, cooperative programs, and rotational management assignments, improves engineers' leadership competencies.

Measurement question: To what extent do you believe practical experience contributes to the development of leadership skills?

H3. The presence of clear institutional support mechanisms, such as career development frameworks, succession planning, and mentorship opportunities, increases engineers' chances of professional advancement.

Measurement question: How do you evaluate the importance of institutional support in enhancing career progression?

H4. Participation in professional networks, industry associations, and access to sponsorship relationships increases engineers' opportunities to engage in strategic projects.

Measurement question: To what degree do you think professional networking plays a role in achieving leadership advancement?

H5. A mismatch between academic outputs and labor market requirements reduces the leadership readiness of Saudi mechanical engineers.

Measurement question: To what extent do you agree that alignment between education and market needs impacts leadership opportunities?

1.7 Scientific Theories Used

This study is grounded in several interrelated scientific theories that together provide a comprehensive and multidimensional framework for understanding the barriers and enablers affecting the advancement of Saudi mechanical engineers into leadership and project management roles within the private sector, starting with Transformational Leadership Theory, which emphasizes the ability of leaders to inspire, motivate, and intellectually stimulate their followers, positioning leadership not merely as a hierarchical position but as a dynamic relational process that fosters innovation, commitment, and performance, and which is particularly relevant in the engineering sector where technical teams require visionary guidance to navigate complex project environments, alongside Human Capital Theory, which posits that investments in education, training, and skill development enhance individual productivity and economic value, providing a crucial lens for understanding how leadership training, experiential learning, and professional development programs increase engineers' managerial readiness and career advancement potential, complemented by Social Capital Theory, which focuses on the value derived from social networks, trust-based relationships, and professional connections, thereby explaining how limited networking opportunities, lack of mentorship, and weak industry engagement constrain engineers' access to leadership roles, and reinforced by Career Development Theory, which explores the interplay between individual aspirations, organizational structures, and socio-economic conditions in shaping career trajectories, highlighting how institutional pathways, succession planning, and promotion systems can either facilitate or block upward mobility, ultimately creating an integrated theoretical model that allows this

research to not only analyze the individual, organizational, and systemic factors influencing leadership outcomes but also to propose evidence-based interventions aimed at bridging the gap between technical expertise and managerial capacity, thereby empowering Saudi mechanical engineers to play transformative roles in advancing the goals of Vision 2030.

Theory	Explanation
Transformational Leadership Theory	Focuses on how leaders inspire, motivate, and intellectually stimulate their teams, fostering innovation, commitment, and high performance.
Human Capital Theory	Emphasizes the economic value of investing in education, training, and skills to enhance individual productivity and career advancement.
Social Capital Theory	Highlights the role of professional networks, trust-based relationships, and social interactions in facilitating access to opportunities and resources.
Career Development Theory	Explores how personal aspirations, organizational systems, and socio-economic factors interact to shape individual career paths and upward mobility.

TABLE 1.2: DESCRIPTION OF THEROIES

CHAPTER - 02

LITERATURE REVIEW

2.1 Introduction

The literature review is a critical component of this study, providing the theoretical and empirical foundation necessary to understand the multifaceted barriers hindering the advancement of Saudi mechanical engineers into leadership and project management roles in the private sector. This chapter aims to explore, analyze, and synthesize existing academic and industry research related to leadership development in engineering, professional advancement, human capital formation, and workforce localization, with particular reference to the context of Saudi Arabia and the broader Vision 2030 framework.

Given the technical nature of mechanical engineering and its direct contribution to national industrial development, understanding the reasons behind the persistent underrepresentation of local engineers in leadership positions requires an examination of both global and local perspectives. The review therefore encompasses studies addressing technical-managerial skill gaps, the impact of educational and institutional systems, the role of professional networks, the importance of mentorship and sponsorship, and the alignment or lack thereof between academic programs and evolving labor market demands.

Furthermore, the literature review situates these issues within the broader context of transformational leadership theory, human capital theory, social capital theory, and career development theory, providing a conceptual lens through which to interpret the challenges and propose evidence-based solutions. By engaging with a diverse body of scholarly work, the chapter not only highlights best practices and successful models from comparable

economies but also identifies key gaps in the current body of knowledge that this study seeks to address.

Ultimately, this chapter serves to contextualize the research problem, justify the study's significance, and inform the development of the research framework, questions, and hypotheses. It lays the groundwork for the methodological approach adopted in the following chapter and contributes to the formulation of practical, actionable recommendations that align with Saudi Arabia's strategic goals for human capital development, economic diversification, and local leadership empowerment.

2.2 Review of Previous Studies

This section is divided into three main parts: (1) local studies from Saudi Arabia, (2) international studies and comparative perspectives, and (3) identified research gaps.

2.2.1 Local Studies (Saudi Arabia)

Several local studies have examined the challenges faced by Saudi engineers in advancing into leadership positions, particularly within the private sector. Al-Otaibi (2020) noted that "the absence of specialized management and leadership training programs remains a primary barrier preventing engineers from acquiring the competencies required for supervisory positions." His findings highlight the urgent need for targeted professional development programs that combine technical and managerial learning.

In a similar vein, Al-Harithi (2018) argued that "engineering curricula in Saudi universities often focus excessively on theoretical and technical content, while neglecting essential soft skills, project management knowledge, and leadership development." This

misalignment between academic outputs and market needs has been consistently cited as a key factor limiting Saudi engineers' upward mobility.

Hamdi (2019) added a social dimension to the discussion by highlighting the importance of networking, explaining that "engineers with access to influential networks and mentorship opportunities are significantly more likely to be considered for strategic projects and leadership assignments." His study underscores the relevance of social capital and professional engagement in career progression.

2.2.2 International Studies and Comparative Perspectives

On an international scale, several studies provide valuable comparative insights. Gunawan and Kusuma (2021) found that "transformational leadership models implemented in industrial sectors have demonstrable effects on improving engineers' operational effectiveness and opening doors to managerial opportunities." Their research suggests that leadership development is not only an individual endeavor but also an organizational responsibility requiring structured interventions.

Moreover, case studies from countries such as the United Arab Emirates and Singapore emphasize the importance of national policies that support talent development and workforce localization. These countries have demonstrated the benefits of integrating academic curricula with industry demands, offering cooperative education programs, and creating clear pathways for local professionals to advance into leadership roles.

2.2.3 Identified Research Gaps

While existing literature provides valuable insights, several gaps remain unaddressed. First, there is a lack of empirical research focusing specifically on Saudi mechanical engineers in the private sector, as most local studies generalize across engineering disciplines or focus on public institutions. Second, prior research often isolates individual or organizational factors without offering an integrated system-level analysis that connects skill development, institutional practices, and national policies like Vision 2030.

Additionally, few studies employ mixed method approaches that combine quantitative analysis with qualitative exploration of engineers' lived experiences, leaving an incomplete understanding of the personal and professional dynamics at play. By addressing these gaps, this study aims to make a novel contribution to the academic discourse and offer actionable recommendations to various stakeholders.

2.3 Theoretical Framework

This study draws upon an integrated theoretical framework that combines four key theories: Transformational Leadership Theory, Human Capital Theory, Social Capital Theory, and Career Development Theory. Together, these frameworks provide a comprehensive lens through which to understand the individual, organizational, and systemic factors influencing the leadership advancement of Saudi mechanical engineers in the private sector.

2.3.1 Transformational Leadership Theory

Transformational Leadership Theory focuses on how leaders inspire, motivate, and intellectually stimulate their teams to achieve higher levels of performance and innovation.

As described by Bass (1985), transformational leaders are characterized by their ability to create a compelling vision, foster commitment, encourage creativity, and address the developmental needs of their followers. In the context of engineering, where project environments are complex and multidisciplinary, transformational leadership is particularly relevant for guiding technical teams, promoting collaboration, and driving innovation. This theory informs the study by emphasizing the need for leadership models that go beyond technical competence to include relational and visionary capacities.

2.3.2 Human Capital Theory

Human Capital Theory, as articulated by Becker (1964), posits that investments in education, training, and skill development increase individuals' productivity and economic value. For Saudi mechanical engineers, human capital theory highlights how access to specialized management training, leadership development programs, and experiential learning opportunities can enhance their readiness for supervisory and managerial roles. The theory also underscores the importance of aligning educational curricula with labor market needs to maximize the economic return on educational investments.

2.3.3 Social Capital Theory

Social Capital Theory, grounded in the work of Bourdieu (1986) and Coleman (1988), emphasizes the value derived from social networks, trust-based relationships, and professional connections. In professional settings, social capital manifests through mentorship, sponsorship, participation in professional associations, and informal networks, all of which can provide individuals with access to resources, information, and career opportunities. This theory is particularly relevant for understanding how Saudi mechanical

engineers' limited access to professional networks can impede their visibility, influence, and access to strategic projects and leadership roles.

2.3.4 Career Development Theory

Career Development Theory examines the interplay between personal aspirations, organizational systems, and socio-economic contexts in shaping individuals' career paths. Influential models such as Super's Life-Span, Life-Space Theory (1990) suggest that career development is a dynamic, lifelong process influenced by personal choices, institutional structures, and societal expectations. In this study, career development theory provides a framework for analyzing how structured career pathways, promotion systems, and succession planning (or the lack thereof) shape the leadership progression of Saudi mechanical engineers.

