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Research Title:

**Challenges, opportunities and the impacts of Vision 2030 on
the Ductwork Manufacturing Sector in Riyadh, Saudi
Arabia**

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Abstract

This Master's Final Project Indicate and investigates the challenges, opportunities and impacts that Vision 2023 in Saudi Arabia on the Manufacturing Sector especially on the HVAC System – Duct work and Duct accessories Manufacturer.

This research aims to analyze the goals and strategies of Vision 2030 – such as diversifying industries, bringing new technologies to the industry, encourage to be more environmentally friendly that will affect the growth and development of the manufacturers for the Duct work and Duct accessories HVAC system Manufacturers in Riyadh Saudi Arabia.

The study used a descriptive and analytical approach. A questionnaire was used to collect initial data. The questionnaire was given to a random sample of managers, engineers, accountants and procurements etc. working on HVAC Manufacturer in Riyadh, Saudi Arabia. A total of 436 questionnaires were received, and after checking, 390 were found to be valid for analysis. The data was analyzed, and the hypotheses were tested using the SPSS program.

The results shows that Vision 2030 of Saudi Arabia impact the schedule pressure on HVAC Manufacturer, project performance and cash flow of the HVAC companies. Also, the results showed that there is an impact on duration, cost, scope, quality, and stakeholder satisfaction.

The study offered several recommendations to improve schedule pressure management and reduce negative impacts.

Key Words used in the research: Vision 2023 Saudi Arabia, HVAC Manufacturer, Saudi Arabia Projects performance, develop the project performance and Riyadh City.

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1 CHAPTER 1: INTRODUCTION

1.1 Introduction

This study shows the importance of Saudi Arabia Vision and the goals that will improve the Saudi market that follow the international standing.

In a swiftly changing global economy, Saudi Arabia's manufacturing sector indicate itself at a crucial juncture where tradition intersects with innovation. Saudi Arabia looking to reduce the use of the oil and use other market to improve the market of KSA.

Back in April 2016, Prince Mohammed bin Salman introduced Saudi Arabia's Vision 2030. It's a big plan to change the country's economy, society, and culture. Looking into it more closely, you can see that the plan has clear goals, focuses on different industries to boost the economy beyond oil, and has important effects on the world. It's all about moving far away from relying so much on oil and building a more diverse and sustainable future for Saudi Arabia.

Recognizing the requirements to move away from relying mainly on oil money, this plan target to make Saudi Arabia a leader in areas like tourism, technology, renewable energy, and entertainment. At its core, Vision 2030 is about building a sustainable and inclusive economy that matches what the people want and prepares the country for a future beyond oil. It also addresses important social and economic challenges, like high youth unemployment and the goal of having a more diverse workforce, all while trying to reduce dependence on government financial support.

This plan shows how important it is to include women in jobs and to make education better so the country can have a strong and skilled work force.

1.2 Problem Statement

The Kingdom is currently moving towards local manufacturing as one of the most strategically sound options, and it is indeed the fastest route for achieving the country's economic goals. However, with the formation of this future economic climate, characterized by strong openness, along with intense competition and the rapid pace of global economic developments, several forms of challenges or obstacles arise that face all economies and business sectors worldwide. Consequently, significant barriers or challenges have emerged for the future of the industrial sector in the Kingdom.

As a result, the industrial sector in the Kingdom will need to confront these challenges or obstacles with strength on multiple fronts. This article will address what these challenges or obstacles are, as well as the means for overcoming.

.

There are several challenges that the national industry in the Kingdom of Saudi Arabia may face, which can be outlined through the below:

Lay on Oil and Gas: The Saudi industry relies heavily on oil and gas, which constitute over 90% of export revenues.

Weak Industrial Structure: The industrial structure impacts industries in Saudi Arabia, and it is important to note that this structure encompasses not only the physical aspect but also the managerial side within companies and manufacturer

Government Regulations and Policies: National industries encounter challenges related to governmental regulations and policies, such as bureaucratic complexities and lengthy procedures.

Labor shortage: Saudi Arabi is facing a shortage of labor especially Saudi labor.

1.3 Study Purposes

Here are the keys of the objectives of the study that solve the challenges that Saudi Arabia faces on manufacturing sector in 2030 vision

Developing the Industrial Sector:

This study will focus on developing the industrial and manufacturing sector. The study will focus on enhancing Saudi manufacturing and supporting local products.

Furthermore, the study is focusing on the below point that helps to face the challenges that will increase the productivity and improve manufacturing sector in Saudi Arabia to the peak in 2030 vision.

Increase the numbers of industrial cities:

Establish and developing industrial cities such as Jubail and Yanbu, which are among the largest centers for heavy factories.

Enhancing the commercial sector and expansion of E-commerce:

The Kingdom gives digital transformation by creating IT infrastructure and promoting e-commerce as part of schedules like Vision 2030

International trade development:

Strengthening trade relations by signing partnership agreements with countries and global economic organizations

1.4 Study Importance

Saudi Arabia is placing a new position in the world and looking for to be one of the top countries in the manufacturing sector. Saudi Arabia is looking for to be country exporting industrial products.

The Kingdom of Saudi Arabia is placing significant emphasis on the development of its industrial and commercial sectors within the framework of Saudi Vision 2030, which focus to diversify the national economy and enhance sustainability.

Here are the keys of the importance points of the study that solve the challenges that Saudi Arabia faces on manufacturing sector in 2030 vision

Developing Industrial Management: It is well known that improving performance and productivity in industrial facilities primarily depends on the efficiency and quality of management within these establishments. Thus, more attention should be given to this aspect in industrial units, particularly medium and small enterprises, which according to statistics constitute most operational industrial units in the Kingdom.

Enhancing the Competitive Capabilities of National Products: Improving the competitiveness of national products to reach a global level is vital for the national industry currently.

Keeping Up with Rapid Developments in Global Markets: As we see now, the development and change in global markets, particularly in technology, occur at an unprecedented speed, posing a significant challenge for business sectors around the world, especially in industry

Transferring and Localizing Technology: Technology currently plays a significant role in increasing productivity, which directly impacts the competitiveness of industrial products.

Focusing on Environmental Sustainability in the Industrial Sector: It is certain that the current focus on the industrial environment will gain increasing momentum in the future.

1.5 Study Questions

To determine the questions and challenges to develop the manufacturing sector to reach the peak in 2030 we need to understand the history of Saudi Arabia in Industry and manufacturing sector.

Increase in the Number of Factories: Numerous factories have been constructed across the kingdom, with their number totaling approximately 7,007 in 2015.

Increase in Investment Capital: The invested capital reached about \$1.1 trillion in 2015

Increase in the Workforce: The number of workers rose in 2015 to around 990,000.

Establishment of Modern Industrial Cities: Many cities have been created and equipped with the necessary services and facilities.

Establishment of the Saudi Authority for Industrial Cities: An independent body overseeing everything related to industrial cities and their development.

Advancements in Industrial Production: There has been significant progress in industrial production in recent years

Increase in GDP for Manufacturing Products: The GDP for manufacturing products (the process of converting raw materials into usable products) increased from 32 billion Riyals in 1974 to approximately 296 billion Riyals in 2015.

Development in Saudi Exports: The Kingdom has prioritized exports, especially "petrochemical products," which compete strongly in global markets in terms of both quality and price.

The above points give a small view of Saudi Arabia history where during time Saudi Arabia focus on how to develop the county in Industries and manufacturing sector. Furthermore, the above points can give many questions and answer on how the study help to solve all the challenges to improve the Saudi Arabia manufacturing sector.

1.6 Research Hypotheses

The below points shows potential research hypotheses for the Challenges, opportunities, and impacts of Vision 2030 on the Ductwork Manufacturing Sector in Riyadh, Saudi Arabia:

- 1- The impact of Vision 2030 on HVAC manufacturers has a significant positive impact on the growth opportunities.
- 2- Part of the challenges of Vision 2030 are the same challenges that HVAC manufacturers are facing.
- 3- The challenges faced by ductwork manufacturers in Riyadh are significantly influenced by regulatory changes introduced as part of Vision 2030.
- 4- There is a good relationship between the new technologies that have been used and approved in Vision 2030 and HVAC Factories.
- 5- The new relationship between Saudi Arabia and other countries in the Vision 2030, such as China and the USA, will give a competitive advantage to the HVAC field.
- 6- Vision 2030 is working on emphasizing local content and Saudization policies, which have led to increased challenges for foreign-owned ductwork manufacturing companies.

1.7 Theoretical Model

Here is some theoretical model will indicate the impact of Vision 2030 on HVAC manufacturers in Riyadh Saudi Arabia:

1- Vision 2030 Initiatives

Saudi Arabia Vision 2030 focus improve the local manufacturing and Saudization. These efforts focused to make raw material and products to be Saudi made. This will affect the foreign companies but with a goal of improving the local companies by giving many chances to local people gain more skills and experience in the international companies and transfer it to local ones.

2- Promote new technologies to the field

Saudi Arabia Vision encourage to use the new technologies to local industries to deduct the cost, increase the production and give the best quality that match international standards

3- Government Support

Saudi's government give the support to local companies and the priority for the large project. Saudi government in big projects choose the local manufacturers over the foreign companies which will encourage the local companies to match the international standards and be local made.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Saudi Arabia Vision 2030 is planning to develop the country's economy to make it first world countries such as USA, Canada and UK etc. Also, Saudi Arabia working to create new opportunities for growth and replace the oil with industries manufacturing. The HVAC manufacturing industry is one of the most important industries that supply duct work and duct accessories system for the main and important project. This chapter is looking to focus on what researchers; industry experts and representatives of the HVAC industry talked about the challenges and opportunities this industry faces that can be improve during the years to achieve the vision of Saudi Arabia on 2030.

Furthermore, one of the goals of Saudi Arabia vision 2030 are to increase the capacity of local manufacturer and make the quality of the local production matching with international standards. It also discusses how the vision might change the way companies work, use new technology, and develop their workforce. By reviewing this information, we can better understand the current situation of the ductwork industry in Riyadh and what the future might hold for it within Saudi Arabia's bigger plans for growth.

2.2 Dependent Variable

The section is studying the overall success of HVAC industry in Saudi Arabia Riyadh. The dependent variable includes how Saudi Arabia Vision 2023 is affecting how well the industries of the ductwork system is doing, how the products were and how they are now, and focusing on how fast it is growing.

2.3 Independent Variable

2.3.1 Factories independent variable

This can be shown in a few points as below:

- Production of Duct work factories level
- The share of Duct work factories in the Saudi Arabia's market
- Increase the number of local factories.
- Revenue growth
- Innovation and adoption of new technologies
- Employment rates within the sector
- Quality standards that factories are complying with.
- Replace oil production growth to industry's production growth.

2.3.2 Projects independent variable

- Impact on Quality of the material delivered to the site
- Impact on Project Timeline
- Impact on Project Cost
- Impact on Owner Satisfaction

By studying these indicators, we can analyze the influences of the vision 2030 along with showing the challenges and opportunities, impacts the development and success of the ductwork manufacturing industry in Riyadh. Figure 1 shows the shape of dependent variable and independent variable that related to the research

