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The Impact of Digital Transformation on Organizational Performance at Aramco

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Abstract

This study examines the impact of digital transformation (DT) on Saudi Aramco's performance, employing a research methodology that combines quantitative and qualitative analysis. Based on the perspectives of Resource-Based View and Dynamic Capabilities, this research examines the role of digital technologies in the research of efficiency, productivity, decision-making, and employee adaptability in the context of oil and gas industry. A survey was conducted among 21 department-based, job-level, and experience-based employees to gather data, supplemented by open-ended responses, which provided further insights into their perceptions and challenges.

Quantitative results demonstrate the broad application of digital tools, including artificial intelligence, IoT, and big data analytics, with staff reporting improvements in workflow, efficiency, accuracy, and output. While employees expressed openness to digital usage, ongoing challenges include training, infrastructure readiness, and clarity of objectives. Qualitative analysis supports these findings, identifying automation, predictive analytics, and IoT as the most effective approaches, but also notes the need for additional training, equipment, and strategic communication to ensure consistency with goals.

The comparative analysis has shown that mid-level managers indicated that there was the most significant alignment between DT initiatives and organizational goals, but staff employees showed a lower level of responses in terms of communication and the visibility of leadership. The alignment of perceptions between employees and the performance measures displayed within the organization has shown that DT has made significant progress in increasing the productivity and efficiency of the enterprise, as well as new, albeit less substantial, effects on cost effectiveness and sustainability. In general, the work demonstrates that DT has provided

Aramco with quantifiable benefits to performance, but indicates that it requires a long-term investment in leadership communication, training, and infrastructure to reach its full potential.

Keywords: digital transformation, organizational performance, Saudi Aramco, efficiency, productivity, leadership, employee adaptability

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Chapter One: Introduction

1.1 Introduction to Digital Transformation in the Oil & Gas Industry

Digital transformation is the integration of cutting-edge digital technologies into an organization's mainstream operations, significantly transforming the operational mode and value provision of organizations. Digital transformation, unlike digitization, which only translates analog processes into digital ones, involves organizational, strategic, and cultural changes aimed at promoting agility, efficiency, and innovation (Vial, 2019). The key technologies in this shift are artificial intelligence (AI), the Internet of Things (IoT), data analytics using big data, blockchain, cloud computing, and immersive technologies such as virtual and augmented reality (VR/AR).

These tools are widely used in the industrial sector and have been proven to enhance performance in various sectors, including telecommunications and finance. Nevertheless, oil and gas are more problematic due to their dependence on large physical infrastructure and legacy systems, and are more difficult to adapt to digital solutions. The increasing sustainability requirements, including regulatory pressures, unstable energy supply, and the emergence of new technologies, have transformed digital transformation into a strategic need, rather than an upgrade. This makeover is essential, especially as the industry strives to streamline operations, optimize processes, reduce operational costs, enhance safety measures, and align with international sustainability goals.

Saudi Aramco, formally known as the Saudi Arabian Oil Company, is the world's largest oil and gas company and has become a leader in driving digital transformation in the energy sector. Aramco has initiated a wide range of action plans to transform various aspects of its

operations; the company launched its holistic digital journey in 2017 (Saudi Aramco, 2023).

These companies are deploying smart plant technologies, utilizing AI-based analytics as a predictive maintenance tool, leveraging blockchain technology to optimize supply chain operations, and employing virtual reality (VR) to train and develop employees.

Moreover, the creation of the Fourth Industrial Revolution (4IR) Center and the high expenditure on the digital twin technologies can be viewed as signifying the company adherence to digital technologies innovation and process optimization (Saudi Aramco, 2024). Aramco has definite plans to transform the Kingdom into a safer, more diversified, and more innovative country. It uses oil revenues and its capacity to support all other spheres. Change at this level is necessary, not just at the organizational level (Saudi Vision 2030, 2023). The company's digital transformation aligns with national objectives, particularly in the areas of technology, human development, and sustainable economic growth.

1.2 Background of Aramco's Digital Transformation Journey

Aramco is undergoing a digital transformation, closely tied to national and global drivers. At the national level, it supports Saudi Vision 2030, which aims for economic diversification, sustainability, and technological dominance (Saudi Vision 2030, 2023). Aramco, like other global energy giants, is under strong pressure to become competitive while also addressing the demands of renewable energy and reducing carbon emissions.

Recent examples of Aramco's initiatives include the Uthmaniyah smart plant improvement, which combines drones, sophisticated sensors, and real-time analytics to enhance operational safety and reliability (McKinsey, 2022). Blockchain technology has been used to implement supply chain management, ensuring transparency and eliminating inefficiencies. Furthermore, VR/AR is integrated into workforce training to help the company save money and

mitigate risks associated with human trials, as people can simulate work processes in a virtual space (ArXiv, 2023). This demonstrates a deliberate effort to integrate technological innovation and sustainable business practices.

1.3 Research Problem

Although Saudi Aramco has invested heavily in digital transformation processes, it is challenging to quantify the overall impact of these practices on the organization's performance. Although being digital is well established as a business concept throughout the corporate world, its implementation in a large pilot organization such as Aramco presents unique challenges and requires a systematic inquiry.

The organization has integrated systems across numerous continents, and thus, digital transformation implementation should be a complex process that requires careful coordination and measurement. The question arises as to what extent these digital initiatives enhanced operational efficiency, productivity, and made the organization stronger and more strategically agile.

The primary challenge in evaluating digital transformation initiatives is the absence of standardized performance measurement within specific sectors, such as oil and gas, which is an obstacle that should no longer be ignored. Many performance assessment measures used in other industries may lack the ability to effectively capture the unique characteristics of operations and performance metrics specific to energy companies. Moreover, digital transformation projects are often undertaken in isolation, with objectives that are not fully integrated into organizational operations, which can lead to a reduction in their effectiveness.

Other threats include cultural resistance to technological change, challenges with integrating new systems, threats of disaster resulting from cyber insecurity, and skills

deficiencies that can hinder the successful use of digital technologies. All these aspects impact the degree to which digital transformation projects realize their goals and achieve organizational performance.

The key question of this study is as follows: to what extent does digital transformation impact organizational performance in Saudi Aramco, and what processes contribute to or hinder the efficacy of these programs? The study particularly focuses on the operational and strategic outcomes to determine whether the organization's digital transformation efforts are yielding the intended results, including cost minimization, improved decision-making processes, a high level of safety, and progress towards sustainability.

Additionally, the study examines the level of response and implementation of digital transformation initiatives across various departments and organizational units within Aramco. This involves determining which of the various departments, including drilling operations, supply chain management, or refining processes, has made the most progress in digital adoption, and how leadership ideally implements or adheres to these change processes and procedures.

These consequences should be considered in Aramco's future strategic planning and can serve as an important source of information for other organizations seeking to replicate this success. The dissertation is designed to provide an exhaustive framework relating digital investment to performance outcomes, as well as evidence-based tips to be included in future strategy planning.

1.4 Research Objectives

The primary objective in this field of research is to explore in detail, the impacts of digital revolution on organizational performance in Saudi Aramco. To achieve this overall purpose, the study adheres to six particular objectives that present deep-seated information on the

capability of digital initiatives to enhance operational efficiency, inculcate innovation, and expand strategic planning capabilities.

Objective 1: To identify and assess the key digital transformation initiatives conducted at Saudi Aramco.

This goal entails undertaking a thorough analytical examination of all digital initiatives, technologies and measures that have been used by Aramco. These are AI-based analytics, Intelligent plants, the supply chain technologies, Internet of Things integration, application of blockchain and plans to develop digital workforce.

Objective 2: Evaluate the impact of digital tools on organizational performance.

This will include the evaluation of the impact of digital transformation on performance metrics such as operational efficiency, innovation output, decision-making output, safety plans, and cost reduction.

Objective 3: Analyze change management strategies and their effectiveness in supporting digital transformation.

Successful change management is a mandatory success factor of digital transformation ventures. The aim of the dissertation is to review the ways Aramco has equipped its employees with the necessary technological changes, the role of leaders in the transformation process, the level of employee engagement, the training and development process, and internal communication.

Objective 4: Assess the alignment between Aramco's digital transformation and Saudi Arabia's Vision 2030.

Due to the strategic significance of Aramco to Saudi Arabia's national development agendas, this objective examines how Aramco's digital transformation activities contribute to

broader national agendas focused on economic diversification, sustainability, innovation, and technological progress.

Objective 5: Analyze challenges and barriers encountered during the implementation of digital transformation.

This goal involves the formal identification of the following factors that contribute to an organizational change initiative: cultural, technical, and resource-based factors, which influence the success or failure of the change undertaking. These are the issues that the future implementation strategies can learn from.

Objective 6: Provide recommendations.

Based on the findings, the research will provide recommendations regarding the digital transformation in Aramco or any other company.

With all of these objectives the study will guide into identifying effective plans, assisting areas of improvement, and contributing valuable knowledge to both academic and industrial level.

1.5 Research Questions

This research follows a set of carefully created questions designed to provide a deep understanding of how digital transformation has impacted organizational performance at Aramco. These questions will go over different areas including technological innovations, internal processes, strategic alignment and organizational structure.

1. What are the main digital transformation initiatives undertaken by Aramco?

This question will examine the spectrum of digital tools and programs presented to improve operations, sustainability, and efficiency, serving as a baseline for further analysis.