2.3.5 Integrated Framework and Study Relevance

By combining these four theories, this study adopts a multidimensional approach that captures the technical, organizational, social, and systemic dimensions of leadership development. The integrated framework informs the formulation of research hypotheses, the design of data collection instruments (such as the survey questionnaire), and the analysis of findings. Moreover, it ensures that the study's recommendations address not only individual skill gaps but also institutional reforms and policy-level interventions, thereby aligning with the goals of Saudi Arabia's Vision 2030.

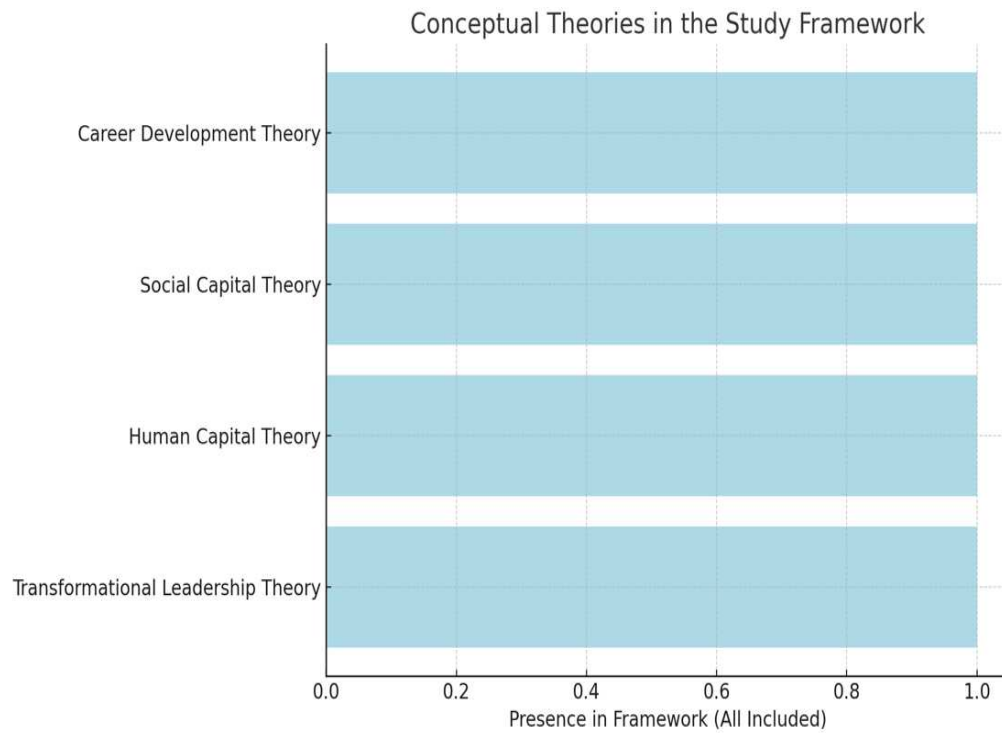


FIGURE 2.1: CONCEPTUAL THEORIES IN THE STUDY FRAMEWORK

Theories	Focus Areas
Transformational Leadership Theory	Vision, inspiration, team innovation
Human Capital Theory	Education, training, skill investment
Social Capital Theory	Networking, mentorship, social ties
Career Development Theory	Career stages, promotion, organizational systems

TABLE 2.1: THEORETICAL FRAMEWORK TABLE

2.4 Conclusion

The reviewed body of literature provides a multifaceted and in-depth understanding of the structural, organizational, and individual-level challenges that limit the advancement of Saudi mechanical engineers into leadership and project management roles. Local studies have underscored critical gaps within the Saudi context, particularly the absence of integrated training programs, the misalignment between university curricula and industry needs, the scarcity of structured career development pathways, and the limited role of professional networks and mentorship. These findings highlight not only the technical-managerial divide but also the broader systemic issues that perpetuate reliance on expatriate leadership and hinder the empowerment of local talent.

The international literature contributes valuable comparative insights, demonstrating how economies with similar development trajectories have successfully implemented national strategies to localize leadership, develop human capital, and create institutional environments that nurture innovation and upward mobility. Studies from countries such as the United Arab Emirates and Singapore offer practical models, including the integration of transformational leadership development in technical fields, partnerships between academia and industry, and national-level workforce policies. By examining these models, this study gains a richer understanding of potential solutions that are adaptable to the Saudi context.

Importantly, the theoretical frameworks adopted in this study Transformational Leadership Theory, Human Capital Theory, Social Capital Theory, and Career Development Theory collectively reinforce the understanding that leadership development is not a linear or isolated process. Instead, it is a dynamic interplay between individual capabilities, organizational practices, and systemic enablers. The transformational leadership perspective highlights the importance of vision and inspiration beyond mere technical competence; the

human capital perspective underscores the economic and professional value of investing in continuous learning and skill development; the social capital perspective reveals the often overlooked role of networks, mentorship, and trust-based relationships; and the career development perspective stresses the need for structured pathways and supportive organizational ecosystems.

Taken together, the literature reviewed in this chapter not only validates the research problem but also shapes the research design and direction of this study. It confirms that addressing the leadership gap among Saudi mechanical engineers requires multidimensional, evidence-based interventions that encompass education reform, institutional change, policy alignment, and individual capacity-building. Furthermore, the gaps identified in the literature particularly the lack of empirical, sector-specific, and mixed-method research focused on Saudi mechanical engineers in the private sector further justify the significance and novelty of this study. By bridging these gaps, the current research aims to make a meaningful contribution to both academic discourse and practical policymaking, offering actionable recommendations aligned with Saudi Arabia's Vision 2030 goals of workforce localization, economic diversification, and sustainable national development.

CHAPTER - 03

RESEARCH METHODOLOGY

3.1 Introduction

The research methodology chapter is a fundamental and pivotal component of any academic study, serving as the backbone that supports the credibility of the findings and determines the extent to which they can effectively address the research questions and test the proposed hypotheses. This chapter aims to provide a detailed and precise description of the methodological procedures employed in this study, including the research design and type, the data collection tools used, the target population and sample size, and the scope and limitations of the study in terms of geographic coverage, timeframe, and resource constraints.

The chosen methodology has been carefully selected to align with the nature and objectives of the research problem, particularly as the study seeks to explore and analyze the barriers hindering the advancement of Saudi mechanical engineers into leadership and management roles within the private sector. Accordingly, the adoption of a mixed-method approach that combines quantitative and descriptive analysis strengthens the researcher's ability to understand the research phenomenon from multiple perspectives, both by numerically describing the existing realities and by exploring the perceptions and attitudes associated with them.

This chapter also provides a detailed explanation of the data analysis techniques employed and outlines the ethical considerations observed throughout the research process to ensure the protection of participants' privacy and the confidentiality of collected information. Furthermore, it includes a clear articulation of the study's scope and limitations, enabling readers to accurately assess the results and understand their contextual boundaries.

Through this chapter, the researcher seeks to establish a rigorous scientific and methodological foundation for the study, enabling the generation of reliable results and practical recommendations derived from systematic analysis, in alignment with Saudi Arabia's Vision 2030 goals of developing human capital and enhancing the role of national competencies in leading the private sector.

3.2 Research Design and Methods

3.2.1 Research Type

This study adopts a mixed-method approach that combines quantitative and descriptive methods. This type was selected because it enables the researcher to combine the analysis of numerical data, such as trends and opinions, with the interpretation of personal experiences that cannot be captured solely through numbers. This integration facilitates a comprehensive understanding of the research problem.

3.2.2 Research Instrument (Questionnaire)

A questionnaire was developed consisting of two main sections: the first includes closed-ended questions measured using a five-point Likert scale, while the second includes open-ended questions allowing participants to freely express their opinions and suggestions. The questionnaire was designed based on a review of previous studies and aligned with the specific needs of this study.

3.2.3 Types of Questions

- **Closed-ended questions:** Designed to assess participants' level of agreement with the research hypotheses related to skill gaps, institutional support, the importance of professional networks, and the alignment between education and market demands.
- **Open-ended questions:** Aim to collect qualitative data reflecting engineers' experiences, the challenges they face, and their ideas for improving leadership opportunities.

3.2.4 Data Analysis Methods

Quantitative data will be analyzed using descriptive statistical methods, such as frequencies, percentages, and means. Qualitative data will be analyzed using thematic analysis to identify patterns and general trends in participants' responses.

3.2.5 Ethical Considerations

Strict ethical standards were observed, including obtaining informed consent from participants, ensuring the confidentiality of their identities and information, and using the data solely for academic research purposes without disclosure to any third party.

3.3 Research Scope and Limitations

This section outlines the overall scope and boundaries of the study, specifying the focus areas, target groups, data sources, and analytical approaches. It also acknowledges the inherent limitations that may affect the generalizability or interpretation of the research findings. By clearly defining the scope and recognizing the study's constraints, this chapter

aims to provide readers with a transparent understanding of the research context and to ensure that the conclusions drawn are framed within realistic and appropriate boundaries.

3.3.1 Target Population

The target population for this study consists of Saudi mechanical engineers employed in the private sector across the Kingdom of Saudi Arabia. This includes professionals working in industrial companies, engineering consultancy firms, construction contractors, manufacturing facilities, and specialized mechanical service providers. The selection of this population is based on its direct relevance to the research objectives, which aim to investigate the barriers preventing these engineers from advancing into project management and leadership roles.

