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**Evaluating the Effects of Implementing Global Project Governance Models on
the Petrochemical Sector in Saudi Arabia**

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Abstract

The petrochemical industry is of striking importance for the development of the Saudi economy, so good governance will be all the more important for the industry to keep progressing. This study aimed at: a) examining the current project governance structure in the oil and petrochemicals industry of Saudi Arabia, b) pointing out the governing mechanisms that have a strong relationship with successful projects, and c) measuring the extent of specific governance practices in their contribution to project success. A mixed methodology approach was used, which involved surveying 89 respondents and a review of secondary source materials. The studies concluded that the topics of governance play a vital role in the sector, and decision-making and control apparatuses are believed to be the main tools that influence the progress of the projects. On top of this, the study also examined the influence of the project management process and project execution digitalization, which should be related to stakeholders' project governance participation. The sectoral recommendations address how to strengthen organisational project management, and the inclusion of digitalization and grouping stakeholders are the core factors. The fourth step may be replicating it with more participants and in different contexts than the one explored. In addition, it can examine the prospects and threats of implementing the project more deeply.

Keywords: Petrochemical sector, project governance, project execution, decision-making, digitalization

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Chapter 1: Introduction

The importance of the petrochemical industry to the Saudi economy has been consistent over time: its historical components are a significant part of the country's GDP (Al Rajhi et al., 2012). The government realized the discovery of oil and massive reliance on the industry in the 1930s when ARAMCO commenced its operation under the Arabian American Oil Company (Abid & Alotaibi, 2020)—endangered it. In addition, the country has attempted to ensure economic diversification over the years so as not to over-rely on oil exports. Economic diversification in the development of the petrochemical sector is also among the most critical areas.

1.1 Background of the Study

1.1.1 Historical Background

The petrochemical industry in Saudi Arabia was established in this era of the late 1970s through the 1980s by the country moving into rapid industrialization to fully use its vast oil resources (Martin, 2020). Development in the sector was due to a government emphasis on significant economic diversification from the traditional oil expense dependence, which was very sensitive to changes in the international oil market. The first petrochemical project ever planned in the Kingdom of Saudi Arabia happened in 1975 - the construction of Jubail Industrial City (Al-Rajhi et al., 2012). Jubail Industrial City was located near the Arabian Gulf and was designed to correctly uphold the petrochemical production process. Another industrial city, Yanbu Industrial City, was operational by 1986, providing a similar infrastructure for petrochemical production (Abdei-Latif & Roeseler, n.d). These industrial cities, therefore, indicated the commencement of the first waves of fast development in the petrochemical arena within Saudi Arabia. In the next ten years, the government invested heavily in developing

complexes like the petrochemical complexes and the SADAF and IBN Sina plants in Jubail.

Today, they act as production sites for petrochemical products, including ethylene, propylene, and polypropylene.

This was further strengthened by the government support featuring preferential policies that favor the growth of the petrochemical industry in a way, such as providing subsidized prices of gas and giving petrochemical companies breaks on taxes (Al-Hajji & Bradley, 2018). Through such policies, all these have been put in place purposely to ensure the entry of such foreign investment and make the industry in the country more attractive. Since then, the petrochemical industry in Saudi Arabia has increased, with the creation of other new industrial cities and complexes on this pedestal.

From 2017 to 2018, tremendous growth has been witnessed in the petrochemical industry since 2017, with the installation of the Yanbu Industrial City Expansion (Al-Khaldi, 2017). The country is the largest petrochemical producer and exporter in the Middle East region; with over 43% of non-oil, GDP coming from exports (Albassam, 2015). Despite the considerable growth of the country's petrochemical sector, Saudi Arabia has seen several challenges in implementing projects. Factors that they have been able to point to as a couple of reasons behind this have included bad project planning, unavailability of skilled labor, and bad bureaucracies that they are usually accused of leading to hindrances in projects, overspends, and quality control issues that bring about delay in cost-effective delivery. In essence, good governance, or somewhat effective project governance practices, has turned vital in the presence of such challenges in the experience of the petrochemical sector in Saudi Arabia to ensure a successfully executed project. Industry in the petrochemical sector within the country's economic diversification efforts has experienced tremendous growth that has contributed to its development. This has made observers

point out the need for governance to solve challenges faced during project implementation. Seeking to fill the research gap, the dissertation will aim to elaborate on the historical background of project implementation within the petrochemical sector in Saudi Arabia, with better hope for the future on better practices in project governance for this sector.

1.1.2 Challenges in Project Implementation

The kingdom has also seen a significant boost in the development of its petrochemical industry, which it is hoped will smoothen the way for actual project development. However, there have been many thorns as the significant growth has been characterized by delays hinging on project plans, inadequate labor, imperativeness, and bureaucratic processes (Yap et al., 2019). Delays result in increased project costs and disrupt projected timings, leading to revenue losses and the erosion of market share in the competitive markets of the global petrochemical industry. The third issue is that it becomes a big problem for projects in the petrochemical sector of Saudi Arabia: project cost and schedule overruns (Bin Seddeeq et al., 2019). For example, these overruns are attributed to many causes, with some pointing out how, from time to time, the market conditions constantly change, the prices of raw materials fluctuate over time, and lastly, poor risk management practices (Rahman et al., 2022). This results in the overrunning of project budgets and, by that means, a reduction of profitability among the industry players in the petrochemicals industry, characterized by a high focus on cost-efficient production. Apart from the above, another challenge noticed within the projects implemented across the petrochemical sector in Saudi Arabia relates to our controlling challenge on the quality aspect (Jawad & Ledwith, 2020). Some major issues that can be found with equipment that is failing, conspicuous safety hazards, and rising product defects are costly fixes, legal disputes, and brand damage,

among other problems that projects will face. Such quality problems directly touch the projects' budgets and dent the full potential of projects set in the budgets.

1.1.3 Impact of Governance on Project Implementation

The challenges faced in project implementation within the Saudi petrochemical sector have highlighted the importance of effective project governance (Alkhatib & Al-Jamil 2015). Therefore, project governance can be understood as the framework that the various systems and processes overlaying it support the running of effective project implementation within the agreed-upon scope and budget. This aspect, therefore, gives in to several decisions, project control, and risk management (Alrowais, 2022). Accordingly, effective project governance is the success of the execution of complex projects across all industries, including the petrochemical sector, according to Aljohani, 2021. Therefore, it is right to assert that a well-structured governance framework will be essential in placing all project delays, over-cost, and quality breach issues at risk and guaranteeing the successful completion of projects in a timely and cost-effective manner. On the other hand, the petrochemical industry of Saudi Arabia is highly affected by poor governance practices.

1.2 Problem Statement

The Kingdom of Saudi Arabia is positioned at a very advanced point when measuring how the petrochemical project governance logically completes such projects (Jawad & Ledwith, 2022). Commonly, project governance practices are poorly understood and the more significant their impact on the success of the dwelling project management in the contemporary context, the more the area is equally substantial (Samset & Volden, 2016). Therefore, this research will attempt to fill the data deficiency, bringing to the forefront the link of governance to projects in terms of time, cost, and quality. It is hoped that having identified the fundamental mechanisms

and methods of project management and having made recommendations for its development then; the research will expand expertise in the field of project governance and hence lead to the reduction of project process inefficiencies in the sector of the petrochemical industry in Saudi Arabia—end of thesis or dissertation proposal.

1.3 Study Purposes

The paper aimed to explore the present position of project governance in the Saudi petrochemical sector. It has to investigate modern, general governance mechanisms behind the excellent implementation of the project while recording how particular governance practices have related to the project's performance in terms of schedule, cost, and quality. This paper further aims to develop recommendations for increasing project governance best practices within the sector and contributing to the overall knowledge of the management of projects and governance within the context of the Saudi Arabian economy.

1.4 Study Questions

To achieve its purposes, this study will seek to answer the following research questions:

- What is the state of project governance practices in the Saudi petrochemical sector?
- What fundamental governance mechanisms influence project execution success in this sector?
- What is the impact of specific governance practices on project performance regarding schedule, cost, and quality?
- What recommendations can be made to improve project governance practices in the petrochemical sector in Saudi Arabia?

1.4.1 Research Hypotheses

Based on the research questions, the following hypotheses will be tested in this study:

- H1: The Saudi petrochemical sector has a strong positive association between project governance and project execution success
- H2: In the Saudi petrochemical sector, centralized project governance structures benefit project execution efficiency and effectiveness.
- H3: In the Saudi petrochemical sector, digitalization significantly affects project governance practices and execution success.

1.5 Theoretical Model

The theoretical model for this study is hooked on the concept of project governance. In simple terms, project governance is a series of systems, processes, and structures to ensure a project is well-delivered and closed in one piece (Ul Musawir et al., 2017). It covers all the activities necessary for a project, from decision-making and project controls to communication. First, proper and effective governance will be witnessed in its two forms. Proper governance may result in favorable results but also disastrous if not well taken care of. A lack of effective governance in the project's life is thus equivalent to death. Rational decisions make using resources effectively in managing the risk and the problem within the process of project performance cost-effectively. Therefore, completing the task promptly and reducing costs is an effective decision-making process.

Project governance also outlines project controls as another significant constituent of project governance. This can further check the implementation of whatever projects are to be undertaken according to the plan, budget, and schedule. It implies that a project's advancement is checked alongside identifying possible project risks, and remedial actions are initiated. In the

petrochemical industry, project controls ensure that tasks are carried out effectively at lower costs than planned and within the prescribed period as desired. Other than decision-making and controls within the execution of the project, the theoretical model also considers the impact of different project governance frameworks in project execution concerning the Saudi petrochemical industry. The three broad project governance structures have advantages and disadvantages: centralized, decentralized, and systems. For example, centralized structures have splendid decision-making processes but are less flexible, leading to delays. On the other hand, the decentralized model provides flexibility, although conflicting interests occasionally may be an obstacle (Brisbois, 2019).

A matrix structure is, in turn, a mixture of some centralized and decentralized features that fit the petrochemical sector in running complex and large projects. The model also considers how digitization can engage and create implications for project governance practices in the petrochemical sector. Modern life today in the digital era offers opportunities to make project management more relevant through the influence of digital enthusiasts who offer a lot through the availability of numerous tools and techniques that can be put into maximum use to boost support in communication, collaboration, and process (Boss & Krauss, 2022). Digital tools, technologies, high efficiency, and effectiveness in properly executing respective mandates support better project governance.

1.6 Summary

The study tries to understand the mechanism of the implementation of the projects executed in the petrochemical sector in Saudi Arabia. From this context, the evaluation of the existing level of implementation of project governance and critical governance practices and mechanisms and their influence on the performance of a project is being proffered with an

emphasis on this. The research will use quantitative and qualitative approaches to ultimately generalize and validate the findings in project governance in the Saudi petrochemical sector.

Chapter 2: Literature Review

2.1 Introduction

The petrochemical industry is an instrument that Saudi Arabia uses for economic diversification while at the same time breaking free from the overdependence on oil export revenues. According to Shan (2024), the industry contributes over 43% of the kingdom's gross domestic product. In most cases, successful deliveries in this sector are characterized by setbacks through delays, cost overruns, or defects in quality. The review examines the available literature on project governance in the petrochemical sector in Saudi Arabia. Project governance, its relation to success in project execution, and what level is the current state of governing projects in the petrochemical sector in Saudi Arabia. It also discusses several governance mechanisms that affect project performance, such as schedule, cost, and quality. By this, it is with an eye that the current world objectives are focused: one, enlighten on the relationship that might exist between project governance and success in the execution of projects; two, identification of gaps in the current research; and three, a presentation of an empirical way to study this research.

2.2 Dependent Variable

The dependent variable in this study is project execution success. The success of project implementation, according to Saqvur (2008), is a multifaceted concept embracing several ideas: the realization of the project within the set scope, budget, and scheduled timeline; its high-quality realization that corresponds to expectations and especially to the specification of stakeholders (Jespersion et al., 2016). Project management aims to realize the expected project outcomes and benefits (Kerzner, 2013). The performance of the schedule, cost, and quality achieve the project's performance. These are essential elements that are, in essence, quintessential in the establishment

of the general success of the project and are sometimes taken as the key performance indicators (KPIs) (Jawad, 2022).

Schedule performance becomes the critical success factor in executing the project as it may keep to the date limit for completion of the projects. Relatively long project delays may lead to financial loss, spoiling the reputation of companies or individuals. This may cause them to lose opportunities that may have been present in the market (Stothard, 2016). Besides, it may also lead to additional costs if the project's resources have to be charged out for longer. Another essential level of project success is cost performance. It is actually among the topmost things that a project should effectively do. The project should work within a definable budget to ensure it does not spend over the allocated resources. Failure of projects to be under the budget may cause the organization a financial loss that will affect stakeholder confidence. Again, cost performance is also crucial in terms of the organization's profitability and return on investment.

Quality performance is the third constituent that, most of the time, gets the highest place within the project, making the project successful. This further implies that attention must be paid to the delivery of a project of high quality that will be within the expectations and specifications of other stakeholders. Failure to live up to the project's quality standards may lead to dissatisfaction among the stakeholders, and apart from damaging the project's reputation; it can result in legal complications. On the other hand, satisfaction could give a project that receives a "satisfactory" variety of experiences to the different stakeholders, those that have met or exceeded expectations, and ending in subsequent favorable benefits in the later project and even to the organization. "Thus, project execution success becomes highly critical regarding the success in reaching the very goals and objectives of the project, and construable critical of some issues, including governance of project practices. Further, the success performance of the project

is not measured by merely timely, cost-effective, and quality project delivery. It made stakeholders happy with the result and ensured the project's overall success achieved its stated goals and objectives.

2.3 Independent Variables

The independent variable in this study is project governance practices. Project governance can be defined as the systems, processes, and structures set up to ensure the efficient delivery of projects (Aaltonen & Kujala, 2010). Other components include the systems used to make decisions in the project governance framework, amongst other project controls. The role of the project governance physical team is vital and significant in the petrochemical industry. It ensures that the projects have been smoothly executed and that project objectives are realized or will be realized. Effective project governance: Project governance deals with a framework for decision-making, ensuring the structuring of appropriate project control in place and a clear governance structure for efficient project management (Jawad et al., 2018).

Articulating this would be the decision-making process witnessed in the life and running of the standard management of projects in the petrochemical industry. The method includes identifying and gathering relevant data and information, evaluating alternatives, and analyzing the risks involved before deciding (Akhtar, 2020). The decision then needs to be made concerning the project's performance about the project schedule, cost, and quality under the effective management of projects. Inappropriate decisions will lead to delays in the project activities, conflict, budget overrun, and other related issues (Artto et al., 2011). In most cases, for instance, in many petrochemical industries, which are capital-intensive and involve very complex processes, the passing of a good decision-making process forms the base for the success of the execution of projects.

Again, the other major factor in the governance of any particular project in the petrochemical sector is project control. It can best be put in perspective through a definition whereby these systems and processes ensure that, in the whole course of the project, it is within the budget and the risks are managed (Jespersen et al., 2016). Project control helps ensure that everything in your project runs correctly and under budget. They would effectively aim to encapsulate the regular monitoring, evaluation, and reporting that the project is performing acceptably while taking 'necessary' corrective action. With project budgets, much as with the petrochemical industry, they can and do very quickly 'escalate' and become significant. That is the reason why Project Controls is essential.

The Governance Framework in the Petrochemical Industry: The governance frameworks in the petrochemical industry concerning project governance are high. A governance framework is an overall structure that governs how an organization exercises its governance over its projects. Most of the top-notch positions in the petrochemical industry of Saudi Arabia are top-down; the position of senior management enjoys a high decisional authority (Hambleton, 2015). The centralized mode of project governance can be seen as an out cooperation of a hierarchical and authoritative culture; reverence to the authorities laid down on the seniors is described (Algarni, 2021). Nonetheless, the centralized governance structure may ultimately produce a late effect with relatively slow progress on the project due to late decision-making. This also gives a faster decision effect, which is positively related to project success in the execution of projects (Jesperen et al., 2016). On the other hand, decentralized governance mostly seems to be marked by autonomy and even a faster decision effect related to the execution success of projects (Jespersen et al., 2016).

