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The Impact of Innovation Strategies on Service Improvement in Saudi Geophysical Consulting Firms

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Abstract:

Given the rapid technical and economic changes, the geophysical consulting industry is undergoing and its clear connection to the goals of Saudi Vision 2030, the purpose of this research was to examine how innovative strategies affect service improvement in these companies in the Kingdom of Saudi Arabia. The significance of the study comes from the critical role geophysical consulting firms play in assisting with infrastructure development, mineral exploration, and the advancement of sustainable natural resource management, all of which call for the implementation of creative approaches that can improve the effectiveness and caliber of services offered.

The research used descriptive-analytical design and a quantitative methodology. A sample of 190 workers of geophysical consulting businesses in the Kingdom were given an electronic questionnaire to complete to gather data. To test hypotheses and assess the significance of relationships between variables, the data were analyzed using SPSS software, utilizing suitable statistical techniques such as arithmetic means, standard deviations, Cronbach's Alpha, correlation and regression analysis, chi-squared test, and analysis of variance (ANOVA).

Three independent variables global developments, development concepts, and consumer requirements and one dependent variable innovation strategies were the focus of the research. With a coefficient of determination ($R^2 = 0.231$), the results demonstrated a statistically significant combined influence of the independent variables on innovation strategies, meaning that these factors account for around 23% of the variation in innovation strategies. Because the industry is service-oriented and heavily depends on changing customer expectations and wants, client requirements were found to be the most significant aspect.

The findings also showed that businesses adopted innovations at a moderate to high level, especially when it came to digital transformation, the use of sophisticated data analytics tools, and the modification of geophysical products to satisfy client needs. On the other hand, several elements raised issues with the extent of dependence on contemporary technology, the adaptability of the workplace, and meeting deadlines for reports, indicating room for organizational and operational development.

According to the report, innovative techniques raise consumer trust, improve operational efficiency, improve service quality, and increase the correctness of technical findings. The study's theoretical frameworks, including Resource-Value Theory (RBV), Dynamic Capability Theory, Innovation Diffusion Theory, and Strategic Alignment Theory, which emphasize the significance of utilizing internal resources and adjusting to environmental changes to achieve a sustainable competitive advantage, are also supported by the findings.

Given these results, the study suggests increasing investment in cutting-edge technologies, encouraging an innovative culture within businesses, creating continuous training programs for technical staff, and fortifying the alignment of innovation strategies with Saudi Vision 2030 objectives. This research gives useful suggestions that may help decision-makers enhance the performance of geophysical consulting businesses in the Kingdom and adds to the body of knowledge on innovation management in the specialized technical consulting industry.

Chapter 1:

Introduction:

Due to the increasing competitiveness and sustainable growth in the modern service business, especially in the knowledge-based fields that are highly dependent on modern technologies and professional skills, innovation has become a critical source of competitiveness. In geophysical consulting companies, innovation is an important element in precision, effectiveness, and dependability of service quality, including seismic data recording, underground imaging, geological studies, and environmental assessment. With the development of the global energy markets and the necessity of accurate geoscientific solutions, the companies need to constantly optimize their strategies to remain competitive. The urgency of innovation in Saudi Arabia is also crucial by national economic transformation programs such as Saudi Vision 2030 which focus on technological progress, digital transformation, and creation of high value service sectors beyond traditional reliance on oil (Hamdouna, 2025).

Although strategic relevance of innovation is a fact, geophysical consulting organizations are faced with the challenge of successfully relating innovation efforts to service performance goals. The costs of implementation are high, organizational change is not always welcome, technical skills are lacking, and the interaction between departments will prevent the successful adoption of innovative methods. In addition, although innovation is commonly believed to be a key determinant of competitive advantage, there is limited empirical research on how innovation directly impacts service enhancement in Saudi geophysical consulting companies. It is thus critical to the academic research as well as managerial decision-making to understand the impact that different attributes of innovation strategies have on the service quality, the efficiency in operations, and customer satisfaction (Sithole, 2024).