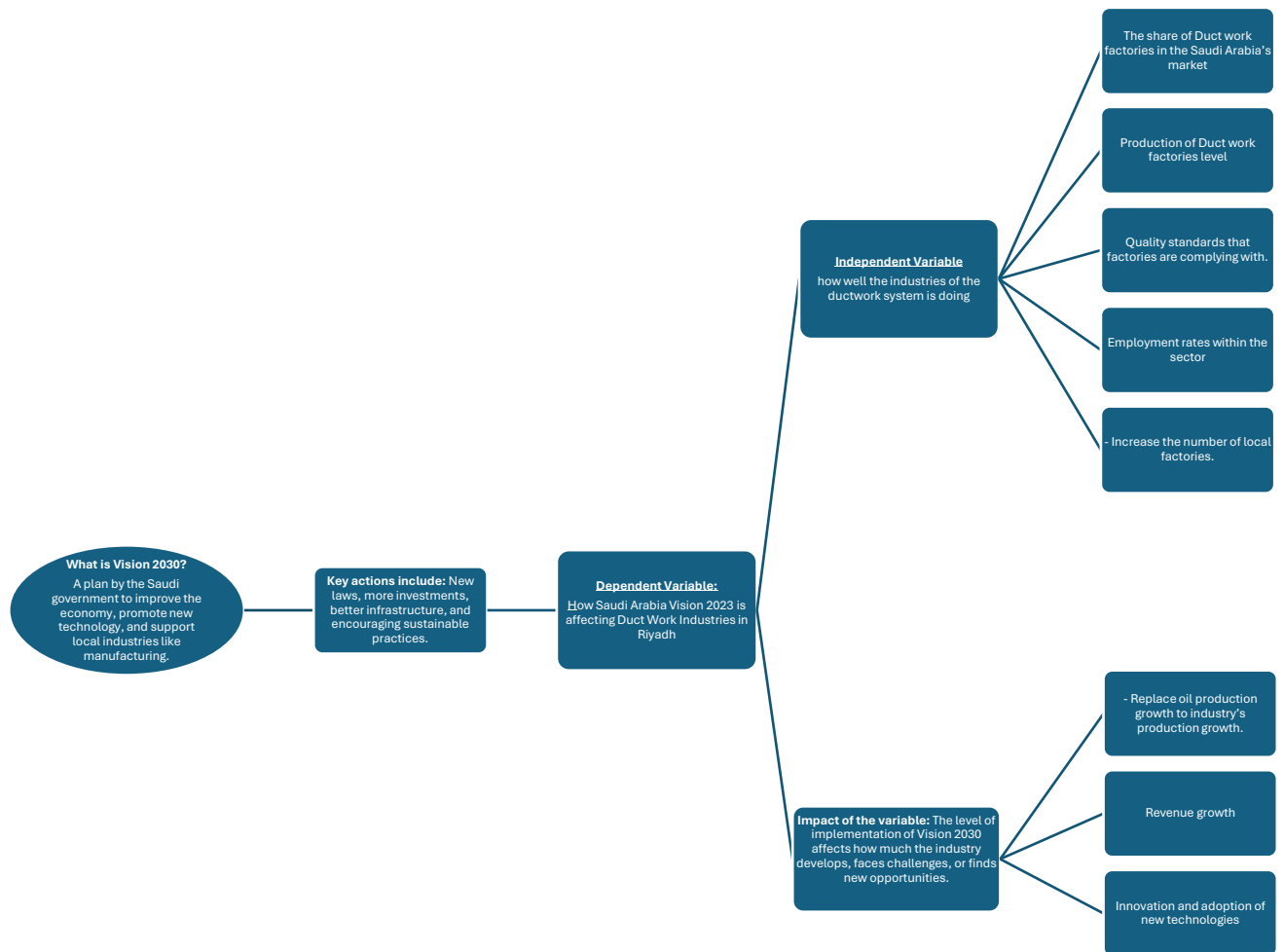


Figure 1: Dependent variable and independent variable on Duct work Factories

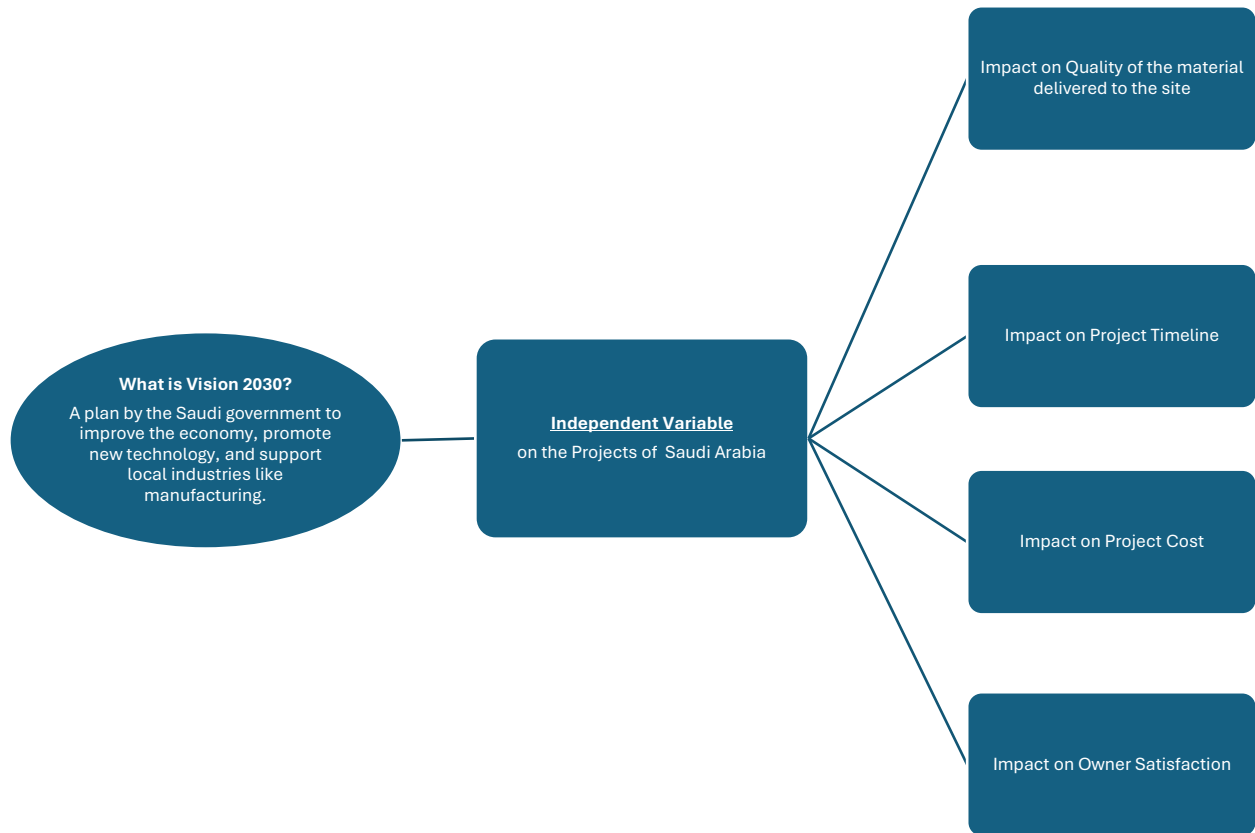


Figure 2: Projects independent variable

Factories independent variable

- Production of Duct work factories level
- The share of Duct work factories in the Saudi Arabia's market
- Increase the number of local factories.
- Revenue growth
- Innovation and adoption of new technologies
- Employment rates within the sector
- Quality standards that factories are complying with.
- Replace oil production growth to industry's production growth.

Projects independent variable

- Impact on Quality of the material delivered to the site
- Impact on Project Timeline
- Impact on Project Cost
- Impact on Owner Satisfaction

2.4 Scope of the Research:

Spatial Domain: This study was applied to duct work industries and construction projects in the Riyadh region of Saudi Arabia.

Human Domain: The study was conducted on a random sample of engineers working in construction projects and duct work industries in the Riyadh region.

Temporal Domain: The study was carried out from January to August 2025.

Thematic Domain: This study focused on the impact of Saudi Arabia Vision 2030 on Duct work industries in the Riyadh region.

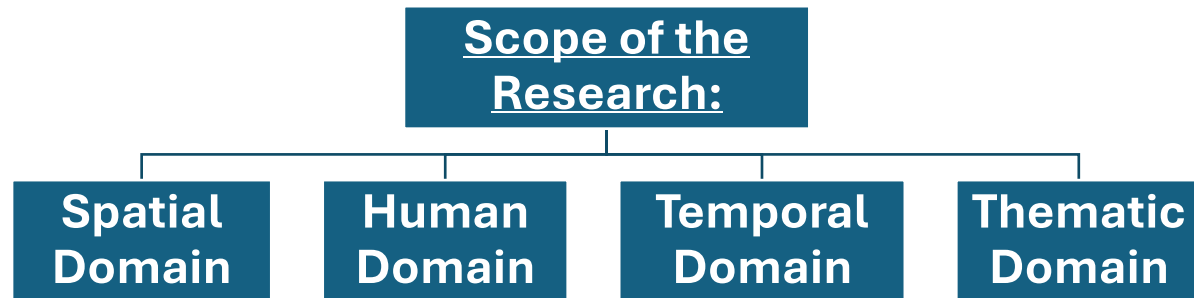


Figure 3: Scope of Research

2.5 Summary of Past Studies

2.5.1 English Version

2.5.1.1 (Saudi Arabia HVAC Ductwork Market Size, 2025)

In 2024, Saudi Arabia HVAC market spent USD 989 M. By 2033, specialists predict it to grow to around USD 2.36 B, with an annual growth rate of about 9.1% from 2025 to 2033. The growth is mainly giving to the increasing need for energy-saving ventilation systems and smart building technologies. Large infrastructure projects under Saudi Arabia's Vision 2030 also support the growth of HVAC ductwork in both commercial and residential buildings

Report Attribute	Key Statistics
Base Year	2024
Forecast Years	2025-2033
Historical Years	2019-2024
Market Size in 2024	USD 989.10 Million
Market Forecast in 2033	USD 2,363.13 Million
Market Growth Rate 2025-2033	9.10%

Figure 4: Saudi Arabia HVAC Ductwork Market Overview

In Saudi Arabia, the HVAC ductwork market is changing thanks to new technology that makes systems more energy-efficient and reliable. For example, in April 2025, AFICO started using an AI-based system from Nanoprecise Sci Corp that predicts maintenance needs. This system monitors HVAC performance in real-time, helping companies find and fix energy problems and equipment issues before they cause breakdowns.

This predictive maintenance helps businesses run their HVAC systems better, reduce unexpected repairs, and save energy. By using smart machines and sensors, AFICO is leading the way in creating energy-saving, smart HVAC solutions. As the demand for greener and smarter systems grows in Saudi Arabia, more innovations are coming to reduce waste and make equipment last longer. With environmental concerns in mind, predictive maintenance is expected to become common, helping company's lower costs, meet regulations, and support Saudi Arabia's sustainability goals. All of this is helping the HVAC ductwork market grow even more.

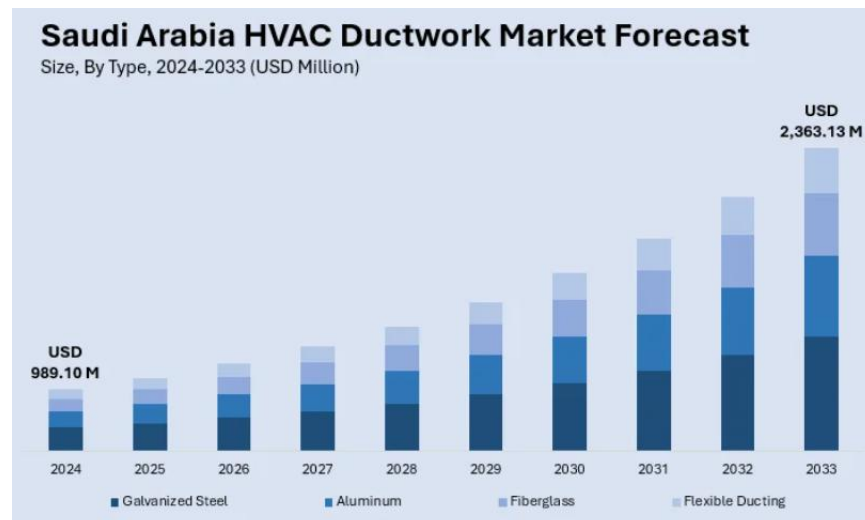


Figure 5: Saudi Arabia HVAC Ductwork Market Forecast

2.5.1.1.1 Sustainability and Performance in HVAC Solutions

The HVAC ductwork market in Saudi Arabia is quickly moving towards systems that are both high-performing and energy-efficient, as sustainability becomes more important in building projects. At the ISH Expo 2025, VTS Group introduced new products like the VENTUS Platinum AHU and a home ventilation unit, showing how the industry is focusing on greener building solutions.

The VENTUS Platinum AHU is designed to use very little energy and includes smart features that work well with existing systems, while also improving indoor air quality. These new systems are useful for both commercial buildings and homes, as urbanization and infrastructure projects grow fast in Saudi Arabia.

Companies are increasingly looking for energy-saving, cost-effective, and healthy indoor environments. These advanced HVAC systems are expected to play a big role in growing the ductwork market, supporting Saudi Arabia's Vision 2030 goals for better energy use and sustainable building practices. This shift marks an important change in how the Saudi HVAC market is developing.

2.5.1.1.2 Saudi Arabia HVAC Ductwork Market Segmentation:

The below study is showing the main sides of the Saudi Arabia market and shows the value from 2023 to 2025, and is divided into groups as shown below:

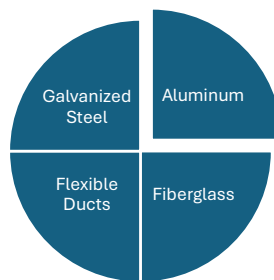


Figure 6: Type Details

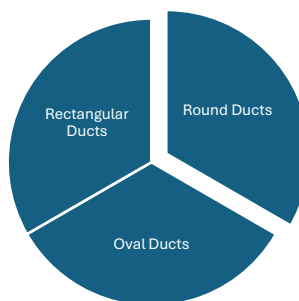


Figure 7: Shape Details:

Use Details:

The report also explains how the ducts are used in different areas.

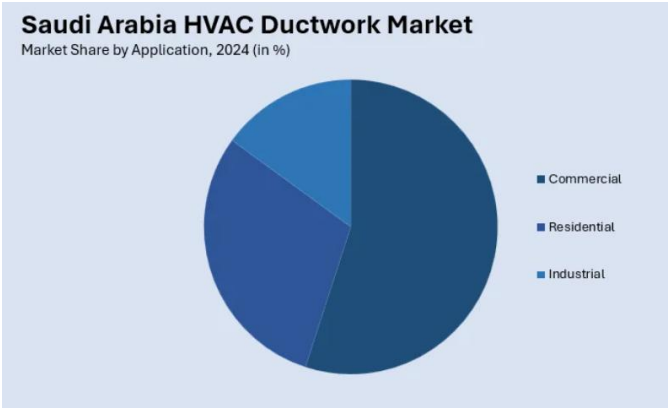


Figure 8: Application Insights:

Applications:

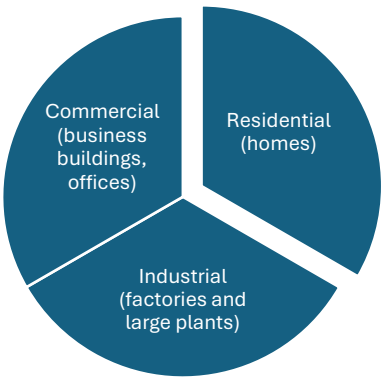


Figure 9: Applications

2.5.1.1.3 Competitive Landscape:

The report is studying the market of the competition. It shows the market setup, the main companies, their strategies, how they compare, and detailed profiles of all big companies.