2. How did digital transformation influence organizational performance at Aramco?

The study aims to see the benefit of digital transformation and different performance metrics, such as cost reduction, operational reliability, employee productivity, decision-making effectiveness, and environmental sustainability.

3. What challenges and difficulties has Aramco faced during digital transformation?

This question identifies elements such as cybersecurity threats or infrastructure limitations that hinder organization, culture, and technology, making it challenging to transition to a digital environment.

4. How effective are the change management strategies at Aramco in supporting this digital transformation?

The question examines the role that leadership and employee training play in motivating employees to adopt transformation initiatives.

5. How do Aramco's digital initiatives aligned with Saudi vision 2030?

This question situates the transformation of Aramco within the broader national context by evaluating its contributions in terms of sustainability, innovation, and economic objectives.

6. What roles do leaderships and decision makers play in the success or failure of the digital transformation initiatives?

This question is more human and strategically centered on digital transformation, with emphasis on the impact of top management on the success or failure of efforts.

1.6 Research Hypotheses

This study is informed by the following seven hypotheses, which will examine the correlation between digital transformation and organizational performance at Aramco.

H1: There is a positive relationship between digital transformation and organizational performance at Aramco, with organizational performance that is reflected in improving productivity, profitability, and environmental sustainability.

H2: Digital transformation at Aramco brings significant and quantifiable efficiency to the operation in the form of more automation, minimized unplanned downtimes, and maximum process optimization.

H3: Digital transformation has positively improved employee productivity and innovation. Employees who utilize digital tools, such as VR training and AI platforms, report higher performance, creativity, and problem-solving capabilities.

H4: Effective change management practices have enhanced the success of digital transformation initiatives by fostering clear and transparent communication, providing leadership support, and promoting ongoing employee development.

H5: Organizational culture and leadership play significant roles in digital transformation success. A supportive culture and committed leadership enhance technology adoption and performance outcomes.

H6: Initiatives of digital transformation aligned with Saudi Arabia's Vision 2030 will have a higher chance of success. Aramco's compliance with national priorities enhances its access to resources and capabilities.

H7: The difference in digital transformation adoption between departments results in performance differences. Departments that are well adopted attain greater performance gains as compared to those with minimal implementation.

1.7 Research Significance

The research incentive has an impact on both academic and practical levels, as it provides significant value in the theoretical background, while also offering operational insights for decision-making at the organizational level. The significance of the study is reflected in several vital contributions to knowledge and practice.

1.7.1 Scientific Importance

Academically, this study fills a gap in the digital transformation literature, as it focuses specifically on the oil and gas industry, which has not received considerable attention in the existing literature. The majority of modern studies focus on digital native sectors, including telecommunications, finance, retail, and medical fields, depicting an increasing digital agility by default. The oil and gas industry is a sector with challenging infrastructure, regulatory requirements, and conventional operational procedures; hence, a special investigation is needed to explore the opportunities and challenges implicit in adopting digital transformation in the industry.

This study contributes to the existing body of theoretical perspectives, including the Resource-Based View (RBV), the Technology-Organization-Environment (TOE) paradigm, and Dynamic Capabilities Theory. By applying these theories to a case study of a large energy company, this study demonstrates that they have practical value and provide empirical solutions to their explanatory forces in the context of digital transformation.

Moreover, the methodology adopted in this research, which combines quantitative survey data with qualitative interview results, offers a solid analysis that can be replicated and applied to investigate similar works in other companies and industry sectors.

1.7.2 Practical Importance

The applied value of this study is multifaceted, as it can provide valuable information to various stakeholders. In the case of Saudi Aramco, the analysis provides a comprehensive evaluation of the digital transformation initiatives and their impact on key performance indicators. The research provides organizational leadership with evidence-based findings on what has worked and what needs to be strengthened, enabling strategic decisions on future technology investments to be made with greater confidence.

For policymakers and those involved in a multinational development plan, the research provides empirical evidence that digital transformation in corporations can help achieve national goals. Considering that Saudi Arabia emphasizes the need to innovate, develop, and digitalize in line with its Vision 2030, the explanations of how large businesses, such as Aramco, can contribute to such a strategy would be an informative input into the policy development and resource allocation process.

The study's findings, particularly in terms of implementation, success factors, and performance measures, can be useful to business executives and digital strategy professionals working in various industries. The applicability of a comprehensive analysis of change management strategies, cultural transformation strategies, and technology adoption approaches offers practical information to organizations venturing on the path of change.

1.7.3 National and Regional Significance

On a national level, the study supports the goals of Vision 2030 in Saudi Arabia, as it empirically indicates the success and challenges of digital transformation at one of the kingdom's most strategically vital organizations. Since Saudi Aramco is a pillar of the Saudi economy, insights into how the company manages digital transformation effectively may serve as a

prospective roadmap for various entities, including departments and corporations, that operate in both the public and private sectors.

The results obtained in the study contribute to the overall vision of how digital technologies can be successfully utilized by traditional industries, benefiting them and offering insights not only about the national, freshly developed innovation policy, but also about economic development policy.

1.8 Research Methodology Overview

The research design employed in this study is a mixed-methods approach, aiming to capture both quantitative and qualitative aspects of digital transformation. The quantitative aspect involved administering a structured survey to Aramco employees across technical, operational, and administrative departments. The perceptions of technology adoption, the sufficiency of training, operational efficiency, and leadership support were measured by the survey. There were 21 valid responses in total, comprising 15 responses from male workers and 6 responses from female workers, who were at different job levels and had varying years of experience.

The qualitative element involved semi-structured consulting with heads of departments, project managers, and specialists in the field of digital transformation. These interviews provided further insight into cultural resistance, leadership tactics, and technical impediments, which are not easily quantifiable.

Moreover, Aramco publications, sustainability, and digital transformation dashboards were reviewed and analyzed to verify and complement the findings. Such triangulation consolidates reliability through the comparisons of survey data, interview texts, and official records.

1.9 Research Limitations

Even though the research is likely to provide a collection of comprehensive statistics regarding the impact of the digital transformation at Aramco, the range of limitations may affect the scope of the study and the relevance of the findings in various contexts:

Restricted Access to Internal Data: One of the biggest corporations in the world, Aramco, has stringent privacy policies. To access such files, we could need a particular exemption. This could make it more difficult to conduct a thorough assessment of the performance of the company.

Response Bias: Intentional or inadvertent factors may cause survey respondents and interviewees to give false information. Allegiance to the company or a fear of being misrepresented may be the driving forces behind the positive comments regarding the digital transformation. This might also introduce bias into our research.

Time Restrictions: Since digital transformation is a process that is ongoing, research suggests that limited time impacting results may not be a fully accurate measure of change, with a situational analytic perspective only.

Company-Specific Context: The unique scale and complexity of Aramco may limit the generalizability of the results to smaller organizations.

Technological Evolution: Ongoing rapid technological change can render some transformation initiatives obsolete within the study period, thereby affecting the study's applicability and relevance.

Cultural Factors: Cultures within organizations and in the country can also shape the results of transformation in completely different ways, depending on the context and the organization.

1.10 Thesis Structure

This thesis is divided into six chapters, which build upon each other to solve the research problem holistically. Chapter One provides an introduction to the study, covering the background, problem, objectives, research questions, hypotheses, significance, and limitations. Chapter Two presents the literature review, which encompasses concise notions of digital transformation, its applications in the oil and gas industry, facilitating technologies, theoretical frameworks, and prior research. The third chapter outlines the research methodology, which includes a description of the design, sampling, data collection, and analysis. Chapter Four outlines the results of the survey, interviews, and the analysis of documents, and is aided by tables and figures. Chapter Five provides the findings as to the availability of the literature and theoretical models and the contribution they have to the other literature, as well as the implications for future research. Lastly, Chapter Six concludes the research by summarizing the key findings, contributions, and providing recommendations for future research and to Aramco.

Chapter Two: Literature Review

2.1 Concept of Digital Transformation

Digital transformation (DT) is widely discussed as one of the integral features of the modern organizational strategy. It entails the production of new high-tech to completely rebrand business models, processes, and the provision of value (Vial, 2019). Scholars claim that DT is not a single instance; it is an ongoing change process exerted by the technological breakthrough and the environmental demands (Westernman et al., 2014). The change not only involves automation but also encompasses new cultural mindsets, leadership styles, and organizational structures. The key idea of digital transformation implies that any organization should reconsider its approach to resource distribution and capability development (Al-Kahtani & Sofian, 2022). For example, AI-driven decision-making alters managerial practices, while IoT-based monitoring redefines maintenance and production processes. In this way, DT can be discussed as the technological and organizational phenomenon that connects the IT adoption to strategic rejuvenation.

2.2 Digital Transformation in the Oil and Gas Sector

Though other sectors like banking, telecommunications, and retail have gone heavy on digital transformation, the oil and gas industry has been slow in adopting it because of its dependence on large infrastructures, the conservative nature of the industry, and the risks involved in the disruption of operations in the sector (Rimini Street, 2023). Traditionally, physical capital and engineering capacity have been the primary priorities for firms in this industry, and digital technologies have become the Third Line of Defense. Nevertheless, the ever-increasing market volatility, the uncertainty of oil prices, and the pressure from regulatory

authorities to lower environmental impact have prompted energy firms to accelerate their digitalization efforts.