This study seeks to assess the impact of innovation strategies on service improvement in geophysical consulting companies in Saudi Arabia through the exploration of the link that exists between strategic innovation practices and key service performance indicators. By examining the link that exists between innovations in terms of technology, procedures, and organization and the improvement of services, this research seeks to make meaningful contributions to the discussion on service innovations in specialized consulting industries and comes at a time when the country seeks to build a knowledge-based and innovative economy (Abker, 2024).

Study Problem:

Despite the growing importance of the geophysical sector in supporting mineral exploration and infrastructure development in Saudi Arabia under Vision 2030, many Saudi geophysical consulting firms still rely on traditional operational methods, conventional survey techniques, and limited digital integration. This causes issues in service efficiency, accuracy, cost control, and overall competitiveness (Gohar, 2025).

Although innovation strategies such as digital transformation, advanced geophysical technologies, artificial intelligence, data analytics, and automation are widely recognized as drivers of service improvement globally, their implementation within Saudi geophysical consulting firms remains inconsistent and sometimes unclear in terms of measurable impact (Alnasser, 2024).

The primary challenge of this study resides in the inadequate understanding of how innovation methods influence the quality, efficiency, reliability, and client satisfaction levels of services supplied by Saudi geophysical consulting organizations. Additionally, there is inadequate empirical evidence determining which specific innovation initiatives contribute most effectively to increasing operational performance and competitive positioning (Keniwe, 2024).

Therefore, this study tries to answer the following central research problem:

- To what extent do innovation initiatives effect service improvement in Saudi geophysical consulting firms?

Importance of Study:

The strategic significance of the geophysical consulting firms in Saudi Arabia in the context of mineral exploration and infrastructure development and sustainable management of resources is what gives this study its relevance. Since the Kingdom is progressing in the process of diversifying its economy within the framework of Vision 2030, it is essential to enhance the performance in this field of services. The concept of innovation strategies has been viewed as a major force of competitiveness and operational excellence; however, its practical contribution within the context of Saudi geophysical consulting companies has not been heavily examined. This is why this study is essential since it will close the gap in knowledge about theoretical innovation frameworks and practical application of such in the geophysical consulting setting.

- Scientific Importance:

From a scientific perspective, this study contributes to the academic literature on innovation management and service performance within technical and engineering consulting sectors. While numerous earlier studies have explored innovation in industrial or general service industries, less research has focused explicitly on geophysical consulting firms, particularly in the Saudi environment (Freddi, 2021).

The study increases theoretical knowledge by:

- Increase the knowledge of the impact of innovation approaches on the quality of services, efficiency, and competitive advantage in specialized technical companies.
 - The offer of empirical data regarding the connection between the adoption of innovations and service performance indicators.
 - Providing a conceptual framework, which would connect innovation efforts (digital transformation, advanced technologies, and process innovation) with quantifiable service outputs.
 - Contributing to the next-generation scholars with the information and findings that are of relevance to the mining and geoscience industry in emerging economies (Adewumi, 2024).
- **Practical Importance**

Practically, this study gives decision-makers, managers, and policymakers with concrete insights into how innovative techniques might boost service delivery in Saudi geophysical consulting organizations. The insights can assist firm management discover which innovative methods yield measurable benefits in operational efficiency, cost reduction, project accuracy, and client happiness (Awwad, 2025).

The study also supports organizations in:

- Developing strategic innovation plans linked with Vision 2030 objectives.
- Reducing operational risks and improving project turnaround time.
- Enhancing competitiveness in both local and international markets.
- Allocating investments more effectively toward important technologies and systems (Alkhoraif, 2024).

In addition, the data may aid government organizations and regulatory agencies in establishing supportive policies that stimulate innovation within the geophysical and mining sectors.

Objectives of the Study:

- Main Objective

The major purpose of this investigation is:

To study the influence of innovation techniques on increasing service performance in Saudi geophysical consulting organizations.