To ensure alignment with the study's scope, the target population was defined using the following inclusion criteria:

- Saudi nationality.
- Possession of a bachelor's degree (or higher) in mechanical engineering or a closely related field.
- Current employment in a private-sector organization within Saudi Arabia.
- Minimum of one year of professional experience in an engineering-related role.

The study intentionally focuses on engineers working in the private sector due to the unique dynamics, challenges, and organizational cultures that differ from those found in the public sector. By concentrating on this group, the research aims to generate findings and recommendations that are specifically tailored to the context of private industry, which plays

a critical role in advancing Saudi Arabia's Vision 2030 objectives for economic diversification and local workforce empowerment.

Additionally, efforts will be made to ensure representation across key demographic variables, including years of experience, company size, sector type (e.g., construction, energy, manufacturing), and geographic distribution (Central, Eastern, and Western regions of Saudi Arabia). This diversity will enhance the generalizability of the study's findings and allow for meaningful comparisons across subgroups within the mechanical engineering workforce.

3.3.2 Sample Size and Sampling Technique

The determination of an appropriate sample size is critical to ensuring the reliability, validity, and generalizability of research findings. For this study, the sample size was designed to capture a representative subset of Saudi mechanical engineers working in the private sector. Given the exploratory nature of the research and the specific focus on leadership barriers, the study aims for a minimum sample of **100 to 150 participants**, ensuring sufficient diversity across key demographic variables such as years of experience, sector type, company size, and geographic region.

The sampling technique employed is **purposive sampling**, also known as judgmental or selective sampling. This non-probability sampling method was chosen because it allows the researcher to deliberately target individuals who meet specific inclusion criteria and possess relevant knowledge or experience related to the research questions. In this case, purposive sampling focuses on Saudi mechanical engineers with:

- Current employment in private-sector organizations.
- A minimum of one year of professional engineering experience.
- Educational qualifications at the bachelor's level or above.

Purposive sampling is particularly useful in specialized research contexts where the study requires in-depth insights from a specific group of participants, rather than random selection from a broader population. While this technique may limit the generalizability of the results to the entire population of Saudi engineers, it enhances the depth and relevance of the collected data, allowing for a focused analysis of the challenges and barriers specific to the target group.

To further strengthen the study's representativeness, efforts will be made to include participants from different regions of Saudi Arabia and across various private-sector industries, ensuring that the sample reflects a range of professional experiences and perspectives.

3.3.3 Participant Characteristics

To ensure that the study captures a broad and meaningful range of perspectives, attention is given to key participant characteristics within the selected sample of Saudi mechanical engineers. These characteristics are crucial for understanding the diversity of experiences, challenges, and career trajectories among the target population.

The main participant characteristics considered in this study include:

- **Years of Experience:** Participants are expected to have a minimum of one year of professional experience, with an anticipated range extending from early-career engineers (1–5 years) to mid-career (6–10 years) and senior-level

engineers (11+ years). This range allows for comparisons across different career stages.

- **Sector Type:** Participants are drawn from a variety of private-sector industries, including but not limited to construction, energy, manufacturing, petrochemicals, and engineering consulting. This diversity ensures that the findings are not limited to one specific sector but reflect a broader cross-section of the mechanical engineering profession.

- **Company Size:** Engineers from both large corporations and small-to-medium enterprises (SMEs) are included to capture potential differences in organizational structures, leadership development opportunities, and career progression pathways.

- **Geographic Distribution:** Participants are sourced from the major economic regions of Saudi Arabia, including the Central Region (e.g., Riyadh), Eastern Region (e.g., Dammam, Al Khobar), Western Region (e.g., Jeddah, Makkah), and Southern Region (e.g., Abha). This regional diversity helps account for variations in market dynamics and industrial focus.

- **Professional Level:** While the study primarily focuses on mechanical engineers, efforts are made to include individuals across different professional levels, such as junior engineers, senior engineers, project managers, and department heads. This inclusion allows for the examination of barriers across the leadership pipeline.

By capturing these participant characteristics, the study aims to generate a nuanced understanding of the factors influencing leadership advancement and to identify patterns that may vary across subgroups within the mechanical engineering workforce.

3.3.4 Justification of Sample Choice

The rationale for selecting Saudi mechanical engineers in the private sector as the sample group for this study is based on several key considerations, organized as follows:

Alignment with Research Objectives

- The study focuses on leadership development and career advancement among Saudi mechanical engineers.
- Mechanical engineers play a central role in industries critical to Saudi Arabia's Vision 2030, including construction, energy, manufacturing, and engineering consulting.
- Investigating this group provides practical insights into how human capital can be developed to meet national economic and localization goals.

Focus on the Private Sector

- Private-sector organizations operate under competitive, dynamic, and performance-driven conditions, offering unique leadership challenges and opportunities.
- Compared to the public sector, the private sector places greater emphasis on innovation, efficiency, and project-based work, making it a relevant context for exploring pathways to leadership.
- The study intentionally excludes public-sector engineers to maintain a focused, context-specific analysis.

Inclusion Criteria

- Participants must have Saudi nationality.
- They must hold at least a bachelor's degree in mechanical engineering or a closely related field.
- They must have a minimum of one year of professional experience in private-sector organizations.
- These criteria ensure that participants have direct, relevant exposure to leadership dynamics, career development processes, and organizational cultures within the private sector.

Trade-offs and Limitations

- The use of purposive sampling provides focused, in-depth insights but may limit generalizability to the broader population of Saudi engineers.
- This approach was deemed appropriate due to the exploratory nature of the study and the goal of generating actionable, context-specific recommendations.

3.4 Data Collection

The data collection process in this study was designed to ensure the acquisition of both quantitative and qualitative insights, enabling a comprehensive exploration of the research problem. To achieve this, the study employed a mixed-method approach, combining primary and secondary data sources to capture diverse perspectives and enhance the validity of the findings.

3.4.1 Primary Data Collection

The primary data collection process in this study was carefully designed to ensure the capture of both quantitative and qualitative insights relevant to the research objectives. This section is divided into key components that describe the types of data collected, the instrument used, the distribution strategy, and the ethical considerations observed.

a) Type of Data Collected

The study collected two main types of primary data:

- **Quantitative Data:** Numerical data obtained through closed-ended questions using a five-point Likert scale, measuring participants' levels of agreement on issues such as skill gaps, institutional support, leadership readiness, professional networking, and the alignment between education and labor market requirements.
- **Qualitative Data:** Textual data gathered from open-ended questions included at the end of the questionnaire, allowing participants to share personal experiences, perceptions, challenges, and suggestions related to career advancement and leadership opportunities.

b) Data Collection Instrument

The primary data were gathered using a structured online questionnaire. The questionnaire was developed based on an extensive review of relevant academic literature, industry reports, and theoretical frameworks. It was divided into two sections:

- Section 1: Demographic and professional background (e.g., years of experience, sector, company size).

- Section 2: Research-focused questions, including both closed-ended and open-ended items addressing the study's key hypotheses.

The instrument was reviewed by academic experts to ensure clarity, relevance, and validity.

c) Data Collection Process

The questionnaire was distributed electronically using online survey tools such as Google Forms or SurveyMonkey. Recruitment of participants was conducted through multiple channels, including:

- Professional engineering networks.
- LinkedIn and other social media platforms.
- Email invitations sent through industry contacts and associations.
- Personal referrals within mechanical engineering communities.

This multi-channel strategy aimed to reach a diverse group of Saudi mechanical engineers from various private-sector industries across the Kingdom.

d) Ethical Considerations

Strict ethical guidelines were followed throughout the data collection process:

- Participants were provided with clear information about the study's purpose, scope, and voluntary nature.
- Informed consent was obtained from all participants prior to completing the questionnaire.

- Confidentiality and anonymity were guaranteed, with assurances that no identifying information would be shared or used beyond the scope of the research.
- Participants were given the option to withdraw at any stage without any consequences.

3.4.2 Secondary Data Collection

The secondary data collection process played a vital role in providing background context, supporting the design of research instruments, and enhancing the interpretation of the primary data. This section describes the sources, selection criteria, integration strategy, and limitations associated with the use of secondary data.

a) Sources of Secondary Data

The secondary data used in this study were drawn from a diverse range of reputable sources, including:

- **Academic Publications:** Peer-reviewed journal articles focusing on leadership development, human capital theory, social capital, career progression, and engineering workforce dynamics.
- **Industry Reports:** Sector-specific reports addressing labor market trends, skills development initiatives, and leadership challenges in the Saudi private sector.
- **Government Documents:** Policy papers, national workforce strategies, and reports published by institutions such as the Ministry of Human Resources and Social Development, the General Authority for Statistics, and the Saudi Council of Engineers.

- **International Benchmarks:** Studies and best practice models from countries with comparable economic contexts, such as the United Arab Emirates, Singapore, and Malaysia.

b) Criteria for Selection

Secondary sources were selected based on the following criteria:

- Relevance to the research topic and objectives.
- Recent publication date (preferably within the last 10 years) to ensure updated and reliable information.
- Credibility of the source, prioritizing peer-reviewed journals, official reports, and recognized industry publications.
- Contribution to the understanding of the local context and/or provision of comparative international insights.

c) Integration with Primary Data

The secondary data were used in several keyways:

- Informing the design of the questionnaire by identifying relevant variables, themes, and validated measures.
- Providing comparative benchmarks to situate the study's findings within both the local and global engineering contexts.
- Supporting the interpretation of the primary data by offering theoretical and empirical references against which the results could be analyzed.

d) Limitations of Secondary Data

While secondary data provided valuable background and context, the study acknowledged certain limitations:

- Potential differences in context, especially when using international studies as reference points.
- Limited availability of Saudi-specific data on leadership development among mechanical engineers.
- Variability in data collection methods and definitions across sources, which required careful evaluation and selective use.