Saudi Arabia HVAC Ductwork Market News:

May 2025: Mada Gypsum Company launched new HVAC duct boards that meet strict quality standards. These boards are strong, flexible, and suitable for both inside and outside buildings. They are fire-resistant and resist moisture, making buildings safer and better.

January 2025: Climate Crete, part of the Novus Crete group and supported by Saudi Arabia's Oil Sustainability Program, improved HVAC ductwork by adding special fibers and recycled materials into concrete. This made their products eco-friendlier and more sustainable, helping Saudi Arabia move toward greener building options. (Saudi Arabia HVAC Ductwork Market Size, 2025)

2.5.1.1.4 Summary of the Study

The industry report provides a clear and detailed overview of the Saudi Arabia HVAC ductwork market. It includes data and analysis of various market segments, past and present trends, future predictions, and how the market is expected to behave from 2019 to 2033.

The report also shares the latest information on what drives the market, the challenges it faces, and the new opportunities it presents.

Porter's five forces analysis helps stakeholders understand how new companies might enter the market, the intensity of competition, the power of suppliers and buyers, and the risk of other products replacing HVAC ductwork. This helps them see how competitive the market is and whether it's a good place to invest.

The competitive landscape section identifies the leading companies, their market position, and their strengths and weaknesses.

2.5.1.2 (Alotaibi, 2025)

Saudi Arabia is going through a huge change. The country is shifting its economy under a plan called Vision 2030.

For many years, oil and gas were the main sources of money for Saudi Arabia. Now, the country is working hard to create other types of industries so it can compete with other countries around the world.

Today's factories are not just making products; they are part of a big effort to build a modern economy that focuses on technology, knowledge, and smart infrastructure.

2.5.1.2.1 Industrial cities and tech clusters across Saudi Arabia

This change is occurring through a connected system of industrial areas and special zones across various sectors, including aviation (airplanes), automobiles, food, mining, and chemicals.

There are already 40 industrial cities in the country. By 2035, Saudi Arabia plans to have around 36,000 factories. These cities are more than just places to make products — they are becoming critical economic centers connected to global markets via modern ports, railways, and highways.

2.5.1.2.2 Big investments boosting industry growth

Saudi Arabia is moving to a new level by focusing on new industrial areas and enhancing its infrastructure. The country recognizes the need to diversify its industries beyond oil.

Some important industrial cities are Jubail and Yanbu. These cities are renowned worldwide for their production of chemicals and plastics, which has enabled Saudi Arabia to remain a leader in energy and chemicals.

Ras Al-Khair Industrial City, on the Gulf coast, is a key place for mining. It has Ma'aden, one of the world's largest aluminum and mineral factories.

In the south, Jazan Industrial City is becoming increasingly crucial for major industries, energy projects, as well as food and agriculture.

King Abdullah Economic City (KAEC) is a unique city that combines industrial facilities, ports, and residential areas. It boasts one of the world's most advanced ports, facilitating international trade.

In central Saudi Arabia, Sudair Industrial City specializes in manufacturing medicines, food, and small consumer products. It helps build the country's supply chain—how goods are made and moved. .

2.5.1.2.3 Special industry clusters for the future

Saudi Arabia is also creating special groups of industries called clusters. These are set up to help develop new and future industries that will be important for the country's growth.

2.5.1.2.4 Food industries in Jeddah city

Aero Park One is a new project in Jeddah. It travels to a large area and serves as a specialized center for aviation, space, and defense technology. It is near the airport and port, making it easy to send and receive goods. The goal is to make Saudi Arabia a central hub for air travel and technology.

2.5.1.2.5 Electric cars

KAEC is building a factory for electric cars. This will help Saudi Arabia become more eco-friendly and work with big car companies from around the world. They aim to manufacture cars and parts locally, thereby establishing robust supply chains.

2.5.1.2.6 Food security and food industry

Jeddah also has a big food factory area with 75 factories and large warehouses. It has attracted over \$5 billion from other countries. The goal is to increase food production in Saudi Arabia, reduce imports, and establish a significant presence in food production and exports.

In April, Saudi Arabia built a new dairy factory area in Al-Kharj. It spans 2 million square meters and will feature factories for producing dairy products, packaging, and animal feed. This will help Saudi Arabia produce most of its dairy needs and sell to nearby countries.

2.5.1.2.7 Ports and railways

Ports and trains are essential for business. Jeddah's main port handles a significant portion of the food trade. Other ports focus on minerals and exports. There is a railway connecting mines, factories, and ports. Soon, a new land bridge railway will connect the Red Sea to the Arabian Gulf, facilitating faster and easier trade.

2.5.1.2.8 Saudi's Growing Industry

Saudi Arabia's industries are growing fast. From factories in Jeddah to high-tech labs and auto plants, the country is building a modern, innovative economy. Modern ports and fast transport help attract international investments.

By working on Vision 2030, Saudi Arabia is becoming a global leader in making and exporting products, not just selling raw materials. This is a real industrial revolution — a big change that shows the country's strong plans.

2.5.1.2.9 Summary of Saudi Arabia's Industrial Growth Under Vision 2030

Saudi Arabia is changing its economy to become more diverse and modern. Instead of mainly relying on oil, the country is building new industries and factories. By 2035, they aim to have approximately 36,000 factories across various sectors, including aviation, automotive, food, mining, and chemicals.

Significant investments are helping this growth. Critical industrial areas include Jubail, Yanbu, Ras Al-Khair, Jazan, and King Abdullah City. New projects include a specialized aviation hub, electric car factories, and extensive food processing facilities, including a dairy farm in Al-Kharj.

Ports and trains also support this growth. New railway projects will make it easier to move goods around the country and to other countries.

This significant change is happening now. Saudi Arabia is becoming a country that manufactures and exports a wide range of products, not just one that sells oil. The goal is to build a strong, innovative, and sustainable economy by 2030 and beyond

2.5.2 Arabic Research

2.5.2.1 (Al-Ghamdi, 2024)

2.5.2.1.1 Saudi Arabia's Efforts in Developing Industry and Commerce

Saudi Arabia is working hard to develop its industries and commerce as part of its Vision 2030. This plan aims to make the economy more diverse and sustainable. Here are the main points

2.5.2.1.2 Development Industry

2.5.2.1.2.1 Improving Key Industries

- Petrochemicals: Saudi Arabia is one of the biggest producers of chemicals made from oil, with companies like SABIC and Aramco
- Mining: The country has started programs to use its minerals and grow the mining industry
- Military: The goal is to produce half of the military equipment inside the country by 2030

2.5.2.1.2.2 Building Industrial Cities

- Cities like Jubail and Yanbu are big centers for heavy industries and chemicals.
- Economic cities like King Abdullah City attract foreign companies.
- About 36 industrial cities are managed across the country.

2.5.2.1.2.3 Supporting Small and Medium Businesses

- Small companies get help through banks and programs like Musharakah, which provide money and support.

2.5.2.1.3 Boosting Business and Trade

2.5.2.1.3.1 Growing Online Shopping

Saudi Arabia is improving internet and digital systems to support online buying and selling

2.5.2.1.3.2 Making Business Easier

- Ports like Jeddah and King Abdullah help with importing and exporting goods
- Platforms like Fasah make customs and paperwork faster

2.5.2.1.3.3 Expanding International Trade

- Saudi Arabia is signing trade agreements with other countries
- It joined the World Trade Organization (WTO), opening new markets for exports

2.5.2.1.3.4 Supporting Local Markets

- Traditional markets and modern shopping malls are being improved
- Foreign companies are encouraged to invest in retail and wholesale businesses

2.5.2.1.3.5 Attracting Investments

- Making it easier for foreign companies to invest by reducing rules and offering tax benefits
- The Public Investment Fund (PIF) finances big projects to help grow the economy.

2.5.2.1.3.6 Focusing on Sustainability and Innovation

- Promoting green industries and renewable energy projects like NEOM
- Using new technology like artificial intelligence and robots to modernize industries

2.5.2.1.3.7 Results of these efforts

- Industry contributes more to the country's economy
- Saudi Arabia is becoming a key logistics hub for trade
- More jobs are created, helping local people and the economy grow

These efforts show Saudi Arabia's strong plan to build a sustainable and growing economy that keeps up with global changes.

2.5.2.1.4 Summary of the study

Saudi Arabia is working to grow its industries and businesses as part of Vision 2030. The country is developing key sectors, including petrochemicals, mining, and military equipment, while building industrial cities. It supports small and medium-sized businesses, making trading easier through improved ports and online platforms. Saudi Arabia is also tempting global acquisitions, enabling green power, and using new technologies such as AI and robotics.

2.5.2.2 (Abousaq, 2024) National Committee for Industry: Challenges and Solutions to Support the Industrial Sector considering Saudi Vision 2030

2.5.2.2.1 Goals of the National Industry Committee

The committee aims to support and develop the industrial sector in Saudi Arabia, thereby helping to show the economy in line with Vision 2030. They aim to address the problems faced by factories, help them remain strong, and make them more competitive both within the country and abroad.

2.5.2.2.2 Why industry investors aren't using ministry programs enough

2.5.2.2.2.1 The Ministry of Industry has created good programs to help factories, such as

- Future Factories: To help factories use advanced technology
- Promising Factories: To support small and medium-sized factories
- Green Factories: To encourage the use of clean energy

2.5.2.2.2.2 But many investors aren't benefiting much from these programs because

- Procedures are complicated: Long and confusing rules make it hard to get support
- Approval takes a long time: It takes too much time to get projects approved
- Competition system: Using competitions limits many investors from benefiting

2.5.2.2.2.3 The Factory Sustainability Program Failed

- The committee tried to create a program to help struggling factories stay open and grow. But unfortunately, the program was canceled before it started, without making any real progress.
- What this shows: The committee isn't good at turning plans into real actions. This means they need to improve their planning and how they work to better help factories in trouble.

2.5.2.2.2.4 Other Challenges Facing the Industry

- Many fees: There are lots of charges like environmental and industrial city fees, which increase costs for investors, especially at the beginning
- Poor coordination: Different government agencies don't work well together, causing confusion
- No help for struggling factories: Factories facing money or operational problems don't get practical support from authorities

2.5.2.2.2.5 How to Improve the Committee's Role

- Factories support program: where it will make a clear plan to help struggling factories, with special teams to find solutions
- Simplify operations: Make rules easier and faster so investors can get help quickly
- Unify costs: Create a single online platform where all fees and procedures are managed under the Ministry's supervision, making things clearer and more transparent
- Promote programs like "Future Factories" and "Promising Factories" and remove the competition system to include more investors

2.5.2.2.2.6 A Central Industrial Platform

To make everything easier, there should be a single online platform for industrial matters

- Easy registration: Investors can submit and track their requests easily
- Transparency: Clear rules about fees and programs
- Monitoring: The Ministry can keep an eye on challenges and respond quickly

This way, supporting factories and developing the industry will become smoother and more effective

2.5.2.2.3 Summary of the study

The Saudi Arabia government is helping factories to improve the economizing. But investors face problems like involved rules, slow approval processes, and a lot of fees. Some programs to support factories haven't worked well. To fix this, they should make rules simpler, combine all fees into one online system, promote helpful programs, and improve teamwork among government agencies. An online platform where investors can easily apply, check their progress, and see clear information will make supporting factories much easier and help the industry grow faster.

3 Chapter 3: Research Methodology

3.1 Introduction

In this chapter, the methodology and procedures followed in the research will be explained. This includes identifying the methodology, the target the sample of the study, the data collection tools in terms of preparation and methods for verifying validity , as well as the statistical tools and processes that will be used to analyze the data.

3.2 Research Design

The research employs a combination of methods, as shown in Figure 6. This study will study the both numbers-based (quantitative) and words-based (qualitative) data. The numbers will show how people sense things, the challenges they face, and the opportunities available. The words will help us understand people's thoughts and feelings more deeply. Using both methods together makes studying stronger and more reliable..

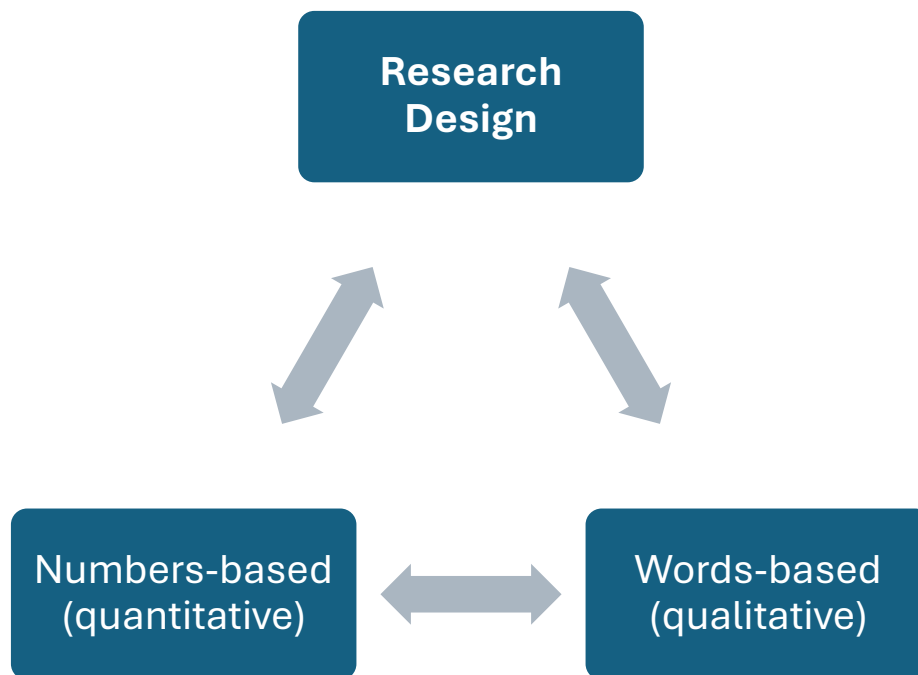


Figure 10: Research Design

3.2.1 Quantitative

Quantitative methods include collecting and analyzing numerical data. The method that will be used is a survey with questions that have ratings or multiple-choice answers, which will help us measure how many people share certain opinions, what challenges they face, and what opportunities they see. This method allows us to see patterns and generalize based on the numbers using SPSS.