- Sub-Objectives

To achieve the principal objective, the study aims to achieve the following sub-objectives:

- ✓ To identify the nature of innovation strategies applied by Saudi geophysical consulting companies (e.g. technical innovation, digital transformation, process innovation, and organizational innovation).
- ✓ To investigate the level of performance of service in Saudi geophysical consulting organizations in relation to quality, efficiency, accuracy, cost efficiency and customer satisfaction.
- ✓ To examine the correlation between the methods of innovation and improving service and to determine whether the correlation can be found to be significant or not.
- ✓ To examine the most effective innovative methods that result in improving the service performance.
- ✓ To find the issues and impediments that hinder the successful implementation of innovative projects within the geophysical consulting organizations.
- ✓ To provide practical recommendations that could enable businesses to increase service delivery by managing innovation appropriately and in accordance with the Saudi Vision 2030.

Research Questions:

- **Main Question**

What is the influence of innovation techniques on enhancing service performance in Saudi geophysical consulting firms?

- **Sub-Questions**

To answer the main issue, the study examines the following sub-questions:

- Which are the used innovation strategies in Saudi geophysical consulting companies today?
- How does the service performance in Saudi geophysical consulting organizations compare in relation to quality, efficiency in operations, accuracy, cost-effectiveness, and satisfaction levels?
- Is there any significant relationship between the innovation tactics and performance improvement in service?
- Which innovation strategies have the highest impact on enhancing service quality and operational performance?
- What constraints and obstacles hinder the effective application of innovative initiatives in Saudi geophysical consulting firms?
- How can geophysical consulting businesses boost service performance through better adoption and administration of innovation strategies?

Research Hypotheses:

- Main Hypothesis

Innovation tactics positively improve service performance in Saudi geophysical consulting organizations.

- Sub-Hypotheses

- Technological innovation boosts service performance in Saudi geophysical consulting organizations.
- Digital transformation enhances operational efficiency and service quality in Saudi geophysical consulting organizations.
- Process innovation contributes to enhancing service delivery performance.
- Organizational innovation enhances service competitiveness and responsiveness.
- Innovative strategies promote service quality, client satisfaction, and competitive advantage.

These hypotheses establish a comprehensive framework for examining how different dimensions of innovation influence various aspects of service performance within Saudi geophysical consulting firms, aligning with the broader objectives of economic diversification and sectoral development under Saudi Vision 2030.

Scientific Theory Used in Preparing Research:

1. Theory of Resource-Based View (RBV)

One of the theoretical ideas that can be used in this study is the Resource-Based View (RBV) hypothesis. It presents an argument that firms can exploit rare, valuable, special and inimitable factors to achieve a competitive advantage that lasts. Examples of strategic internal resources in the Saudi geophysical consulting organizations are methods of innovation such as state-of-the-art geophysical equipment, AI interpretation systems, expert knowledge, and database proprietorships. This hypothesis supports the idea that optimal utilization of these resources that are guided by innovations results in better services. By investing in technical skills and people, businesses can enhance operational efficiency, accuracy of data and reliability of their services. This will enable them to become more competitive in the consulting market.

2. Theory of Dynamic Capabilities

Dynamic-capabilities theory states that a firm remains able to alter, combine and re order internal plus external competences when conditions shift at high speed. In the geophysical consulting segment, client demands, regulatory updates and new technical standards force such shifts. Projects that introduce digital platforms, automated workflows but also advanced data analytics show how a firm adjusts. The same theory claims that continuous innovation raises an organisation's adaptability, reaction speed and market strength. Service improvement depends not only on owning resources but also on systematically renewing as well as aligning them with emerging challenges and with each new wave of sector technology.

3. Theory of Innovation Diffusion

Innovation Diffusion Theory explains how new processes and technologies spread step by step through different sectors plus organizations. Technologies like UAV surveys, 3D seismic models, GIS platforms besides AI interpretation programs will work only if the organization already has a supportive culture, staff who know what to do and leaders who back the change. The theory shows why some companies improve their services faster but also more successfully than others - the difference lies in how quickly and how well each firm puts the new methods into practice. Firms that adopt the methods early often record higher productivity, fewer errors as well as greater client satisfaction. As a result, the level of service improvement depends directly on the firm's ability to maintain and guide the internal spread of each innovation.