New industry studies reveal that the value in oil and gas operations can be unlocked for substantial gains through digital technologies. According to McKinsey (2022), the potential of DT to generate close to one trillion dollars in added value to the entire global industry is evident in terms of minimizing equipment downtime, optimizing equipment maintenance, and increasing the likelihood of enhancing energy efficiency within the industry. The predictive analytics of the information obtained during the drilling process will help companies predict equipment failures before they occur and prevent costly man-down situations. Likewise, under IoT-linked monitoring systems, operators will be capable of remotely tracking assets and identifying potential risks in real-time, thereby constructing safer and more stable operations.

Saudi Aramco has led in this change. Since 2017, there has been a comprehensive set of digital initiatives carried out by the company, as well as a number of projects being developed that include its Uthmaniyah smart plant, which optimizes the application of thousands of sensors to supply real-time information on its operation and feed it into more sophisticated systems of analysis (Saudi Aramco, 2023). Because the systems promote safety, reliability, and efficiency, real maintenance can be predicted, and the distribution of resources can be improved. Aramco is also incorporating blockchain in an effort to increase supply chain transparency, streamline operations, and reduce administrative waste. Moreover, the company has adopted immersive technologies, including virtual and augmented reality, to train its workforce. One can simulate crucial experiences in safe simulation environments and learn how to apply the lessons learned to high-risk physical conditions using this method (ArXiv, 2023). The given examples illustrate that the digitalization of the oil and gas business is no longer just a peripheral phenomenon but has

become a significant strategic force. Digitalization at Aramco does not just present itself as an operational mandate, but also as an avenue through which the company can meet its long-term requirements in the global energy markets, as part of Saudi Arabia's efforts to achieve its long-term vision 2030.

2.3 Digital Transformation Technologies

The scope of the technologies that the oil and gas industry is digitalizing is far-reaching and constantly growing. The most immediate effect was on artificial intelligence (AI), which enables organizations to apply advanced analytics, natural language processing, and machine learning to large datasets. In the oil and gas industry, AI is commonly deployed in reservoir modeling, drilling optimization, and predictive maintenance. This enables AI to lead to cost savings, as well as improvements in safety and operational reliability, by eliminating unplanned equipment breakdowns. In one report, McKinsey (2022) indicated that AI-driven predictive models have minimized equipment breakdowns (up to 40 percent) and have increased asset availability (by an average of 20 percent). In Aramco, AI-controlling systems have started being embedded in the drilling process and refinery systems, where it collect ongoing data to maximize their resource allocation and minimize their risk.

Another cornerstone technology is the Internet of Things (IoT). IoT entails the implementation of sensors in a physical asset that enables it to send data in real-time. IoT is applied to remotely monitor the assets, predictive maintenance, and hospitality in oilfields (Whatfix, 2023). As an example, valves and pipelines connected to IoT enable operators to identify the presence of leaks or irregularities as soon as possible, diminishing risks and threats to the environment. The smart plant projects at Aramco heavily rely on the use of IoT technology to ensure a high level of visibility into the complexity of operations.

Intimately related is big data analytics, which is the capability to handle and analyze large amounts of structured and unstructured information. Oil and gas companies produce massive amounts of data through seismic surveys, drilling logs, and production records. Much of this information would be wasted without analytics. Big data is utilized by companies such as BP and Shell to predict demand, optimize production processes, and improve energy efficiency (Whatfix, 2023). At Aramco, analytics is utilized to enhance operational and strategic decisions and performance by identifying bottlenecks in the supply chain, optimizing supply chain operations, and evaluating sustainability efforts.

Blockchain has emerged as a disruptive technology for providing security and transparency in business transactions. One of the oil and gas industry applications where blockchain is particularly applicable is in supply chain management, enabling reliable transactions among various providers, minimizing fraud, and facilitating easier compliance with regulations. Blockchain experiments conducted by Aramco in procurement have demonstrated a reduction in administrative paperwork and errors (ClearMVP, 2023).

Workforce training is also being redefined by the use of immersive technologies, such as virtual and augmented reality. Conventional oil and gas training is typically costly and risky due to the inherent dangers associated with field operations. Implementing VR systems provides employees with virtual worlds that enable them to practice procedures without risking accidents. This reduces training costs while also enhancing preparedness and the confidence of workers (ArXiv, 2023).

An alternative frontier is digital twins. A digital twin is an online model of a real-life system, maintained with operational information in real-time. This will enable engineers to experiment and optimize performance, anticipating the need to maintain without interfering with

actual operations. Digital twins in the operations of the Aramco refinery exemplify how technology designed to monitor the efficiency and safety of operations can offer flexibility in responding to evolving demand.

Lastly, most of these technologies are aided by cloud computing, a system that delivers scalable data storage, data integration, and collaboration. Cloud applications provide access to vast amounts of centralized data and analytics, as seen in the case of multinational corporations like Aramco, resulting in a reduction of on-premises IT utilization. The cloud also enables a quicker response to international presence and facilitates cross-border collaboration, allowing Aramco to remain efficient and responsive, despite its immense size (Alharti et al., 2022; Al-Fadli, 23).

2.4 Theoretical Frameworks

Three main perspectives serve as the theoretical background of the present study, including the Resource-Based View (RBV), Technology-Organization-Environment (TOE) framework, and the Dynamic Capabilities theory. Both theories offer various considerations for the impacts of digitization on an organization.

The Resource-Based View (RBV) emphasizes that companies need resources that are both valuable and non-substitutable, rare, and inimitable to create a sustainable competitive advantage (Barney, 1991 as cited in Hoang, 2024). The strategic resources of Aramco can be seen in the company's utilization of digital technologies, including AI platforms, custom-created data analytics, and the level of digital skills among its employees. Through such massive spending on these areas, Aramco enhances its ability to innovate, reduce costs, and remain competitive in the long run. RBV emphasizes that digital transformation is not a simple

operational upgrade, but rather a strategic initiative involving the investment in unique organizational assets.

Tornatzky and Fleischer's (1990) Technology-Organization-Environment (TOE) model has developed a holistic approach to understanding technology adoption. It views three contexts: technological, organizational, and environmental (Mailani et al., 2024). The technological context refers to the compatibility, complexity, and relative advantages of digital technologies. The organizational context highlights leadership support, organizational culture, and available resources. Some of the environmental factors affecting the company include regulatory forces, competition, and external forces such as Saudi Vision 2030. In the case of Aramco, this structure illustrates the interaction between internal preparedness and external forces in determining the success of digital adoption.

The concept of Dynamic Capabilities theory, as defined by Teece (2007), refers to how firms sense opportunities, seize them, and reconfigure resources in response to change. With the concept of sustainability concerns and energy transition that the world is experiencing, the delivery of the 4IR Center by Aramco and its investments in renewable energy can be regarded as the dynamic capability of the company. Through the creation of these adaptive capabilities, Aramco will be able to withstand technological shocks and environmental stress, thereby enduring.

2.5 Previous Studies

The literature on digital transformation highlights both successes and challenges across industries. In other industries (banking), DT enabled better customer experience and simplification of processes, whereas in the medical field, it allowed the creation of more efficient hospital operations and the development of personalized medicine. In retail, DT has contributed

to supply chain improvements and enhanced customer relations through e-commerce platforms (Verhoff et al., 2021). These examples suggest that digital transformation is widely adopted across various industries, yet the results typically vary depending on the industry's level of preparedness and resource availability.

The body of research is less in the case of the oil and gas industry. According to McKinsey (2022), predictive analytics reduces the occurrence of equipment failure by 40 percent in companies that utilize the technology and increases asset uptime by 20 percent. Plaque inspection by Shell using the drones has also enhanced the safety and efficiency of the inspection programs by cutting the cost of inspections by half. Likewise, virtual and augmented reality have been conceptualized as increasing preparedness and reducing risk exposure when used for employee training (ArXiv, 2023). The implementation of these devices by Aramco demonstrates how the oil giant is adapting to global trends, but due to the magnitude and visual intricacy of the field, distinct challenges remain.

Rimini Street (2023) states that big data analytics has evolved the work of the oil and gas industry, leading to 25 percent operational efficiency, 20 percent savings in drilling design planning, a 15 percent decrease in drilling costs, 6 to 8 percent increases in production rates, and 30 percent decreases in unplanned downtime. These indicators demonstrate the practical value that can be achieved through the implementation of significant digital change.

Although these examples are positive, cultural resistance, cybersecurity vulnerabilities, and the lack of digital skills are identified as obstacles in many studies. Another insight from the literature is that, despite organizations' deployment of innovative technologies, they often do not give sufficient significance to change management and leadership in achieving successful implementation. This highlights the need for research that integrates technological aspects with

organizational and cultural perspectives, particularly in complex industries such as the oil and gas sector.

2.6 Literature Gaps

Existing scholarship reveals several gaps. Most research studies conducted have focused on the banking, telecommunications, and retail industries, which have not been extensively researched in the oil and gas industry. Even in areas where the study of oil and gas companies is conducted, the emphasis is placed on isolated technology rather than overall change. The special needs of organizations of such size and complexity at Aramco are scarcely addressed in existing research; therefore, it is challenging to apply the results of smaller or less advanced companies.