Additionally, as the attention of project management increases and digitalization continues to grow, project governance shows increased emphasis on collaboration and communication, and the data further becomes high-speed. Digitalization will improve the project governance structure and additional favorable reserves from further accruing in the Saudi Arabia petrochemical section. Today, the project team members can work in close relations and become project data that are easy to access and analyze with the deployment of digital project management software and tools used for digital communication. However, there is a lack of research on the impact of digitalization on project governance and execution in this sector.

2.4 Summary of Past Studies

2.4.1 Historical Development and Challenges in the Saudi Petrochemical Sector

The Saudi petrochemical sector has played a vital role in developing the nation's economy because such contribution to the national GDP has been quite notable, let alone towards the diversification of the economy. The literature also summarizes and sections historical development and challenges Saudi petrochemicals face.

2.4.2 Historical Development:

The basis underlying the petrochemical industry in Saudi Arabia is the vast oil reserves on that land. The attributes of the petrochemical industry point to the basis that dates back to the 1970s, when the government sought to ease the high dependency on oil exportation and, at the same time, diversify the economy. Another chance for another leg up in sectoral development to aim at improvement through Vision 2030 is diversifying the economy and improving its non-oil-based sectors of the country (Anis, 2020). In the meantime, he created a Royal Commission for Jubail and Yanbu before the opening of the first petrochemical complex in 1983 (Niblock, 2008).

In Saudi Arabia, the government further fostered a conducive environment for higher production and petrochemical product export by providing subsidies to the sector (Hertog, 2008). Therefore, the petrochemical industries in Saudi Arabia were developing quickly, drawing most of the investors who wished to create businesses to serve both Asian and European markets into Saudi Arabia (Yamada, 2011). The industry continued to expand during the 1990s and early 2000s by establishing new petrochemical complexes, and new international firms opened up relations. More petrochemical products were being developed within the country, with the local share in the market increasing progressively.

2.4.3 Regulatory Challenges

The regulations in Saudi Arabia have worried petrochemical industry investors. The current government regulations and the opaque regulatory process in Saudi Arabia make petrochemical investors nervous (Al Ankari, 2004). Project approvals and the respective permits taken after that are seriously high-handed, bureaucratic governmental procedures with unclear regulations, also a significant obstacle of the projects in bulk by then due to project delays, leading to exorbitant costs that are bulging to be shouldered by companies (Ramady, 2010). It reduces competitiveness within the sector in terms of growth and development.

In addition, these regulations are usually not uniform; thus, they confuse the companies that wish to invest in the sector. Inconsistency in regulation may, therefore, result in different interpretations and implementation by government agencies, bringing more challenges to companies in terms of compliance (Niblock 2008). It thus happened that in some other circumstances, regulations, and policies had retroactively been effected at the risk of legal and, consequently, financial risk for the companies that worked in the region or sector (Hertog 2008).

2.4.4 Market Instability:

This is attributed to the fact that nature-wise, petrochemicals provide products to the global market; any fluctuation significantly changes profitability. In this regard, most Saudi Arabia's situational dependency on the export of petrochemical products links them inextricably with variations within the global market, especially in demand (Krane, 2019). The recent fall in oil prices due to the oversupply of oil in the market has not been unkind to the sector's performance, whereby it has suffered from reduced profits and the lag in new investments in companies. The overall petrochemical sector is suffering from unprecedented solid challenges, further complicated by the significant COVID-19 pandemic that brought some of its toughest challenges in today's memory. According to Anis (2020), this affected profitability since disruptions in global supply chains took place, and demand for petrochemical products started contracting. Borders shuttered, and materials and labor movements continued to experience a persistent challenge, leading to increased project delays and costs for companies.

2.4.5 Sustainability Challenges:

Growing concerns about the increased involvement of petrochemicals and the environmental impacts associated with such an activity based on climate change that is calling for sustainable development. Other critics have identified the issue of dependency on petrochemicals in many different parts of the industrial manufacturing of states, such as in the development of plastics and other developments in the value chain on issues related to the extent to which industries are repositories of carbon-emitting toxins and other pollutants (Wilson et al., 2011). This has called for the development of environmentally sensitive means of production, starting from the source of raw materials to the production of alternative and renewable resources for petrochemical production. In addition, the dependence on petrochemicals and plastic-based

products has also heightened the scope of environmental pollution, especially in the case of plastic waste. While this has implications for the environment alone, it raises concerns about human health and marine life (Yamada 2011). Furthermore, as consumer and governmental focus regarding environmental sustainability sharpens, the petrochemical sector may be hard-pressed to look for a way to keep its social license unless the plastic topic changes.

2.5 Project Governance and Project Execution Success in the Petrochemical Sector

Project execution success is a crucial outcome of project governance and is affected by various enablers and barriers. Jawad and Ledwith (2018) give a few enablers and obstacles for a successful template of the project control system in the petroleum and chemical industry: proper organizational structure, budget and resources, project control software and hardware, clear project objectives, and effective communication. Thus, these are the significant determinants for resistance to the barriers of the project control system. Against this resistance to change, lack of training and complex project environment are determined with no or little contribution by top management.

Another study by Aru (2022) discussed the influence of project management practice on project performance within the oil industry. In that case, it is estimated that running the project through proper planning, management of risks, and control is one of the most significant contributions toward the project performance in a petroleum project. Jawad and Ledwith (2021) researched enablers (success factors) and barriers to successfully implementing a project control system and found effective project management practice as one of the prerequisite enablers.

Measure the model towards the success of project control systems for contractor companies in the petroleum and chemical industry in Saudi Arabia. According to Jawad and Ledwith (2022), a project control system may result in the successful execution of the project

due to effective risk management and communication, in addition to the integrated systems for project organizations. The study by Redda and Turner (2018) indicates the dimensions of success and contributing factors to the success of large projects. The study shows critical successes are effective control, risk management, and stakeholder communication.

According to Nassif (2017), his research on multicultural global project success established that project leadership is a critical success factor to ensure success in execution. It follows from this research that today's project managers and project teams operate in environments, in most instances, that are culturally diverse and thus go through many challenges associated with the successful execution of projects. Downstream parts of the petroleum industry (refining/petrochemical plants) are some projects that relate to this large and complex execution. With this background, Faraji et al. (2022) derived the support decision model based on the project complexity measurement plan in the context of contractors' bidding and mark-up strategies. The study has established that the complexity of a project is a factor that positively influences the project's successful execution and should be well elaborated on in the development stage of corresponding bidding and tendering strategies.

Effective project governance is one of the enablers toward successful implementation, while poor. In contrast, governance is the primary barrier to the implementation and success of enterprise resource planning (ERP) system" (Al-Turki, 2011). "On that score, project governance practices will help to a greater extent in securing success. Factors that may enable the success of project governance include effective communication, project management practice, and top management support. Poor project governance enablers include lack of training, resistance to change, and project environment complexity. There is an extreme necessity for an appropriate project governance framework, which preferably tends to grow or is shaped by good project

leadership and practice to ensure that successful projects unfold, especially in the petrochemical industry. The chapter that follows relates current trends in the governance practices that are being undertaken within the Saudi petrochemical sector and the influence that they have on affecting success in project execution.

2.6 Project Governance Practices in the Saudi Petrochemical Sector

The petrochemical sector in Saudi Arabia is mainly dependent on the execution of petrochemical projects, which is quite essential for its growth and development. The industry is the goose that lays the golden eggs as it substantially contributes to the country's non-oil GDP (Jadwa Investment 2017). It is also worth noting that the implementation of projects in this sector is usually confronted with delays, cost exceedance, and quality problems (Akhtar 2020). They might influence project outcomes and result in stalling of the entire industry, preventing its growth.

These problems can be resolved by exploring governmentality in the Saudi petrochemical industry. Project governance comprises all processes, systems, and means to achieve successful project delivery and completion (Jawad & Ledwith, 2022). The petrochemical sector has increasingly shown interest in project governance within the last few years; nowadays, most companies have started to adopt formal governance structures to improve project performance (Jawad et al. 2018).

The initial task in the assessment of project governance in the petrochemical industry in Saudi Arabia is to consider its current position. A work of Hambleton (2015) on the reasons and effectiveness of petrochemical projects in Saudi Arabia emphasizes the importance of good governance in ensuring project success. Research indicated that sector participation, which requires definition of roles and responsibilities, process-based decision-making, and robust

project controls, defines the sector's future success. In addition, Anis (2020) analyzed the financial performance, volatility, and trend of a petrochemical company in Saudi Arabia and determined that organizations with better governance performances also have better economic performance.

Various important governance mechanisms influence project implementation success in the Saudi petrochemical industry. In fact, Jawad and Ledwith (2022) referred the project control groups as risk management, document control, and communication management. Project control systems are critical in monitoring the project development, predicting the risk of problems, and providing fast solutions. In addition, centralized institutional governance systems are efficient in the execution and effectiveness of the project (Jawad & Ledwith, 2022). Alhajri and Alshibani (2018) underlined major delays in the petrochemical projects in Saudi Arabia, one of which is the governance issue ranging from ineffective planning and design.

The digitalization has brought many changes in the project management practices of petrochemical companies in Saudi Arabia. Gashgari (2017) researched the influence of corporate governance approaches and systems by large organizations in the country and the advent of digital technologies to improve the governance process. The article by Algarni (2021) was a research study that investigated the impact of engineering management and leadership practices on passion in petrochemicals in Saudi Arabia.

Secondly, the use of digital technologies has been found to significantly affect the link with leadership and trust of the employee reporting for an industry project, which is another essential factor of the petrochemical industry project governance (Alrowais, 2022). This is found to be identified in Alrowais study on the CSR reporting among the petrochemical firms in Saudi

Arabia. Along with that, CSR has been added to boost the performance through the incorporation of CSR within the methods of corporate governance (Alshareef and Sandhu, 2015).

This should be met in putting in place concrete project governance recommendations in the petrochemical industry within Saudi Arabia. Another development that began early when Alzahrani developed local project management maturity model detailing the main three areas of enhancing according to the model: project planning and control, project documentation, and project communication. This evidently means that strategic approaches in the management of resources lead to efficiency in utilization and performance enhancement in the petroleum sector. As per Krane in 2019, energy governance success in the Kingdom will encompass more participatory and intensified transparency, at which stakeholders' roles come into play.

This framework shows how important project governance is to the success of petrochemical projects in Saudi Arabia. Generally, among other aspects, the most basic fundamental underpinning of having project governance as it stands in the current state within the sector is centralized governance of project control systems. For instance, factors like CSR, reporting, and digitalization contributions have largely contributed in the view that projects in the sector look modernized in terms of project governance. This will improve project governance through the provided recommendations and developed maturity models or strategic developed resource management that will suit the country. As indicated in the study, the project governance on petrochemical industry in Saudi Arabia; it is not an exception but hedged with the requisite guidelines to the private enterprises and government in improving project performance and other sector attractiveness capabilities.

2.7 Impact of Governance Practices on Project Performance

2.7.1 Decision-Making Processes:

Petrochemical sector in Saudi Arabia requires effective designs to implement projects. Nevertheless, construction research have shown that decision-making in this industry is always lethargic and bureaucratic which in turn cause delays, overruns, and conflicts (Artto et al., 2011). The research of Alshareef and Sandhu (2015) indicates that the decision-making system of Saudi petrochemical organizations is centralized, while the top management possesses more power of the decision-making process. Decision-making is centralized in the country due to its culture, which is hierarchical and autocratic, where the top management is the main decision-making authority (Algarni 2021).

The centralized system could result in the delays since all the decisions need many approvals to be implemented. Furthermore, delays in decision-making lead to dissatisfaction among the project team and other stakeholders; they lose their interest, and as a result, project progress suffers. This is made more challenging in a fast-moving and competitive industry, like petrochemicals, with delays, thereby costing both money and market opportunities (Jawad & Ledwith 2021).

2.7.2 Project Controls:

Project control is an important element in monitoring and controlling the project progress, costs, and risks. However, Hameed et al. (2017) show the weakness and ineffectiveness of project controls in the petrochemical industry in Saudi Arabia resulting in cost overruns and schedule delays. Jawad et al. (2018) established that lack of adequate project controls was the main barrier to the successful implementation of project control systems in the Saudi petrochemical sector. De-standardization and not unification are one of the main problems in

project controls in the industry. All projects are unique and complicated the controls should vary in all projects. However, it results in inconsistencies, lack of uniformity in the projects and becomes hard to track and compare the projects performance. Additionally, poor alignment of project controls with other project management elements like scheduling and risk management systems does not allow project managers to overview the project (Jawad & Ledwith 2022) fully.

2.7.3 Governance Frameworks:

The governance framework is the typical estuary and control of project governance in any organization. Centralizing governance systems is a common practice in the petrochemical market, and executives who face limited difficulties in making decisions (Hambleton 2015) do it. The power culture results in a centralized project governance style that emphasizes the powers of the senior management (Algarni 2021). Such an approach to project governance causes delays and redundancy because approvals from different levels are required. The above also may result in project decision-making without accountability and transparency. In decentralized governance structures, leaders delegate decision-making to lower levels of management, promoting quick decisions and frequent autonomy (Jespersion et al. 2016). This is beneficial for the success of the project execution since it leads to timely and informed decisions. Nevertheless, decentralized governance systems also have shortcomings; for instance, the decision-making becomes fragmented without a single course. Centralization and decentralization must be balanced by the organizations in the project governance and be specific to each project's peculiarities. This will facilitate proper and timely decision-making and project implementation in Saudi Arabia's petrochemical industry.

2.7.4 Digitalization and Governance Practices:

The role of digitalization in project management is becoming relevant and supports active collaboration, communication, and data management. As per Jawad & Ledwith (2021), digitization can improve the project governance practices in the Petrochemical sector of Saudi Arabia concerning the KSA 2030 agenda. However, the studies on how digitalization impacts project governance and realization in this industry are inadequate. As demonstrated by research conducted by Alhajri and Alshibani (2018), digitalization can enhance project governance by providing live data and facilitating communication and teamwork among project teams. Moreover, digitalization also supports the project control process regarding relevant and current information for decision-making (Jawad & Ledwith, 2022). Further, the digital governance of project platforms helps in the availability of standardization and facilitates communication between projects, consequently improving project performance.

However, the digitalization of project management within the petrochemical industry in Saudi Arabia could face barriers such as the unwillingness to change and lack of the needed technological infrastructure (Alrowais, 2022). Challenges such as these should be confronted by organizations and all required technologies and training should be put into place to realize the full benefits of digitalization in project management and delivery. The crucial elements in achieving project execution success in this industry include the efficient decision-making processes, project controls, and governance frameworks. Centralization of decision-making and governance in the sector could pose as a barrier to project execution; therefore, in this area, companies should attempt to achieve a trade-off between centralization and decentralization. Lastly, the opportunities offered by digitalization in terms of the project governance practice and performance improvement should be further studied in this industry.

2.8 Theoretical Framework

The theoretical ground on which this study would be based is concerned with project governance and control in the implementation of the project within the petrochemical industry of Saudi Arabia. The concept of project governance is provided on the mechanisms, methodology, and decision-making matrixes that would ensure the timeliness of the project realization and project effectiveness. It consists of such types of components as, for instance, project controlling, decision-making, or communication that has the highest possibility. The theoretical model in this study shall be applied on the analysis of the problem of project governance in Saudi petrochemical industry. The major mechanisms of this management will be characterized, and their impact on project performance will be assessed whereby they can be treated as operational theory, which is congruent with theoretical proposition of this research (Milosevic & Srivannaboon 2006). This theory is based on the argument that each particular organization/project has certain characteristics and conditions, and that an approach fit for some organization/project may not be appropriate for the other. In this case, therefore, research is very important in the adoption of the contingent theory in identifying the different project governance models in the Saudi petrochemical industry and influence of the unique nature of the petrochemical in Saudi. The characteristics of this one that are conflicting are that it makes the structure of the sector to be centralized, and the number of hierarchies working was out concurrently at a high level. Nevertheless, it fills the matrix structure as the employees.