3.2.2 Qualitative methods

This method focusses on collecting information through open-ended questions, interviews, or discussions. This helps us understand people's thoughts, feelings, and experiences more deeply. Instead of just numbers, we learn why people feel a certain way or what their specific challenges and ideas are.

3.3 Population of the study

The number of factories in Saudi Arabia increased by 10% from 2023 to reach 11,600 factories. In Saudi Arabia, there are 37 companies specializing in HVAC ductwork factories. In Riyadh, seven factories and companies manufacture and supply ductwork systems. Each factory has a different organizational size. (The study did not cover the workshops) (HVAC in Saudi Arabia, n.d.)

The Study was done to the following factories/Company names:

- 1- Arabian Thermal Aire Industries Company Limited (known as ATAI)
- 2- Safid Company,
- 3- Al Mabani Company
- 4- Technical duct Factory
- 5- Sharqawi Company.
- 6- ALAFCO
- 7- Zahra Duct Factory (known as ZDF)

The previous companies have different Organizational size in leading manufacturer& supplier of HVAC (Duct work and Duct accessories) in Riyadh Saudi Arabia. (ATAI, 2025) (SAFID, 2025) (Sharqawi, 2025) (Almabani Co, 2025)

ATAI Co	SAFID Co	Al Mabani Co	Sharqawi Co	Technical duct Factory	ALAFCO	ZDF
ATAI With a 40 year track record as the leading manufacturer& supplier of Duct work and duct accessoreis ,	SAFID was founded as a joint venture between the Rahbani Group and NOKIA CO (Finland) in 1979	Al Mabani Al Umumiyyah is Industries which is one of the leading manufacturers of HVAC ducts and duct accessories	Established our first factory in 1995 in Jeddah and second one in 2009 in Riyadh	An ISO 9001:2015 quality certified, highly integrated HVAC duct factory with a long history in the design, manufacturing, installation & commissioning of engineered HVAC duct system	A leading Manufacturer of HVAC Duct work and Accessories in the Middle East.	ZDF is one of the eldest factories in KSA for this industry

Figure 11: Population of the study

The population comprises of key stakeholders within the ductwork manufacturing sector in Riyadh, based on industry reports and sector directories shown below.

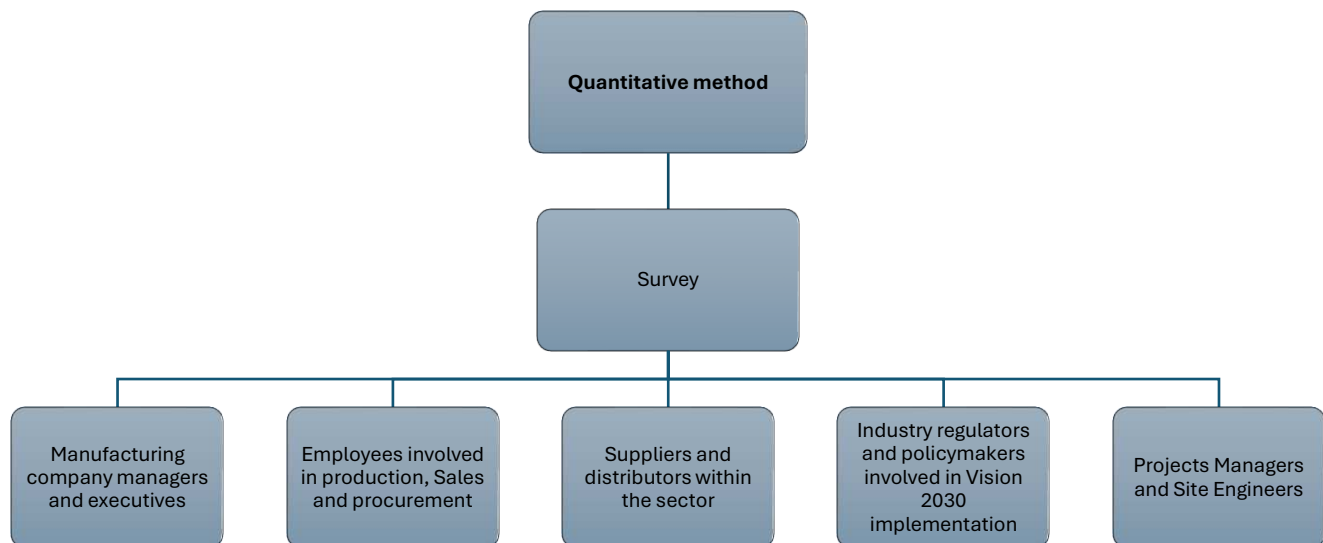


Figure 12: Quantitative Method and the population comprises key stakeholders within the ductwork manufacturing sector in Riyadh

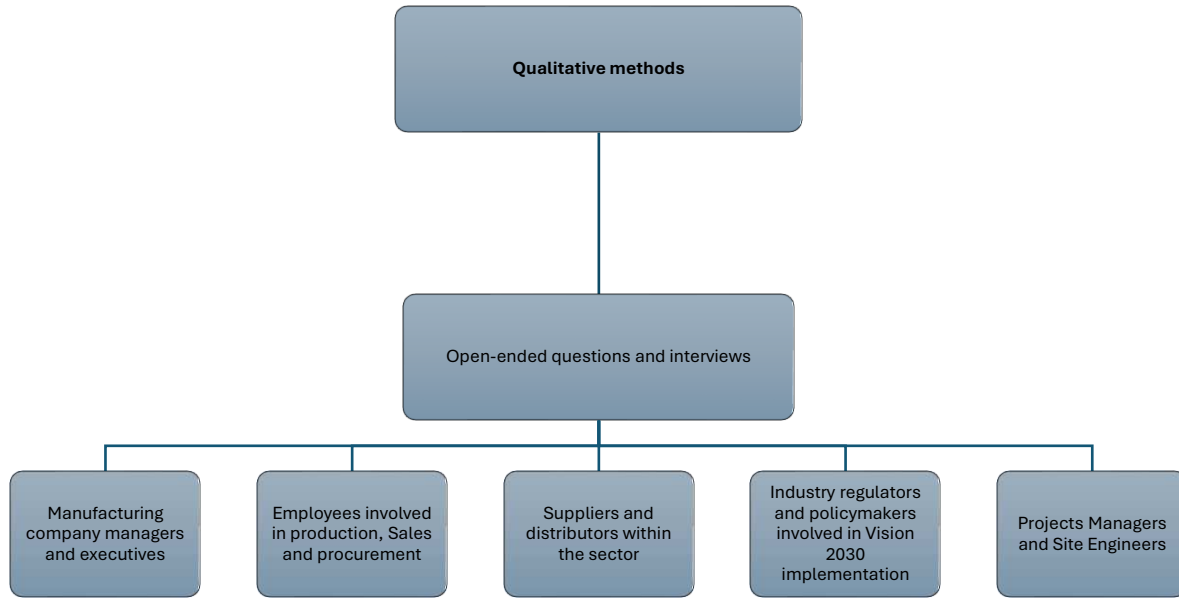


Figure 13: Qualitative Method and the population comprise key stakeholders within the ductwork manufacturing sector in Riyadh

3.4 Sample Characteristics

The sample will include participants representing various roles and organizational levels within the sector to ensure a comprehensive understanding. Characteristics include:

- Age range: 20-60 years
- Gender: Both male and female participants
- Education: From technical diplomas to advanced degrees
- Experience: Minimum of 1 year in the ductwork manufacturing industry
- Organizational size: Small, medium, and large enterprises
- Organization size
- Position
- Organizational level
- Industry Perspectives

3.5 Sample Size Determination

The number of the factories in Saudi Arabia has increase from 2023 10% to reach 11,600 factories. Duct work factories in Saudi Arabia there are 37 companies for HVAC in Saudi Arabia. In Riyadh, there are 7 factories/companies as manufacturers and suppliers for the duct work system. Each factory has 200-300 staff (250 as average) Note(1 ÷ 3 of them are engineers) (The study did not cover the workshops)

(HVAC in Saudi Arabia, n.d.)

$$7 \text{ Factories} \times \left(250 * \frac{1}{3}\right) = 584 \text{ Engineers in 9 Factoreis in Riyadh}$$

Based on Cochran's formula: $n_0 = (Z^2 \times p \times (1-p)) / e^2$

(Thompson, (2012)

Where:

- $Z=1.96$ $Z = 1.96$ $Z=1.96$ (for 95% confidence)
- $p=0.5$ $p = 0.5$ $p=0.5$ (maximum variability)
- $e=0.05$ $e = 0.05$ $e=0.05$ (margin of error)

Result:

The **recommended sample size** is approximately **232 respondents** to ensure a 95% confidence level with a 5% edge of error from a population of 584 people.

To sum up, the study will be on the 7 companies (ATAI, Safid Company, Al Mabani Company, Technical duct Factory, Sharqawi Company, ALAFCO, as ZDF)) with a total **232** respondents.

A random sample was selected from the research population, consisting of engineers working on construction projects in the Riyadh region of Saudi Arabia. The questionnaire was converted into an electronic form via Google Drive, and the electronic link was then sent to the targeted sample through social media communication applications.

A total of 584 questionnaires were collected, and after review and verification, the researcher obtained 232 valid questionnaires for analysis. Since the number of engineers working in duct work factories in the Riyadh region is 584 engineers (HVAC in Saudi Arabia, n.d.), the minimum acceptable sample size for the research at a 95% confidence level, according to Stephens Thompson's formula, is 232. This is less than the number of responses the researcher received.

The distribution of the sample based on demographic characteristics was as follows, as illustrated below:

Table 1: Demographic characteristics

Demographic Information	Perspectives	Numbers	Percentage %
Gander	Male	201	86.64
	Female	31	13.36
	Total	232	100%
Age	25 - 30	27	0.12
	31 - 35	51	0.22
	36 - 40	59	0.25
	41 - 45	73	0.31
	46 - 50	15	0.06
	51 and more	7	0.03
	Total	232	100%
Degree	Technical Diploma	8	3.45
	Bachelor's Degree	183	78.88
	Master's Degree	35	15.09
	Doctorate or higher	6	2.59
	Total	232	100%
Years of Experience in Ductwork Manufacturing Industry:	1-2 years	25	10.78
	3-5 years	70	30.17
	6-10 years	106	45.69
	11+ years	31	13.36
	Total	232	100%
Employer/Organization	ATAI Co	48	20.69
	Safid Co	39	16.81
	Al Mabani Co	31	13.36
	Sharqawi Co	46	19.83
	Technical duct Factory	27	11.64
	ALAFCO	22	9.48
	ZDF	19	8.19
	Total	232	100%
Organizational Size:	Small (1-100 employees)	41	17.67
	Medium (101-200 employees)	58	25.00
	Large (201+ employees)	133	57.33
	Total	232	100%
Your current role within the organization:	Factory Production Engineers / Worker	73	31.47
	Factory Supervisor/Team Leader	27	11.64
	Factory Manager	7	3.02
	Factory Executive/Director	23	9.91
	Factory Sales	46	19.83
	Factory Technical Engineer	56	24.14
	Total	232	100%

To Sum up the above table:

- **Mostly Men:** About 87% of the people are men, and only around 13% are women.
- **Age Groups:** Most people are between 31 and 45 years old. Very few are younger than 30 or older than 50.
- **Education:** Most have a bachelor's degree. Some hold a master's degree, while a few possess a technical diploma or a doctorate.
- **Work Experience:** Many people have been working in the industry for 3 to 10 years. Fewer have less than 2 years or more than 11 years of experience.
- **Where They Work:** The biggest companies are ATAI Co, Safid, and Sharqawi Co. Other companies have fewer workers.
- **Size of the Company:** Most workers work in large companies with over 200 employees. Some work in medium-sized companies, and a few are in small companies.
- **Jobs:** The largest group works as factory technicians or workers. Others are in sales, as supervisors or managers. Few are in top management roles.

In short, the workforce is mainly made up of experienced, middle-aged men working in larger companies, primarily in hands-on jobs such as manufacturing and supervision.