Another gap concerns measurement. Though individual pieces of evidence related to the utilization of technologies such as AI and internet of things resulted in some forms of evidence of positive impacts there is the implication on how efficient any given technology is; very little have been discovered in terms of empirical experience of how the impact effect of any one given initiative brings overall organizational performance outcomes of productivity, innovation, and nimbleness of a strategic method. Likewise, the cultural and leadership variables have largely gone unnoticed, and they hold a decisive factor in the adoption of technology in previously conservative sectors. Similarly, the cultural and leadership variables have been largely overlooked, yet they possess a decisive element in the adoption of technology in formerly conservative areas. Lastly, there is a lack of understanding on how to match current government strategies with company digital activity. Another interesting relationship in the case of Aramco, a company hardly spoken of in the literature, is this alignment with Saudi Vision 2030.

The research study tries to fill these gaps by providing a new paradigm of relating the organizational outcomes to a digital transformation in an oil and gas company.

Chapter Three: Methodology

3.1 Research Design

To investigate the juxtaposition of digital change at Aramco, a summative research mixed-methodology, which is a mixture of the quantitative and qualitative research approach will be employed. The digital transformation concept is not merely a technological phenomenon that could be quantified via surveys; it is also a process on the organizational and corporate one that should be further investigated by applying the concept of qualitative approach, which is why the mixed-methodology approach should be mentioned. Quantitative data avails practical and objective data once their leaders are supportive, prolific and effective. Conversely, the significance of this information can be made by qualitative data given the possibility that they accumulate the experiences, knowledge, and priorities of the situations. Such a methodological triangulation will make the results more valid and reliable because the research will guarantee that the data offers breadth and depth in terms of analyzing the connection between digital transformation and organization performance.

It is an exploratory design because digital transformation in the oil and gas industry has not been extensively researched compared to the financial and telecommunications industries. This type of design will enable the flexibility of the study in determining new patterns, discovering new topics, and attributing them to pre-existing theoretical models, such as the Resource-Based View (RBV), Technology-Organization-Environment (TOE) framework, and Dynamic Capabilities theory.

3.2 Population and Sampling

The research sample will be composed of Saudi Aramco employees that are either willing to take part in digital transformation initiatives or are already a victim of it. These are technical

services employees, operations units employees, business units employees and employees at different job levels, such as non-manager staff and the senior managers. Since Aramco is a big firm where the employees are distributed in a number of countries, surveying the whole population was unrealistic. Instead, it was dismissed according to the departmental requirements in which the work on digital projects had to be done depending on a utilitarian sampling method.

Twenty one workers, 15 men, and 6 women with a mix of age and job experience took part in this study. The sample offers a fair representation of employee sentiments, despite being a small number in relation to the total Aramco workforce. Notably, this enables us to see the differences in diversity by hierarchy and position, allowing us to use a variety of roles to assess how digital transformation is perceived at different organizational levels. Voices from management and non-management will overlap; the results will show the consequences of local transformation as well as the general management effects.

3.3 Data Collection Methods

The research study will use a variety of tools in both quantitative and qualitative designs to ensure high-quality and comprehensive data collection. The selection of such tools (surveys, interviews, and reviews of the documentation) is determined by their reliability and relevance to the research. It will also be selected based on how effectively it has fulfilled the study objectives.

The questionnaire survey was intended to be the primary quantitative instrument. It was circulated electronically to the Aramco staff and contained closed-ended and open-ended questions. Five-point Likert scale closed-ended questions were used to assess perceptions regarding technology adoption, workflow simplification, adequacy of training, efficiency improvement, innovation, decision-making, support for leadership tasks, and openness to adopting digital tools. Open-ended questions welcomed employees to share their thoughts on

maturity, assuring them that digital initiatives, which had been exhausting, would be addressed, as well as their proposals for improvement through enhanced digital remuneration. This duality provided the opportunity to conduct statistical analysis and gather more in-depth qualitative information using the same tool.

In addition to surveys, semi-structured interviews were conducted with department heads, project managers, and digital transformation experts. The interviews provided further insight into strategic decision-making, cultural resistance, and the leader's role in transformational management. Interviews were also structured by theme, which followed the study's objectives but allowed respondents to delve into the details of their experiences and views.

Lastly, the publicly available Aramco reports, sustainability publications, and digital transformation dashboards were reviewed through a documentation review. The latter secondary data served to support the results of the surveys and interviews, as well as to highlight specific objective indicators of Aramco's achievement in terms of sustainability, innovation, and operational performance.

3.4 Data Analysis

The survey data analysis used both descriptive and inferential techniques. Answers obtained on the Likert scale were summed, and the central tendency measures (mean, median, mode) were calculated to summarize views on digital transformation. Correlation analysis was conducted to examine the relationships between variables of training adequacy, leadership support, and perceived performance improvements. To test the hypotheses on how the effects of digital adoption on productivity and efficiency depend, regression models were employed. Graphical formations (bar charts and histograms) were drawn to make the outcomes easy to grasp and succinct.

Thematic analysis was employed in the qualitative data analysis, including interviews and responses to open-ended questions in the survey. This was achieved through transcription, coding of recurrent themes in the responses, and combining them into themes, including resistance to change, training and skill development, leadership support, and infrastructure challenges. These themes were subsequently checked against theoretical expectations to identify conformities and anomalies. Quantitative and qualitative findings were integrated to provide triangulation, thereby strengthening the interpretations.

3.5 Validity and Reliability

To maximize validity, the survey tool was well-developed and follows the established constructs of earlier studies in the area of digital transformation and organizational performance. It was tested on a small sample of respondents during a pilot study to refine the questionnaire, and was later revised to improve readability. The cross-validation of resources describes the fact that triangulation across surveys, newspapers, and documents provided a greater degree of validity because several sources of knowledge were cross-linked.

The issue of reliability was considered through data collection consistency. The survey participants were all given a questionnaire in an electronic form, and all interviews were conducted using a semi-structured guide to ensure consistency across the board. To assess internal consistency, the responses on the Likert scale were evaluated using statistical reliability tests. The combination of methodological rigor and cross-verification reduces the risk of bias and enhances confidence in the study's conclusions.

3.6 Ethical Considerations

This study revolved around ethical integrity. These individuals were informed about the study's aim and assured that their answers would be kept confidential. The respondents had the

right to participate in surveys and interviews, and could withdraw at any stage. The anonymity of the data was maintained to prevent anyone from being identified, especially given the sensitivity of the discussion on organizational issues. Furthermore, care was taken to ensure that results would be presented in a manner that does not jeopardize either individual participants or Aramco on the organizational level. These ethical practices ensured the study adhered to the standards of Ethics in research and protected the participants.

3.7 Methodological Limitations

Despite the serious method used in the study, several limitations should be acknowledged. To begin with, the quantitative data collection from 21 survey respondents is not representative of the entire organization and may therefore limit the extrapolative validity of the results. Second, the use of self-reported data introduces an element of bias, as staff members may have provided overly positive answers due to subservience or the absence of organizational consequences. Third, some performance indicators could not be measured directly because they were not accessible through the company's internal data. Lastly, the study is cross-sectional, and hence, it captures perceptions at a particular point in time, which is not the objective of digital transformation, as it is also a dynamic process. Despite these constraints, the combination of various data sources enhances the validity of the results and presents a compelling case study of the Aramco transformation process.

Chapter Four: Results

The chapter shows the results of the mixed-methods study of the influence of digital transformation (DT) on the performance of Saudi Aramco as an organization. The findings are presented in four sections: the demographic environment of the survey, survey scores (quantitative analysis), qualitative information, and the integration of findings with measures used to monitor executive performance.

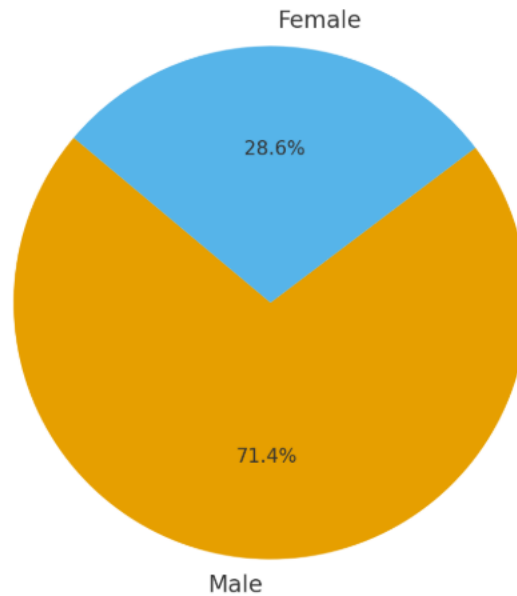
4.1 Demographic Profile of Respondents

The response rate received was 21 employees of Saudi Aramco. The sampled participants represented various genders, ages, experience years, job levels, and departments, as can be seen in Table 4-1. This diversity also represents a reflective account of what the employees think about their digital transformation initiatives, which is critical in that the results would reflect the managerial as well as the non-managerial perspectives.