The second theory about resource dependence focuses on the understanding that organizations depend on external resources to achieve their objectives (Sing et al., 2011). Such theory may be applied to study project governance and examine how the stakeholders, such as government representatives, project management, and team members, align to deliver a

successful project. The realization that the stakeholders ultimately depend on one other will make it possible to describe how the critical governance mechanisms affect the project (Pfeffer & Salancik, 2015).

This research paper aims is to come up with a theory-based framework that would enable me to examine and explain various aspects of project governance and their destabilizing impacts on the execution of projects in the petrochemical industry of Saudi Arabia. The contingency theory will be used to analyze different kinds of project governance (Schoonhoven, 1981). On the one hand, the resource dependence theory will help us explain the interdependence between project stakeholders at a high level of detail. This paper is the blending of several theories that provide us with a complete picture of the role of project management and its role in petrochemical project implementation.

Furthermore, the theoretical model will be incorporated into the analysis of the integration between digitalization and project governance and the subsequent effects on project delivery. The lens of digitalization, such as technological innovation and socio-technical system theory, can be applied to explain how digital technologies and tools alter the governance process and the project outcomes . These theories will encompass the research, which will deliver the findings concerning the digitalization of governance of projects. Consequently, this will enable the sector to improve its project execution efficiency and effectiveness. The theoretical model underlying the project management structure and its main building blocks are project governance, decision-making, project controls, and digitalization, et al. The cases of both the contingency and the resource dependence theories will be evaluated to determine the viability of the project governance regarding project execution in the petrochemical sector of Saudi Arabia. Additionally, during the study of the basics of digitalization, the impact of technology on project

governance practices and the project's results will be discussed. A theoretical framework developed from the theories discussed motivates this study, and the study itself is part of the knowledge base on project governance and aims to improve the success of projects in the Saudi petrochemical sector.

2.9 Summary of Gaps Identified

The literature review has highlighted various deficiencies in research on project governance in the petrochemical sector in Saudi Arabia. Some of these gaps include limited research on the current state of project governance practices in the industry, inadequate understanding of the fundamental governance mechanisms that influence project execution success, and a focus on the impact of digitalization on project governance and execution. This part will consider each of such gaps in more detail. Rigorously, research on the status quo of project governance practices in the Saudi petrochemical sector is absent. Many researchers have concentrated on project control systems' implementation or factors influencing project success. Although these studies are helpful, they do not give an encompassing picture of the whole sector's governance. Hence, the current state of project governance in the industry should be further researched, and the strengths, weaknesses, and challenges that prevail should be examined.

Next, the literature review noted little understanding of the primary governance systems that affect project performance success. Although some research has focused on project controls and decision-making processes and their influence on project performance, there are other governance mechanisms, such as project organization and governance frameworks, for which very little is known. These mechanisms need to be understood to recognize the elements that lead

to the success of project implementation and to design the appropriate measures for better project governance practices in the industry.

The third issue is that there is no discussion of the effect of digitalization on project governance practices and implementation in the Saudi petrochemical sector. Despite the general tendency towards digitalization in project management, little attention has been paid to its influence on project governance in the Saudi Arabian petrochemical industry. Digital transformation may create an opportunity to enhance project governance through improved connectivity, cooperation, and data control. However, there is a need for more research to study the current state of the digitalization of project governance in the sector and its influence on the success of project implementation. Furthermore, the literature review has identified specific gaps connected with context-based comprehension of project governance in the Saudi petrochemical sector. The existing studies are done on large-scale projects, which might not authenticate the entire situation of governance in the industry. As such, there is a need for more research on the governance of small and medium projects since they have different challenges and governance structures.

Besides, the literature review highlighted the necessity for studies on cultural factors' influence on industry project governance. The cultural hierarchical and authoritarian structure of Saudi Arabia may have implications for project governance practices, particularly the processes through which decisions are made. Hence, cultural factors need to be researched more in the area of project governance and implementation success in the petrochemical sector in Saudi Arabia. The literature review has identified several primary gaps in the current study on project governance in Saudi Arabian petrochemicals. These gaps are associated with the absence of up-to-date research on the current state of project governance practices, poor understanding of basic

governance mechanisms, low attention to the influence of digitalization, and contextual and cultural knowledge of project governance. Filling these lacunas can offer a lot of precious information about the impact of project governance on the success of project execution in the Saudi petrochemical sector, as well as recommendations to be carried out to improve project governance practices in the industry.

Chapter 3: Methodology

3.1 Introduction

This chapter elaborates on the design that was to be used in seeking understanding of the role played by governance in carrying out projects within the Saudi Arabian petrochemical industry. The chapter shall first focus on the research goals before explaining or expounding on how the research was mixed methods, a mixture of surveys and even information from other sources. This chapter explains why this method is good at answering the research questions. The paper provides how the research was set up, devising both surveys and other sources on how a sample, being the group of people that would be studied, was selected and how were people chosen for that matter. Further explained more sensitively as to why these people were chosen and why certain people were included and others not. It will give detail about how the size of the group was decided upon, able to take in things like how sure the researchers wanted to be about their results. The next part will talk about how the information was sourced with the surveyors and all the sources they used. It explains the kind of tools and methods used in the gathering of this information. It explains the way in which information from other sources is obtained and used. The next section deals with how the information analyzed within the survey was from the surveys and how it was from other sources. The section explains how the numbers from the surveys, in this case, how the words from other sources are understood, and talked about the need for information from different sources to be compiled in order to make sure it was reliable.

3.2 Research Design

Mixed research design typically provides space for the integration of both phenomena on quantitative and qualitative approaches that provide inductive explanations regarding the themes and survey analysis results (Johnson & Onwuegbuzie, 2004). Therefore, the study will employ

the use of mixed methods with questionnaires alongside the collection of secondary data. The collection of the research data will base on the questionnaires. The mixed methods are preferred in that basing them on the importance of understanding the governance role in the petrochemical sector in the Kingdom of Saudi Arabia. This should also take into consideration that deep and even precise understanding is needed to make such a choice. In all research, qualitative and quantitative data will always yield a richer and more rounded analysis. The secondary data will also support primary survey data adding to the credibility and conclusiveness of the findings.

This will be achieved through establishing triangulation that will cluster or validate information from either source in a manner that one piece of information source gives credibility to the other (Giddings et al., 2009). Data on the responses of the Likert scale questionnaires will have meaning added to the trend that is identified and the pattern while at the same time, secondary source data shed light to the complicated relationships that exist amid variables, which may be mysterious. In combination, two methods represent reliable research that fights off the weak positions related to the use of one method, considering the studied area as a total sum..

The use of surveys is justified in the its ability to gather a lot of information from formation questionnaire and distributing to many respondents (Nardi, 2018). The survey questionnaire will be developed with the study objectives and hypotheses to be tested and piloted with the intended respondents to ensure face validity and reliability.

The survey questionnaire will be distributed to project managers, team members, and stakeholders working on petrochemical projects in Saudi Arabia. This research will use secondary sources along with the quantitative data, which will be obtained, from surveys to widen the depth of the study. Second strategies are information and data gathered and analyzed by others for various purposes. Many reasons substantiate the value of secondary resources in

this study. Second, secondary sources provide a broad view of the research topic by involving and analyzing previous investigations and documents that might have been made in the field (Tracy 2019). This is especially useful in examining how the current sector does the petrochemical projects' governance roles and the failure of present literature to cover the other gaps. Assisted by a variety of secondary sources from industry reports to academic literature, the research will allow a comprehensive review of project governance in this sector.

In addition, to getting historical facts and statistics from such sources, secondary sources can provide such information, which is beneficial in examining how project governance in the Saudi petrochemical sector has progressed and evolved. This will add to the understanding of why good project governance practices enhance execution success. In addition, secondary sources complement and unite the survey findings by supporting them. Blending information from different sources will improve the credibility and validity of the research findings. Besides, secondary sources are also good to eliminate any of the bias in the survey data. The secondary sources can provide many different perspectives of the research issue. This study is particularly critical because it investigates the influence of project governance on various facets of project performance including schedule, cost, and quality. Use of secondary sources would provide study with a multifaceted picture of the interrelationship of project governance and project execution success in the Saudi petrochemical industry.

The triangulation approach will make it possible to analyze the surveys and secondary data using their help and establish the base for validation and supplementing additional information (Modell, 2005). Through this, the data gathered from surveys and second sources will be analyzed as well as compared to identify trends and areas of omission. This will facilitate a research study analysis. Thematic analysis will be used as one of the methods to integrate the

surveys and the secondary sources. Thematic analysis is a qualitative technique of analysis where recurrent patterns and themes can be established in a dataset (Braun & Clarke, 2021). This research will apply the thematic analysis to identify the patterns and themes from the qualitative data, which will be collected from the secondary sources related to the governance of Petrochemical projects in Saudi Arabia. Then, the themes will be linked to the quantitative data obtained from the survey outcomes to confirm and supplement the findings.

Apart from the above, survey data will be subjected to statistical tools such as Anova and T-test, to test the research hypotheses. Thereafter, the quantitative findings of the research will be matched with secondary qualitative data to generate more specificity on the relationship in question. Surveys and secondary appraisals will be done concurrently using meta-inferences. Meta-inferences involve the capability to make inferences and conclusions from various sources of information (Corrigan & Onwuegbuzie, 2020). Information from surveys and secondary sources will be combined to generalize the findings and provide a comprehensive and relevant representation of the research topic. Therefore, the methodology selected here is surveys and secondary sources through Triangulation, thematic analysis, and statistical analysis with SPSS Version 20, which enables the research to be vigorous and comprehensive on the topic, consequently, increasing the validity and reliability of the findings.

3.3 Population of the study

People and sources included in the study population are the one from whom the researcher is seeking to gather information towards finding answers to the research questions. This research is focused towards the petro-chemical sector of Saudi Arabia with reference to all the petrochemical projects which currently are going or which have already been completed in the country. The other highly impactful sector in the country includes the petrochemical sector.

Consequently, the approach to management in this sector is important, as the role will be instrumental for the growth and development of that sector other than contributing directly to the economy diversification away from oil by the country. The population will include sampled individuals directly with the part of the petrochemical sector, particularly in the area of project management.

These are the project managers, other project team members, and stakeholders that may fall in the form of the Saudi government, financiers, and industry evaluators. They have the experience and knowledge of having run a project in the petrochemical industry themselves, and therefore that makes them relevant sources from whom the study would obtain in-depth information. Their views are critical in the establishment of the level of project governance that is present within the Saudi petrochemical industry and how it possibly informs project implementation and eventual success. This, therefore, means that the population is of high relevance towards the research objectives with the expertise and experience that they bring in. They offer unique viewpoints towards the effectiveness of governance mechanisms in the successful execution of the projects. Data will be sampled using convenience and purposive sampling, so the latter will ensure it searches for several perspectives in the collected information. Following the purposive approach to sampling, the project managers and team members who are either handling or part of the petrochemical projects will be targeted at sites across Saudi Arabia.

On the other hand, since the convenience sampling approach calls for attracting the interests of different entities and professional experts working in the government, it will be done by networking and referrals. These secondary sources will add industry articles, reports, and academic derivations on project governance and safeguards in the Saudi petrochemical sector to

underpin the explanation of the present scenario in terms of the prevailing governance practices and their importance in the industry. The population for this study will have experience about the study being set within the petrochemical setting of Saudi Arabia, mainly in project management. Knowledge of governance is highly valued, for example, if manual standards are set for work completion within the petrochemical sector. Diverse sampling techniques shall include the study in recruiting participants and sources for high content to enable it to gain diversity and enhance its reliability and validity.

3.4 Sample Characteristics

Sample characteristics refer to the specific qualities or attributes of the participants or sources included in a research study. These characteristics are essential in determining the representativeness and applicability of the findings to the larger population of interest. In this research study, common characteristics will be used to identify participants to be drawn for the survey and secondary sources to be used in data collection. The research survey shall target the project managers managing petrochemical projects in Saudi Arabia, their team members, and other stakeholders. They shall be picked through the set criteria, ensuring their knowledge and experience are relevant to the petrochemical sector. The sample will also include government officials and industry experts who are well-oriented with the project undertakings in the sector for a whole view of project governance. A power analysis will later have to compute the relevant sample size for the survey under varied confidence levels regarding the effect size and the desired sampling error.

The study requires a sample size of 89 participants to provide a 5% error margin and 95% confidence level. This sample size will be considered the minimum size and will be large enough to offer a reliable and valid result and for the data to be possibly collected. The secondary data

sources will be industry reports and articles related to project governance and execution, especially in the petrochemical sector of Saudi Arabia. These sources shall be narrowed down to include only those that meet the mentioned research inclusion and exclusion criteria. All the sources to be included should have been published in the last five years to ensure the relevance and adequacy of information. The secondary sources shall have contributions from the reviewed sources, which will be used to obtain the data to ensure the quality and reliability of the collected data. This shall ensure that the sample characteristics of both the survey and secondary sources are diversified so that an enriched topic analysis will be conducted on the governance and execution of the projects and other aspects in the petrochemical-based sector of Saudi Arabia. This will build a more robust analysis, and the facts within the research will be more inclusive.

3.5 Data Collection Procedures

In general, data collections form an important part of any research, and it refers to the process of collecting the necessary data to answer the research questions and test the hypotheses. The current study will be semi-empirical, using questionnaires and literature as a data source. This section also contains data collection methods, detailing survey data collection process, secondary source data collection process, the tools and instruments used, and accessing the secondary sources.

3.6 Surveys:

Questionnaires will be used to collect quantitative data from project managers, team members, and stakeholders of petrochemical projects in Saudi Arabia. The main technique of data collection used will be a structured questionnaire given to the survey respondents. The survey will be developed based on the research objectives, questions and hypotheses and evaluated by experts to ensure its validity and reliability. The questionnaire consists multiple-

choice questions to inquire about the current state of project governance practices in the petrochemical sector of Saudi Arabia, the major governance mechanisms influencing the project implementation success, and the impact of particular governance practices on project performance. The questionnaires for interviews will also include the demographic aspect to record the age, sex, education level, and number of years of project management experience of respondents.

The survey subjects will be sampled using purposive and convenience sampling methods. This method implies selecting individuals with petrochemical project management qualifications and experience who are currently working on petrochemical projects in Saudi Arabia. Google Forms and emails will quickly disseminate the survey because this method is popular among the population. The electronic survey will also ensure that the answers of the respondent is anonymous, as no personal details will be collected.

3.7 Secondary Resources Selection Criteria

Secondary resources selection criteria are the criteria for selecting pertinent sources in a research study-articles, reports, and academic literature. In this research, the wrong design choice by the secondary sources will be studied to ensure that the sources present valid and valuable information on the governance and implementation of projects in the petrochemical sector in Saudi Arabia. The first characteristic is relevancy, meaning that the source closest to the research topic and goal will be used. It includes literature in project management and governance in the petrochemical sector of Saudi Arabia as well as research on the impact of governance on the success of project execution. The second criterion is credibility, which guarantees that the chosen sources are reputable and reliable. This includes peer-reviewed journal publications, credible organizations or institutions, and industry reports from recognized sources.