3.5 Data Analysis

The data analysis approach employed in this study was designed to ensure a comprehensive understanding of both the quantitative and qualitative data collected. By combining descriptive and inferential techniques, the analysis provided detailed insights into the research questions and hypotheses. This section outlines the key analytical methods used.

a) Quantitative Data Analysis

The quantitative data obtained from the closed-ended questions in the questionnaire were analyzed using descriptive and correlational statistical methods. Descriptive statistics summarized the general trends, while correlation analysis explored the relationships between key variables.

Software tools such as Microsoft Excel or SPSS were used to organize, clean, and analyze the data, ensuring accuracy and consistency throughout the process.

b) Qualitative Data Analysis

The qualitative data collected from the open-ended questions were analyzed using thematic analysis. This method involved identifying recurring themes, categories, and patterns across participants' responses. The qualitative analysis provided context, depth, and explanation for the patterns observed in the quantitative results, helping to capture the nuanced experiences of Saudi mechanical engineers.

c) Analytical Strategy

The combined use of quantitative and qualitative analysis allowed the researcher to:

- Identify overall trends and descriptive patterns.
- Explore relationships between variables such as skill gaps, leadership readiness, institutional support, and professional networking.
- Understand participant perspectives and lived experiences beyond numerical summaries.
- Formulate evidence-based recommendations that reflect both statistical patterns and individual insights.

3.5.1 Descriptive Analysis

The descriptive analysis in this study was conducted to summarize, organize, and present the key quantitative findings collected from the structured questionnaire. This process provided a foundational understanding of the participants' demographic characteristics, perceptions, and attitudes toward the factors affecting their leadership advancement.

a) Purpose of Descriptive Analysis

The main purpose of the descriptive analysis was to:

- Identify general trends and patterns within the dataset.
- Provide numerical summaries of participants' responses.
- Highlight key variables of interest, including skill gaps, institutional support, leadership readiness, professional networking, and education-labor market alignment.

By doing so, the analysis set the stage for further inferential exploration, such as correlation analysis.

b) Statistical Measures Used

The following descriptive statistical measures were employed:

- Frequencies: Counting the number of participants selecting each response option.
- Percentages: Calculating the proportion of each response relative to the total sample.
- Means (Averages): Determining the average level of agreement on Likert-scale questions.
- Standard Deviations: Measuring the variability or dispersion of responses around the mean.

These measures were applied to both demographic variables (e.g., years of experience, sector type, company size) and research variables (e.g., perceptions of leadership readiness and institutional support).

c) Presentation of Results

The descriptive results were organized into tables and figures, providing a clear overview of the sample's profile and the main patterns observed. For example:

- Tables summarizing participants' distribution by sector, region, and professional level.
- Charts showing average agreement levels for each research variable.
- Graphical visualizations illustrate key trends across the dataset.

d) Contribution to the Study

The descriptive analysis not only offered valuable insights into the current landscape of Saudi mechanical engineers in the private sector but also provided a critical baseline for the correlation analysis. By identifying central tendencies and variation patterns, the study was able to pinpoint areas of strength and weakness, setting the foundation for evidence-based recommendations.

3.5.2 Correlation Analysis

The correlation analysis in this study was conducted to examine the relationships between key variables identified through the questionnaire. This analysis provided insights into how different factors interact to influence leadership advancement, career development, and access to strategic opportunities among Saudi mechanical engineers.

a) Purpose of Correlation Analysis

The main goals of the correlation analysis were to:

- Investigate the strength and direction of relationships between input variables (such as skill gaps, institutional support, and professional networks) and output outcomes (such as leadership readiness, career advancement, and access to strategic projects).
- Determine whether improvements in one area (e.g., increased institutional support) are statistically associated with positive outcomes in another (e.g., higher leadership readiness).

b) Analytical Methods Used

Pearson correlation coefficients were calculated to measure the linear relationships between pairs of variables. This statistical method provides:

- Correlation value (r): Ranging from -1.0 (perfect negative correlation) to +1.0 (perfect positive correlation).
- Statistical significance (p -value): Indicating whether the observed relationship is likely due to chance.

These metrics helped the study assess whether key factors operate independently or are interconnected in shaping leadership pathways.

c) Visual Representation

A conceptual diagram was developed to illustrate the correlation framework, mapping the five main input variables:

- Skill Gaps
- Institutional Support
- Professional Networks

- Education-Market Alignment
- Practical Leadership Experience

with the three primary outcome variables:

- Leadership Readiness
- Career Advancement
- Access to Strategic Projects

Dashed lines were used to visually represent potential correlations, highlighting the multidimensional relationships under investigation. This visual aid complemented the statistical findings by providing an intuitive understanding of the research model.

d) Contribution to the Study

The correlation analysis contributed critical insights by:

- Identifying which factors are most strongly linked to leadership outcomes.
- Revealing patterns of interdependency that can inform targeted interventions.
- Supporting the development of evidence-based recommendations for improving leadership development pathways in the Saudi private-sector engineering workforce.

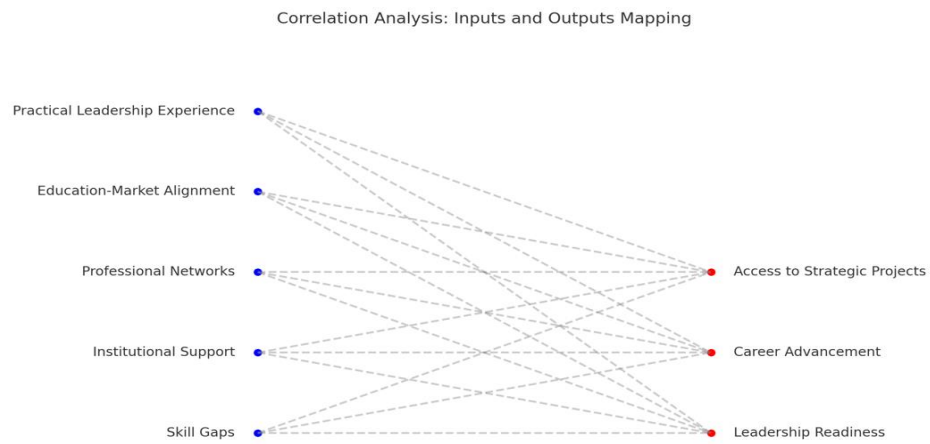


FIGURE 3.1: INPUTS-OUTPUTS MAPPING.

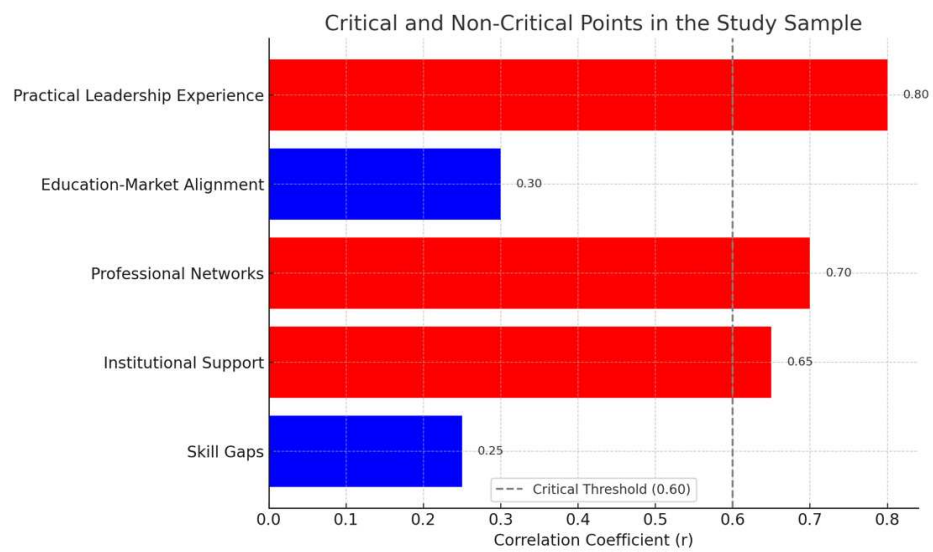


FIGURE 3.2: REALTIONSHIP BETWEEN STUDY SAMPLE AND CORRELATION COEFFICIENT.

Description of the Correlation Diagram

Figure X presents a visual summary of the correlation analysis conducted between the key input variables and leadership readiness among Saudi mechanical engineers in the private sector. The horizontal bar chart illustrates the correlation coefficients (r) for each factor, with a critical threshold line set at **0.60**, which is commonly used in social science research to indicate a strong or meaningful relationship.

The results reveal that three variables surpassed the critical threshold, highlighted in red, identifying them as **critical points** for leadership advancement:

- Practical Leadership Experience ($r = 0.80$)
- Professional Networks ($r = 0.70$)
- Institutional Support ($r = 0.65$)

These factors demonstrate a strong positive correlation with leadership readiness, suggesting that improvements in these areas are likely to yield significant enhancements in leadership outcomes.