Table 4-1: Demographic Profile of Respondents

Variable	Categories	Frequency	Percentage
Gender	Male	15	71.4%
	Female	6	28.6%
Age	20–30	2	14.29%
	31–40	16	71.43%
	41–50	1	4.76%
	51+	2	9.52%
Years of Experience	0–5	5	23.81%
	6–10	10	47.62%
	11–20	4	19.05%
	21+	2	9.52%
Job Level	Non-Managerial	7	33.33%
	Mid-Level Manager	11	52.38%
	Senior Manager	3	14.29%
Department	Business	11	52.38%
	Operations	6	28.6%
	Technical Services	4	19.05%

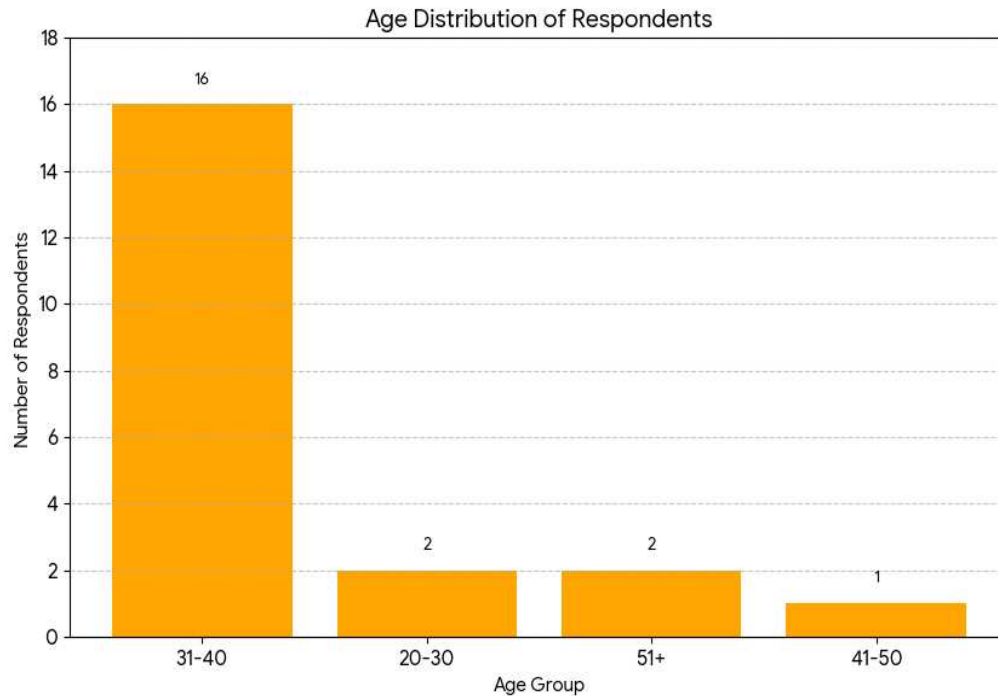
Figure 4-1: Gender Distribution of Respondents



The gender analysis (Figure 4-1) illustrates that men formed the larger percentage of the respondents (71.4%), whereas women formed 28.6% of the sample. This representation is a gender distortion that people experience in the oil and gas sector, where technically and operationally, men prevail, yet the proportion of operating women in managerial and business positions is gradually increasing.

In terms of the age components, the highest percentage of respondents was 31-40 (71.43%), 20-30 (14.29%), and 51+ (9.52%). A smaller group (4.76%) was 41-50 years old. The age distribution, which has been plotted in Figure 4- 2, indicates that digital transformation programs are being executed in a population having mostly mid-career professionals who are largely malleable to adopt fresh technologies without considering the experience of working years in the industry.

Figure 4-2: Age Distribution of Respondents



The years of professional experience also oscillated, with many respondents mentioning 6-10 years of service at Aramco, and others noting much longer terms of service of more than 20 years. The histogram of experience (Figure 4-3) shows that most of the experience days (6-10 years) constituted the highest background, and long-term employees (21+ years) constituted a small but significant population. The findings are instrumental in explaining how generations and differences in occupational levels can be the determinants of uptake of digital tools.

Figure 4-3: Distribution of Respondents by Years of Professional Experience

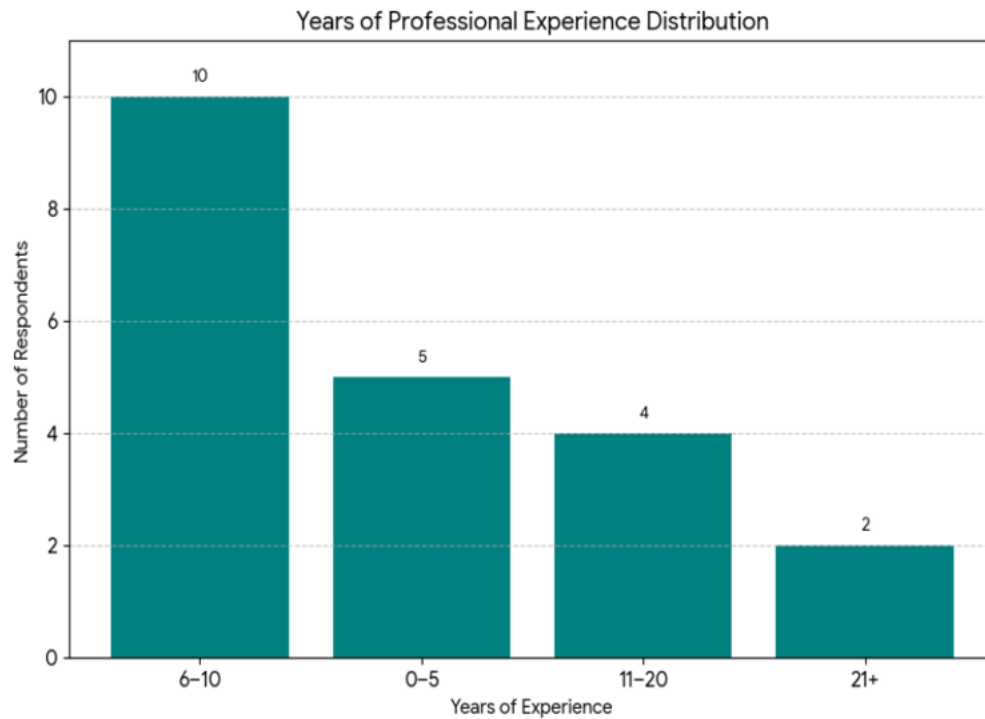
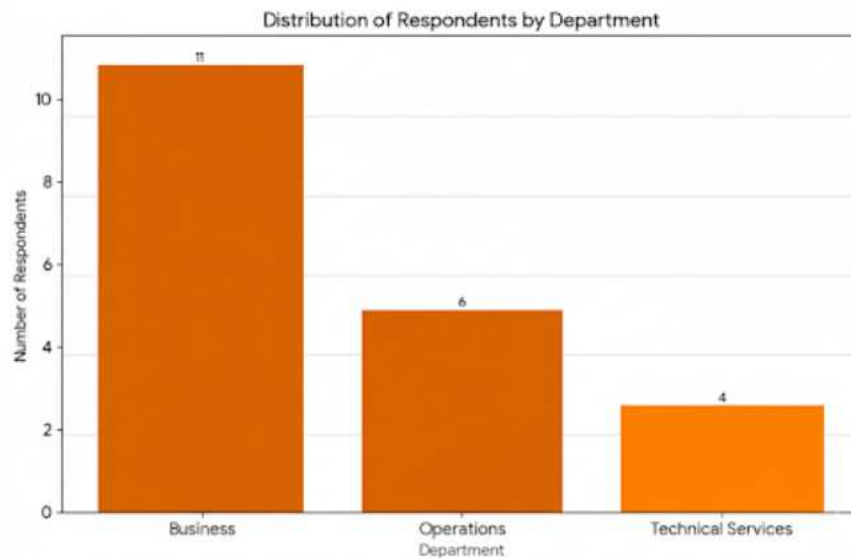


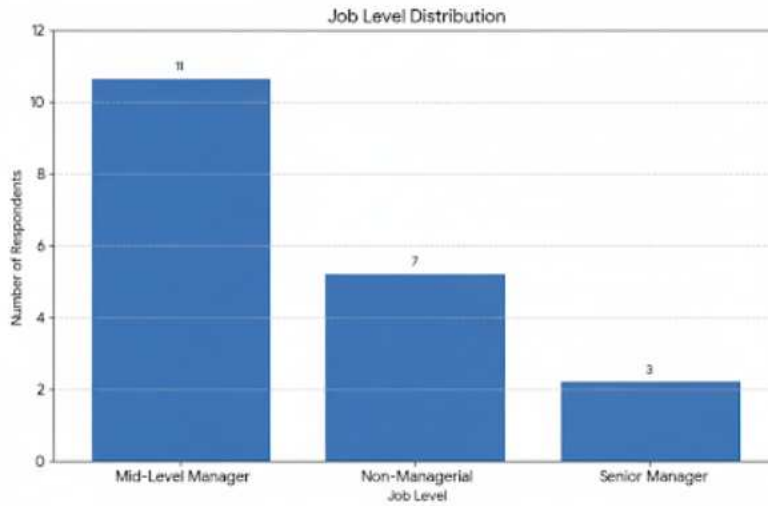
Figure 4-4 indicates that it was found to have departmental affiliations with Business (52.38%), Operations (28.58%), and Technical Services (19.04%). Such a segmentation of the department may be an excellent indicator of how personnel from the administrative side and those from the technical side experience the impact of digitalization.