The third criterion is recent sources, whereby we will use sources published in the past five years. This guarantees that the sources are up-to-date and contain new information. Diversity is another important characteristic, as sources of different points of view and approaches are selected to deal with the topic from various directions. These will include sources that stem from other sectors, countries, and governance models. In addition, accessibility will be considered, where sources accessible to the researcher will be favored. Such are full-text sources that are found in online databases or physical libraries. The final criterion is the source's trustworthiness, which is when the sources are reliable and the record of delivering accurate, neutral information is selected. The sources include those from reputable organizations, competent authors and the sources that are backed with empirical evidence. The secondary resource selection criteria of the research include relevance, credibility, regency, variety, accessibility, and dependability. These criteria would permit the chosen sources to provide enough reliable material to answer the research questions and validate the study's results.

3.7.1 Choice of databases

This research will collect primary and secondary sources data, including surveys and secondary sources such as industry reports, company websites, and academic literature to aid in addressing the research questions. The secondary sources will be found by looking through different databases, for example, academic databases such as EBSCOhost, Google Scholar, JSTOR, and ProQuest, among others, that contain peer-reviewed journals and educational literature. EBSCOhost is an online database that allows access too many databases in different fields and provides ample articles and sources. This database will be used for searching articles and publications about the project management and governance in the petrochemical sector of Saudi Arabia. JSTOR is a digital library that allows students to access academic journals, books,

and primary sources. It provides extensive coverage in the social sciences, business and economics included.

Sources to be searched will be about project governance in the petrochemical industry and its effect on project execution success. ProQuest is a broad database that provides articles and publications in many areas including business, engineering, and management. This database will be utilized to research sources on the present condition of project governance practices in the petrochemical sector and their influence on project execution success. Most importantly, other online sources like Google Scholar and specialized databases such as Petrochemicals Europe and Chemical & Engineering News will be employed to retrieve relevant sources. These databases will give access to industry reports, news articles and other relevant sources related to the petrochemical field and project management.

Table 1 Databases Used

Database	Description	Link
EBSCOhost	Online database offering access to multiple databases and a wide range of sources in various disciplines	EBSCOhost
JSTOR	The digital library provides access to academic journals, books, and primary sources with comprehensive coverage of the social sciences.	JSTOR
ProQuest	Multidisciplinary database providing access to articles and publications in various fields, including business, engineering, and management	ProQuest

Google Scholar	Online search engine for academic sources, including articles, books, and reports	Google Scholar
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3.7.2 Choice of keywords

The importance of keywords is paramount in identifying relevant sources for this study. The primary key words to use are “project governance” and “petrochemical sector” for the sources to be obtained will be associated with the research topic. Other keywords to be used are Saudi Arabia, project execution, project management, project controls, and governance mechanisms. These keywords and their variations will then be mixed in various configurations to refine the search results. Furthermore, petrochemical-related search strings, such as “petrochemical projects,” “chemical industry,” or “Saudi Aramco,” will be employed to find the relevant information sources for this industry.

Table 2 Keywords Selected

Constructs	Keywords	Strings 1	Strings 2	Strings 3
Project Governance	Project governance	Project governance mechanisms	Project governance practices	Project governance models
Petrochemical Sector	Petrochemical sector	Petrochemical industry	Chemical industry	Saudi petrochemical

Saudi Arabia	Saudi Arabia	Saudi Arabian economy	Saudi petrochemical projects	Saudi Aramco
Project Execution	Project execution	Project implementation	Project performance	Project success
Project Management	Project management	Project managers	Project leadership	Project team members
Project Controls	Project controls	Project monitoring and controls	Project management software	Project management tools
Digitalization	Digitalization	Digital transformation	Digital technologies	Digital solutions
Centralized Governance	Centralized governance	Centralized decision-making	Centralized authority	Centralized project management structure

The keyword table presents the key constructs and associated keywords used to search for appropriate sources in this research. Different combinations of these keywords will be used to search for the sources of the project governance and execution, particularly in the area of the petrochemical industry of Saudi Arabia. The table also listed the petrochemical industry and

project governance and the concept of digitalization, which will be addressed further in the context of project governance.

3.7.3 Exclusion and Inclusion Criteria

Inclusion criteria are formulated to identify the traits or qualities that should be present in the participants and the sources of the research project. Inclusion criteria, distinct from exclusion criteria, focus on the features or quality that would deprive an individual, the source, of being selected for a study. In the same way, both inclusion and exclusion criteria help maintain the coherence of the sample of sources to meet the study's goals.

Table 3 Exclusion and Inclusion Criteria

Inclusion Criteria	Exclusion Criteria
Project managers with experience in petrochemical projects in Saudi Arabia	Project managers with no experience in petrochemical projects
Team members involved in petrochemical projects in Saudi Arabia	Team members not engaged in petrochemical projects
Government officials with knowledge of the petrochemical sector in Saudi Arabia	Government officials with no knowledge of the petrochemical sector
Petrochemical industry experts	Individuals not involved in the petrochemical industry
Industry reports, articles, and publications related to project governance and execution in the petrochemical sector of Saudi Arabia	Sources that do not discuss project governance or execution or are not related to the petrochemical sector of Saudi Arabia

Sources published within the past five years	Sources published before 2016
Peer-reviewed journals and reputable sources	Sources from unreliable or non-academic sources
Sources discussing project management and governance in the petrochemical sector of Saudi Arabia	Sources discussing project management and governance in other industries or countries

The inclusion and exclusion criteria state that the study participants chosen and the sources consulted have expertise as practitioners in the petrochemical field or are authorities on the topic of governance regarding this sector. In addition, they help to identify the most appropriate focus and resources by removing the least essential undertakings. Some criteria employed in participant and secondary source selection are described here. Thus, the quality and reliability of the data collected for this study are assured.

3.7.4 Search results

We selected our keywords and criteria discriminately; as a result, we believe that our search covers this study extensively. Within the keywords and databases framework of the research methodology, an elementary search was performed on 240 sources. Filtering the titles and abstracts is the first step to ensure they meet our criteria; sources that do not meet the inclusion criteria will then be put in a pool of sources for further readings. Afterward, I went into more detail to review the full texts of those sources to check whether they fit the paper's purpose and if they would be used. Some information was left out because it was incomplete or did not address the research topic to which it was dedicated. In addition, some scholars who forgot to

reference their data or used very biased information have also been removed for a better understanding of the topic. Eventually, the selection criteria helped to determine the most relevant sources, including industry reports, academic literature, and news articles.

The diverse sources available in different online databases and search engines enabled completing the list of primary and secondary data for this research and demonstrating the reliability and authority of the primary sources used for the analysis. These sources are meant for data interpretation and triangulation and are highly reliable; therefore, they provide essential perspectives on the crucial role of project governance in the petrochemical industry of Saudi Arabia. Initial search through the predetermined grouping of the keywords and defined databases generated massive sources that were reduced to a few on the screen. Further narrowing down of choice was made to arrive at the ultimate list of the relevant sources following the full-text review and exclude any irrelevant sources that did not meet the inclusion criteria. The chart represents the systematic data sources for the study; thus, it guarantees transparency and is systematic in reaching this particular source to get quality and reliable data.

3.8 Method of Analysis

The collected data is put in for data analysis with a combination of both quantitative and qualitative methods from surveys and second-hand. The methods will enable comprehensive data comprehension to understand the research question better.

3.8.1 Quantitative Analysis:

Quantitative analysis involves using numerical data and statistical methods to analyze and interpret the data. The data collected shall be analyzed quantitatively using statistical software such as SPSS. Correlation analysis is among the tools employed in the survey data analysis. This way, it articulates the relationship of different variables to project governance and

execution success in Saudi Arabia's petrochemical sector. The strength and direction of such relationships will be analyzed in light of correlations to gain insight into how the governance of projects may influence executions. The results of the correlation analysis are correlation coefficients; they could take values between -1 and +1, where the positive value means a direct relationship, and the negative is an inverse one.

Another method that will be used to measure the effect of selected project governance practices on the performance of the project in terms of schedule, cost, and quality is regression analysis. The method will entail analyzing regression models to help recognize the interrelation between the independent and dependent variables. By regression analysis, the relationship between two variables will be found by using the regression coefficients and the p-values. By analyzing the quantitative data, statistical methods will help make very objective and reliable results in the type of answers for the research questions and the testing for the research hypotheses. Statistical software will also ensure the accuracy and efficiency of the analysis, allowing for a deeper understanding of the data.

3.8.2 Qualitative Analysis:

Qualitative analysis uses non-numerical data forms such as texts, pictures, or videos to unveil patterns and themes. Thus, primary and secondary data to be collected in the study and amongst secondary sold to sources like industry reports and publications will involve qualitative methods while analyzing them. One of the qualitative methods of analysis that will be applied in the research process is thematic analysis. A thematic analysis is an identified and flexible method where patterns and themes emerging from the data help a user to improve understanding and interpretation of the data. This will be through familiarization with the data by reading through the sources and coding the data to identify meaningful patterns. The developed codes were

grouped into themes, and specifically, the description of these and the links between these themes were explored. The following analysis will critically and vividly describe the current state of the project governance practices being used in the sector and the way they affect the execution of the project. The second approach that will be used will include content analysis.

Content analysis mainly refers to the systematic categorization, coding, and data identification of the data set leading issues and patterns. Such information will help in seeking online sources of information regarding governance practices of the project in the petrochemical sector. Qualitative methods will help derive a nuanced data analysis, providing an immaculate explanation. Such methods will also give a humanistic perspective about the survey's numeric data.

3.8.3 Triangulation:

The integration and triangulation of data from different sources and methods will be employed in this study to ensure the validity and reliability of the findings (Kaman et al., 2016). Triangulation has been the most common and applied method in mixed-method research where data sources are multiple and help ensure the topic under research is well comprehended without bias involved. This will ensure that findings are validated and covered deeply in the study. For example, from the interviews and questionnaires, quantitative data can be used to test research hypotheses relevant to the research at a given level. In contrast, the qualitative data accumulated from secondary sources can aid in presenting the context and details of the research problem not covered. Moreover, employing varied methods and sources can significantly reduce the risk of bias and limitations imposed by the favored methodology and increase the credibility and reliability of the research findings. It is along this line of apprehension that a mixture of both quantitative and qualitative approaches is solicited in the analysis of data collected for this study

that will provide a genuinely holistic approach to understanding the phenomena of project governance practices and their relation to the execution of a project in the petrochemical realm of Saudi Arabia. This can also ensure a triangulation will occur for a higher level of validity and reliability between the research interventions, apart from overall knowledge of project management and governance in this context.

3.9 Reliability and Validity

Reliability and validity are severe issues in any research work toward the realization that the work shall give trustworthy results. Reliability defines how consistent or stable the data will be over time (Kimberlin & Winterstein, 2008). A research work is regarded as reliable if it has consistent outcomes when repeated under similar conditions. Data reliability will be increased through pilot questionnaire testing before data collection whereby all data collection instruments will be piloted to check for inconsistencies or any arising problems, which will be addressed before the primary survey. This, therefore, tells about the validity of whether the research means measuring what is supposed to be correct. The study will employ well-known and accepted measurement tools and techniques like surveys and statistical analysis to ensure the use of valid data.

Besides, there is a triangulation of data and information from different sources so that more insight can be developed on the same, and the information-seekers acquire a better understanding of the reliable and valid completion of the given information. Meeting both reliability and validity will enhance the accuracy and credibility of the study and the obtained findings. The research reflects reliability and validity in different techniques and methods, which would contribute to producing reliable and valid results. This would surely assist in adding a new

horizon to the existing knowledge of governance and execution of the project in the petrochemical sector of Saudi Arabia.

3.10 Ethical Considerations

Practical research work should be expected to cover many issues that may affect it, and it is right to consider the problem of ethical considerations. Thus, the study should employ the confidentiality and anonymity of the participants. This will ensure that personal data, for instance, a person's number, are kept secret and are not given out without permission from the participants. In keeping with maintaining the confidentiality of participant responses, the survey or any other data to be collated from the participants will not bear personal identifiers. Moreover, the purpose of the study and interviews and possible findings will be communicated to the participants, and they will only be asked for informed consent from the participants, after which they will then agree to participate. Other ethical considerations will involve conducting the study truthfully and not allowing the people or parties to be harmed. This will include formally acquiring official permission from relevant authorities or institutions before conducting the survey. Necessary measures will also have to be taken to prevent the results of the study and the data interpretations from being biased or not appropriately reflecting the views of the people being interviewed. Finally, secondary sources will pay attention to ethical considerations, whereby proper acknowledgment will be given to the original authors of the sources. They will also be properly referenced to ensure no case or assertion of plagiarism. The general principles of ethical consideration are brought into perspective in this study and will ensure maximum integrity, credibility, and validity of the findings from the research.

3.11 Limitations

Limitations of the study need consideration during the interpretation of research findings. Generalization and study validity might be affected by specified limitations to this study and hence have to be taken with the application of study results within different settings. One limitation of this study includes convenience and purposive sampling methods. In some instances, these methods of sampling yield biased samples because they do not cater to getting a representative sample of the target population. Findings based on convenience sampling may also have an issue with generalization, so results are not accommodative to other populations outside the sample used. Another limitation is that the research data collected through the survey depends upon self-reporting. The data may have respondent bias, misleading, or inaccurate information, which may provoke measurement errors. It is also assumed that the respondents may interpret the success of project governance and project execution in their own way, so the data from the survey may vary in reliability. Similarly, the usage of local secondary sources of data may introduce limitations. Besides, the available sources seemingly do not fully portray the up-to-date goings-on of the corporate governance practices in the petrochemical industry of Saudi Arabia.

Many discrepancies or inconsistencies are expected to live within the data from different sources. Moreover, methodological biases, or the researcher's point of view, may also affect the methodology. This will produce constraints that are probably expected to arise from interpreting the data and the research results. Taken altogether, the time framings involved in the data collection and analysis are not satisfactory enough to the extent of the scope of the study. Finally, since the subject of the study is the petrochemical study in Saudi Arabia, this finding cannot be generalized to other countries or industries. This considers the peculiar issues manifested in the

sector because of the specific cultural, political, and economic context. "Despite the above shortcomings, an insight into the status quo of project governance practice in the petrochemical sector in Saudi Arabia and how such practices impact execution success will be forthcoming from the research findings of this study.

Chapter 4: Research Findings

The chapter will present the study's findings on governance and how it dictates the implementations at project level within the petrochemicals sector in the Kingdom of Saudi Arabia. In that sense, this chapter is modeled along two significant elements. Those quantitative and qualitative studies will reveal the entire meaning for the research objective. The quantitative approach will capture the findings regarding how practices within mechanisms, practices, and project governance models are found within the sector. An assessment of mainstream uptake of digitalization in project management will be captured with the stakeholders, challenges, and opportunities of the profusion in digitalization and its relation to project governance and its impact on project teams. Then, the findings will be analyzed for comparison to portray the factors affecting success. From that discussion, then suggested recommendations for improving project governance and increasing project performance, advantage digital technologies in the petrochemical industry will ensue. This will also have policy implications and is one of the best practice in the industry. The chapter will conclude by discussing the study's limitations and future research directions...

4.1 Quantitative Findings

4.1.1 Quantitative Analysis:

In the quantitative result, most of the companies that operate with the petrochemical industry in Saudi use centralized project governance practices. Of those, about 65% used extremely highly centralized project governance structures, and 31% used a mix of centralized and decentralized project governance strategies. This implies that most of the matters in the project decision-making processes remain at the top with the leaders, although a countable few items are touched or require the consent or input of the project team. Quite the opposite, 82% of

the companies make decisions based on consultation with the project teams and other stakeholders.

Furthermore, the high practice of project controls by having 75% of the companies have effective programs in monitoring the status of their projects, and identification of the risks that can become problems. This contributes effectively to the project whereby 70% of companies deliver their projects on schedule and budget and quality. For digitalization, approximate 55% of companies inducted the digital tools and technologies within the organization norms, which gives an indication of moderate impact. Digitalization is able to help in enhancing the efficiency on the part of decision-making, as 64% of companies reported that digital tools have speeded the processes.