3.6 Data Collections procedures

To collect data and achieve the research objectives, the questionnaire was chosen as the main tool because of its ease of application, low cost, accuracy of results, and ability to gather diverse data. The questionnaire was also tested on a small sample of participants before being widely distributed, to ensure its effectiveness and the reliability of the results. After collecting the data, the results were analyzed and processed using SPSS software (Zoubi, 2023)

3.7 Study Determinants

The research was conducted on a purposive sample of seven leading manufacturing companies specializing in ductwork and duct accessories, based in Riyadh, Saudi Arabia. This study aims to provide an in-depth analysis of the key challenges and opportunities facing the sector, as well as the strategic impacts of Saudi Arabia's Vision 2030 on ductwork manufacturing. By focusing on these prominent industry players, the research offers valuable insights into the sector's current dynamics, prospects, and alignment with national economic diversification goals, thereby contributing to a comprehensive understanding of the sector's transformative journey within the framework of Vision 2030.

3.8 Method of Analysis

Step One: The researcher challenged the main objective of the study, which is to identify the Challenges, opportunities, and the impacts of Vision 2030 on the Ductwork Manufacturing Sector in Riyadh, Saudi Arabia

Step Two: Identifying measurement areas for the research tool: The measurement areas for the research tool consisted of two parts:

- A- Demographic characteristics (gender, age, educational level, years of experience, Employer/Organization, Organizational Size, and current role within the organization).
- B- The impact of Vision 2030 on the Ductwork Manufacturing Sector, on the main points of the study, which are mentioned below:
 - Production of ductwork factories level (5 Q&A)
 - The share of ductwork factories in Saudi Arabia's market (5 Q&A)
 - Increase the number of local factories. (5 Q&A)
 - Revenue growth (5 Q&A)
 - Innovation and adoption of new technologies (5 Q&A)
 - Employment rates within the sector (5 Q&A)
 - Quality standards that factories are complying with. (5 Q&A)
 - Replace oil production growth with the industry's production growth. (5 Q&A)

Step Three: Formulating Preliminary Research Tool Statements. After identifying the survey areas, the statements were drafted by reviewing the theoretical framework and the tools used in previous studies, including the current research. Each area's statements were formulated by the general definitions of the targeted survey domain.

Step Four: Scoring responses for the principal axes: Responses were graded using a five-point scale, strongly agree, agree, neutral, disagree, and strongly disagree, with scores assigned as follows: 5, 4, 3, 2, 1, respectively

Step Five: Formulating Instructions for the Research Tool: The survey instructions were drafted to inform the sample respondents about the purpose of the study tool, ensuring clarity of the statements and their suitability for the respondents' level of understanding. Additionally, the study variables' data were presented, with an emphasis on the confidentiality and privacy of the information provided.

Step Six: Finalizing the questionnaire in its final form and administering it to the targeted sample. This involved converting the questionnaire into an electronic format and then sending the electronic link (via Google Drive) to the target sample through either hard or soft copy.

3.9 Truth of the research tool's paragraphs.

3.9.1 Validity of the Research Tool (Judges' Validity):

The researcher showed the first version of the questionnaire to a group of experts. They reviewed it and gave their feedback. The researcher asked them if the questions accurately measure the goals, if the questions are clear, if each question fits with its topic, and if all important areas are covered. They also suggested some changes, like rephrasing, deleting, or adding questions. The researcher made the changes that most experts agreed on. As a result, the questionnaire was finalized and included in the appendices.

3.9.2 Internal Consistency

We checked if the questionnaire is reliable by measuring how well each question relates to its group. We used a simple method called Pearson's correlation. To do this, we tested it on 57 engineers working on building projects in Riyadh, Saudi Arabia. The results are shown on the table below.

Table 2: Internal Consistency

Topic – Part	Perspectives NO	Pearson Correlation	The Topics	Perspectives NO	Pearson Correlation
Industry Perspectives - Part 1	1	.783**	Industry Perspectives - Part 2	1	.868**
	2	.760**		2	.811**
	3	.703**		3	.665**
	4	.744**		4	.703**
	5	.710**		5	.759**
Industry Perspectives - Part 3	1	.803**	Industry Perspectives - Part 4	1	.840**
	2	.754**		2	.798**
	3	.605**		3	.697**
	4	.680**		4	.738**
	5	.727**		5	.749**
Industry Perspectives - Part 5	1	.823**	Industry Perspectives - Part 6	1	.852**
	2	.800**		2	.795**
	3	.689**		3	.753**
	4	.790**		4	.731**
	5	.721**		5	.761**
Industry Perspectives - Part 7	1	.899**	Projects (Site) - Perspectives - Part 1	1	.874**
	2	.840**		2	.830**
	3	.656**		3	.662**
	4	.598**		4	.664**
	5	.767**		5	.770**
Projects (Site) - Perspectives - Part 2	1	.834**	Projects (Site) - Perspectives - Part 3	1	.872**
	2	.803**		2	.810**
	3	.660**		3	.662**
	4	.742**		4	.719**
	5	.739**		5	.757**
Projects (Site) - Perspectives - Part 4	1	.855**			
	2	.792**			
	3	.702**			
	4	.715**			
	5	.798**			

The above table shows the Pearson correlation coefficients between each statement of the study axes and the total score for the axes. We find that all correlation coefficients between each statement and the score of the first axis are high and varied as shown in the table above.

This indicates that the study axes in the questionnaire possess internal consistency validity, and their statements are strongly correlated with the axes. Therefore, they effectively measure what they were designed to assess.

3.9.3 Reliability

To check if the research tool is reliable, Cronbach's alpha was used on a sample. The sample included 60 engineers working on construction projects in Riyadh, Saudi Arabia. This indicates that the tool has high reliability, so the results can be trusted to make correct decisions. The results are shown on the table below.

Table 3:Reliability

Topic – Part	Perspectives NO	Alpha Cronbach	The Topics	Perspectives NO	Alpha Cronbach
Industry Perspectives - Part 1	1	0.787	Industry Perspectives - Part 2	1	0.814
	2			2	
	3			3	
	4			4	
	5			5	
Industry Perspectives - Part 3	1	0.74	Industry Perspectives - Part 4	1	0.815
	2			2	
	3			3	
	4			4	
	5			5	
Industry Perspectives - Part 5	1	0.813	Industry Perspectives - Part 6	1	0.83
	2			2	
	3			3	
	4			4	
	5			5	
Industry Perspectives - Part 7	1	0.81	Projects (Site) - Perspectives - Part 8	1	0.745
	2			2	
	3			3	
	4			4	
	5			5	
Projects (Site) - Perspectives - Part 9	1	0.803	Projects (Site) - Perspectives - Part 10	1	0.818
	2			2	
	3			3	
	4			4	
	5			5	
Projects (Site) - Perspectives - Part 11	1	0.825	Total Perspectives	55	
	2		Alpha Cronbach	0.9	
	3				
	4				
	5				

3.9.4 Correction standard:

The Likert five-point scale was used to evaluate the answers. To find the correct cell size, to determine the correct cell size we follow the below:

- 1- Deduct the difference between the limits ($3 - 2 = 1$)
- 2- Divide it on the No of the Cell ($2/3 = 0.66$)
- 3- Add it to the lowest value of limit

The table below shows the above practice to determine the cell size

Table 4: Correction standard:

The mean value	Result	Percentage of relative weight	Level (degree
From 1 - 1.66	Agree	67% to 100%	Very High
1.67 - 2.32	Neutral	34% to 66%	Medium
2.33 - 3	Disagree	0% to 33%	Low

3.9.5 Processing and Statistical Tools Used:

We used many statistical methods and tools with the IBM SPSS version 25 software. These helped us check the goals of the study and answer the research questions. The main tools included:

1. Frequency and percentages to describe the sample, such as gender, age, education level, years of experience, workplace, and type of client.
2. Pearson's correlation coefficient to see if the tool used in the study was consistent internally.
3. Cronbach's Alpha to check if the tool was reliable and stable.
4. Calculating averages, standard deviations, scores, relative weights, levels, and rankings to answer the research questions.
5. ANOVA (Analysis of Variance) test to examine research hypotheses.

4 Practical Study

4.1 Introduction

This chapter presents the results from the statistical analysis of the data collected through the questionnaire. It aims to answer the questions raised in the study. It also reviews the hypothesis testing. Additionally, it shows some findings and offers recommendations and suggestions.

4.2 Data Analysis

Using the figure below to study the mean, Standard Deviation & Range. The below figure shows that if the mean value from 1 to 1.80 the result will be strongly Agree, if the mean value from 1.181 to 2.60 the result will be Agree, if the mean value 2.61 to 3.40 the result will be Neutral, if the mean value is between 3.41 and 4.20 the result will be Disagree and if the mean value is between 4.21 and 5 the result will be Strongly disagree.

Note:

Agree = 1

Neutral = 2

Disagree = 3

The mean value	Result	Percentage of relative weight	Level (degree
From 1 - 1.66	Agree	67% to 100%	Very High
1.67 - 2.32	Neutral	34% to 66%	Medium
2.33 - 3	Disagree	0% to 33%	Low

Figure 14: Correction standard to find the Mean, Standard Deviation & Rang

4.2.1 Industry Perspectives - Part 1: The share of Ductwork Factories in Saudi Arabia's Market

Industry Perspectives - Part 1 The share of Ductwork Factories in Saudi Arabia’s Market								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	The market share of local ductwork factories has significantly increased due to government support	Frequency (Repeat NO)	113	87	32	1.65	0.711	Agree
		Percentage in %	48.7	37.5	13.8			
2	International competitors continue to hold a larger portion of the market, limiting local factory growth.	Frequency (Repeat NO)	84	107	41	1.81	0.712	Neutral
		Percentage in %	36.2	46.1	17.7			
3	The rise of local factories has replaced imports, strengthening domestic manufacturing.	Frequency (Repeat NO)	146	71	15	1.44	0.614	Agree
		Percentage in %	62.9	30.6	6.5			
4	The share of local ductwork factories remains stable amid fluctuating global demand	Frequency (Repeat NO)	179	42	11	1.28	0.544	Agree
		Percentage in %	77.2	18.1	4.7			
5	Market dominance by local factories has led to better pricing and quality control.	Frequency (Repeat NO)	195	29	8	1.19	0.476	Agree
		Percentage in %	84.1	12.5	3.4			
Result of the Total Perspectives (Industry Perspectives - Part 1 The share of Ductwork Factories in Saudi Arabia’s Market)						1.47	0.454	Agree

Figure 15: The mean and Standard Deviations of the share of Ductwork Factories in Saudi Arabia's Market.

Summary:

- The most popular opinion is that the government helps make local ductwork factories grow.
- The least popular is that local factories control prices and quality better.
- People generally agree with the statements, but some opinions are more popular than others.

4.2.2 Industry Perspectives - Part 2 Increase in the Number of Local Factories

Industry Perspectives - Part 2 Increase in the Number of Local Factories								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	The number of local ductwork factories has significantly grown over the past five years.	Frequency (Repeat NO)	90	102	40	1.78	0.718	Neutral
		Percentage in %	38.8	44	17.2			
2	New factory establishments are declining due to market saturation.	Frequency (Repeat NO)	118	81	33	1.63	0.72	Agree
		Percentage in %	50.9	34.9	14.2			
3	Government incentives have played a key role in boosting factory numbers.	Frequency (Repeat NO)	142	81	9	1.43	0.569	Agree
		Percentage in %	61.2	34.9	3.9			
4	The increase in factories has led to more competitive pricing in the local market.	Frequency (Repeat NO)	164	61	7	1.32	0.529	Agree
		Percentage in %	70.7	26.3	3			
5	The overall number of factories has remained steady with little recent growth.	Frequency (Repeat NO)	191	37	4	1.19	0.438	Agree
		Percentage in %	82.3	15.9	1.7			
Result of the Total Perspectives (Industry Perspectives - Part 2 Increase in the Number of Local Factories)						1.48	0.458	Agree

Figure 16: The Mean and Standard Deviations of the increase in the Number of Local Factories

To Sum up:

- Most people think government help has increased factory numbers.
- Fewer people believe that the total number of factories has stayed the same.
- Overall, people mostly agree with these statements, but some ideas are more popular than others

4.2.3 Industry Perspectives Part 3- Revenue Growth

Industry Perspectives Part 3- Revenue Growth								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	Revenue in the ductwork sector has significantly increased due to higher demand.	Frequency (Repeat NO)	115	88	29	1.63	0.697	Agree
		Percentage in %	49.6	37.9	12.5			
2	Manufacturers are experiencing a decline in revenue as competition intensifies.	Frequency (Repeat NO)	138	86	8	1.44	0.563	Agree
		Percentage in %	59.5	37.1	3.4			
3	Revenue growth is driven by large infrastructure projects across the country.	Frequency (Repeat NO)	86	112	34	1.78	0.685	Neutral
		Percentage in %	37.1	48.3	14.7			
4	Recent technological innovations have helped factories increase their revenue.	Frequency (Repeat NO)	191	37	4	1.19	0.438	Agree
		Percentage in %	82.3	15.9	1.7			
5	Revenue levels have remained stable with little recent change.	Frequency (Repeat NO)	205	25	2	1.13	0.357	Agree
		Percentage in %	88.4	10.8	9			
Result of the Total Perspectives (Industry Perspectives - Part 3- Revenue Growth)						1.43	0.394	Agree

Figure 17: The Mean and Standard Deviations of Revenue Growth

Summary:

Most industry experts agree that revenue has generally stayed steady or increased slightly, with the most agreement on revenue levels being stable. The statement about infrastructure projects had the least agreement, meaning fewer people believe that large infrastructure projects are driving revenue growth.

had the least agreement, meaning fewer people believe that large infrastructure projects are driving revenue growth.