Figure 4-4: Distribution of Respondents by Department



At last, the job levels were distributed among non-managerial employees (33.33%), mid-level managers (52.38%), and senior managers (14.29%), as shown in Figure 4-5. Through this distribution, the majority of the respondents were middle managers who may serve as interveners between the top leadership and the frontline employees. Their views are particularly helpful in that they have both operating barriers to day-to-day digital adoption as well as alignment of the strategies with organizational goals.

Figure 4-5: Job-level Distribution



4.2 Survey Results (Quantitative Analysis)

Quantitative outcomes were interpreted with the help of Likert-scale questions based on descriptive statistics. The highest level of digital technology adoption was taken into consideration, along with the effects on the functionality of the industry on operational efficiency/productivity, leadership, and communication concerning the adoption of digital technologies, and the willingness of employees to embrace digital technologies.

4.2.1 Adoption of Digital Technologies

Respondents were asked about the presence and use of digital technologies capable of supporting the daily operational processes in their departments: artificial intelligence (AI), Internet of Things (IoT), and big data analytics.

Table 4-2: Adoption of Digital Technologies

Response Value	Frequency	Percentage
1 (Strongly Disagree)	1	4.8%
2 (Disagree)	2	9.5%
3 (Neutral)	3	14.3%
4 (Agree)	9	42.9%
5 (Strongly Agree)	6	28.6%

The mean score for the statement indicating that my department utilizes digital technologies (AI, IoT, data analytics) in its daily work, was high (4.05). The outcome supports the fact that the use of high-order digital tools is a fact to which the surveyed respondents are subjected. The overall mean score is a great measure of how often these technologies are adopted by the depicted departments.

4.2.2 Impact on Operational Efficiency and Productivity

Participants were asked to evaluate the existence of simplified workflow, improved accuracy, greater efficiency, enhanced productivity, and quality choices as outcomes of DT.

Table 4-3: Perceived Impact of Digital Transformation on Efficiency and Productivity

Statement	Mean
DT has simplified workflows and improved accuracy	4.05
DT has increased operational efficiency	4.24
My team is more productive due to digital innovations	4.14
Decision-making has improved due to digital systems	3.95
DT has fostered innovation in my work	4.24

The results show that the attitude towards DT is always upscale in many aspects. More than four-fifths of the interviewees agree that digital innovations have increased efficiency and productivity. Three out of every four employees mentioned that the workflow has become simpler and accurate, and we may be tempted to believe that not only is speed being accelerated with the use of DT, but also human error is being minimized. They also perceived more that there was a better response in the area of decision-making, data-driven systems imply an influence on the quality of management. Interestingly, the least agreement was made regarding

innovation, implying that although DT is making improvements to processes, its contribution to creativity and innovation seems less clearly obvious to employees.

Most workers rated in the 4-5 range regarding changes in decision-making, confirming that digital technologies have enhanced real-time visibility of data, accuracy of reporting, and transparency in the decision-making process. Nevertheless, smaller groups of workers indicated a rating of 2 or 3 based on continuing training, or access and system integration problems.

4.2.3 Leadership and Communication

The questions of leadership support, employee openness toward the use of digital tools, communication with DT goals, and change adaptability were a part of the survey.

Table 4-4: Leadership and Communication

Statement	Mean
Leadership supports DT efforts	4.29
Employees are open to adopting digital tools	4.19
There is clear communication about DT goals	4.33
My department adapts quickly to digital change	4.19

Since more than three-quarters of the staff were knowledgeable about DT's management fidelity, this level of leadership support was well appreciated. Employees were also open to using digital tools, as seen by the 83.80% who indicated that they were willing to do so. However, only roughly 70% of respondents agreed that objectives were clearly expressed, indicating that communication regarding DT goals was more compromised. This suggests a communication breakdown that could impede more extensive alignment with the organizational agenda. According to 83 percent of respondents, departmental adoption of digital change is proceeding at a moderate rate. This further implies that the transformation will probably be supported by more robust and internally consistent directives from leadership.

4.3 Qualitative Insights

Single-ended questions about key programs, areas of most difficulty for the staff, and suggestions for enhancing their performance were used to gather information about the staff.

4.3.1 Most Impactful Digital Transformation Initiatives

The digitization of procedures was chosen by the staff as the program that had the biggest impact. By reducing paperwork and other repetitive manual processes, they have seen that workflow automation and the usage of digital dashboards have improved productivity. Also mentioned regularly were predictive analytics and AI, which were mainly used to predict equipment maintenance requirements, as well as optimization of operations. Smart tools (such as those adding IoT-enabled sensor tools) were perceived to enhance safety control and the reliability of operational work. A smaller number of respondents placed an emphasis on VR and AR training platforms and the reduction of costs and risks of traditional training.

Table 4-5: DT Initiatives National and Local (the most frequently mentioned, qualitative data)

Initiative	Frequency Mentioned
Process digitalization	7
Predictive analytics & AI	5
Smart tools/IoT integration	4
VR/AR for training	3
Blockchain in supply chains	2

These qualitative results support quantitative data, which revealed that employees who were strongly associated with DT were highly associated with efficiency and productivity.

4.4 Cross-Sectional and Comparative Analysis

This section will give a detailed comparative analysis of the results of the survey at different levels of job in different departments to have a more granular understanding. With the

given small size of the sample, these comparisons can be defined as exploratory only and reflect the possible trends rather than statistically significant differences.

4.4.1 Perceptions by Job Level

Most of the results of perception on the impact of DT were reported to be consistent among levels of different jobs, albeit showing some minor differences. Table 4-6 shows average scores of all survey questions, and this is based on the Non-Managerial reviews, Mid-Level Manager reviews, and Senior Manager reviews.

Table 4-6: Mean Perceptions of Digital Transformation by Job Level

Survey Question	Non-Managerial (N=7)	Mid-Level Manager (N=11)	Senior Manager (N=3)
My department uses digital technologies (AI, IoT, data analytics) in daily operations.	4.00	4.00	4.33
These technologies have simplified workflows and improved data accuracy.	4.29	3.91	4.00
My company provides sufficient training to adopt digital tools.	5.00	4.14	4.09
Digital transformation has increased operational efficiency.	3.86	4.67	4.36
My team is more productive due to digital innovations.	4.00	4.00	5.00
Decision-making has improved due to digital systems.	3.57	4.09	4.33

Digital initiatives have fostered innovation in my work.	3.85	4.09	4.14
Our department adapts quickly to changes enabled by digital tools.	3.71	4.27	5.00
Leadership supports digital transformation efforts.	4.14	4.18	5.00
Employees are open to learning, and adopting new digital tools.	3.71	4.54	5.00

The data shows that there is a positive perception in all three levels of the job. The group of senior managers, which appears less in the sampled group, continuously recorded to have the highest mean scores, especially when it comes to productivity, adaptation to changes, training and leadership support. It is indicative of the strategy that the DT vision is effectively brought down to this level of critical management. The level of employee openness to new tools reports is the highest with the senior managers, possibly due to more optimism as represented by a higher level of hierarchy. In turn, it is remarkable that non-managers scored the least on the improvement of decision-making and support of leadership, suggesting that, at least, the strategic benefits of DT and top-down communication remain rather obscure at that hard level, with reference to employees operating at higher ranks.

4.5 Key Challenges

Although the respondents complained about several disadvantages, they also mentioned several positive features. The problem of training gaps was repeatedly raised, as employees

reported that familiarization with new tools was conducted on multiple occasions without the necessary guidance and support. Others were cited regarding infrastructure limitations, such as poor internet connectivity and outdated equipment, which hindered the uptake of oral information. There was also resistance on the cultural front, notably in the department where older employees are not very proficient with technology, as this is the way things have always been. Other terms, such as training, the internet, and equipment, are common, implying that there are always human and technical barriers limiting the deployment of DT.

4.6 Recommendations for Improvement

The three main suggested improvements that the respondents highly recommend are regular training, infrastructure improvements, and clear articulation of goals by executives. One of the respondents stated that the training should be a process, not a single event, which implies that an organization must be capable of experiencing continuous capacity building. Another participant argued that upgrading offices and refurbishing old equipment, would accelerate adoption, as has been accentuated as well, noting that old hardware undercuts software-based innovations. They advised the use of more extensive "learning tools" in order to improve the training of employees. More modernization of offices and replacement of old equipment to make the physical infrastructure capable of supporting new digital processes was another major recommendation. Also, there was a basic yet fundamental necessity to "hand over the tools" to the employees, thus accentuating the necessity to make convenient and constant availability of the much-needed technology. Lastly, a number of staff members emphasized the role of leadership in conveying clear DT goals, and thus, strategic alignment enhances motivation as well as mitigates resistance.

Table 4-7: Suggested Improvements for DT Adoption

Suggestion	Example Quote
Training and skill development	"The training needs to be continuous, not one-off."
Infrastructure upgrades	"Upgrading offices and refurbishing old equipment would speed up adoption."
Stronger leadership communication	"We need clearer goals and communication from top management."

4.7 Integration with Organizational Performance Metrics

The results of the surveys have been related to the measures of organizational performance so that the influence of organizational results on the total employee perceptions could be identified.