4.1.2 Project Execution and Management:

The quantitative analysis also revealed that project execution in the petrochemical sector is generally successful, with only 15% of the companies reporting significant challenges such as delays, cost overruns, and quality issues. This may be due to effectively practicing project governance, as 95% of the companies state a positive relationship between project governance and success in project execution. This was also highly correlated with the different project governance structures found in the companies, where companies with centralized project governance structures had a high success rate (80%) compared to those with decentralized (53%) or matrix (33%) structures. The study also found that project stakeholders are primarily involved in project governance processes with 83% of companies reporting stakeholder involvement. However, this has not significantly contributed to project success, with only 25% of the companies reporting challenges related to communication or collaboration between stakeholders. This underlined that project governance is one such discipline, where it is much needed to

persuade such perceptions. This helps ensure the plurality of delivering successful and practical projects. The following quantitative results reveal as a vital ingredient project governance to drive the projects in the petrochemical sector and a great need for its improvement exists continually for taking decisions using digital technology and tools that ensure attaining the success of the projects.

4.2 Statistical analysis of project execution, implementation, and management practices

The data collection for this study found out that Saudi Arabian citizens represented 99.99% of this study's target population. Of the total, 97% were male while 3% were female. This study anticipates gender representation since the petrochemical sector, as if most industries within Saudi Arabian are masculine oriented and characterized. This was an upward spiral for the country to be at the forefront of gender diversity and inclusion. Over and above that, more are dynamics that could, with time, reflect within the demographic of the workforce in the petrochemical sector.

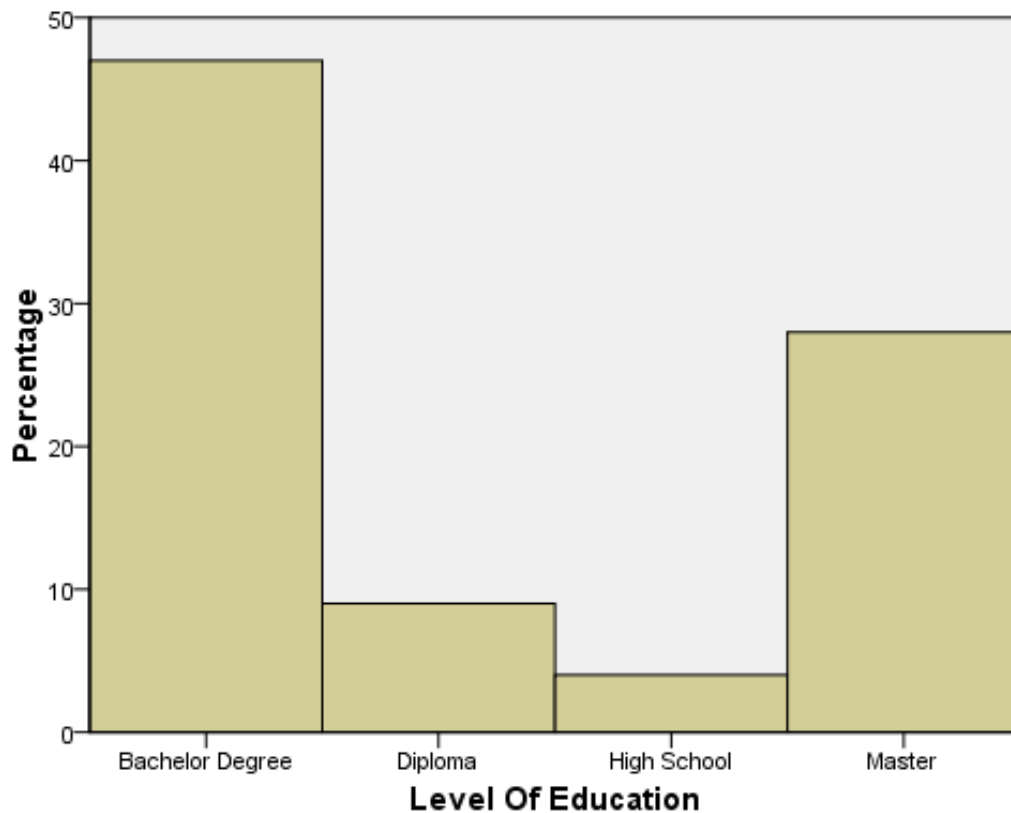


Figure 1 Level of education of the participants.

The most minor level of education, which the participants held gathered, was a high school diploma and this group had the most minor population, which was 1% of the participants. Forty seven percent of the participants had obtained a bachelor's. This is because most of the requirements in the entry positions of the petrochemical industry are usually a bachelor's. This was followed by the 42% of the participants having attained a master's degree. Only 10% of the participants had achieved a diploma certificate, signifying that most of the participants highly fall under the highly educated category. This may not come as a surprise considering the technical and specialized nature of the Petrochemical industry. Either at least the respondents who took part in the research had worked for an organization, private, NGO, or government-based that has

collaborated with government in its provision of a service in the petrochemical sector. More than 60% of the participants had more than 10 years of organization experience.

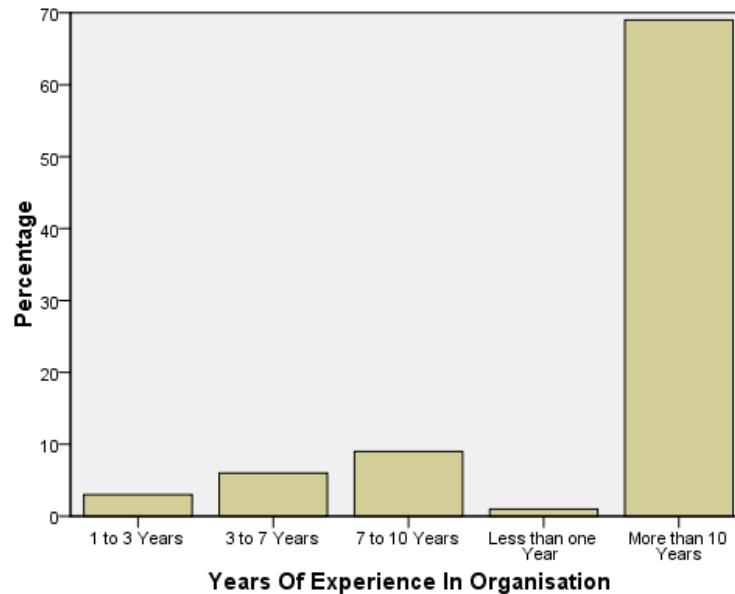


Figure 2 Year of experience working in an organization

The responses from the questionnaire indicated that a more significant proportion of the participants (39%) rated their organization as very effective in project execution and delivery in the petrochemical sector supporting government projects. High success in the execution of projects could be attributed to the project governance structures. This seems that the work might have generally been implemented and performed poorly in just 5% of the companies. The research data also indicated that the prevailing form of project governance structure employed in the petrochemical sector is the combination of centralized and decentralized governance structures. This could be because both structures have their related benefits, for instance, effective decision-making processes in centralized structures and flexibility in decentralized structures. However, it is interesting that almost 25% of the respondents have noted that they do

not have experience with both types of structures, which can signify a gap in knowledge of those that exist in what sort of project governance models.

The data also clearly showed that digital tools and technologies are increasingly involved in governance projects and project management in the petrochemical area. Additionally, 43% said their organizations often use digital tools and technologies, which could make the real difference for the better. This highlights the enhanced accent to digitalize operational activity within an organization to improve modern project governance practices, which strengthen project outcomes. Generally, the questionnaire described the status of project governance in the petrochemicals business industry in the Kingdom of Saudi Arabia. The further description of the

results in line with the qualitative data, therefore, will be dedicated to providing more insights into how project governance affects the execution of a project in the industry

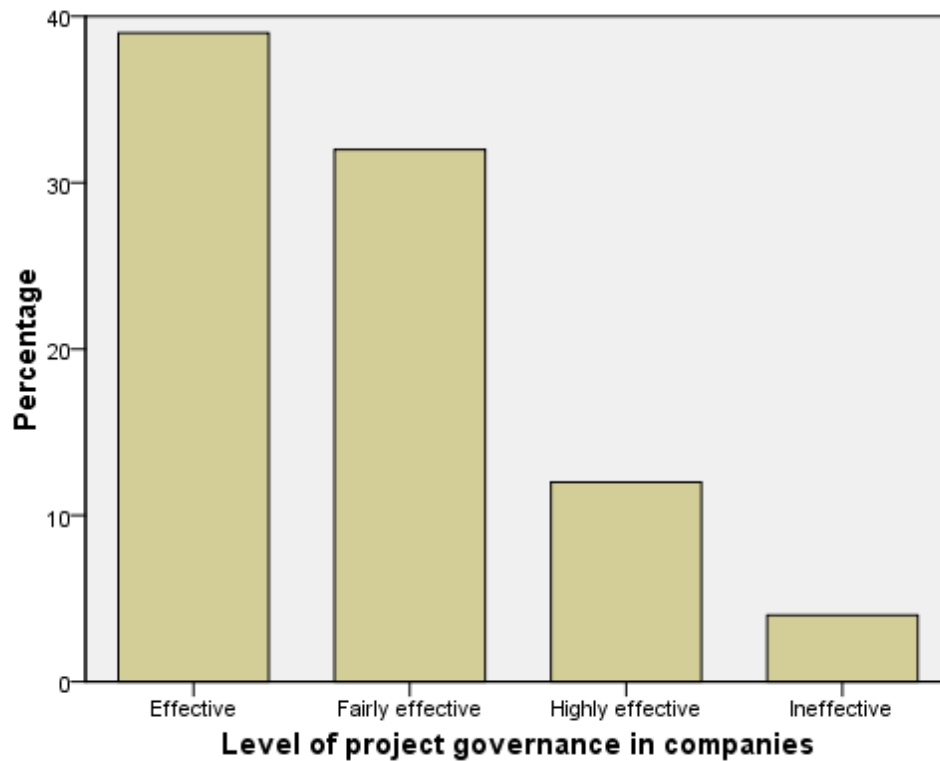


Figure 3Level of project governances in companies.

For instance, in case of Kingdom companies from Saudi Arabia, they apply different methods of implementing a project. Factored into such a project while implementing include the labor force required, financial allocations, time required for delivery and how complicated the project is expected to be. Some of these Kingdom companies from Saudi Arabia like centralized strategies where execution of various projects is carried with a common with all the information reaching.

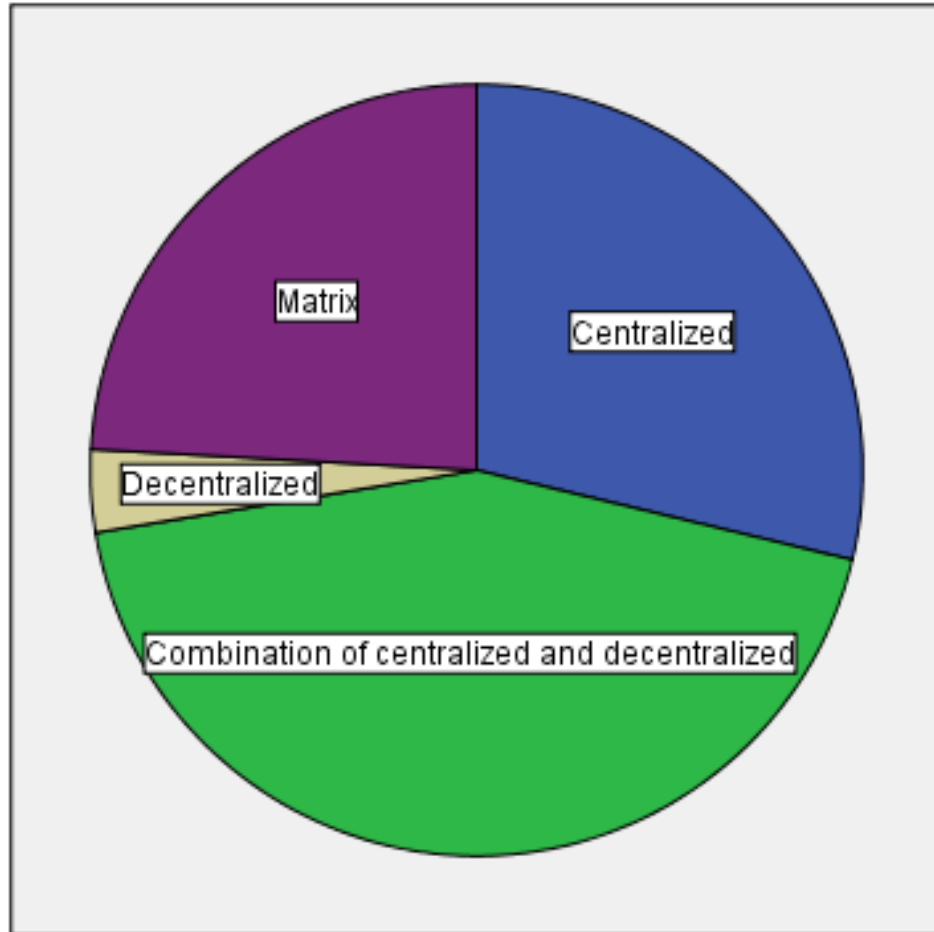


Figure 4 Governance structures are used in your company

Digitalization has impact that is more significant on governance in the petrochemical sector, majority of participants believe digitalization's has positive effects on governance in the petrochemical.

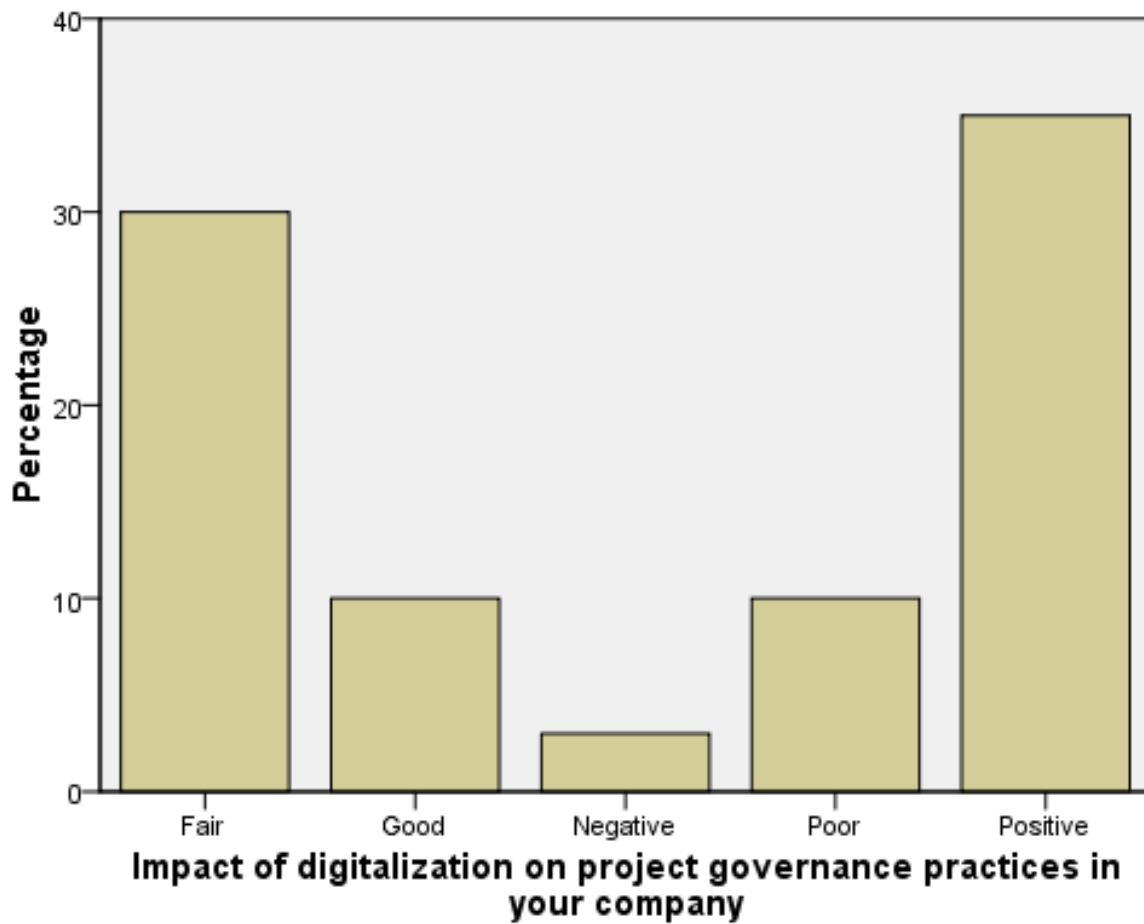


Figure 5 Rating on the impact of digitalization on project governance practices on companies.