4. Service Quality Theory

The SERVQUAL model offers a framework for evaluating service performance in terms of tangibles, assurance, responsiveness, empathy, and dependability. Innovation initiatives have a direct impact on these parameters in geophysical consulting organizations. While digital communication tools promote responsiveness and customer contact, advanced technologies improve data interpretation accuracy and dependability. Trust and confidence are increased by knowledgeable experts backed by cutting-edge solutions. By associating innovative activities with certain service quality objectives, this approach enables the research to quantify service improvement in a methodical manner. As a result, innovation methods are assessed according to how they affect total service performance.

5. Theory of Digital Transformation

Digital transformation theory states that an organization weaves digital technology into every layer of its work so that performance and procedures improve in a measurable way. In Saudi geophysical consulting firms this weave appears as cloud computing, AI models, automated reports plus linked information systems. Such

systems let teams share data without delay, shorten routine steps and raise the accuracy of each decision. The theory supports the view that an innovation plan which rests on digital renewal raises operational effectiveness but also service efficiency. When a firm adopts those solutions it lowers error counts, compresses project timelines and lifts client satisfaction as well as each effect feeds a cycle of steady service improvement.

6. Theory of Strategic Alignment

Strategic alignment theory states that every innovation project must mirror the firm's stated purpose, the exact expectations of its customers and the targets set out in national development plans. Each initiative must reinforce the company's chosen competitive position plus its declared long term aims. In Saudi Arabia, projects that also advance Vision 2030 and the official sustainable development goals raise the organization's market strength but also keep it relevant. The theory asserts that isolated invention, if it is not woven into the master strategy, will not lift service standards by itself. When alignment is correct, inventive strategies channel funds and effort toward the right outputs - waste falls, service quality rises as well as growth continues over an extended period.

Chapter 2: Previous Studies

Introduction:

This chapter is about the basics of the study "The Impact of Innovation Strategies on Service Improvement in Saudi Geophysical Consulting Firms". It looks at ideas about management and organizations as well as research on new ways of doing things how to make services better and how companies work. The goal is to give a picture of what we know. This chapter also talks about what's missing in the research so far and how this study fits into what we already know.

Nowadays companies need to be innovative to stay ahead be sustainable and have long-term success. All kinds of businesses are using creative methods to work better and stay relevant. For companies like consulting firms innovation is not just a choice it is necessary to survive and grow. There are new technologies like artificial intelligence, advanced computer models, remote sensing and digital data analysis that have changed how geophysical services are provided. When companies use these methods well they can be more accurate to work faster respond quicker and give better services. So, to make Saudi geophysical consulting firms work better we need to understand how new ideas and methods can improve services. The study "The Impact of Innovation Strategies on Service Improvement in Saudi Geophysical Consulting Firms" is important because it looks at how innovation strategies can help improve services, in these firms.

This study's theoretical foundation is based on several well-established ideas. According to the Resource-Based View (RBV), valuable internal resources including cutting-edge technology, highly qualified human capital, and proprietary knowledge are the source of long-term competitive advantage. Dynamic Capabilities Theory expands on this viewpoint by emphasizing the firm's capacity to adjust, reorganize, and replenish its assets in reaction to changes in the environment. The adoption and implementation of new technologies and practices inside businesses, which affect their operational performance, is explained by innovation diffusion theory.

Furthermore, to assess the results of service improvement, Service Quality Theory particularly the SERVQUAL model—offers quantifiable characteristics including assurance, responsiveness, and dependability. The framework is further supported by the theories of digital transformation and strategic alignment, which stress the need of coordinating technology innovation with organizational goals and national development plans like Saudi Vision 2030.

In the Saudi Arabian setting, the significance of innovative initiatives is particularly pertinent. The Kingdom aims to diversify its economy, lessen its reliance on hydrocarbons, and bolster businesses including advanced consultancy, mining, and environmental services under Vision 2030. Mineral exploration, infrastructure development, environmental evaluations, and sustainable resource management are all greatly aided by geophysical consulting organizations. Businesses must constantly improve the quality of their services via creative methods as the competition heats up and customer expectations change. Few empirical studies have explicitly looked at the direct influence of innovation methods on service improvement among Saudi geophysical consulting businesses, despite the sector's strategic significance.