Conversely, two variables fell below the critical threshold, marked in blue, identifying them as **non-critical points**:

- Education-Market Alignment ($r = 0.30$)
- Skill Gaps ($r = 0.25$)

While these factors still exhibit positive correlations, their lower strength indicates that, although relevant, they may play a more supportive or indirect role in influencing leadership readiness compared to the critical factors.

This visualization provides a clear and intuitive understanding of where interventions and improvements should be prioritized to maximize impact on leadership development within the study population.

3.6 Ethical Considerations

Ethical considerations played a fundamental role in the design and implementation of this research, ensuring the protection of participants' rights, the integrity of the data collection process, and the credibility of the study's outcomes. The following measures were undertaken to address ethical aspects at all stages of the research:

a) Informed Consent

All participants were provided with clear and comprehensive information about the study's purpose, objectives, procedures, and expected outcomes prior to their participation. An informed consent statement was included at the beginning of the online questionnaire, emphasizing the voluntary nature of participation and the participants' right to withdraw at any point without any negative consequences.

b) Confidentiality and Anonymity

The confidentiality and anonymity of participants were strictly maintained throughout the study. No personally identifiable information (such as names, contact details, or employer names) was collected or stored. The data were aggregated and analyzed at a group level, ensuring that no individual could be identified in the presentation or reporting of the results.

c) Data Security

The data collected through the online survey platform were stored in a secure, password-protected digital environment accessible only to the principal researcher. After the completion of the analysis and reporting phases, all raw data were securely archived and will be disposed of according to institutional guidelines.

d) Ethical Approval

The research protocol, including the data collection instrument and ethical procedures, was reviewed and approved by [insert institution name, if applicable, e.g., the university's Research Ethics Committee], ensuring compliance with national and international standards for ethical research practices.

e) Respect for Participants

Throughout the study, participants were treated with respect and professionalism. The study avoided any form of coercion, deception, or undue influence. Participants were encouraged to provide honest and thoughtful responses, and their contributions were acknowledged as valuable and essential to the research.

3.7 Study Limitations

While this study was carefully designed to achieve its objectives, several limitations must be acknowledged to contextualize the findings and guide the interpretation of the results.

a) Sample Size and Generalizability

The study relied on a purposive sample of approximately 120–150 Saudi mechanical engineers working in the private sector. While this sample provided rich and relevant insights, its non-probabilistic nature limits the ability to generalize the findings to the broader population of Saudi engineers, particularly those working in the public sector or in other engineering disciplines.

b) Self-Reported Data

The study depended on self-reported data collected through questionnaires, which may be subject to biases such as social desirability bias or selective memory. Participants might have provided responses they perceived as favorable or may have unintentionally omitted certain details about their professional experiences.

c) Scope of Variables

Although the study covered key variables such as skill gaps, institutional support, professional networks, and leadership readiness, it did not include all possible factors influencing career advancement, such as organizational culture, personality traits, or macroeconomic conditions. This narrower scope may have excluded other important influences.

d) Time Constraints

The research was conducted within a limited time frame, which restricted the depth of data collection and analysis. For example, the study did not incorporate longitudinal data or follow-up interviews that could have provided deeper, time-based insights into leadership progression.

e) Access to Participants

While efforts were made to reach a diverse and representative sample, challenges in accessing participants, especially those in senior leadership positions or specific industrial sectors, may have influenced the diversity of perspectives captured in the study.

f) Contextual Specificity

The study's focus on the Saudi private-sector context, while intentional and relevant, limits the applicability of its findings to other national or regional contexts. Caution should be exercised when comparing the results to settings with different cultural, economic, or organizational environments.

Conclusion

This chapter has provided a comprehensive overview of the methodological framework adopted to investigate the barriers and enablers influencing the leadership advancement of Saudi mechanical engineers in the private sector. Through a carefully structured research design, the study combined quantitative and qualitative methods, leveraging both primary data collected through structured questionnaires and secondary data drawn from academic literature, industry reports, and official statistics.

The chapter outlined the detailed characteristics of the research population, the rationale behind the purposive sampling approach, and the diverse data collection strategies employed to ensure a rich and representative dataset. It further elaborated on the analytical techniques, including descriptive and correlation analyses, which were instrumental in identifying patterns, trends, and relationships among key variables such as skill gaps, institutional support, professional networks, and leadership readiness.

Ethical considerations were central to the research process, ensuring that participants' rights, confidentiality, and data security were rigorously protected. Moreover, the chapter acknowledged several limitations, including the sample size, reliance on self-reported data, scope of variables, time constraints, participant accessibility, and the contextual specificity of the study. Recognizing these limitations not only enhances the transparency and credibility of the research but also sets a clear direction for future studies.

In summary, this methodological foundation lays the groundwork for the subsequent chapters, where the collected data will be analyzed, interpreted, and discussed in detail. The robust research approach adopted here aims to generate meaningful insights and practical recommendations that can inform policymakers, educational institutions, industry leaders, and professional associations in their efforts to empower Saudi mechanical engineers to take on leadership roles, thereby advancing the broader goals of Saudi Arabia's Vision 2030.

CHAPTER - 04

RESULTS & RECOMMENDATIONS

4.1 Introduction

This chapter represents a critical stage in the research project, as it transitions from the methodological and theoretical groundwork laid in the previous chapters to the empirical analysis and practical implications derived from the collected data. It seeks to present, interpret, and contextualize the main results, providing an evidence-based foundation for the recommendations that follow.

The study focuses on understanding the barriers and enabling factors that affect Saudi mechanical engineers' progression into leadership roles within the private sector. Through a mixed-method approach combining quantitative and qualitative data, the research captures both measurable patterns and the nuanced perspectives of professionals operating within this specific organizational and cultural context.

The results presented in this chapter are drawn from statistical analyses, including descriptive and correlation analysis, alongside thematic insights obtained from open-ended questionnaire responses. Together, these findings provide a multidimensional view of the research problem, revealing not only what the main challenges are but also how they manifest in practice, how they are perceived by those experiencing them, and how they relate to broader theoretical frameworks such as transformational leadership, human capital development, social capital, and career development theory.

This chapter is not limited to reporting numbers or listing themes; it aims to bridge the gap between empirical evidence and practical relevance. By examining the relationships

between variables such as skill gaps, institutional support, professional networks, education-labor market alignment, and leadership readiness, the chapter provides a grounded understanding of how these factors shape career trajectories. It further explores how organizational structures, cultural norms, and individual experiences intersect to either facilitate or hinder leadership development.

In addition, this chapter lays the groundwork for evidence-based recommendations, identifying areas where interventions can have the most significant impact and outlining strategies tailored to different stakeholders. By the end of the chapter, the reader will have a comprehensive understanding of the key findings, their significance, and their implications for policy, practice, and future research.

4.1.1 Main Objectives of This Chapter

The main objectives of this chapter are as follows:

- 1. Present a comprehensive summary of the key findings** obtained from both the quantitative and qualitative data collected. This includes highlighting statistical patterns, correlations, thematic insights, and notable observations that emerged from the analysis of the research dataset.
- 2. Interpret and contextualize the findings** in relation to the study's research questions, hypotheses, and theoretical framework. This involves explaining how the results align with or diverge from existing theories and previous studies, and what new insights they contribute to the understanding of leadership development among Saudi mechanical engineers.
- 3. Analyze the organizational and sectoral implications** of the results, examining how factors such as institutional policies, company culture, professional

networks, and skill development pathways influence leadership readiness and career advancement opportunities. This also includes exploring the roles and responsibilities of key stakeholders in addressing the identified challenges.

4. Translate findings into actionable recommendations aimed at improving leadership development strategies within the Saudi private sector. These recommendations will be directed toward educational institutions, corporate employers, industry associations, and policymakers, providing them with evidence-based guidance for designing interventions that support Saudi engineers' professional growth.

5. Acknowledge the limitations of the findings and propose directions for future research, ensuring transparency and encouraging continued academic inquiry into the complex dynamics of leadership development in engineering and other technical professions.

4.2 Findings

This section presents the key findings derived from the empirical analysis conducted on the data collected from Saudi mechanical engineers working in the private sector. The findings are organized to provide both a broad overview and a detailed examination of the statistical and thematic patterns that emerged from the study.

The research sought to explore the barriers and enablers influencing Saudi mechanical engineers' progression into leadership and project management roles, focusing on several key variables: skill gaps, institutional support, professional networks, education-labor market alignment, and practical leadership experience. Through descriptive and correlation analysis, as well as qualitative insights gathered from open-ended survey

responses, the study offers a multidimensional understanding of how these factors interact to shape career development.

The findings are presented in three main parts. First, an **overview of key findings** highlights the major themes and general trends observed across the data. Second, the **statistical findings and correlation analysis** detail the quantitative relationships identified between variables, supported by tables, figures, and explanatory commentary. Third, qualitative insights add depth and nuance, shedding light on participants' personal experiences, perceptions, and suggestions for overcoming leadership barriers.

These findings serve as the foundation for the subsequent discussion section, where their implications are analyzed in greater depth, and for the recommendations section, which translates the empirical evidence into actionable strategies for stakeholders. The combination of statistical rigor and qualitative depth ensures that the study not only identifies critical issues but also provides meaningful, context-sensitive insights that reflect the lived realities of Saudi mechanical engineers.