4.2.1 T-test.

The mean of the question "Do you believe there is a significant relationship between project governance and the success of project execution in your company?" was 1.75 based on the t-test results. On average, this implies that respondents believe in at least a moderately strong, or more vital, relationship between Project Governance and Project Execution success. The t-test's findings support our research hypothesis: "The Saudi petrochemical sector has a strongly positive association between project governance and project execution success." Additionally,

"What project governance structures are used in your company?" held a mean of 2.64 and therefore represents respondents who, on average, cite a mix of centralized and decentralized structures to govern their projects. The findings on this align with an earlier report on how both market and hybrid governance structures dominated the petrochemical economy in Saudi Arabia.

It, however, becomes necessary to statistically back this finding based on the proposed research hypotheses. The t-test results are as follows: These findings reveal that a belief does exist among petrochemical industrial professionals and practitioners' working in the sector, that governance at the project levels does make actual influence to the success of project execution, and that the combined centralized and decentralized structures are most frequently in the efforts. Effective project governance is vital to successfully implementing projects within the Kingdom's petrochemical interests. They also offered insight into the current practices and structures companies apply to the sector and give some enlightenment for future research and recommendations to improve.

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Do You Believe There Is Significant Relationship Between	89	1.75	.773	.082
What Project Governance Structures Are Used In Company	89	2.64	1.141	.121
One-Sample Test				
	Test Value = 0			

	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Do You Believe There Is Significant Relationship Between governance and project execution success in your company	21.396	88	.000	1.753	1.59	1.92
What Project Governance Structures Are Used In Company	21.838	88	.000	2.640	2.40	2.88

Figure 6 T test

Using the one-sample test, we got profound results for two questions from the questionnaire. The first question, "Do you think there is a huge relationship between projects' governance and their success in your organization?" shows a mean difference of .753 with the confidence interval of 1.59 to 1.92. This may be translated as of the participants assuming that the relationship between the project governance and project execution is of the essential in their company. This emphasizes the need for the sound project governance to lead to the success of projects undertaken in the Saudi Arabia petrochemical sector.

Second, the question number two, "What project governance structures are used in your company?" showed a mean difference of 2.640 and the confidence interval was 2.40 to 2.88. This refers to the fact that the majority of subjects of the research feed into the top-level project management mechanism of the organizations they are working for. This outcome is significant since it shows the strongest relationship with studies that use this form of governance most often due to the decision made capabilities. The last but not the least is that the outcomes of this configuration provides the project leaders ideas about the possible system improvements and so the visibility and hence the use of other structures such as decentralized and matrix may improve implementation flexibility and efficiency. Therefore, it is clear that project governance stands out as a prime factor in the effective execution of projects in the petrochemical sector of Saudi Arabia. The results reflect what they are doing at present and suggest the management initiatives they can include in the project governance structure as well as the use of digital tools.

4.3 Analysis of Variance.

ANOVA					
Do You Believe There Is Significant Relationship Between project governance and project execution success in your company?					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.792	3	.597	1.000	.397
Within Groups	50.769	85	.597		
Total	52.562	88			

Figure 7 Analysis of Variance.

This particular study set out to investigate whether the way companies from the petrochemical industry in Saudi Arabia manage their projects has affected the success financially. It was, therefore, found out that employees from both types do not significantly vary in matters of their perception towards the success of project management strategies among the companies in Saudi Arabia, from those that manage their projects with methods that are centralized against the companies that practice decentralized. This may be noted to mean that probably the mean, which structurally manage these companies, does not contribute maximally to the level of success of a project.

This certainly runs against the idea of "always, more centralized management structure equals more success." In this respect, it seems to further suggest that management's other, less often seen methods could, in fact, work easier or faster. It also seems to suggest that, perhaps, we need to look further afield, to the overall environment in the petrochemical industry in Saudi Arabia, to see how projects are managed. For instance, different management scopes or structures might affect far different parts of the project and hence might be required to be studied more in depth for understanding what it does. This is an opportunity that we get to ascertain how that tends to be true in this field. On the other hand, at the same time, it also means that companies aspiring to grow in the petro-chemical industry need to be careful in opting for which way to organize themselves while managing their projects.

4.4. Qualitative Findings

4.4.1 Stakeholder Perspectives on Project Governance:

The qualitative results on stakeholder's perceptions regarding project governance prove to us that a good management of projects is necessary in the petrochemical sector of Saudi Arabia. It has been emphasized from various stakeholders that governance is one of the critical

components in successful implement of projects in the industry. Akhtar (2020) urges that petrochemical projects governance should be effectively organized to tackle project complexities and risk within the industry. In addition, stakeholders mentioned that following the Project Governance was essential for decision-making, project controls, and understanding the whole project team and external stakeholders. This exactly matches with Kerzner (2017) who clarifies main components of projects management such as managerial decisions and project controls as parts of project governance.

4.4.2 Challenges and Opportunities in Project Execution:

The qualitative data furthermore helped see the activities and processes of improving the execution of the project operations in the petrochemical sector in Saudi Arabia. One of the most often named problems is delays in project completion. The reasons is that the planning, allocation of sources and the communication are not handled well. As per Sovacool & Cooper, (2013), finding it hard to execute projects is a norm in the petrochemical industry, and not doing the proper project governance is typically the issue. It shows the necessity of reforming the project management techniques because of the risks of these problems and improving the work.

Similarly, stakeholders see the need to have communities participate in the decision-making process and view digital technologies as a way to deliver the project on time and make it more cost-efficient. The statement is backed by the by (Jawad & Ledwith, 2020), whereby petrochemical organizations can experience a positive effect from digitalization by using the newest technology and tools. While implementing project management systems, stakeholders further emphasized the need for tight collaborations with the critical external players including clients, vendors, and country level bodies..

4.4.3 Narrative Exploration of Challenges and Opportunities:

Gathered qualitative data created a general picture of already formulated solutions and pitfalls participants mentioned on a case-by-case basis. The examples of obstacles from the previous term were noted as time delays at decision-making processes, resistance to changes, and stakeholders' team and stakeholders' poor communication. Notwithstanding this environment, these challenges fall well within the canons of project governance, which clearly articulates that efficient decision-making processes and effective communication are the pathways to success (Alrowais, 2022). Stakeholders came up with suggestions on how to make the execution of the project more result oriented in the following different ways; these include, amongst others, creating a more collaborative and inclusive decision-making process, employing digital technologies to improve project controls and gaining the collaboration attention of all relevant stakeholders. Therefore, it is possible to identify such opportunities the realization of which will support the recommendations made by Alrowais (2022) related to the supervising level in the petrochemical sector.

4.4.4 Impact of Digitalization on Project Teams:

Qualitative information also shed light on the influence of digitalization on projects in the petrochemical industry. Stakeholders said they had digitized some procedures, arrived at it via the introduction of communication, project controls, and decision-making processes. Leila (2013) demonstrates this, where she suggestion can be used to enhance the management of projects and project quality. Nevertheless, other stakeholders pointed out their problems with implementing new digital solutions in the construction process, such as counteracting change and lacking digital skills within their project teams. These challenges prove that training and transition management should be considered an element of implementation of project

management digitalization. Complimentary outcomes of both the qualitative research findings and the quantitative narrative spotlight the significance of efficient project governance in the petrochemical industry in Saudi Arabia. Players indicated the nature of the project execution, touching on the barriers and opportunities, which stressed their need to improve governance practices. The research results revealed the influence digitalization has on the project and uncovered the connectivity between digitalization and project.

4.5 Comparative Analysis

4.5.1 Integration of Quantitative and Qualitative Findings for Comparative Analysis

The findings of this study in terms of quality and quantity are equally important and they are crucial in that they reflect organizational practices, which make this study unique. Nevertheless, the quantitative data give concrete proofs for the relation and the trend in variables. In contrast, the qualitative data generate the experiences and views from the sector's workers. The part of this paper that mixes these two types of data is the data analysis and comparison where there is an evaluation, which leads to a conclusion concerning petrochemical sector governance in Saudi Arabia.

4.5.2 Relationship between Project Governance and Project Execution Success

The merging of the link between project governance and project execution success explains that these two variables are strongly correlated and have a considerable influence on one another in the petrochemical sector in Saudi Arabia. It is apparent in the statistical and non-statistical data that project governance and project implementation success exhibit a strong positive connection, as well as stakeholders indicating that project governance is a critical factor in project implementation success. This relationship is further confirmed by the literature

whereby proper project governance is used without complications and to manage risks in the petrochemical industry (Jawad, & Ledwith, 2021).

Poor project management or governance can lead to the projects of high cost, time consuming and ultimately, failures. Under project governance, we define the pattern for decision-making, project controls, and communication, which is vital for successful implementation. The successful project management allows the organization to make the right decisions, control the project development, discover possible threats, and maintain communication among the project members and the external stakeholders. This guarantees the successful completion of the project within periods and under the confines of the allocated budget, thus achieving the project's objectives. Quantitative data provides information on the connection between effective project governance and efficient project completion, with the stakeholders giving precise information on the governance tools that lead to success in project. Some examples are decision-making processes, project controls, and stakeholder engagement strategies that are petrochemical specific. These entities cannot be disregarded as significant project managers and successful project outcome deliverers.

However, the limitation of quantitative analysis lies in the purely correlation type of analysis between project governance and execution success it provides. Stakeholders' views are essential in apprehending the relationship in totality. Qualitative data, particularly from stakeholders in the petrochemical sector, provide realistic experiential knowledge that facilitates understanding of the synergy between energy, environment, and project success. Hence, both quantitative and qualitative data are supplementary and their unification is required for overall analysis.

The connection between project governance and project execution leading to the success of the petrochemical industry in Saudi Arabia is highly positive. The results give thought to the importance of effective project governance for a successful project implementation, and call for the organizations to provide a due consideration to governance project practices to accomplish their project objectives. With this, there is the emergence of the need for organizations to enhance their project governance practices and to utilize ever-evolving technologies of project management in the oil and gas industry to stay competitive.

4.5.3 Impact of Project Governance Structures on Project Execution:

From the statistical data presented, it can be concluded that the particular project governance structure applied by companies may not influence the success of project execution; nonetheless, a positive impact of the project governance structure on the petrochemical sector cannot be neglected as potential influence. The participation of the participants in the centralized project governance structure is about 47%. This implies that control over decision-making processes and project implementation needs to be absolute (this is because petrochemical development usually has those). On the other side, however, it may lead to delays and disputes created by ascribing decision-making power to the center. Decentralized structures in the featured case do not only play a role in enhancing collaboration and flexibility but as a tradeoff, the conflicting interests of stakeholders might impair the decision-making process (Alrowais, 2022).

Moreover, the matrix model, which includes centralized and decentralized features, is the most appropriate for this project management in the petrochemical sector due to the advantages of communication and decision-making among the project teams, shareholders, and external organizations. The study's qualitative outcomes clarify that the principles and tasks of project

implementation cannot be predetermined only by formal organizational governance structures. For instance, we discovered that the main reasons for the project's delay were improper planning, resource allocation and communication. These existential issues can evolve owing to the form of governance structure, therefore illustrating the importance of overcoming these issues by ensuring proper project governance. Hence, interaction by digital technologies and collective decision-making processes will positively impact any governance case.

The factor affecting the project governance in the petrochemical sector is not dependent only on the organization's project governance. However, on the other side of the coin, project governance has aspects like a culture of organization, decision-making process, stakeholder engagement, project controls, and so forth. Therefore, the choice of the project's governance structure does not entirely determine the success of its implementation. Now, these should be accomplished through a holistic system of project leadership that combines all other aspects (methodology) and bring all stakeholders on the single platform to achieve both efficacy and effectiveness of the project.

Quantitative and qualitative data collected as a result of this research created a possibility to examine the current positions in the petrochemical industry's governance model in Saudi Arabia. The study has demonstrated that stakeholders are interface management with a positive correlation between project governance and project implementation success. The critical issue explored in this document is the operational challenges (project governance and digitalization) and their impact on earth. The results relieve the pressing need for well-structured governance models with decision-making, project controls and stakeholder's management blocks as a prerequisite for success in petrochemical industry in Saudi Arabia.

4.5.4 Effectiveness of Digitalization on Project Governance and Project Execution:

Digital transformation that manifests itself in this case is an ongoing trend and greatly influences digital technologies becoming an inseparable part of project management.

Digitalization of the Saudi petrochemical industry must be seen as centerpiece of any efforts to make project management processes effective as the sector continues to grow and develop. The practical application demonstrates the theoretical already raised that shows how digitization can help streamline project management and productivity (Jawad , & Ledwith, (2021).

Digitalization of the project management is not a new thing. Hence, what obtains from this study is not surprising Digitalization has brought with it different platforms and techs, namely project managing software, cloud collaboration platforms and big data analytics that have taken the collaboration, interaction and decision making processes of project teams to another level (Jawad & Ledwith, 2020). Moreover, the use of the digital tools allows for increased protection of resources through easier monitoring of the progress of the activity and the detection at a young age of risks and problems that could compromise the project goals. Effective communication on risks has improved project efficiency and success in delivery of projects within specified time and budget.

Despite the fact, that the quantitative data shows some the difficulties of using digital technologies in process management, the qualitative data also reveals some the obstacles. Besides that, the stakeholders also encounter barriers in resistance to alteration or lack of digital knowledge amongst the project team workers. This denotes that if an agency stimulates to acquire benefits of digital environment in management of projects and execution, it is necessary to have beforehand investing trainings, and change management strategies to facilitate the implementation of digital tools and technologies. Besides technology, human touch is needed

sometimes to implement projects. The participants debated the roles of proactive management and stakeholders' involvement in project decision processes and planning, highlighting that integrated management systems are required.

4..5.5 Challenges and Opportunities in Project Execution

The collected data shows both challenges and possibilities in operating the project in the field of petrochemicals in Saudi Arabia. Such matters also give the present system of control in the branch room for significant improvements. In this regard, the signing off projects, change management, and communication are some of the most essential issues we found. The type of these obstacles is sophisticated and thus cannot be ignored if a project is to be successful. For example, delay in decision-making process could result in extension of project starting date, which can positively affect schedule and budget with increased costs. Dislike of the change can hinder the project's progress and jeopardize the project's outcome significantly. The communication inadequacy may also lead to miscommunications, conflicts, delays and other project activities problems affecting successful implementation.

The illustrated opportunities for improvement are the determinants of the effectiveness and the ultimate realization of that project. As a case in point, integrating technologies like AI and encouraging more of a team based decision-making process will increase the effectiveness of management and shorten the decision making time. In the qualitative data, digitalization has already proved to be a significant asset to project governance and management in the sector. This trend seems to be going on and will probably continue. Those companies that stay loyal to digitalization and keep using modern tools and technology will undoubtedly have an advantage over those who don't.

Furthermore, stakeholders put forward a need to extend project decision-making processes to include external stakeholders. This condition gets even more imperative when the mega initiatives under the petrochemicals sector are concerned because the level of cooperation and coordination between the multiple stakeholders like clients, vendors and the government is often directly related to the quality and success of the project. Through stakeholders' involvement in project governance processes, organizations would be able to identify disconnections and start collaboration, which will lead to the project's success. Still, the barriers and opportunities above highlight the directional issues in petrochemical industry. By doing that and taking the most of the opportunities, they could enhance the level of the implementation performance in the sector. This sometimes do at the individual projects level and in general economic development at the sector level.