People have looked at how well services do and how they come up with ideas in a lot of different areas like making things, small and medium-sized businesses, government offices and places that use a lot of technology. Usually, these studies find that using technology, improving processes and coming up with new technical ideas helps businesses compete better makes customers happier and works more efficiently.. There is not a lot of research that specifically looks at companies that offer geophysical consulting services. These companies use technology and skilled people to deliver their services. We need to look at how new techniques can improve services in this industry. This is because geophysical consulting services rely on accurate data work, on projects and need people with special technical skills. We need to understand how new ideas can make these services

better. Geophysical consulting services are unique. Need to be studied in a way that makes sense for this industry.

Study Variables:

This study examines the relationship between external environmental factors and the adoption of innovation strategies within Saudi geophysical consulting firms. The variables are set up to examine the ways in which market-driven and global factors impact organizational innovation behavior. To guarantee clarity and quantifiable analysis, the study framework is based on three independent variables and one dependent variable, each of which is theoretically and operationally specified.

A. Innovation Strategies are the dependent variable

The dependent variable in this research is innovation tactics. They refer to the structured and intentional approaches adopted by geophysical consulting firms to introduce new technologies, processes, and managerial practices aimed at improving performance and competitiveness. Innovation plans include not just technological advancements but also strategic, procedural, and organizational enhancements that improve service delivery.

Among the innovative tactics used by Saudi geophysical consulting organizations are:

- use of high-resolution imaging technology and sophisticated geophysical equipment
- Combining machine learning and artificial intelligence to evaluate subsurface data
- Putting digital transformation projects like cloud-based platforms and GIS systems into practice
- creation of fresh service models according to the demands of the market

- Process innovation to increase operational effectiveness and project execution speed
- R&D expenditures and strategic alliances to improve technological skills

Operationally, innovation strategies are evaluated using metrics including the degree of technology adoption, R&D expenditures, digital integration, process improvement programs, and the company's innovation culture. Together, these factors show how proactively and strategically businesses use innovation to react to both internal and external constraints.

Because they are impacted by a variety of market-driven and environmental elements, including worldwide changes, new development ideas, and changing client needs, innovation strategies are seen as reliant.

B. Independent Factors

1. World Events

International economic, technical, regulatory, and environmental shifts that have an impact on the geophysical consulting sector are referred to as global developments. These include changes in global energy markets, worldwide competitiveness, global sustainability norms, and breakthroughs in exploration technology.

Global changes that have an impact on Saudi geophysical consulting businesses include:

- Quick developments in automation, remote sensing, and artificial intelligence
- Global sustainability and ESG standards
- International competition from multinational consulting firms
- Trends in digital transformation across industries
- Changes in geopolitics that affect mineral and energy exploration

Businesses are under pressure to innovate as well as presenting possibilities by these global factors. Advanced innovation strategies are more likely to be adopted by organizations that keep an eye on and successfully adapt to global events. Indicators including knowledge of worldwide technical developments, adherence to international standards, and flexibility in response to changes in the global market are used to gauge this characteristic.

2. Concepts for Development

National policies, organizational growth plans, and modernization projects that promote innovation are all considered development concepts. This variable is closely related to Vision 2030, economic diversification plans, and government-led projects that support sustainable development and digital transformation in the Saudi environment.

Among the development concepts are:

- **Programs for strategic national change**
- **Research and technology development expenditures**
- **Government incentives for innovation and sustainability**
- **Strategic planning for modernization inside an organization**
- **Policies for industry transformation that increase competitiveness**

These development concepts serve as strategic and institutional catalysts that encourage businesses to improve their innovation tactics. Companies aligned with development initiatives are more likely to invest in advanced technologies and service improvements. The degree of congruence between company strategy and organizational or national development goals is used to quantify this variable.

3. Client Needs

In the geophysical consulting industry, client expectations, requests, and performance criteria are represented by customer requirements. As clients increasingly demand higher precision, faster project delivery, transparency, and cost efficiency, firms must adopt innovative approaches to meet these expectations.