4.2.4 Industry Perspectives Part 4 Innovation and Adoption of New Technologies

Industry Perspectives Part 4 Innovation and Adoption of New Technologies								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	Factories have significantly adopted new technologies to improve efficiency.	Frequency (Repeat NO)	115	83	34	1.65	0.723	Agree
		Percentage in %	49.6	35.8	14.7			
2	The industry has been slow to implement automation and digital tools.	Frequency (Repeat NO)	88	103	41	1.8	0.719	Neutral
		Percentage in %	37.9	44.4	17.7			
3	Innovation has led to better product quality and customer satisfaction.	Frequency (Repeat NO)	151	71	10	1.39	0.571	Agree
		Percentage in %	65.1	30.6	4.3			
4	Recent technological advancements have not significantly impacted manufacturing processes.	Frequency (Repeat NO)	172	51	9	1.3	0.536	Agree
		Percentage in %	74.1	22	2.9			
5	The industry is actively investing in new technologies to stay competitive.	Frequency (Repeat NO)	196	31	5	1.18	0.435	Agree
		Percentage in %	84.5	13.4	2.2			
Result of the Total Perspectives (Part 4 Innovation and Adoption of New Technologies)						1.46	0.46	Agree

Figure 18: The Mean and Standard Deviations of Innovation and Adoption of New Technologies

Overall:

Most people believe that the industry is actively investing in new technologies and that technology adoption is generally improving. The least agreed-upon point is that the industry is slow in adopting automation and digital tools.

4.2.5 Industry Perspectives Part 5 Employment Rates within the Sector

Industry Perspectives Part 5 Employment Rates within the Sector								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	Employment in the ductwork industry has significantly increased due to sector growth.	Frequency (Repeat NO)	111	76	45	1.72	0.771	Neutral
		Percentage in %	47.8	32.8	19.4			
2	Job opportunities have declined as factories automate production lines.	Frequency (Repeat NO)	89	89	54	1.85	0.772	Neutral
		Percentage in %	38.4	38.4	23.3			
3	The sector has created many skilled jobs for Saudi nationals.	Frequency (Repeat NO)	129	89	14	1.5	0.61	Agree
		Percentage in %	55.6	38.4	6			
4	Employment levels have remained relatively stable over recent years.	Frequency (Repeat NO)	174	46	12	1.3	0.562	Agree
		Percentage in %	75	19.8	5.2			
5	The industry is facing challenges in attracting qualified workers.	Frequency (Repeat NO)	193	34	5	1.19	0.445	Agree
		Percentage in %	83.2	14.7	2.2			
Result of the Total Perspectives (Part 5 Employment Rates within the Sector)						1.51	0.487	Agree

Figure 19: The Mean and Standard Deviations of Employment Rates within the Sector

Summary:

- Most participants believe that attracting skilled workers remains a significant challenge for the industry.
- Fewer respondents think employment levels have grown substantially in recent years.
- Overall, there is a general agreement on these issues, though opinions vary somewhat among respondents.

4.2.6 Industry Perspectives Part 6 Quality Standards Factories Are Complying With

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Industry Perspectives Part 6 Quality Standards Factories Are Complying With								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	Most factories are now complying with international quality standards like ISO.	Frequency (Repeat NO)	117	81	34	1.64	0.725	Agree
		Percentage in %	50.4	34.9	14.7			
2	Quality compliance has decreased due to cost-cutting measures.	Frequency (Repeat NO)	167	59	6	1.41	0.603	Agree
		Percentage in %	72	25.4	2.6			
3	Strict adherence to quality standards has improved product durability.	Frequency (Repeat NO)	151	67	14	1.31	0.515	Agree
		Percentage in %	65.1	28.9	6			
4	Regulations on quality standards are becoming more stringent.	Frequency (Repeat NO)	84	108	40	181	0.708	Neutral
		Percentage in %	36.2	46.6	17.2			
5	Some factories are still struggling to meet international quality benchmarks.	Frequency (Repeat NO)	188	41	3	1.2	0.434	Agree
		Percentage in %	81	17.7	1.3			
Result of the Total Perspectives (Part 6 Quality Standards Factories Are Complying With)						1.47	0.468	Agree

Figure 20: The Mean and Standard Deviations of Quality Standards Factories Are Complying With

In conclusion:

- There is a general belief that most factories are complying with international quality standards.
- Concerns remain about a subset of factories that are still working toward meeting these benchmarks.
- Overall, industry professionals tend to agree that quality standards are being increasingly adhered to, though some differences in perception persist

4.2.7 Industry Perspectives Part 7 Replacing Oil Production Growth with Industry's Production Growth

Industry Perspectives Part 7 Replacing Oil Production Growth with Industry’s Production Growth								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	Growth in manufacturing is significantly reducing dependence on oil revenues.	Frequency (Repeat NO)	88	107	37	1.7	0.729	Neutral
		Percentage in %	37.9	46.1	15.9			
2	Oil production remains the main contributor to Saudi Arabia’s economy despite industrial growth.	Frequency (Repeat NO)	79	113	40	1.83	0.698	Neutral
		Percentage in %	34.1	48.7	17.2			
3	The shift from oil to manufacturing is happening gradually but steadily.	Frequency (Repeat NO)	146	80	6	1.4	0.541	Agree
		Percentage in %	62.9	34.5	2.6			
4	Industrial growth has had little impact on oil sector revenues.	Frequency (Repeat NO)	148	78	6	1.39	0.539	Agree
		Percentage in %	63.8	33.6	2.6			
5	Diversification efforts are successfully replacing oil sector growth with industry expansion.	Frequency (Repeat NO)	185	43	4	1.22	0.455	Agree
		Percentage in %	79.7	18.5	1.7			
Result of the Total Perspectives (Part 7 Replacing Oil Production Growth with Industry’s Production Growth)						1.5	0.453	Agree

Figure 21: The Mean and Standard Deviations of Replacing Oil Production Growth with Industry's Production Growth

Conclusion:

- Most people agree that efforts to replace the oil are working (opinion 5).
- People are less sure about whether oil is still the main part of the economy (opinion 2).

4.2.8 Projects (Site) - Perspectives - Part 1 Impact on Quality

Projects (Site) - Perspectives - Part 1 Impact on Quality								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	The Vision 2030 has led to improvements in the quality of materials supplied for ductwork projects.	Frequency (Repeat NO)	145	79	8	1.41	0.559	Agree
		Percentage in %	62.5	34.1	3.4			
2	The focus on local manufacturing under Vision 2030 has positively affected the quality standards of deliveredmaterials.	Frequency (Repeat NO)	157	69	6	1.35	0.529	Agree
		Percentage in %	67.7	29.7	2.6			
3	The quality assurance processes for materials have improved.	Frequency (Repeat NO)	191	38	3	1.19	0.425	Agree
		Percentage in %	82.3	16.4	1.3			
4	The emphasis on sustainability and innovation in Vision 2030 has enhanced the quality of materials used in projects.	Frequency (Repeat NO)	82	115	35	1.66	0.728	Neutral
		Percentage in %	35.3	49.6	15.1			
5	The technological advancements promoted by Vision 2030 have improved the quality of materials used in ductwork projects.	Frequency (Repeat NO)	93	99	40	1.77	0.723	Neutral
		Percentage in %	40.1	42.7	17.2			
Result of the Total Perspectives (Projects (Site) - Perspectives - Part 1 Impact on Quality)						1.4	0.457	Agree

Figure 22: The Mean and Standard Deviations of Impact on Quality

In simple words:

- Most people believe that Vision 2030 has made materials better.
- They are less certain about how much local factories helped improve material quality.

4.2.9 Projects (Site) - Perspectives - Part 2 Impact on Project Timeline

Projects (Site) - Perspectives - Part 2 Impact on Project Timeline								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	The Vision 2030 has contributed to faster project completion times in ductwork manufacturing and installation.	Frequency (Repeat NO)	79	115	38	1.67	0.743	Neutral
		Percentage in %	49.6	34.1	16.4			
2	Since Vision 2030, I have experienced fewer delays in project timelines due to new policies and initiatives.	Frequency (Repeat NO)	90	98	44	1.8	0.735	Neutral
		Percentage in %	38.8	42.2	19			
3	The support for local manufacturing under Vision 2030 has reduced lead times for material delivery.	Frequency (Repeat NO)	134	86	12	1.47	0.595	Agree
		Percentage in %	57.8	37.1	5.2			
4	The frequency of project delays has decreased since the implementation of Vision 2030.	Frequency (Repeat NO)	177	47	8	1.27	0.518	Agree
		Percentage in %	76.3	20.3	3.4			
5	Vision 2030 has significantly influenced the scheduling and planning of ductwork projects in my experience.	Frequency (Repeat NO)	159	33	4	1.18	0.425	Agree
		Percentage in %	84.1	14.2	1.7			
Result of the Total Perspectives (Projects (Site) - Perspectives - Part 2 Impact on Project Timeline)						1.478	0.46	Agree

Figure 23: The Mean and Standard Deviations of Impact on Project Timeline

Concluding Note:

The responses suggest a consensus that Vision 2030 has positively impacted project timelines and material quality, especially by reducing delays and enhancing manufacturing support. Overall, the project perspectives lean strongly toward agreement that the initiative has been beneficial.

4.2.10 Projects (Site) - Perspectives - Part 3 Impact on Project Cost

Projects (Site) - Perspectives - Part 3 Impact on Project Cost								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	Vision 2030 has increased the overall costs of ductwork projects.	Frequency (Repeat NO)	119	82	31	1.62	0.711	Agree
		Percentage in %	51.3	35.3	13.4			
2	Policies introduced under Vision 2030 have affected the costs related to material procurement.	Frequency (Repeat NO)	134	88	10	1.47	0.58	Agree
		Percentage in %	57.8	37.9	4.3			
3	The promotion of local manufacturing under Vision 2030 has reduced material costs.	Frequency (Repeat NO)	91	103	38	1.77	0.711	Neutral
		Percentage in %	39.2	44.4	16.4			
4	The focus on quality and innovation driven by Vision 2030 has impacted project costs.	Frequency (Repeat NO)	166	58	8	1.32	0.536	Agree
		Percentage in %	71.6	25	3.4			
5	Vision 2030 has contributed to cost savings or overruns in my projects.	Frequency (Repeat NO)	191	36	5	1.2	0.45	Agree
		Percentage in %	82.3	15.5	2.2			
Result of the Total Perspectives (Projects (Site) - Perspectives - Part 3 Impact on Project Cost)						1.475	0.4612	Agree

Figure 24: The Mean and Standard Deviations of Impact on Project Cost

Overall Result:

The combined responses yield an **average score of 1.475** with a **standard deviation of 0.4612**, indicating a general agreement that Vision 2030 has impacted project costs positively or negatively.

4.2.11 Projects (Site) - Perspectives - Part 4 Impact on Owner Satisfaction

Projects (Site) - Perspectives - Part 4 Impact on Owner Satisfaction								
Perspectives NO	Perspectives	The Scale	Agree	Neutral	Disagree	The Means	Standard Deviations	Result
1	The emphasis on quality and sustainability in Vision 2030 has increased owner satisfaction.	Frequency (Repeat NO)	115	81	36	1.66	0.733	Neutral
		Percentage in %	49.6	34.9	15.5			
2	Project owners perceive that Vision 2030 has positively impacted project outcomes.	Frequency (Repeat NO)	78	112	42	1.84	0.704	Neutral
		Percentage in %	33.6	48.3	18.1			
3	Owners are more satisfied with the durability and quality of ductwork materials since Vision 2030 initiativesstarted.	Frequency (Repeat NO)	151	70	11	1.4	0.579	Agree
		Percentage in %	65.1	30.2	4.7			
4	Transparency and communication with project owners have improved due to the initiatives under Vision 2030.	Frequency (Repeat NO)	167	56	9	1.32	0.544	Agree
		Percentage in %	72	24.1	3.9			
5	Vision 2030 has increased owner satisfaction in ductwork projects.	Frequency (Repeat NO)	194	31	7	1.19	0.467	Agree
		Percentage in %	83.6	13.4	3			
Result of the Total Perspectives (Projects (Site) - Perspectives - Part 4 Impact on Owner Satisfaction)						1.482	0.47047	Agree

Figure 25: The Mean and Standard Deviations of Impact on Owner Satisfaction

Overall Result:

The combined responses yield an average score of 1.482 with a standard deviation of 0.47047, indicating a general agreement that Project (Site) – Perspectives – Part 4 has positively impacted owner satisfaction.

4.3 Hypotheses Testing:

4.3.1 Increase in the number of local factories on impact on quality using Anova.

- H0 Null hypothesis: There is no statistically significant relationship between the share of Ductwork Factories in Saudi Arabia's Market on Impact on Quality
- H1 – The alternative hypothesis: There is statistically significant relationship between the share of Ductwork Factories in Saudi Arabia's Market on Impact on Quality

Hypothesis: If the resulting probabilistic value is less than 0.05, so, Null Hypothesis will be rejected and accepted the alternative hypothesis.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	593.980	1	593.980	221.201	<.001 ^b
	Residual	617.607	230	2.685		
	Total	1211.586	231			

a. Dependent Variable: Increase_Factories

b. Predictors: (Constant), Impact_on_Quality

Figure 26: Increase in the Number of Local Factories on Impact on Quality using ANOVA

As a result, we find that the significance value is ($0.001 < 0.05$) from figure 23, indicating that the alternative hypothesis is accepted and the null hypothesis is rejected. This means there is a statistically significant relationship between the increase in the number of local factories on impact on quality using ANOVA

4.3.2 Increase in the number of local factories impact on project cost using Anova.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1068.216	1	1068.216	1713.678	<.001 ^b
	Residual	143.370	230	.623		
	Total	1211.586	231			

a. Dependent Variable: Increase_Factories
b. Predictors: (Constant), Impact_on_Project_Cost

Figure 27: Increase in the number of local factories on impact on project cost using Anova.