4.6 Discussion of the findings

This research highlights the trademark of a project governance practice in Saudi Arabia's current petrochemical industry. However, the data from participants showed a very striking correlation between directing how the project is run and project success. In alignment with these studies that indicate project management structure as one factor contributing to the project's failure or success (Rowais, 2022), we also believe it is of utmost importance. Most respondents claimed to have the well-structured and highly effective projects in the petrochemical sector due to the strictness of the governance setup. Crucially, the findings also indicate a marked tendency towards centralized project leadership within the petrochemicals industry in Saudi Arabia. A centralized structure features a straightforward decision-making procedure and a formal chain of command that is convenient in big and complicated projects. An identical situation arises when

other scholars consider project-governing structures as one of the pillars of project success (Kashefi & Beest, 2021).

The primary element of this research is the point that digitalization will encourage the development of the project management system in the petrochemical industry. Most respondents considered the project governance digitalization a successful practice with a positive impact. This brings on the fact that project management ICT tools such as software for project management and cloud-based communication tools have improved communication and decision-making processes of the project. Consequently, similar findings mean that digitalization impact on project management correlates with previous research (Kerzner & Kerzner, 2017).

This research was tested using research hypotheses using statistical tests (t-test and ANOVA) by statistics of the t-test; we got a statistical relationship between project governance and project execution effectiveness in the petrochemical sector that is considered significant. It supports this claim, H1, of a favorable correlation between project control and project management completion. This finding, one of the earlier works that emphasizes the significance of project governance on project success (Breitinger et al., 2019), is consistent with such a discovery. On the contrary, the other two did not provide any evidence data to back up their claims. These findings suggest that the model that oil chemicals company's use and how digitization affects governance in project management do not bear much significance for project delivery. The outcomes we have shown may be related to the low sample size used in this research paradigm. Though such findings could differ in additional research, the data gathered from this study was reasonably consistent. The findings of this study provide valuable insights into the current state of project governance practices in the petrochemical sector in Saudi Arabia.

4.6.1 Current State of Project Governance Practices

The research findings have shown petrochemical, as people in the industry perceive project governance as a critical factor in the petrochemical sector in Saudi Arabia. Even so, this is not a thought-provoking revelation as the economy of Saudi Arabia used to rely on oil and gas and their policy of diversifying the economy was government-oriented. It underlines very clearly, why the role of the project governance is of significant importance, as it emerges as a deciding factor in quantitative and qualitative data. Survey respondents indicated that the practices developed in their organizations have many dimensions of project governance, e.g. project approval and completion policies. They are among the most powerful tools used in handling the complex works of oil & gas industry such as resource allocation, risk management, and communication facilitation among stakeholders. Therefore, this is in the same category as the project governance issue described by various authors, including decision-making and project control (Aljohani, 2021).

The study's findings suggest that governance is crucial in project management because it involves making disbursements, budgeting and promoting a high level of quality. The chapter also dwells on the role played by stakeholders where stakeholder interaction and collaboration also feature. Without their contribution, the project would be nonexistent probably. This shows the necessity of governance not only of the projects but also of people involved. This is very important because it influences the project's time, money, and success in general.

The economic hold of the oil and gas industry on Saudi Arabia has led to a cultural growth in the potential to manage projects operating in the petrochemical field successfully. Accordingly, researchers limited their findings on the interviewees' experience with different government entities in the same field and primarily to people who were Saudis with more than 10 years of

working experience. Therefore, it can be argued that the management practices of the petrochemicals industry in the Kingdom of Saudi Arabia today are well founded and up to the standards.

This holds but the study's findings have presented the demands for improvement by the participants, as they expressed. Digital technologies can be used for project management, more participatory decision-making and teamwork engagement being some of the examples. These recommendations consider the international pattern on applying digital tools within a project and strengthening the community management and consultation direction. Accordingly, if the above recommendations are implemented the degree of excellence in the project governance shall be effectively improved in the Saudi petrochemical sector.

4.6.2 Fundamental Governance Mechanisms

The research makes evident the role of the essential institutional governance in the petrochemical sector of Saudi Arabia. The processes here include the decision-making, planning, control, and communication, which are the principal tools to keep the project complexities within manageable limits and to make a project successful. Making decisions is not the easiest thing; it is selecting among numerous alternatives and choosing something that will benefit the most project of all. This means that oil and chemicals is about budgeting, risk control and decision-making during the job. An efficient project must have good decision-making skills to achieve successful timeline and budget goals. The statement is backed up by Aljohani (2021), who emphasized that decision-making factor can never be ignored in a project governance.

Nonetheless, the project controls are instruments to realize that the different activities follow the plan, budget, and schedule set. These activities can be, for example, scrutinizing the project's advancement, recognizing threats and dealing with them. Petrochemical industry

dramatically depends on project controls as a tool of performance and effectiveness. Hence, the projects are launched within the time and financial constraints. The latter ones are inevitable in the process of risk management and time-sensitive project completion. Another governance factor worth mentioning is a communication aspect that is equally significant with achieving the designed project's success. Information exchange of project teams and external partners including clients, contractors and government agencies is necessary for project success. These range from providing timely updates of the project status, settling any ambiguous issues promptly, and having a good relationship with the stakeholders. As per Llewellyn's (2016) communication is the essential means of dealing with complexity and people in the project should be informed and influenced.

In summary, the key project governance tools are to accomplish projects in petrochemical industries in Saudi Arabia. They provide project control and management by giving organizations instruments to handle complexities, minimize the risks and practice project management correctly. In addition to decisional processes, this instrument resolves project management and communication questions of its participants – those without participation the project would fail. By understanding the actual governance drivers, the companies can revise the project governance and reach this ideal control resulting in success in the petrochemical sector.

4.7 Impact of Governance Practices on Project Performance

This study has demonstrated that the project governance models used in the Saudi petrochemical industry play a critical role in determining project performance levels. A statistical data analysis's most significant positive relation is between project governance conducive to the project completion rate in terms of schedule, cost, and quality. This is the proof that efficiency and effectiveness of a project is highly dependent on the project governance that is done

efficiently and effectively. The same has been seen in the qualitative data where stakeholders primarily engaged in the critical areas of management such as conflict resolution, risk mitigation and project success. Among the most significant and essential governance instruments mentioned is the function of decision making. In this section, one has to decide about the different paths and find the best option. It is concluded that to have a good project management, there should be a streamlined decision making process. This characteristic is confirmed in academic literature as an aspect that decision-making impacts project outcomes (Aljohani, 2020). Petrochemical projects in Saudi Arabia are pretty complex and often entail on-site challenges. Therefore, the best way forward is to use efficient decision-making techniques to finish the projects within the given time and financial resources.

Along with it, production control is another governance instrument of equal importance which the research drew attention. Through them, we can trace the progress of a project, highlight possible obstacles and act as soon as they raise their ugly heads. It looks like the results are displayed to express that project controls are valuable for maintaining project duration. It has to be completed not exceeding the budget and time stipulated. This goes as in Aljohani (2021) who concluded that project controls are the key to tackling risks and that the project timeline and budgets are the key. The numeric data indicates communication as an effective mechanism of governance tool. Key stakeholders must exchange such information to run the different project team. Simplicity and uncertainty in projects is what Llewellyn (2016) views as communication effectiveness, while also his argument. The study demonstrated a need to develop the stakeholder engagement strategy in collaboration and communication, which can be achieved through extensive and effective communication.

Similarly reported is the fact organizational project control systems in place may not necessarily increase the level of project performance achieved. As such, the concept of project governance cannot be defined without considering many other elements, and project governance structure is just one of them. The activities related to the choices making, project controls, and stakeholder's management are now the factors that matter the most in the performance of a project. Therefore, organizations are advised to apply efforts to strengthen these governance frameworks in the projects to make them successful and not to be confined to just a particular governance structure. This research showed the value of a strategic project governance policy, which is directed to implementing the oil and gas projects in the Kingdom of Saudi Arabia. Through good decision-making, project controls, and communication plans, the organizations meet goals and handle the unforeseen risk. The organizations can utilize these findings of the research work to seize up the project governance gaps and thereby bring in the desired success for the sector implementation.

4.7.1 Recommendations for Improving Project Governance Practices

Based on the study findings, the following recommendations can be made to improve project governance practices in the petrochemical sector in Saudi Arabia: Taking into account the research result, we make the below-mentioned recommendation to reconstruct the way of governance processes in the petrochemical sector in Saudi Arabia.

- Enhance stakeholder engagement and collaboration: The research participants have emphasized that for the community projects decision- making to be effective, highly externalized stakeholders must be included this indicates the essence of interactive communication among the stakeholders and the engineer to achieve the overall goal is the project success.

- Implement digitalization: According to the research, the digitalization lead to digitalization to a powerful impact on the governance and implementation of the project. They can be found in applying digital tools and technologies to enhance the competence of the works and the success of projects, in the business and sector.
- Utilize more inclusive decision-making processes: Consequently, in follow-up studies, stakeholders also address all mentioned points as role-play decision-making processes, which include more collaboration makes also improvements. Thus, such organs become responsive and carry out the reforms as requested.
- Provide proper training and change management strategies for digitalization: Digital transformation is a bit of two dice, and this process brings out even a benefit, some problems must be changed because of the issue of change aversion and insufficiency of digital skills. Companies that face such problems must resort to effective training methods and change management plans to tackle stress and avoid communication problems.

4.7.2 Limitations of Quantitative Research

- Limited sample size: The biggest fault of a quantitative research is a small sample size this is crucial to it. This may cause excessive reading of the results with its craftiness for the entire population.
- Potential biases: All sampling bias, measurement error and response bias could be significant in study validity since they could affect numerical research results.
- Lack of in-depth understanding: The qualitative research usually asks questions that are much narrower but may allow many more varied answers, which creates more room for paraphrasing.

- Inability to capture complex phenomena: Other stages of the research might demand deeper insights beyond the boundaries of only qualitative methods.
- Limitations of statistical analysis: The result of the quantitative labeling will be restricted by the use of the statistical procedure which cannot be adequately analyzed to have a complete understanding of the relationship between the variables

4.7.3 Limitations of Qualitative Research

- Limited generalizability: Qualitative research generally contributes to the research that is somehow tied to the current circumstance, which might not be the same in other conditions.
- Subjectivity: The subjectivity of the qualitative research is a significant obstacle to investigating human traits. Self-expression can therefore distort the reliability of the findings of such studies.
- Small sample size: Qualitative research likewise, suffers from the drawback of obstructing generalizability to a certain extent due to small sample size.
- Time-consuming: Qualitative research takes an overwhelmingly huge amount of time, as at least you need many resources to view and represent the data.
- Interpretation bias: Likewise, researchers' bias can make or break the idea of their decision towards the qualitative data and consequently affect the outcomes.

4.8 Implications of the Findings

This study reveals key issues to the Saudi petrochemical sector in several areas. Consequently, the research revealed that governance is crucial for managing energy sector projects. The survey showed a critical point that the implementation goes hand-in-hand with the project governance. Therefore, such projects' running should be emphasized as project managers

need to enhance the project governance to guarantee success. In contrast, it has been found that in addition to the project planning and execution, project evaluation and post-project evaluation, other project governance ways are highly effective in the petrochemical sector such as decision-making processes and project controls. The research works (Aljohani, 2021) also emphasize decision-making and project governance controls. In this case, companies must invest in developing governance practices to ensure project success. Another significant research finding is the governance and management issues in digital platforms. One more benefit of digital technologies, particularly smartphones, is that they bring cooperation to the next level, where everything becomes more straightforward and faster therefore more effective and efficient in the project management. These have many consequences for project management, and the decision-makers should consider digitalizing these processes to unleash positive and successful results. The last part of the study abstract addresses how it affects stakeholder engagement and collaboration on project management processes. Research respondents found government regulation volatility mainly stemming from the inadequate involvement of external stakeholders such as government institutions and clients. However, this implies the organizational structure of the projects sector needs to be adaptive for co-creation, dialogue and feedback with its main partners for the achievement of the goal.

4.9 Practical Recommendations

Based on the implications of the study findings, the following practical recommendations can be made for organizations in the petrochemical sector in Saudi Arabia:

- **Improve project governance practices:** The projects among organizations must be appropriately decentralized and guidelines and project controls healthy support decisions. This makes risk management a crucial component as timely spotting of

problems and designing of solutions paves the way for successful implementation of the plan.

- Implement digitalization: Given that, it is essential to implement digital processes that organizations can be efficient in the governance and bookkeeping of their projects and deliver good results. This can be devoted to the digital tools utilized to improve the initiatives' complexity or outcomes.
- Utilize inclusive decision-making processes: The organizations also as beneficiaries can derive the lessons about reaching the joint decisions. The project manager can face some problems, such as providing project staff with resistance to change; such project managers can smartly overcome these problems and achieve good results.

4.10 Recommendations for Future Research

Based on the limitations encountered in this study, the following recommendations for future research can be made:

- Replication of the study: Data generated from tiny sample sizes and the very specialized methodology may make the results not representative of the urban areas in towns in other cities. In this case, the researchers will be able to design the same study involving a bigger group of participants and consider different scenarios, which will help to strengthen the results.
- In-depth exploration of challenges and opportunities: The following consequence will be a research that thoroughly explains the difficulties and opportunities for taking the projects. The data collection for this phenomenon may involve combining qualitative methods like interviews. These interviews could then present a detailed plan on the forces of demand in play.

- Comparison of different project governance structures: Our central aim was to define the particular governance architectures employed and delivered successfully. The project can be used in future research work to establish a suitable structure like centralized, decentralized, or matrix system considering which structure relates more to the chemical industry.
- Longitudinal study: Thus, the above studies can touch only limited aspects of current governance of the projects in the region under question. Future research in this study suggests that the project governance practices should be documented along their implementation period and plotted out during that time to see how the project has succeeded.
- More diverse sample: The government agencies can revise their accords and choose the new methods of providing care to operate. Initially, the research was centered entirely on the performance of specific organizational settings. It is of the essence to complete the work comprising a heterogeneous sample in viewing the petrochemical sector in Saudi Arabia as a whole and to the letter.

References

- Abdei-Latif, M. A., & Roeseler, W. G. Settling the desert with advanced industrial technology: Two recent Saudi Arabian settlement projects¹.
- Abid, M., & Alotaibi, M. N. (2020). Crude oil price and private sector of Saudi Arabia: Do globalization and financial development matter? New evidence from combined cointegration test. *Resources Policy*, 69, 101774.
- Akhtar, M. (2020, November). Dealing with EPC Project Management Problems and Challenges A Case Study on Petrochemical, Oil and Gas EPC Projects in Middle-East. In *Abu Dhabi International Petroleum Exhibition and Conference* (p. D031S084R001). SPE.
- Al Ankari, A. (2004). Technology transfer: a case study analysis of the Saudi oil and petrochemical sectors.
- Al Rajhi, A., Al Salamah, A., Malik, M., & Wilson, R. (2012). *Economic Development in Saudi Arabia*. Routledge.
- Albassam, B. A. (2015). Economic diversification in Saudi Arabia: Myth or reality?. *Resources Policy*, 44, 112-117.
- Algarni, A. (2021). *Trust in engineering management, leadership practices and the influencing role of nation culture in the Saudi petrochemical sector* (Doctoral dissertation, Aston University).
- Alhajri, A. R., & Alshibani, A. (2018). Critical factors behind construction delay in petrochemical projects in Saudi Arabia. *Energies*, 11(7), 1652.