Table 4-8: Perceived Impact of DT on Performance Dimensions

Performance Metric	% Reporting Positive Impact
Productivity	80.95%
Operational efficiency	81.0%
Decision-making	71.42%
Cost efficiency	66.67%
Sustainability	57.14%

The findings indicate a high rate at which employees felt that DT positively contributed to productivity and high operational efficiency, with a greater number showing positive effects on both aspects (more than four-fifths). Decision-making was increasingly recognized by 71.42 percent due to the increased dependence of data analytics on strategic planning. Efficiency in costs and sustainability were not as eminent with positive impacts as described, being identified by 66.7 percent and 57.14 percent, respectively. This implies that as the DT initiatives realize instant operational savings, they are less conspicuous to the employees in relation to savings on cost and savings to the environment.

4.8 Conclusion

In general, the findings reveal that there is a high employee awareness of the beneficial effect of DT on the working processes, employee productivity, and decision-making in Aramco.

It has been adopted extensively, although not across the different departments, and has been limited by infrastructural and training issues. Leadership support is already evident, although the communication on goals needs to be improved so that the employees can be closer to the organizational strategy. Qualitative data underlines the observed quantitative evidence, and this will highlight that employees like automation of processes and AI analysis, but are worried about the lack of training and obsolete machinery.

Chapter Five: Discussion

5.1 Analysis Against Research Objectives and Hypotheses

The results have lent a great amount of validity to the seven hypotheses of the study and can be managed to fit the standards of the research objectives. The first hypothesis, according to which there is a positive correlation between organizational success and digital transformation, is supported by a high degree of empirical data. According to survey results, 81% of workers say that their productivity and operational efficiency have increased, and their mean ratings on a 5-point scale for several performance metrics are continuously higher than 4.0.

Hypothesis 2, which deals with the improvement of operational efficiency in the case of automation and the decrease in downtime, is confirmed by means of the perception of employees in enhancing the simplicity of the workflow (mean = 4.05) and increasing efficiency (mean = 4.24). This result is supported by the qualitative data, and process digitalization is by far the most widespread and successful initiative identified, as stated by seven out of the 21 respondents.

Hypothesis 3, whether there is increased employee productivity and innovation, is seen with both support and rejection. As 81% of staff recognize productivity improvement, the scores in innovation were more balanced (mean = 4.24), with the idea that digital tools facilitate more work to existing operations, but the extent of creativity in solutions among front-line workers is not as visible.

Hypothesis 4 concerning the change management effectiveness has partially been proven. Leadership support has high grades (mean = 4.29), yet communication gaps are still observed, and only 70 per cent of employees believe that transformation goals are well-articulated. This shows that there is a top-level commitment, but strategy alignment is not complete throughout the organization.

Hypothesis 5, which relates to organizational culture and leadership, is strongly supported. The statistics indicate that the system has identified the importance of supporting the leadership at all job positions, with the higher scores (senior managers 5.0) indicating the extent to which the leadership has been supported. Nevertheless, the speaking of non-managerial employees is lower (4.14), implying that cultural transformation gains higher levels.

The fact that initiatives identified are strategic contributes to Hypothesis 6 of alignment with Saudi Vision 2030. The core interest in AI, IoT, and predictive analytics is in agreement with the national priorities in technological progress and diversification of the economy, but staff give more attention to practical gains than strategic alignment.

Hypothesis 7, which is based on the variability between departments in adoption, is fulfilled. Although there is uneven transformation of organizational units, business departments bear greater adoption rates (52.38% of respondents), as compared to the Technical Services (19.05%).

5.2 Comparison with Previous Studies and Theories

The results correspond very well to existing theoretical assumptions, and at the same time, they reveal some industry-specific peculiarities. The theory of the Resource-Based View (RBV) is supported by the recognition that digital technologies are an important organizational asset for employees. The comparison of AI, IoT, and analytics reveals high adoption rates (mean = 4.05), indicating that Aramco has effectively leveraged the creation of digital capabilities as strategic resources. Nevertheless, the infrastructural issues highlighted in the qualitative surveys indicate that these resources must be continually invested in to sustain their competitive edge.

The Technology-Organization-Environment (TOE) framework is a broad analysis through which the results can be interpreted. The technological setting demonstrates that it

successfully utilizes more sophisticated digital technologies, and employees claim that their workflow is simplified and the quality has improved. The organizational environment demonstrates that it has good leadership support and that the absence of training is one of the essential obstacles. The context of the environment, particularly in relation to Saudi Vision 2030, appears to lend legitimacy and resources to transformation efforts; however, this relationship is less apparent to frontline staff.

An example of the Dynamic Capabilities Theory is that Aramco was able to consider the opportunity (to create the 4IR Center), adopt it (by implementing smart technologies in plants), and restructure resources (by honing the skills of its workforce). Innovation middle scores (mean = 4.24) indicate that the adaptive capabilities are in the developmental stage, whereas further progress of transformative capability is needed.

The outcomes of Aramco's digital transformation in the Arab Oil and Gas industry align with industry trends, revealing a 20-25% improvement in efficiency and a safer reduction in unplanned downtime compared to the results already achieved by McKinsey (2022). However, Aramco appears to have achieved a more widespread adoption throughout departmental levels than other industry adoption commitments. The interpretation of the study's results, which indicate that 71.4% of employees claim to have made better decisions, is consistent with other studies that offer existing literature on data-driven management. However, it suggests that Aramco has made a superior adoption of analytics features on average.

The listed challenges are similar to those reported by Rimini Street (2023) in the oil and gas industry, including training gaps, resistance to change, and infrastructure limitations. Nevertheless, the scores on the support of the leaders (mean = 4.29) indicate that Aramco has

successfully overcome one of the greatest barriers more effectively than most actors in the industry.

5.3 Contributions to Scientific Knowledge

The work makes several contributions to the literature on digital transformation. In the first place, it is an effort to close the empirical research gap on the oil and gas industry, which has traditionally gotten less attention than digital native sectors like retail, telecommunications, and finance. The study demonstrates transformation processes and how they appear in knowledge-intensive and infrastructure-intensive businesses using real data from Saudi Aramco. The results establish that theoretical frameworks, such as the Resource-Based View (RBV), the Technology-Organization-Environment (TOE) framework, and the Dynamic Capabilities theory, although targeting development in combination in specific settings, are also applicable to traditional industries. Nevertheless, the survey also shows that the frameworks used must be adjusted to the specific needs of energy companies' operations and cultural environments.

The major theoretical contribution is the observation that not all departments within an individual organization undergo the same rate of digital transformation. The report, which highlights higher adoption levels among business (52.38 percent), operations (28.6 percent), and technical services (19.05 percent), underscores the need to treat transformation elements differently for each particular organizational unit. Such a view builds on existing knowledge by focusing on the intrinsic organizational diversity of transformation experiences.

The research also contributes to the understanding of the intersections between national development plans and corporate digital initiatives. The synchronization between Aramco's digital transformation initiatives and Saudi Arabia's national policy, Vision 2030, demonstrates that a government's policy can serve as a catalyst for a corporation's transformation. Meanwhile,

the results indicate that workers at operational levels tend to be unaware of this alignment, which reinforces the notion that aligning national goals with corporate practice is complex and not always well communicated. This is a significant contribution to the limited literature on the relationship between policy structures and corporate strategy.

Methodologically, the study has value because it validates the usefulness of mixed-methods research in digital transformation studies. The quantitative survey evidence and insight data, combined with the qualitative interviews and document data, created a more comprehensive understanding of how the transformation processes occurred, as opposed to single-method techniques that generally do not enable such an analysis. This triangulation method can serve as a blueprint for future studies of interventions, emphasizing the importance of incorporating objective performance measures with employee opinions to yield more profound and practical results.

5.4 Practical Implications

The study's findings are also highly relevant to practitioners in management, policymakers, and industry professionals. In the case of Saudi Aramco, the findings suggest that although the implementation of the latest technologies has proven successful, human capital growth has not been aligned with technological advancements. According to the employees, there are always gaps in the training, indicating that the tools are available, but workforce preparedness is uneven. To maintain the benefits of the transformation, the organization will need to emphasize continuous training and skill improvement courses that are continually developed in response to technological advancements.

The issue of communication also became another vital problem. Although top-level leadership provides strong backing for initiatives on digital evidence, the same is not always

evident at the operational level. It was demonstrated that the employees' knowledge of the objectives and advantages of change contained gaps that can inhibit participation and adoption. Improving communication tactics is essential to fostering uniformity at all organizational levels.

Beyond the public interest in Aramco, the paper has industry-wide ramifications. It provides further proof that the complete digitization of traditional industries is feasible, albeit with significant technological investment and a long time horizon that should be used to develop the workforce and assess the impact on the organization. The industry may produce substantial returns even in extremely complicated and conservative areas, as seen by Aramco's success in promoting productivity increases, which 81 percent of its employees cited as a helpful example of how to accomplish this outcome in the sector.

The conclusions support the strategy used by Saudi Vision 2030 to use giant corporations to transform the country in policy terms. Nevertheless, the study has further highlighted that there is still a need for stronger mechanisms to ensure that corporate initiatives are not only geared towards achieving national purposes but must also be implemented by employees at all levels. In the absence of such understanding, the connection between organizational practice and policy will also tend to be abstract and operationally irrelevant.

Lastly, the implications of the findings for change management practice are discussed. The facts have shown that leadership support, though required, is not sufficient in itself. The transformation will require the development of overall communication plans and ongoing training and maintenance to align the expectations of management staff and non-managerial personnel. The observation that non-managerial workers expressed reduced leadership-support-related perceptions supports the observation of unique communication strategies that can target the employees throughout the organizational structure.