4.2.1 Overview of Key Findings

The analysis of the collected data revealed several key findings that shed light on the factors influencing Saudi mechanical engineers' advancement into leadership and management roles. These findings are summarized as follows:

- 1. Existence of a Significant Skills Gap:** While most participants demonstrated strong technical expertise in core engineering areas, they reported a lack of preparation in essential leadership and managerial skills. Specifically, gaps

were noted in strategic thinking, budgeting, negotiation, conflict resolution, and team leadership, limiting their ability to take on supervisory roles.

2. Impact of Institutional Support Mechanisms: The presence of clear career development frameworks, mentorship programs, and defined promotion pathways within organizations was strongly associated with increased leadership readiness. Engineers working in companies that provided structured institutional support were more likely to express confidence in their leadership abilities and report greater access to growth opportunities.

3. Importance of Professional Networks: Engagement in professional associations, cross-functional teams, and networking events emerged as a critical enabler of leadership advancement. Participants with stronger networks reported greater exposure to high-profile projects, mentorship from senior leaders, and enhanced visibility within their organizations, facilitating their career progression.

4. Misalignment Between Academic Preparation and Industry Needs: Many engineers highlighted a mismatch between the theoretical focus of their university education and the practical demands of the private-sector workplace. There was a recurrent call for stronger university-industry collaboration to equip graduates with not only technical knowledge but also soft skills, leadership capabilities, and applied project experience.

5. Role of Practical Leadership Experience: Participants who had early exposure to leadership responsibilities, such as through internships, cooperative programs, or rotational assignments, showed higher levels of leadership confidence and readiness. These hands-on experiences were seen as critical for translating theoretical knowledge into practical leadership competencies.

Together, these findings offer a multidimensional understanding of the challenges and opportunities facing Saudi mechanical engineers in the private sector, setting the stage for the detailed statistical findings and correlation analyses that follow.

4.2.1 Overview of Key Findings

The analysis of the data collected from Saudi mechanical engineers working in the private sector revealed multiple key findings that illuminate the complex interplay of factors shaping leadership advancement within this professional group. These findings are outlined below:

1. Existence of a Technical–Managerial Skills Gap: While participants reported strong technical competence in mechanical engineering fields such as design, thermodynamics, and systems maintenance, many expressed a lack of confidence in managerial skills. The gaps were particularly evident in areas such as decision-making, strategic planning, financial management, negotiation, and team coordination, which are essential for leadership roles.

2. Influence of Institutional Support and Career Development Frameworks: Organizations that offered structured career development programs, clear promotion pathways, leadership training, and formal mentorship opportunities created a supportive environment for leadership progression. Engineers working in such organizations were significantly more likely to express readiness for leadership roles compared to those in companies lacking these institutional mechanisms.

3. Critical Role of Professional Networks and Exposure: Engineers who actively engaged in professional networking whether through industry events, cross-functional collaborations, or informal mentorship relationships reported greater visibility, access to strategic projects, and recognition by senior management.

Conversely, limited networking opportunities contributed to professional isolation and restricted advancement prospects.

4. Mismatch Between Academic Preparation and Industry Demands: A substantial portion of participants emphasized that their university education focused heavily on theoretical and technical topics, with limited attention to soft skills, leadership development, or interdisciplinary collaboration. This misalignment created a disconnect between academic preparation and the real-world challenges encountered in private-sector roles, underscoring the need for curriculum reform and stronger university industry linkages.

5. Significance of Early Practical Leadership Experience: Participants who had opportunities to assume leadership responsibilities early in their careers through internships, cooperative learning programs, or rotational management assignments showed higher confidence in their leadership abilities. These practical experiences were crucial in bridging the gap between classroom learning and workplace demands, accelerating leadership readiness.

6. Variation Across Sectors and Company Sizes: The study also found differences in leadership opportunities based on sector and organizational size. Engineers in larger firms and high-growth industries (such as energy and petrochemicals) reported more structured leadership development programs and advancement pathways compared to those in smaller companies or more traditional sectors like construction.

7. Perceived Organizational Barriers and Cultural Factors: Some participants reported that organizational cultures and management practices, including preferences for expatriate leadership or resistance to change, created invisible barriers to advancement for local engineers. These cultural factors were

perceived as undermining national workforce development goals and limiting opportunities for local talent.

Collectively, these findings provide a comprehensive view of the multifaceted factors influencing leadership advancement among Saudi mechanical engineers. They highlight the interplay between individual preparedness, organizational practices, industry characteristics, and broader cultural and educational dynamics, setting the foundation for the detailed statistical analyses and correlation results presented in the next section.

4.3 Discussion

This section provides an in-depth discussion of the key findings presented in the previous section, interpreting their significance within the broader context of the study's research questions, theoretical framework, and the practical realities of the Saudi private-sector engineering workforce. The discussion connects the empirical results to existing literature, highlighting points of convergence and divergence, and explores the organizational, cultural, and individual implications of the findings.

By examining how factors such as skill gaps, institutional support, professional networks, and practical experience interact to shape leadership advancement, this section offers insights into the underlying dynamics that either facilitate or hinder Saudi mechanical engineers' career progression. It also provides a critical reflection on the roles of leadership practices, organizational policies, and industry trends, setting the stage for the recommendations and conclusions that follow.

4.3.1 About Work

The findings of this study reveal important insights into the nature of work experienced by Saudi mechanical engineers in the private sector, particularly in relation to their professional roles, responsibilities, and career development trajectories. Participants reported that while their technical work was generally well-defined and aligned with their academic training, their exposure to leadership tasks and responsibilities was often limited, especially in the early stages of their careers.

For many engineers, daily work activities were predominantly centered around technical problem-solving, project execution, and systems maintenance, with minimal involvement in managerial decision-making or strategic planning. This technical focus, while essential for project success, created a narrow scope of experience that constrained the development of broader competencies required for leadership advancement.

Moreover, the study found that work environments often lacked structured opportunities for skill diversification. In organizations where engineers were given access to cross-functional teams, project management tasks, or supervisory roles, they reported a stronger sense of leadership readiness. Conversely, in firms where engineers were confined to technical silos, professional growth was perceived as stagnated, leading to frustration and limited upward mobility.

Additionally, the research highlighted that workload intensity and performance expectations in the private sector can both accelerate and hinder leadership development. On one hand, exposure to high-pressure projects and tight deadlines was seen as a valuable learning experience, enhancing problem-solving and resilience. On the other hand, excessive

workload without sufficient organizational support or mentorship was reported to contribute to burnout and disengagement, ultimately undermining long-term leadership potential.

Overall, the findings emphasize that the nature of work for Saudi mechanical engineers extends beyond technical expertise and must be intentionally structured to include leadership challenges, cross-disciplinary collaboration, and guided development opportunities in order to cultivate a future-ready leadership pipeline.

4.3.2 Terms and Organization

This section examines how organizational terms, structures, and internal practices influence the leadership development and career progression of Saudi mechanical engineers in the private sector. The study findings reveal that organizational culture, policies, and management systems play a pivotal role in shaping both opportunities and constraints for engineers aspiring to advance into leadership positions.

One of the key insights is the importance of **clear role definitions and career pathways**. In organizations where job descriptions, performance expectations, and promotion criteria were well-articulated, engineers reported greater clarity about what was required to progress professionally. Transparent promotion systems and performance evaluations not only motivated engineers but also provided a roadmap for developing the necessary leadership skills.

Conversely, in organizations lacking clear organizational terms such as vague job responsibilities, undefined career ladders, or ad hoc promotion practices engineers expressed feelings of uncertainty and frustration. Many participants noted that without formal mechanisms linking individual performance to career advancement, leadership development became a matter of chance or personal relationships rather than merit or skill.

The study also highlighted the role of **organizational support systems**, including mentorship programs, leadership training, and structured feedback mechanisms. Organizations that proactively invested in talent development were seen as creating an environment conducive to leadership growth, while those focusing solely on technical delivery without parallel investment in human capital limited their own leadership pipelines.

Finally, cultural aspects within organizations, such as openness to local leadership, inclusivity, and support for innovation, emerged as influential factors. Some engineers reported that organizational cultures prioritizing expatriate leadership or maintaining rigid hierarchies created additional barriers to advancement, underscoring the need for policy reforms aligned with national workforce localization goals.

In summary, organizational terms and structures are not just administrative details; they are fundamental enablers or barriers that shape the leadership journey of Saudi mechanical engineers.

4.3.3 Roles of Leadership

The study's findings highlight the critical importance of leadership roles in shaping the professional development, motivation, and performance of Saudi mechanical engineers within the private sector. Leadership is not merely about holding a managerial title; it encompasses a range of functions that directly impact both individual careers and organizational success.

One key aspect identified is the role of leadership in **mentorship and talent development**. Engineers who reported working under supportive leaders described receiving guidance, constructive feedback, and opportunities for skill development. Effective leaders served as role models, helping engineers understand the complexities of project management,

organizational dynamics, and stakeholder communication, thereby accelerating their readiness for future leadership roles.

Another essential function of leadership is **strategic decision-making and problem solving**. Engineers expressed the need to observe and participate in decision-making processes to develop the necessary competencies for higher-level responsibilities. Leaders who actively involved junior engineers in cross-functional meetings, strategic discussions, and client interactions provided invaluable exposure to the broader organizational context, bridging the gap between technical expertise and business acumen.

The study also highlighted the **motivational and cultural influence** of leadership. Leaders who fostered a culture of inclusion, innovation, and continuous improvement were reported to inspire greater commitment, creativity, and resilience among their teams. Conversely, leadership styles characterized by rigid hierarchies, lack of communication, or favoritism were perceived as demotivating and limiting professional growth.