As a result, we find that the significance value is ($0.001 < 0.05$) from figure 24, indicating that the alternative hypothesis is accepted and the null hypothesis is rejected. This means there is a statistically significant relationship between the increase in the number of local factories on impact on project cost using ANOVA

4.3.3 Increase in the number of local factories impact on project timeline using Anova.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.559	1	2.559	.487	.486 ^b
	Residual	1209.027	230	5.257		
	Total	1211.586	231			

a. Dependent Variable: Increase_Factories
b. Predictors: (Constant), Impact_on_Project_Timeline

Figure 28: Increase in the number of local factories impact on project timeline using Anova

As a result, we find that the significance value is ($0.486 > 0.05$) from figure 25, indicating that the alternative hypothesis is rejected and the null hypothesis is accepted. This means there is no statistically significant relationship between the increase in the number of local factories on impact on project timeline using ANOVA

4.3.4 Increase in the number of local factories impacting on owner satisfaction

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.463	1	1.463	.278	.599 ^b
	Residual	1210.123	230	5.261		
	Total	1211.586	231			

a. Dependent Variable: Increase_Factories

b. Predictors: (Constant), Impact_on_Owner_Satisfaction

Figure 29: Increase in the number of local factories impacting on owner satisfaction

As a result, we find that the significance value is ($0.599 > 0.05$) from figure 26, indicating that the alternative hypothesis is rejected and the null hypothesis is accepted. This means there is no statistically significant relationship between the increase in the number of local factories on impact on project timeline using ANOVA

4.4 Results of the study.

4.4.1 Industry Perspectives - Part 1: The share of Ductwork Factories in Saudi Arabia's Market

The different opinions about the share of ductwork factories in Saudi Arabia's market. The table gives the number of people who agree, are neutral, or disagree with each opinion. It also shows how strong these opinions are (average scores) and how much they vary (standard deviation).

Key points:

- **Most agreed opinion:** The first sentence about the market share increasing because of government support. The average agreement score is 1.65, which is the highest among all sentences. The opinion is mostly positive, with many people agreeing.
- **Least agreed opinion:** The last sentence about market dominance leading to better pricing and quality control. Its average agreement score is 1.19, which is the lowest. This means fewer people strongly agree with it.

Mean and Standard Deviation:

- The total average agreement (mean) across all sentences is **1.47**.
- The total variation (standard deviation) is **0.454**, meaning opinions are somewhat similar but have some differences.

Summary in simple words:

- The most popular opinion is that the government helps make local ductwork factories grow.
- The least popular is that local factories control prices and quality better.
- People generally agree with the statements, but some opinions are more popular than others.

4.4.2 Industry Perspectives - Part 2 Increase in the Number of Local Factories

The study people's opinions about the increase in local ductwork factories in Saudi Arabia over the past five years. It includes how many agree, are neutral, or disagree with each statement, along with the average scores (means) and how many opinions vary (standard deviations).

Key points:

- The most agreed statement is about government incentives helping boost factory numbers. It has the highest mean score of **1.43** and many people agree.
- The least agreed statement is about the overall number of factories staying steady with little recent growth. Its mean score is **1.19**, which is the lowest, meaning fewer people strongly agree with it.

Mean and Standard Deviation:

- The average agreement across all statements is **1.48**.
- The variation in opinions (standard deviation) is **0.458**.

To Sum up:

- Most people think government help has increased factory numbers.
- Fewer people believe that the total number of factories has stayed the same.
- Overall, people mostly agree with these statements, but some ideas are more popular than others

4.4.3 Industry Perspectives Part 3- Revenue Growth

The opinions of industry professionals on revenue growth in the ductwork sector. Each perspective shows how many people agree, are neutral, or disagree, along with average scores (means) and how consistent those responses are (standard deviations).

In simple words:

- The first perspective says revenue has increased a lot because of higher demand. Most people agreed with this, with a mean of 1.63 and a standard deviation of 0.697.
- The second perspective states that manufacturers are losing revenue due to intense competition. Most people agreed here too, with a mean of 1.44 and a standard deviation of 0.563.
- The third perspective says revenue growth is driven by big infrastructure projects. Most people were neutral about this, with a mean of 1.78 and a standard deviation of 0.685.
- The fourth perspective says recent technological innovations have helped factories increase revenue. Most agreed here, with a mean of 1.19 and a standard deviation of 0.438.
- The fifth perspective states that revenue levels have stayed steady with little recent change. Most people agreed, with a mean of 1.13 and a standard deviation of 0.357.

Which statement had the highest and lowest responses?

- The **highest mean** (least agreement) is for the third statement about infrastructure projects, with a mean of 1.78.
- The **lowest mean** (most agreement) is for the fifth statement about steady revenue levels, with a mean of 1.13.

Summary:

Most industry experts agree that revenue has generally stayed steady or increased slightly, with the most agreement on revenue levels being stable. The statement about infrastructure projects had the least agreement, meaning fewer people believe that large infrastructure projects are driving revenue growth.

had the least agreement, meaning fewer people believe that large infrastructure projects are driving revenue growth.

4.4.4 Industry Perspectives Part 4 Innovation and Adoption of New Technologies

Opinions about innovation and new technologies in the industry. It includes five perspectives, each showing how many agree, are neutral, or disagree, along with their average scores (means) and how many responses vary (standard deviations).

Simplified analysis:

1. **First perspective:** Factories have adopted new technologies to improve efficiency.
 - Most people agree with this, with a mean of 1.65 and a standard deviation of 0.723.
2. **Second perspective:** The industry is slow in adopting automation and digital tools.
 - Most people are neutral, with a mean of 1.8 and a standard deviation of 0.719.
3. **Third perspective:** Innovation has improved product quality and customer satisfaction.
 - Most agree here, with a mean of 1.39 and a standard deviation of 0.571.
4. **Fourth perspective:** Recent technological progress has not greatly affected manufacturing processes.
 - Most agree, with a mean of 1.3 and a standard deviation of 0.536.
5. **Fifth perspective:** The industry is actively investing in new technologies to stay competitive.
 - Most agree here, with a mean of 1.18 and a standard deviation of 0.435.

Highest and lowest responses:

- The **highest mean** (least agreement) is for the second perspective about slow industry adoption, with a mean of 1.8.
- The **lowest mean** (most agreement) is for the fifth perspective about active investment in new technologies, with a mean of 1.18.

Overall:

Most people believe that the industry is actively investing in new technologies and that technology adoption is generally improving. The least agreed-upon point is that the industry is slow in adopting automation and digital tools.

4.4.5 Industry Perspectives Part 5 Employment Rates within the Sector

The study indicate views on employment trends within the industry sector. It shows the number of respondents who agree, remain neutral, or disagree with each statement, along with the average ratings (means) and the degree of variation in responses (standard deviations).

Main points:

- The most widely agreed statement is that the industry faces challenges in attracting qualified workers, with a mean score of **1.19**, indicating a strong consensus.
- The least agreed statement is that employment has increased significantly due to sector growth, with a mean score of **1.72**.

Overall insights:

- The average level of agreement across all statements is approximately **1.51**.
- The responses show moderate variation, with a standard deviation of **0.487**.

Summary:

- Most participants believe that attracting skilled workers remains a significant challenge for the industry.
- Fewer respondents think employment levels have grown substantially in recent years.
- Overall, there is a general agreement on these issues, though opinions vary somewhat among respondents.

4.4.6 Industry Perspectives Part 6 Quality Standards Factories Are Complying With

This Figure highlights industry opinions regarding adherence to quality standards in manufacturing facilities. It shows the number of respondents who agree, are neutral, or disagree with each statement, along with the average ratings (means) and the variability in responses (standard deviations).

Key observations:

- The statement with the highest consensus is that most factories meet international quality standards such as ISO, with a mean score of **1.64**, indicating strong agreement.
- The least agreed is found in the statement about some factories still struggling to meet global quality benchmarks, which has a mean of **1.2**.

Overall summary:

- The average agreement across all statements is approximately **1.47**.
- The responses exhibit moderate variability, with a standard deviation of **0.468**.

In conclusion:

- There is a general belief that most factories are complying with international quality standards.
- Concerns remain about a subset of factories that are still working toward meeting these benchmarks.
- Overall, industry professionals tend to agree that quality standards are being increasingly adhered to, though some differences in perception persist

4.4.7 Industry Perspectives Part 7 Replacing Oil Production Growth with Industry's Production Growth

Analyze what engineers think about replacing oil production with industry growth in Saudi Arabia. It includes five different opinions (perspectives). For each opinion, people gave their responses, and the table shows how many agreed, were neutral, or disagreed.

Key Points:

- The **average (mean)** shows how much people agree or disagree.
- The **standard deviation** shows how spread out the responses are; smaller numbers mean responses are closer together.
- The **fifth opinion**: "Diversification efforts are successfully replacing oil sector growth."
- It has the **highest mean score of 1.22** (which means most people agree).
- It also has the **lowest standard deviation (0.455)**, meaning responses are close to the average.
- The **second opinion**: "Oil production remains the main contributor to Saudi Arabia's economy."
- It has the **highest mean score of 1.83** (which indicates more disagreement).
- The responses are more spread out, with a **standard deviation of 0.698**.

Conclusion:

- Most people agree that efforts to replace the oil are working (opinion 5).
- People are less sure about whether oil is still the main part of the economy (opinion 2).

4.4.8 Projects (Site) - Perspectives - Part 1 Impact on Quality

What engineers think about how the Vision 2030 plan has affected the quality of building materials, especially for ductwork projects. There are five statements, and respondents indicated whether they agree, are neutral, or disagree.

Important Points:

- The **average** (mean) tells us how much people agree or disagree with each statement.
- The **spread** (standard deviation) shows whether most responses are similar or very different.
- The **first statement**: "Vision 2030 has improved the quality of materials used in ductwork projects."
- It has the **highest average score of 1.41**, meaning most people agree.
- The responses are very similar, with a **small variation** (standard deviation of 0.559).
- The **second statement**: "Local manufacturing under Vision 2030 has positively affected material quality."
- It has a slightly lower average of 1.35, so a bit fewer people agree.
- The responses vary a little more here, with a **standard deviation of 0.529**.

In simple words:

- Most people believe that Vision 2030 has made materials better.
- They are less certain about how much local factories helped improve material quality.

4.4.9 Projects (Site) - Perspectives - Part 2 Impact on Project Timeline

The study captures opinions on how the Vision 2030 initiative has influenced project timelines, focusing on the quality and delivery of materials, especially for ductwork projects.

Key Observations:

- Most respondents agree that Vision 2030 has had a positive effect on project progress and material quality.
- The statements with the strongest consensus are about faster project completion and reduced delays.
- The overall agreement level across all perspectives is high, with an average score of **1.478**.

Highlights:

- The **highest agreement** is seen in the statement that Vision 2030 helped **speed up project completion** by improving manufacturing and installation processes, with a **mean of 1.67**.
- The **least agreement** is in the statement about **reducing project delays** since Vision 2030's implementation, but even here, most respondents still agree, with a **mean of 1.27**.

Concluding Note:

The responses suggest a consensus that Vision 2030 has positively impacted project timelines and material quality, especially by reducing delays and enhancing manufacturing support. Overall, the project perspectives lean strongly toward agreement that the initiative has been beneficial.

4.4.10 Projects (Site) - Perspectives - Part 3 Impact on Project Cost

This section presents an analysis of opinions regarding how Vision 2030 has influenced project costs, based on survey responses across various perspectives

Overview of Responses:

- The table records the number and percentage of respondents who **agree**, are **neutral**, or **disagree** with each statement.
- It also includes the **frequency** (number of responses), **mean scores**, and **standard deviations** for each perspective.
- The **overall result** indicates the general consensus regarding the impact of Vision 2030 on project costs.

Perspective 1:

- **Statement:** "Vision 2030 has increased the overall costs of ductwork projects."
- **Conclusion:** Majority agree that costs have risen.

Perspective 2:

- **Statement:** "Policies introduced under Vision 2030 have affected procurement-related costs."
- **Conclusion:** Most respondents concur that procurement costs are impacted.

Perspective 3:

- **Statement:** "Promotion of local manufacturing under Vision 2030 has decreased material costs."
- **Conclusion:** Responses are mixed, leaning toward neutrality.

Perspective 4:

- **Statement:** "Focus on quality and innovation driven by Vision 2030 has impacted project costs."
- **Conclusion:** Strong agreement that quality focus affects costs.

Perspective 5:

- **Statement:** "Vision 2030 has contributed to cost savings or overruns in my projects."
- **Conclusion:** Clear consensus that Vision 2030 influences project costs, mostly in savings or overruns.

Overall Result:

The combined responses yield an **average score of 1.475** with a **standard deviation of 0.4612**, indicating a general agreement that Vision 2030 has impacted project costs positively or negatively.

4.4.11 Projects (Site) - Perspectives - Part 4 Impact on Owner Satisfaction

This section presents an analysis of opinions regarding how Project (Site) – Perspectives has impacted owner satisfaction, based on survey responses across various perspectives.