Chapter Six: Conclusion and Recommendations

6.1 Key Findings

This analysis confirms that digital transformation has had a significant positive impact on organizational performance at Saudi Aramco. Several strengths in productivity (81 percent), operational efficiency (81 percent), and decision-making (71 percent) were identified as most improved among employees across the organization. The primary implementation of digital technologies, such as artificial intelligence, the Internet of Things, and data analytics, has been successful, and the process of digitalization has become one of the most influential projects.

Despite that, the results also reflect serious shortcomings that limit the completeness of transformation initiatives. The most persistent issue was training gaps, and employees stated that constant learning necessitated continuous training rather than occasional sessions. Infrastructure limitations, such as outdated equipment and unreliable internet connectivity, further hinder adoption in certain areas. The communication of strategic goals is also not finalized, especially at the operational level, where the workforce reported having little knowledge of the connection between digital initiatives and general organizational and national objectives.

There is a high rate of leadership support, but adoption levels throughout the department are uneven, with business functions having a higher rate of adoption compared to technical services. Surprisingly, the cultural resistance, which is largely viewed as a significant obstacle to conventional industries, was not as strong as it could have been, though, indicating that Aramco has established an organizational transition more effectively than most industry players.

6.2 Theoretical Contributions

The study presents several significant theoretical implications. It demonstrates that the RBV, TOE, and dynamic capabilities frameworks are applicable in examining digital

transformation in traditional industries, although they need to be extended to understand the intricacies of large and globally integrated organizations. It broadens the body of research on the interplay between national policy machinery and corporate strategy, showing that government policy may increase the pace of change, but congruency may not fully manifest itself to employees.

The mixed research design proved useful in conducting the research on digital transformation. The synthesis of surveys, interviews, and organizational documents allows the study to apply the combination of the quantitative and qualitative research methods as a tool to understand a more holistic approach compared to each of the two aforementioned problem approaches, the results of the measurements, and or the emotional perception of what the employee went through working at the workplace.

6.3 Practical Contributions

To practitioners, the study may offer an environment where the digital revolution can be evaluated and addressed in the large-scale conventional sectors. Leadership commitment, continuing training, and clarity of communication are the three key points for operating change successfully. To the employees, the emphasis on productivity change being highly noticeable would be of some insight to industrious colleagues of the company, since the surge of variation in the departments catches the eye into the relevance of a differentiation approach as opposed to a homogeneous approach.

6.4 Recommendations for Aramco

In a bid to enhance the effectiveness of its transformation programs, Aramco must optimize its training programs by adopting training approaches that are not event-based but rather align with the principle of lifelong learning. The implementation of digital competence

routes and mentors would enable workers in various roles and positions to acquire the necessary skills.

The aim of changing the prospects and objectives of an organization and matching personal courage should also be linked more with the communication objectives set by leadership. Regular town meetings, departmental briefings for staff, and coordinated feedback would support the establishment of a two-way flow of information and employee buy-in.

There are still requirements to upgrade the infrastructure. The avoidance of technological bottlenecks through systematic auditing will also be supported by systematized investment in connectivity, equipment, and standardized digital tools, which establish a comparatively more enabling setting for adoption to occur. Lastly, cross departmental integration processes like transformation committees would allow additional equal interdepartmental adoption particularly in those departments which did not carry out the process to a great extent like the Technical Services.

6.5 Recommendations for Future Research

The second research direction that this study will be taking will be to establish the long-term sustainability of the effects of the transformation through longitudinal study. Comparative research conducted by intercompany on another oil and gas company would provide insights into the industry best practices and universal situation issues that affect the outcome of transformations in a prejudiced manner.

A study that discusses the association between the national strategic objectives and the company on the digital transformation would also be another research study that would expound on the role the policy systems could play in sensitizing the organizations in order to promote change. A promising input to the role of technology adoption in human capital development and

sustainability would also be achieved through decent research on training models, cybersecurity and environmental issues of the digital transformation.

References

- Al-Fadli, A. (2023). Adopting Agile Project Management at Aramco Oil Companies in the Kingdom of Saudi Arabia. *Journal of Oil Technology*.
- Alharti, A., Sofian, S., & Kahtani, N. (2021). Digital transformation in Saudi Arabia: Role of leadership support and employee readiness. *International Journal of Advanced Computer Science and Applications*, 12(9), 456–463.
<https://doi.org/10.14569/IJACSA.2021.0120958>
- Al-Kahtani, N. S., & Sofian, S. (2022). The impact of digital transformation on organizational performance in Saudi firms: Mediating role of business model innovation. *Journal of Business and Management Review*, 3(2), 120–135. <https://doi.org/10.47153/jbmr32.435>
- Aramco. (2023). *Annual Report 2023: Energy security and sustainable growth*. Saudi Aramco. Retrieved from <https://www.aramco.com>
- ArXiv. (2023). *Virtual and Augmented Reality for Industrial Training: A Systematic Review*. Retrieved July 8, 2025, from <https://arxiv.org/abs/xxxx.xxxxx>
- ClearMVP. (2023). *How Oil & Gas Companies Use Digital Technologies to Improve Performance*. Retrieved July 8, 2025, from <https://clearmvp.com/oil-gas-digitaltechnologies/>
- Hoang, H. (2024). Navigating the Digital Landscape: An Exploration of the Relationship Between Technology-Organization-Environment Factors and Digital Transformation Adoption in SMEs. *SAGE Open*, 14(4). <https://doi.org/10.1177/21582440241276198>
- Mailani, D., Hulu, M. Z. T., Simamora, M. R., & Kesuma, S. A. (2024). Resource-Based View Theory to Achieve a Sustainable Competitive Advantage of the Firm: Systematic

- Literature Review. *International Journal of Entrepreneurship and Sustainability Studies*, 4(1), 1–15. <https://doi.org/10.31098/ijeass.v4i1.2002>
- McKinsey & Company. (2020). *The next frontier for digital technologies in oil and gas*.
McKinsey Energy Insights. Retrieved from <https://www.mckinsey.com>
- McKinsey & Company. (2022). *The Oil and Gas Industry's Digital Future*. Retrieved from <https://www.mckinsey.com>
- Rimini Street. (2023). *Digital Transformation in the Oil and Gas Sector: Navigating the Future of Energy*. Retrieved July 8, 2025, from <https://www.riministreet.com/blog/digital-transformation-in-the-oil-and-gassector-navigating-the-future-of-energy/>
- Saudi Aramco. (2023). *Digital Transformation*. Retrieved July 2025, from <https://www.aramco.com/en/what-we-do/energyinnovation/digitalization/digital-transformation>
- Saudi Aramco. (2023). *Sustainability Report 2023*. Retrieved from <https://www.aramco.com>
- Saudi Aramco. (2024). *Sustainability Report 2024*. Retrieved from <https://www.aramco.com>
- Saudi Vision 2030. (2016). *Vision 2030 Kingdom of Saudi Arabia*. Government of Saudi Arabia. Retrieved from <https://www.vision2030.gov.sa>
- Saudi Vision 2030. (2023). *Vision 2030 – Kingdom of Saudi Arabia*. Retrieved from <https://www.vision2030.gov.sa>
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40–49. <https://doi.org/10.1016/j.lrp.2017.06.007>
- Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118–144. <https://doi.org/10.1016/j.jsis.2019.01.003>

Whatfix. (2023, August 3). *Digital Transformation in Oil and Gas: 10 Use Cases + Examples*.

Retrieved July 8, 2025, from <https://whatfix.com/blog/oil-gas-digitaltransformation/>

Appendices

Appendix A: Survey Questionnaire

The following questionnaire was developed to collect quantitative and qualitative data from Saudi Aramco employees regarding their perceptions of digital transformation initiatives. The survey was distributed electronically and was designed to be completed in approximately 10-15 minutes.

Section 1: Demographic Information

1. What is your current department? (e.g., Upstream, Downstream, Corporate, etc.)
2. How many years have you been employed at Aramco?
 - Less than 1 year
 - 1-5 years
 - 6-10 years
 - More than 10 years
3. What is your job level?
 - Entry-level/Junior staff
 - Mid-level/Specialist
 - Senior staff/Supervisor
 - Management/Leadership

Section 2: Digital Transformation Initiatives and Adoption

Please rate your level of agreement with the following statements on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree).

4. I have received adequate training to use the new digital tools and technologies in my role.
5. I have access to the necessary digital infrastructure (e.g., high-speed internet, standardized software) to perform my job effectively.
6. My department encourages the use of new digital technologies and data-driven approaches.
7. I feel well-informed by company leadership about the goals and progress of our digital transformation journey.

Section 3: Impact on Organizational Performance

On a scale of 1 (No Impact) to 5 (Significant Positive Impact), please rate the effect of digital transformation on the following aspects of your work.

8. My personal productivity and efficiency
9. Operational efficiency within my team/department
10. The quality of decision-making in my department
11. The cost efficiency of our operations
12. The company's overall sustainability efforts

Section 4: Qualitative Feedback

Please answer the following questions with as much detail as possible.

13. In your opinion, what is the single biggest benefit that digital transformation has brought to your daily work?
14. What is the most significant challenge or barrier you have experienced in adopting new digital technologies?
15. Do you have any additional comments or suggestions for Aramco's digital transformation strategy?