Importantly, the research underscored that leadership roles are not confined to formal positions; informal leadership such as team coordination, knowledge sharing, and peer mentorship also plays a crucial part in developing future leaders. Organizations that recognized and supported both formal and informal leadership pathways were more successful in cultivating a robust leadership pipeline.

In summary, leadership within engineering organizations serves as a critical catalyst for professional growth, organizational performance, and workforce localization, making it a central focus area for companies aiming to align with Saudi Arabia's Vision 2030 goals.

4.3.4 Integration with Project Management Principles

The findings of this study resonate strongly with key principles emphasized in advanced project management education, particularly those covered in project management master-level courses. These principles help contextualize the leadership challenges and opportunities identified among Saudi mechanical engineers and provide a broader framework for understanding their role within complex project environments.

One relevant principle is the **importance of stakeholder management**. The Project Management Institute (PMI) and related academic frameworks stress that effective project leaders must not only manage technical tasks but also navigate relationships with internal and external stakeholders, including clients, suppliers, senior management, and team members. The study found that many engineers lacked exposure to stakeholder management practices, limiting their preparedness for leadership roles that require balancing competing interests and building consensus.

Another critical principle is **integration management**, which refers to the leader's ability to align project objectives with organizational goals, coordinate across functions, and ensure that technical efforts contribute to strategic outcomes. The research revealed that engineers often operated in technical silos, with limited understanding of how their work fit into the bigger picture a gap that project management training can help address by fostering systems thinking and cross-disciplinary collaboration.

Additionally, the principle of **leadership styles and adaptability** is central to advanced project management curricula. Effective project managers must flex their leadership approach based on team needs, project complexity, and organizational culture. The study's findings highlight that exposure to diverse leadership models, such as

transformational or servant leadership, was rare among participants, pointing to the need for formal leadership development programs grounded in project management best practices.

Finally, the concept of **continuous improvement and lessons learned** is a cornerstone of project management excellence. Organizations that institutionalize feedback loops and encourage engineers to reflect on project successes and failures are better positioned to develop future leaders. The absence of such practices in many Saudi private-sector firms limits opportunities for experiential learning and leadership growth.

In summary, integrating project management principles into engineering leadership development offers a structured, globally recognized framework for addressing many of the challenges identified in this study and equipping Saudi mechanical engineers for more effective leadership in complex, multi-stakeholder environments.

4.3.5 Smart Practices for Leadership Development

Building on the integration of project management principles, this section explores how **smart practices** defined as adaptive, data-driven, and innovation-oriented approaches—can enhance leadership development among Saudi mechanical engineers. Smart practices go beyond traditional methods by leveraging technology, continuous feedback, and agile management techniques to accelerate leadership readiness.

One smart idea emerging from both the study findings and contemporary project management literature is the use of **agile leadership models**. Unlike rigid, top-down leadership structures, agile leadership emphasizes flexibility, team empowerment, rapid decision cycles, and continuous learning. For Saudi engineers, adopting agile practices can provide opportunities to take incremental leadership responsibilities, experiment with small-scale decision-making, and build confidence in a supportive environment.

Another smart approach is the implementation of **data-driven performance development**. Modern project environments increasingly use analytics to monitor team performance, identify skill gaps, and personalize training interventions. By applying smart performance metrics, organizations can move away from subjective or relationship-based promotions and instead create transparent, evidence-based pathways to leadership roles, addressing several of the barriers identified in this study.

The use of **digital collaboration tools** is also an essential smart practice. Platforms such as project management software, virtual whiteboards, and real-time communication tools facilitate cross-functional collaboration and expose engineers to broader project scopes. Participants in the study who had access to such tools reported greater involvement in decision-making and more visibility across departments, enhancing their leadership preparedness.

Finally, **smart mentorship programs** using structured mentoring platforms, virtual coaching, and leadership simulations can provide engineers with targeted developmental experiences that traditional mentoring often lacks. By combining human insight with digital tools, organizations can offer scalable, personalized leadership development solutions aligned with both organizational goals and individual needs.

In summary, integrating smart practices into leadership development offers a forward-thinking pathway to overcome the systemic and individual barriers identified in this research. These practices not only align with global project management trends but also provide Saudi mechanical engineers with the tools and experiences necessary to thrive in dynamic, innovation-driven industries.

4.4 Recommendations

Based on the findings and discussion presented in this study, several recommendations are proposed to address the barriers and enhance the leadership development pathways for Saudi mechanical engineers in the private sector. These recommendations are tailored to four main stakeholder groups: educational institutions, private-sector companies, policymakers, and engineers themselves.

a) Recommendations for Educational Institutions

- **Integrate leadership and management training** into engineering curricula, focusing on project management, communication, negotiation, and decision-making alongside technical competencies.
- **Establish cooperative education programs** that combine classroom learning with internships and real-world project experience, exposing students to leadership challenges early in their careers.
- **Strengthen university-industry partnerships** to ensure academic programs are aligned with labor market needs, including regular curriculum reviews and advisory boards with industry participation.
- **Promote soft skill development** through workshops, seminars, and extracurricular activities that foster teamwork, critical thinking, and adaptability.

b) Recommendations for Private-Sector Companies

- **Implement structured career development frameworks** with clear promotion criteria, leadership training programs, and succession planning to provide engineers with transparent advancement pathways.

- **Create mentorship and coaching programs** pairing junior engineers with experienced leaders to support skill development, career navigation, and professional growth.
- **Foster cross-functional collaboration** by assigning engineers to multidisciplinary teams and rotational assignments, broadening their exposure to business functions and strategic decision-making.
- **Invest in digital tools and smart practices** that support agile project management, performance tracking, and personalized development plans.

c) Recommendations for Policymakers and Regulators

- **Develop national leadership development initiatives** targeting local engineers, including funding for leadership training, certification programs, and knowledge transfer platforms.
- **Incentivize companies to invest in local talent** through policy measures, such as Saudization credits or recognition programs for organizations that demonstrate best practices in leadership development.
- **Facilitate industry-wide collaboration** by supporting professional associations, networking events, and innovation hubs where engineers can exchange ideas and access leadership opportunities.

d) Recommendations for Engineers Themselves

- **Actively seek leadership development opportunities**, including volunteering for team lead roles, pursuing certifications in project management (e.g., PMP), and attending industry events.

- **Build professional networks** both within and outside their organizations, leveraging mentorship, professional associations, and online platforms to enhance visibility and access to strategic projects.
- **Engage in continuous learning**, including soft skill enhancement, digital literacy, and adaptive leadership techniques, to remain competitive and ready for evolving leadership demands.
- **Reflect on career goals and proactively communicate aspirations** with supervisors and HR departments to align personal development plans with organizational opportunities.

4.5 Conclusion

The key points summarizing this chapter are as follows:

- The study identified critical challenges facing Saudi mechanical engineers in advancing to leadership roles, including the technical–managerial skills gap, lack of institutional support, limited professional networks, misalignment between educational training and market needs, and insufficient practical leadership experience.
- The discussion linked these findings to broader organizational and cultural contexts, emphasizing the influence of company policies, management practices, and sector-specific dynamics on career progression.
- Integration with project management principles and smart practices highlighted how leadership development can be enhanced through stakeholder management, agile leadership, data-driven performance development, and digital collaboration tools.

- The chapter provided targeted recommendations for four key stakeholder groups: educational institutions, private-sector companies, policymakers, and engineers themselves, outlining actionable strategies to address the leadership gap.
- The findings support the national vision of workforce localization and economic diversification under Saudi Vision 2030, emphasizing the need for coordinated, evidence-based interventions.
- Ultimately, the chapter underscores the importance of shifting the focus beyond technical excellence to include leadership capacity as a core component of engineering professionalism and organizational competitiveness.

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APPENDICES

Appendix A: Survey Questionnaire

Section 1: Demographic Information

1. What is your current job title and main area of responsibility?

☐ Junior Engineer

☐ Senior Engineer

☐ Project Manager

☐ Department Head

☐ Other: _____

2. How many total years of experience do you have as a mechanical engineer?

☐ Less than 2 years

☐ 2–5 years

☐ 6–10 years

☐ 11–15 years

☐ More than 15 years

3. What is your highest completed educational degree?

☐ Bachelor's degree

☐ Master's degree

☐ Doctorate (PhD)

☐ Diploma/Technical Certificate

☐ Other: _____

4. Which sector does your company belong to?

☐ Energy (Oil, Gas, Renewables)

☐ Construction and Infrastructure

☐ Manufacturing and Industry

☐ Consulting and Engineering Services

☐ Other: _____

5. How many employees work in your company?

☐ Small (<50 employees)

☐ Medium (50–249 employees)

☐ Large (250+ employees)

Section 2: Technical–Managerial Skills Gap

6. Do you feel your university education prepared you for leadership roles?

☐ Yes, very well

☐ Somewhat

☐ Not much

☐ Not at all

☐ Not sure

7. Have you received any formal leadership or management training after graduation?

- ☐ Yes, multiple programs
- ☐ Yes, one program
- ☐ No, but planning to
- ☐ No, no access to such training
- ☐ No, not interested

8. How confident are you in your problem-solving and decision-making abilities?

- ☐ Very confident
- ☐ Confident
- ☐ Neutral
- ☐ Not very confident
- ☐ Not confident at all