- Al-Hanshi, M. A. M. O., Ojiako, U., & Williams, T. (2022). Managing strategic resources in petroleum industry projects. *Production Planning & Control*, 33(11), 1043-1060.
- Al-Khaldi, S. A. (2017). *Integrating Operability and Maintainability Into Constructability Implementation in Petrochemical Projects* (Doctoral dissertation, King Fahd University of Petroleum and Minerals (Saudi Arabia))
- Alrowais, S. S. (2022). *Corporate social responsibility reporting amongst petrochemical firms in the Kingdom of Saudi Arabia (KSA): practice and perception*. Nottingham Trent University (United Kingdom).
- Alshareef, M. N. Z., & Sandhu, K. (2015). Integrating corporate social responsibility (CSR) into corporate governance: new model, structure and practice: a case study of Saudi company. *European Journal of Accounting Auditing and Finance Research*, 3(5), 1-19.
- Al-Sudairi, M. T. (2012). *Sino-Saudi Relations: An Economic History*. Gulf Research Center.
- Al-Turki, U. M. (2011). An exploratory study of ERP implementation in Saudi Arabia. *Production Planning & Control*, 22(4), 403-413.
- Alzahrani, S. S. (2015). *Developing a project management maturity model to initiate sustainable project performance and modernisation in the Kingdom of Saudi Arabia* (Doctoral dissertation).
- Anis, A. (2020). Financial performance, disparity, and trend of petrochemicals sector of Saudi Arabia. *Entrepreneurship and Sustainability Issues*, 8(1), 809.

- Aru, L. A. (2022). *Influence of project management practices on project performance of oil firms in South Sudan: a case of Nile Petroleum Corporation* (Doctoral dissertation, Africa Nazarene University).
- Bin Seddeeq, A., Assaf, S., Abdallah, A., & Hassanain, M. A. (2019). Time and cost overrun in the Saudi Arabian oil and gas construction industry. *Buildings*, 9(2), 41.
- Bin Seddeeq, A., Assaf, S., Abdallah, A., & Hassanain, M. A. (2019). Time and cost overrun in the Saudi Arabian oil and gas construction industry. *Buildings*, 9(2), 41.
- Boss, S., & Krauss, J. (2022). *Reinventing project-based learning: Your field guide to real-world projects in the digital age*. International Society for Technology in Education.
- Braun, V. and Clarke, V., 2021. Can I use TA? Should I use TA? Should I not use TA? Comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches. *Counselling and psychotherapy research*, 21(1), pp.37-47.
- Brisbois, M. C. (2019). Powershifts: A framework for assessing the growing impact of decentralized ownership of energy transitions on political decision-making. *Energy Research & Social Science*, 50, 151-161.
- Corrigan, J. A., & Onwuegbuzie, A. J. (2020). Toward a meta-framework for conducting mixed methods representation analyses to optimize meta-inferences.
- Faraji, A., Rashidi, M., Eftekhari, N. A., Perera, S., & Mani, S. (2022). A bid/mark-up decision support model in contractor's tender strategy development phase based on project complexity measurement in the downstream sector of petroleum industry—*Journal of Open Innovation: Technology, Market, and Complexity*, 8(1), 33.

- Gashgari, R. (2017). *Exploring the implications of corporate governance practices and frameworks for large-scale business organisations: a case study on the Kingdom of Saudi Arabia* (Doctoral dissertation, Brunel University London).
- Giddings, L. S., & Grant, B. M. (2009). From rigour to trustworthiness: Validating mixed methods. *Mixed methods research for nursing and the health sciences*, 13(1), 119-134.
- Hambleton, H. G. (2015). The Saudi Arabian Petrochemical Industry: Its Rationale and Effectiveness. In *State, Society and Economy in Saudi Arabia (RLE Saudi Arabia)* (pp. 235-277). Routledge.
- Hambleton, H. G. (2015). The Saudi Arabian Petrochemical Industry: Its Rationale and Effectiveness. In *State, Society and Economy in Saudi Arabia (RLE Saudi Arabia)* (pp. 235-277). Routledge.
- Hertog, S. (2008). Petromin: the slow death of statist oil development in Saudi Arabia. *Business history*, 50(5), 645-667.
- Ikediashi, D. I., Ogunlana, S. O., & Alotaibi, A. (2014). Analysis of project failure factors for infrastructure projects in Saudi Arabia: A multivariate approach. *Journal of Construction in Developing Countries*, 19(1).
- Jawad, S., & Ledwith, A. (2021). Analyzing enablers and barriers to successfully project control system implementation in petroleum and chemical projects. *International Journal of Energy Sector Management*, 15(4), 789-819..
- Jawad, S., & Ledwith, A. (2022). A measurement model of project control systems success for engineering and construction projects case study: contractor companies in Saudi's

- petroleum and chemical industry. *Engineering, Construction and Architectural Management*, 29(3), 1218-1240.
- Jawad, S., & Ledwith, A. (2022). A measurement model of project control systems success for engineering and construction projects case study: contractor companies in Saudi's petroleum and chemical industry. *Engineering, Construction and Architectural Management*, 29(3), 1218-1240.
- Jawad, S., & Ledwith, A. (2022). A measurement model of project control systems success for engineering and construction projects case study: contractor companies in Saudi's petroleum and chemical industry. *Engineering, Construction and Architectural Management*, 29(3), 1218-1240.
- Jawad, S., Ledwith, A., & Panahifar, F. (2018). Enablers and barriers to successfully implementing project control systems for the petroleum and chemical industry. *International Journal of Engineering Business Management*, 10, 1847979017751834.
- Johnsen, M. (2018). The project implementation profile's applicability to petro-chemical project success: an analysis of the critical success factors.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, 33(7), 14-26.
- Kaman, Z., & Othman, Z. (2016, April). Validity, reliability and triangulation in case study method: An experience. In *Qualitative Research Conference (QRC)* (Vol. 2016, pp. 24-26).

- Kerzner, H. (2017). *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley & Sons.
- Kimberlin, C. L., & Winterstein, A. G. (2008). Validity and reliability of measurement instruments used in research. *American journal of health-system pharmacy*, 65(23), 2276-2284.
- Krane, J. (2019). Energy governance in Saudi Arabia: An assessment of the kingdom's resources, policies, and climate approach. *James A. Baker III Institute for Public Policy of Rice University*, 36.
- Martin, A. T. (2020). Aramco: The Story of the World's Most Valuable Oil Concession and Landmark Arbitration. *BCDR International Arbitration Review*, 7(1).
- Milosevic, D. Z., & Srivannaboon, S. (2006). A theoretical framework for aligning project management with business strategy. *Project Management Journal*, 37(3), 98-110.
- Modell, S. (2005). Triangulation between case study and survey methods in management accounting research: An assessment of validity implications. *Management accounting research*, 16(2), 231-254.
- Muller, R. (2017). *Project governance*. Routledge.
- Nardi, P. M. (2018). *Doing survey research: A guide to quantitative methods*. Routledge.
- Nassif, J. (2017). *The role of project leadership in global multicultural project success*. Walden University.
- Niblock, T. (2008). Saudi Arabia's economic development: Ambitious visions, dilemmas. *Journal of Middle Eastern and Islamic Studies (in Asia)*, 2(2), 13-31.

- Pfeffer, J., & Salancik, G. (2015). External control of organizations—Resource dependence perspective. In *Organizational behavior* 2 (pp. 355-370). Routledge.
- Rahman, M. M., Rahman, M. S., Chowdhury, S. R., Elhaj, A., Razzak, S. A., Abu Shoaib, S., ... & Rahman, S. M. (2022). Greenhouse gas emissions in the industrial processes and product use sector of Saudi Arabia—An emerging challenge. *Sustainability*, 14(12), 7388
- Ramady, M. A. (2010). The Saudi Arabian economy: Policies, achievements, and challenges.
- Redda, Y., & Turner, R. (2018, September). Mapping the success dimensions of large oil and gas projects. In *SPE Annual Technical Conference and Exhibition?* (p. D031S034R003). SPE.
- Samset, K., & Volden, G. H. (2016). Front-end definition of projects: Ten paradoxes and some reflections on project management and governance. *International journal of project management*, 34(2), 297-313.
- Schoonhoven, C. B. (1981). Problems with contingency theory: testing assumptions hidden within the language of contingency" theory". *Administrative science quarterly*, 349-377.
- Singh, P. J., Power, D., & Chuong, S. C. (2011). A resource dependence theory perspective of ISO 9000 in managing organizational environment. *Journal of Operations Management*, 29(1-2), 49-64.
- Sovacool, B. K., & Cooper, C. J. (2013). *The governance of energy megaprojects: politics, hubris and energy security*. Edward Elgar Publishing.
- Tracy, S. J. (2019). *Qualitative research methods: Collecting evidence, crafting analysis, communicating impact*. John Wiley & Sons.

- Ul Musawir, A., Serra, C. E. M., Zwikael, O., & Ali, I. (2017). Project governance, benefit management, and project success: Towards a framework for supporting organizational strategy implementation. *International Journal of Project Management*, 35(8), 1658-1672.
- Wilson, R., Metcalfe, B. D., & Mimouni, F. (2011). Globalization, governance and leadership development in the Middle East. *Leadership development in the Middle East*, 61-85.
- Yamada, M. (2011). Gulf-Asia relations as “post-rentier” diversification? The case of the petrochemical industry in Saudi Arabia. *Journal of Arabian Studies*, 1(1), 99-116.
- Yap, J. B. H., Chow, I. N., & Shavarebi, K. (2019). Criticality of construction industry problems in developing countries: Analyzing Malaysian projects. *Journal of Management in Engineering*, 35(5), 04019020.

Appendix

English Abstract

The petrochemical industry is of striking importance for the development of the Saudi economy, so good governance will be all the more important for the industry to keep progressing. This study aims at: a) examining the current project governance structure in the petrochemicals industry of Saudi Arabia, b) pointing out the governing mechanisms that have a strong relationship with successful projects, and c) measuring the extent of specific governance practices in their contribution to project success. A mixed methodology approach was used, which involved surveying 89 respondents who are working in the same industries and a review of secondary source materials. The studies concluded that the topics of governance play a vital role in the sector, and decision-making and control apparatuses are believed to be the main tools that influence the progress of the projects. On top of this, the study also examined the influence of the project management process and project execution digitalisation, which should be related to stakeholders' project governance participation. The sectoral recommendations address how to strengthen organisational project management, and the inclusion of digitalization and grouping stakeholders are the core factors. The fourth step may be replicating it with more participants and in different contexts than the one explored. In addition, it can examine the prospects and threats of implementing the project more deeply.

Keywords: Petrochemical sector, project governance, project execution, decision-making, digitalization

Arabic Abstract

ملخص الدراسة:

تشكل صناعة البتروكيماويات أهمية بالغة لتنمية الاقتصاد السعودي، وبالنظر الى حجم المشاريع التي تدفع بها الدولة في هذا القطاع، تكمن أهمية حوكمة المشاريع بالطريقة التي تساعد على تحقيق المستهدفات والمخرجات المتوقعة لضمان التنفيذ وفق أعلى معايير الجودة وبما لا يؤثر على تكلفة وجدولة المشاريع لذلك كانت هذه الدراسة والتي تهدف الى: (أ) دراسة هيكل حوكمة المشاريع الحالي في صناعة البتروكيماويات في المملكة العربية السعودية، (ب) الإشارة الى اليات الإدارة الحاكمة التي لها علاقة قوية بالمشاريع الناجحة، (ج) قياس ممارسات الحوكمة في المساهمة في نجاح المشروعات. هذه الدراسة استخدمت منهجية مختلطة والتي شملت استبانة بهدف جمع معلومات واستطلاع آراء مجموعة من العاملين في القطاع، كذلك مراجعة المواد والمصادر الثانوية والدراسات السابقة. وخلصت الدراسة الى أن حوكمة المشاريع تلعب دوراً محورياً وحيوياً في مشاريع القطاع، كما أنها تؤكد على أهمية ودور أدوات اتخاذ القرار والرقابة كأدوات أساسية ورئيسية في تقدم المشاريع. بالإضافة الى ذلك، تناولت الدراسة تأثير عملية إدارة المشروع والتكنولوجيا الرقمية على الأداء وتحقيق المستهدفات المطلوبة من المشاريع، والتي يجب أن تكون ذات صلة بمشاركة أصحاب المصلحة في حوكمة المشروع. تتضمن التوصيات ثلاثة عوامل رئيسية في نجاح حوكمة المشروع وهي تعزيز إدارة المشروع المؤسسية، وتضمين التكنولوجيا الرقمية وتجميع أصحاب المصلحة. يمكن أن يكون للدراسة وتطبيقاتها على شريحة أكبر وسياقات مختلفة أثر أكبر في الكشف عن افاق جديدة وتهديدات محتملة لحوكمة المشاريع بشكل أعمق.

الكلمات المفتاحية: قطاع البتروكيماويات، حوكمة المشاريع، تنفيذ المشاريع، اتخاذ القرار، التكنولوجيا الرقمية.

Questionnaire

1. What is your experience with project execution in your company?
 - a. Experienced significant challenges such as delays, cost overruns, and quality issues.
 - b. Experienced some challenges, but overall successful project execution.
 - c. Rarely faced any challenges, and project execution is generally successful.
 - d. No challenges encountered, and project execution is always successful.

2. How would you rate the level of project governance in your company?
 - a. Ineffective
 - b. Fairly effective
 - c. Effective
 - d. Highly effective

3. What project governance structures are used in your company?
 - a. Centralized
 - b. Decentralized
 - c. Matrix
 - d. Combination of centralized and decentralized

4. How do decision-making processes work in your company?
 - a. Decisions are made at the top level with minimal input from project teams.
 - b. Decisions are made collaboratively, with input from project teams.
 - c. Project teams are primarily responsible for decision-making.
 - d. Combination of top-level and project team decision-making.

5. How often does your company utilize digital tools and technologies for project governance?
 - a. Rarely or never

- b. Occasionally
- c. Frequently
- d. Always

6. How would you rate the impact of digitalization on project governance practices in your company?

- a. No impact
- b. Minimal impact
- c. Moderate impact
- d. Significant impact

7. Do you believe there is a significant relationship between project governance and project execution success in your company?

- a. Strongly disagree
- b. Disagree
- c. Agree
- d. Strongly agree

8. Have you seen any differences in project execution success between centralized and decentralized governance structures in your company?

- a. Yes, centralized structures lead to better project execution.
- b. Yes, decentralized structures lead to better project execution.
- c. No significant difference between the two structures.
- d. No experience with both structures.

9. In your experience, how has digitalization affected decision-making processes in your company?

- a. Has not affected decision-making processes.
- b. Made decision-making faster and more efficient.
- c. Improved collaboration and communication for decision-making.

d. Has not been utilized for decision-making in the company.

10. How do you measure project execution success in your company?

- a. Schedule adherence
- b. Cost control
- c. Quality assurance
- d. All of the above

11. Do you think there is a need for improvement in project governance practices in your company?

- a. Yes, significant improvements are needed.
- b. Some improvements are needed.
- c. No, the current practices are effective.
- d. Uncertain or not applicable.

12. Have you personally experienced any challenges in project execution related to project governance in your company?

- a. Yes, significant challenges affecting project success.
- b. Some minor challenges.
- c. No, project execution has been smooth and successful.
- d. N/A, not directly involved in project execution.

13. In your opinion, how important is project governance in ensuring successful project execution in your company?

- a. Not important at all.
- b. Somewhat important.
- c. Important.
- d. Very important.

14. How involved are project stakeholders (e.g., clients, vendors, government entities) in project governance processes in your company?

- a. Not involved at all.
- b. Somewhat involved.
- c. Highly involved.
- d. N/A, projects do not involve external stakeholders.

15. Based on your observations, do projects in your company face any issues related to communication or collaboration between project stakeholders?

- a. Yes, significant issues.
- b. Some minor issues.
- c. No issues.
- d. Not applicable, not involved in project execution.

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في المملكة العربية السعودية
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