Overview of Responses:

- The table records the number and percentage of respondents who agree, are neutral, or disagree with each statement.
- It also includes the frequency (number of responses), mean scores, and standard deviations for each perspective.
- The overall result indicates the general consensus regarding the impact of Project (Site) – Perspectives – Part 4 on owner satisfaction.

Perspective 1:

- Statement: "The emphasis on quality and sustainability in Vision 2030 has increased owner satisfaction."
- Conclusion: The responses are neutral, indicating no strong agreement or disagreement.

Perspective 2:

- Statement: "Project owners perceive that Vision 2030 has positively impacted project outcomes."
- Conclusion: The responses are neutral, showing a balanced view or uncertainty among respondents.

Perspective 3:

- Statement: "Owners are more satisfied with the durability and quality of ductwork materials since Vision 2030 initiatives started."
- Conclusion: The majority agree that owner satisfaction has increased in this area.

Perspective 4:

- Statement: "Transparency and communication with project owners have improved due to Vision 2030 initiatives."
- Conclusion: Respondents mostly agree that communication has improved, positively impacting owner satisfaction.

Perspective 5:

- Statement: "Vision 2030 has increased owner satisfaction in ductwork projects."
- Conclusion: The majority agree that owner satisfaction has increased due to Vision 2030.

Overall Result:

The combined responses yield an average score of 1.482 with a standard deviation of 0.47047, indicating a general agreement that Project (Site) – Perspectives – Part 4 has positively impacted owner satisfaction.

4.5 Recommendations and Suggestions

1. **Hire more Saudi workers** and focus on local talent to support Vision 2030 goals.
2. **Use new technology** like automation and smart machines to make better and faster ductwork.
3. **Work with other companies and organizations** to share ideas and improve products.
4. **Improve how materials are delivered** so products are made and sent on time, saving money.
5. **Make eco-friendly and sustainable products** that are good for the environment.
6. **Train workers regularly** so they have the skills needed for modern manufacturing.
7. **Use government support and programs** to help grow the business.
8. **Find new markets** inside and outside Saudi Arabia to sell more products.
9. **Plan your business** to match the goals of Vision 2030 for a stronger future.
10. **Keep checking market trends and rules** so your business stays updated and competitive.
11. **Enhance communication** and coordination among all stakeholders.
12. **Continuous monitoring** of project progress.
13. **Allocate sufficient time** to ensure quality and inspection to avoid errors and defects.
14. **Adherence to standards** and technical specifications to ensure the quality of the completed work.
15. **Working to enhance trust among all stakeholders** through transparency in project management.
16. Identify the research gaps in this study and conduct in-depth research on them.
17. Conduct a study on the relationship between project timelines and Vision 2030 of Saudi Arabia

5 References

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6 The Appendices

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Midocean University
College of Administration
Department / Master's in Business Administration

Research Title:
Challenges, opportunities and the impacts of Vision 2030 on the Ductwork Manufacturing Sector in Riyadh, Saudi Arabia

Tareq Abduthaleem Alkhoul
243001737
Master of Business Administration

Main Supervisor:
Dr. Al-Faisal Abdul Hamid

Second Supervisor:
Dr. Faiz Jarad

Academic Year:
2025

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ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	593.980	1	593.980	221.201	<.001 ^b
	Residual	617.607	230	2.685		
	Total	1211.586	231			

a. Dependent Variable: Increase_Factories

b. Predictors: (Constant), Impact_on_Quality

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1068.216	1	1068.216	1713.678	<.001 ^b
	Residual	143.370	230	.623		
	Total	1211.586	231			

a. Dependent Variable: Increase_Factories

b. Predictors: (Constant), Impact_on_Project_Cost

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.559	1	2.559	.487	.486 ^b
	Residual	1209.027	230	5.257		
	Total	1211.586	231			

a. Dependent Variable: Increase_Factories

b. Predictors: (Constant), Impact_on_Project_Timeline

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.463	1	1.463	.278	.599 ^b
	Residual	1210.123	230	5.261		
	Total	1211.586	231			

a. Dependent Variable: Increase_Factories

b. Predictors: (Constant), Impact_on_Owner_Satisfaction

Correlations

		Industry Perspectives - Part 1 The market share of local ductwork factories has significantly increased due to government support	Industry Perspectives - Part 1 local factory competing the International competitors	Industry Perspectives - Part 1 The rise of local factories has replaced imports, strengthening domestic manufacturing.	Industry Perspectives - Part 1 The share of local ductwork factories remains stable amid fluctuating global demand	Industry Perspectives - Part 1 Market dominance by local factories has led to better pricing and quality control.
Industry Perspectives - Part 1 The market share of local ductwork factories has significantly increased due to government support	Pearson Correlation	1	.642**	.370**	.396**	.355**
	Sig. (2-tailed)		<.001	<.001	<.001	<.001
	N	232	232	232	232	232
Industry Perspectives - Part 1 local factory competing the International competitors	Pearson Correlation	.642**	1	.304**	.367**	.362**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001
	N	232	232	232	232	232
Industry Perspectives - Part 1 The rise of local factories has replaced imports, strengthening domestic manufacturing.	Pearson Correlation	.370**	.304**	1	.507**	.481**
	Sig. (2-tailed)	<.001	<.001		<.001	<.001
	N	232	232	232	232	232
Industry Perspectives - Part 1 The share of local ductwork factories remains stable amid fluctuating global demand	Pearson Correlation	.396**	.367**	.507**	1	.612**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001
	N	232	232	232	232	232
Industry Perspectives - Part 1 Market dominance by local factories has led to better pricing and quality control.	Pearson Correlation	.355**	.362**	.481**	.612**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	
	N	232	232	232	232	232

** . Correlation is significant at the 0.01 level (2-tailed).

Statistics

		Industry Perspectives - Part 1 The market share of local ductwork factories has significantly increased due to government support	Industry Perspectives - Part 1 local factory competing the International competitors	Industry Perspectives - Part 1 The rise of local factories has replaced imports, strengthening domestic manufacturing.	Industry Perspectives - Part 1 The share of local ductwork factories remains stable amid fluctuating global demand	Industry Perspectives - Part 1 Market dominance by local factories has led to better pricing and quality control.
N	Valid	232	232	232	232	232
	Missing	0	0	0	0	0
Mean		1.65	1.81	1.44	1.28	1.19
Std. Deviation		.711	.712	.614	.544	.476

Industry Perspectives - Part 1 The market share of local ductwork factories has significantly increased due to government support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	113	48.7	48.7	48.7
	Neutral	87	37.5	37.5	86.2
	Disagree	32	13.8	13.8	100.0
	Total	232	100.0	100.0	

Industry Perspectives - Part 1 local factory competing the International competitors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	84	36.2	36.2	36.2
	Neutral	107	46.1	46.1	82.3
	Disagree	41	17.7	17.7	100.0
	Total	232	100.0	100.0	

Industry Perspectives - Part 1 The rise of local factories has replaced imports, strengthening domestic manufacturing.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	146	62.9	62.9	62.9
	Neutral	71	30.6	30.6	93.5
	Disagree	15	6.5	6.5	100.0
	Total	232	100.0	100.0	

Industry Perspectives - Part 1 The share of local ductwork factories remains stable amid fluctuating global demand

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	179	77.2	77.2	77.2
	Neutral	42	18.1	18.1	95.3
	Disagree	11	4.7	4.7	100.0
	Total	232	100.0	100.0	

Industry Perspectives - Part 1 Market dominance by local factories has led to better pricing and quality control.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	195	84.1	84.1	84.1
	Neutral	29	12.5	12.5	96.6
	Disagree	8	3.4	3.4	100.0
	Total	232	100.0	100.0	

Reliability Statistics

Cronbach's Alpha	N of Items
.787	5

Reliability Statistics

Cronbach's Alpha	N of Items
.814	5

Reliability Statistics

Cronbach's Alpha	N of Items
.740	5

Topic – Part	Perspectives NO	Pearson Correlation	The Topics	Perspectives NO	Pearson Correlation
Industry Perspectives - Part 1	1	.783**	Industry Perspectives - Part 2	1	.868**
	2	.760**		2	.811**
	3	.703**		3	.665**
	4	.744**		4	.703**
	5	.710**		5	.759**
Industry Perspectives - Part 3	1	.803**	Industry Perspectives - Part 4	1	.840**
	2	.754**		2	.798**
	3	.605**		3	.697**
	4	.680**		4	.738**
	5	.727**		5	.749**
Industry Perspectives - Part 5	1	.823**	Industry Perspectives - Part 6	1	.852**
	2	.800**		2	.795**
	3	.689**		3	.753**
	4	.790**		4	.731**
	5	.721**		5	.761**
Industry Perspectives - Part 7	1	.899**	Projects (Site) - Perspectives - Part 1	1	.874**
	2	.840**		2	.830**
	3	.656**		3	.662**
	4	.598**		4	.664**
	5	.767**		5	.770**
Projects (Site) - Perspectives - Part 2	1	.834**	Projects (Site) - Perspectives - Part 3	1	.872**
	2	.803**		2	.810**
	3	.660**		3	.662**
	4	.742**		4	.719**
	5	.739**		5	.757**
Projects (Site) - Perspectives - Part 4	1	.855**			
	2	.792**			
	3	.702**			
	4	.715**			
	5	.798**			

Topic – Part	Perspectives NO	Alpha Cronbach	The Topics	Perspectives NO	Alpha Cronbach
Industry Perspectives - Part 1	1	0.787	Industry Perspectives - Part 2	1	0.814
	2			2	
	3			3	
	4			4	
	5			5	
Industry Perspectives - Part 3	1	0.74	Industry Perspectives - Part 4	1	0.815
	2			2	
	3			3	
	4			4	
	5			5	
Industry Perspectives - Part 5	1	0.813	Industry Perspectives - Part 6	1	0.83
	2			2	
	3			3	
	4			4	
	5			5	
Industry Perspectives - Part 7	1	0.81	Projects (Site) - Perspectives - Part 8	1	0.745
	2			2	
	3			3	
	4			4	
	5			5	
Projects (Site) - Perspectives - Part 9	1	0.803	Projects (Site) - Perspectives - Part 10	1	0.818
	2			2	
	3			3	
	4			4	
	5			5	
Projects (Site) - Perspectives - Part 11	1	0.825	Total Perspectives	55	
	2		Alpha Cronbach	0.9	
	3				
	4				
	5				

Questionnaire

Dear Mr. / Ms.,

Thank you for your cooperation. I hope your answers will reflect reality as closely as possible to contribute to achieving accurate results. I assure you that your responses will be highly valued and treated with utmost confidentiality, used solely for the purpose of academic research. Given the importance of your opinions, I kindly request you complete this survey. I am currently conducting research titled " Challenges, opportunities and the impacts of Vision 2030 on the Ductwork Manufacturing Sector in Riyadh, Saudi Arabia: An Application to Construction Projects in Riyadh Region" as part of the requirements for the master's program in Project Management. I am a student at Midocean University – College of Management, specializing in a master's degree in project management. I would like to inform you that

Sincerely,

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المخلص

مشروع التخرج النهائي لهذا الماجستير يسلط الضوء ويحقق في التحديات والفرص والتأثيرات التي يحملها رؤية 2023 في المملكة العربية السعودية على قطاع التصنيع، خاصة على مصانع أنظمة التدفئة والتهوية وتكييف الهواء و تصنيع أنابيب التهوية وملحقاتها.

يهدف هذا البحث إلى تحليل أهداف واستراتيجيات رؤية 2030، مثل تنويع الصناعات، إدخال تقنيات جديدة إلى القطاع، وتشجيع الممارسات البيئية المستدامة، والتي ستؤثر على نمو وتطوير مصنعين أنابيب التهوية وملحقاتها لأنظمة التدفئة والتهوية وتكييف الهواء في الرياض، المملكة العربية السعودية.

استخدمت الدراسة منهجاً وصفيًا وتحليليًا. تم جمع البيانات الأولية من خلال استبانة وُزِعَ على عينة عشوائية من المديرين، المهندسين، المحاسبين، وموظفي المشتريات العاملين في مصانع التهوية وتكييف الهواء في الرياض، المملكة العربية السعودية. تم استلام إجمالي 436 استبياناً، وبعد المراجعة، تبين أن 390 منها صالحة للتحليل. تم تحليل البيانات واختبار الفرضيات SPSS. باستخدام برنامج

تُظهر النتائج أن رؤية 2030 للمملكة العربية السعودية تؤثر على ضغط الجدول الزمني على مصنع أنظمة التهوية، وأداء المشاريع، وتدفق السيولة النقدية للشركات العاملة في المجال. كما أظهرت النتائج وجود تأثير على مدة التنفيذ، والتكلفة، والنطاق، والجودة، ورضا الأطراف المعنية.

قدمت الدراسة عدة توصيات لتحسين إدارة ضغط الجدول الزمني وتقليل التأثيرات السلبية.

الكلمات المفتاحية المستخدمة في البحث: رؤية 2023 السعودية، مصنع أنظمة التدفئة والتهوية وتكييف الهواء، أداء مشاريع السعودية، تطوير أداء المشاريع، مدينة الرياض

عنوان البحث

التحديات والفرص وتأثيرات رؤية 2030 على قطاع تصنيع مجاري الهواء في
الرياض، المملكة العربية السعودية

طارق عبد الحليم سليمان الخولي

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ماجستير في إدارة الأعمال

المشرف الثاني المشرف الرئيسي

د. الفيصل عبد الحميد

د. فايز جراد

العام الدراسي:

2025