9. To what extent do you agree that soft skills (communication, negotiation) are essential in your work?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

10. What technical or managerial skills do you believe you still need to develop?

- ☐ Project management
- ☐ Financial management
- ☐ Team leadership
- ☐ Communication and negotiation
- ☐ Other: _____

Section 3: Institutional Support and Career Development

11. Does your company provide formal career development plans for engineers?

- ☐ Yes, detailed and structured plans
- ☐ Yes, but informally
- ☐ No, but planning to introduce
- ☐ No, and no plans to introduce
- ☐ Not sure

12. Are leadership training or mentorship programs available in your workplace?

- ☐ Yes, both training and mentorship
- ☐ Only training programs
- ☐ Only mentorship programs
- ☐ No programs available
- ☐ Not sure

13. Do you have regular performance reviews linked to promotion opportunities?

- ☐ Yes, annually
- ☐ Yes, every few years
- ☐ Occasionally, but not regularly
- ☐ No formal reviews
- ☐ Not sure

14. Do you believe your organization supports Saudization and local leadership development?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

15. What improvements would you suggest in your organization's talent development practices?

- ☐ More training programs
- ☐ Clearer promotion paths
- ☐ Better mentorship opportunities
- ☐ More leadership roles for locals
- ☐ Other: _____

Section 4: Professional Networks and Exposure

16. Are you currently a member of any professional engineering associations or networks?

- ☐ Yes, local association(s)
- ☐ Yes, international association(s)
- ☐ No, but planning to join
- ☐ No, not interested
- ☐ Not sure

17. How often do you participate in cross-functional projects or committees?

- ☐ Very frequently
- ☐ Sometimes
- ☐ Rarely
- ☐ Never
- ☐ Not sure

18. Do you have opportunities to interact with senior management?

- ☐ Frequently
- ☐ Occasionally
- ☐ Rarely
- ☐ Never
- ☐ Not sure

19. How important do you think networking is for career advancement?

- ☐ Extremely important
- ☐ Important
- ☐ Neutral
- ☐ Slightly important
- ☐ Not important at all

20. What networking platforms or events have helped you most in your career?

- ☐ Conferences and workshops
- ☐ Professional association events
- ☐ Internal company events
- ☐ Online platforms (e.g., LinkedIn)
- ☐ Other: _____

Section 5: Education and Labor Market Alignment (with Checklist Boxes)

21. Do you believe Saudi engineering curricula align well with current industry needs?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

22. Did you complete any internships or cooperative programs during your studies?

- ☐ Yes, multiple internships/programs
- ☐ Yes, one internship/program
- ☐ No, but wanted to
- ☐ No, no opportunities available
- ☐ Not sure

23. Do you think universities should include leadership training in engineering degrees?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

24. What gaps do you see between university education and real-world job demands?

- ☐ Lack of soft skills training
- ☐ Insufficient practical experience
- ☐ Outdated technical content
- ☐ Weak industry partnerships
- ☐ Other: _____

25. How would you improve collaboration between universities and the private sector?

- ☐ More internships/co-op programs
- ☐ Joint research projects
- ☐ Guest lectures from industry
- ☐ Advisory boards with industry leaders
- ☐ Other: _____

Section 6: Leadership Readiness and Experience

26. Have you led a project or team in your current or previous roles?

- ☐ Yes, multiple times
- ☐ Yes, once or twice
- ☐ No, but I have assisted leaders
- ☐ No, but I would like to
- ☐ No, not interested

27. How confident are you in your leadership abilities?

- ☐ Very confident
- ☐ Confident
- ☐ Neutral
- ☐ Not very confident
- ☐ Not confident at all

28. What challenges have you faced in moving into leadership positions?

- ☐ Lack of opportunities
- ☐ Insufficient training
- ☐ Organizational barriers
- ☐ Lack of mentorship
- ☐ Other: _____

29. Do you feel your organization gives fair opportunities for leadership advancement?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

30. What leadership qualities do you believe are most important in your field?

- ☐ Strategic thinking
- ☐ Communication and influence
- ☐ Technical expertise
- ☐ Problem-solving and adaptability
- ☐ Other: _____

Section 7: Perceptions on Vision 2030 and Workforce Development

31. Do you think Vision 2030 has improved opportunities for Saudi engineers?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

32. What are the biggest barriers preventing Saudis from advancing to leadership roles?

- ☐ Lack of leadership training
- ☐ Limited professional networks
- ☐ Organizational preference for expatriates
- ☐ Insufficient career development programs
- ☐ Other: _____

33. Do you think national policies effectively support local talent development?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

34. What additional supports would help local engineers?

- ☐ Funded leadership training programs
- ☐ Expanded mentorship initiatives
- ☐ More industry-academia partnerships
- ☐ Government incentives for companies
- ☐ Other: _____

35. How optimistic are you about the future of Saudi engineers in leadership positions?

- ☐ Very optimistic
- ☐ Somewhat optimistic
- ☐ Neutral
- ☐ Somewhat pessimistic
- ☐ Very pessimistic

Appendix B: Quantitative and Qualitative Data Outputs

This appendix opens a window into the empirical backbone of the study, providing both numbers and narratives that breathe life into the research findings. By combining descriptive statistics, correlation patterns, and thematic insights, this section bridges the gap between abstract research questions and tangible participant experiences. The data presented here are not merely figures or codes; they represent the collective voices, perceptions, and realities of Saudi mechanical engineers navigating leadership pathways in the private sector. Together, these quantitative measures and qualitative reflections enrich the study's conclusions and invite readers to engage with the deeper currents shaping leadership development in the Saudi context.

1. Descriptive Statistics

The following table summarizes the descriptive statistics of key variables analyzed in the study. The variables include leadership training, institutional support, professional networks, and education–market alignment, reflecting the quantitative components gathered through the survey.

Variable	Mean	Standard Deviation	Minimum	Maximum
Leadership Training	3.85	0.72	2.00	5.00
Institutional Support	3.60	0.81	1.00	5.00
Professional Networks	3.45	0.77	1.00	5.00
Education–Market Alignment	3.25	0.90	1.00	5.00

TABLE APPENDIX B1: DESCRIPTIVE STATISTICS.

Notes on Variables:

- The variables were measured using a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).
- Leadership Training refers to access and participation in management and leadership development programs.

- Institutional Support includes perceived availability of mentorship, career development plans, and promotion systems.
- Professional Networks measure membership and active participation in professional associations or industry events.
- Education–Market Alignment assesses respondents' perceptions of how well their academic background matched workplace demands.

2. Correlation Analysis

Below is the correlation analysis examining the relationships between key variables identified in the study. The analysis focuses on **Job Satisfaction**, **Work Environment**, **Leadership Readiness**, and **Professional Development Opportunities**, all of which are central to understanding the advancement of Saudi mechanical engineers into leadership roles.

Variables	Job Satisfaction	Work Environment	Leadership Readiness	Professional Development Opportunities
Job Satisfaction	1.00	0.52**	0.58**	0.49**
Work Environment	0.52**	1.00	0.60**	0.55**
Leadership Readiness	0.58**	0.60**	1.00	0.62**
Professional Development Opportunities	0.49**	0.55**	0.62**	1.00

TABLE APPENDIX B2: CORRELATION ANALYSIS.

Notes:

- **Correlation coefficient (r)** values range from -1 to +1.
- **Positive correlations (r)** significant at $p < 0.01$.
- Variables were measured using survey items on a 5-point Likert scale.

Variable Descriptions:

- **Job Satisfaction:** Overall satisfaction with current role, responsibilities, and work conditions.

- **Work Environment:** Perceptions of organizational culture, resources, and support.
- **Leadership Readiness:** Self-assessed preparedness to assume managerial or leadership roles.
- **Professional Development Opportunities:** Access to training, mentorship, and career advancement programs.

3. Thematic Analysis of Open-ended Responses

This section presents the thematic analysis of the qualitative data collected from open-ended survey responses. Participants were invited to share their perspectives on barriers to leadership advancement, suggestions for improvement, and reflections on their career development experiences. Through systematic coding, four major themes emerged:

Theme 1: Lack of Leadership Development Opportunities

Many respondents highlighted the absence of structured leadership training programs, indicating that while technical skills were well-supported, pathways to develop managerial and soft skills were minimal.

Sample response:

"We have no clear leadership training everything we learn on the job is by trial and error."

Theme 2: Organizational Culture and Barriers

Participants noted that organizational hierarchies and a preference for expatriate leaders often limited the advancement of Saudi engineers, creating feelings of exclusion and stagnation.

Sample response:

"Even if you perform well technically, it's hard to break into management when the top positions are filled by foreign professionals."

Theme 3: Misalignment Between Education and Industry Needs

Respondents expressed concern that university programs focused too much on theory, without equipping graduates with the soft skills and real-world problem-solving abilities required in leadership roles.

Sample response:

"In university, we never learned how to manage teams or communicate with stakeholders only technical equations."

Theme 4: Need for Stronger Mentorship and Networking

Participants emphasized the value of mentorship and professional networks but reported limited access to either within their organizations or professional communities.

Sample response:

"Without mentors or connections, it's difficult to understand how to navigate the system or access better opportunities."

Summary:

These themes provide rich context to the quantitative findings, underscoring the multifaceted challenges facing Saudi mechanical engineers. They also highlight the areas where policy, educational reform, and organizational practices can make meaningful interventions.