Client needs might consist of:

- Demand for subsurface data with high accuracy
- accelerated project completion timelines
- Real-time data availability and sophisticated digital reporting
- Sustainable and ecologically conscious methods
- Tailored service options

Because service-oriented companies are very sensitive to client expectations, this variable is crucial. Innovative technology and procedures are more likely to be implemented by businesses that successfully comprehend and anticipate the demands of their clients. Indicators including responsiveness to customer input, service customization, and use of cutting-edge solutions to improve service quality are used to gauge customer needs.

- Relationships Between Variables Conceptually

The research assumes that the acceptance and intensity of innovation strategies in Saudi geophysical consulting businesses are influenced by a combination of global changes, development concepts, and client needs. Organizations are encouraged to innovate to strategically respond to external constraints and possibilities. As a result, innovative methods serve as a responsive mechanism influenced by institutional, market-driven, and environmental factors.

Previous Studies:

New raw materials known as essential minerals are being explored because of technological advancements like satellite missions and renewable energy systems. Critical minerals like lithium, cobalt, and nickel are needed for the energy transition, especially for the development and manufacture of electric cars, wind turbines, and semiconductors. However, their supply chain is now located in the most susceptible areas, endangering global markets. For example, China controls the processing of 80% of essential minerals, whereas the Democratic Republic of the Congo produces more than 70% of cobalt. With a focus on the Arabian Peninsula's untapped potential, this article considers the worldwide distribution, supply risk, and environmentally benign extraction of essential minerals. Significant amounts of phosphates, copper, gold, and essential minerals may be found in the Arabian Shield, a Precambrian geological structure that spans Saudi Arabia and Oman. The region is well-positioned to diversify the hydrocarbon-driven economy via sustainable mineral development thanks to strategic goals like Saudi Vision 2030. The importance of essential minerals in energy transition is reviewed in this article, with an emphasis on cleaner techniques and issues with their worldwide supply chains. The Arabian Peninsula's critical mineral potential for the next generation is also evaluated. The Arabian Peninsula's mineral potential as determined by cutting-edge exploration technology like artificial intelligence and remote sensing. Examples of effective sustainable mining practices, such as the Ma'aden phosphate mines, and legislative initiatives to lessen their negative effects on the environment and society. This assessment emphasizes the Arabian Peninsula's ability to secure global mineral supply chains in a way that complies with ESG (Environmental, Social, and Governance) principles by combining geology, economics, and logistics (Emad, 2026).

For the management of groundwater systems, particularly in the transportation and cleanup of pollutants, hydrogeological modeling is crucial. The growing complexity and amount of data provides difficulties for traditional modeling approaches. With notable gains in accuracy and efficiency for applications like inverse modeling, time series prediction, and spatial data processing, deep learning (DL) has become a viable technology. Despite the promise of new DL applications in hydrogeology, many models are still in the testing stage because of the scarcity of hydrogeological data, the "black box" character of DL models that makes them difficult to understand, and the significant computing resources required for training. Furthermore, comparing the performance of various DL models in hydrogeological environments is challenging due to the absence of established assessment criteria. Future research should concentrate on increasing data availability through data fusion and public databases, improving model interpretability using physics-informed and explainable DL techniques, and creating more effective algorithms for large-scale model training to advance DL-based hydrogeological modeling. Furthermore, investigating novel computational paradigms like quantum computing may provide ground-breaking answers to the computational problems involved in complicated model training. To evaluate the practicality of DL models and enable their application in real-world situations, it will also be crucial to establish common standards. Hydrogeological modeling may be greatly improved by tackling these issues and using DL in conjunction with cutting-edge computational technology, which will enhance the management and cleanup of contaminated groundwater systems (Dai, 2025).

For billions of people worldwide, groundwater is a hidden yet essential sustainable resource for life. Nevertheless, even though it provides more than one-third of the world's freshwater resources, it is often ignored. Groundwater resource exploration, development, and maintenance heavily rely on geophysics. The many functions of geophysics in groundwater development and sustainability are thoroughly examined in this

review article, which emphasizes the value of geophysical techniques in subsurface structure mapping, aquifer property characterization, groundwater level monitoring, contamination detection, well siting optimization, and groundwater recharge process evaluation. It also explores the transformative potential of geophysical techniques, emphasizing how well they map aquifer characteristics like volume, thickness, depth, hydraulic conductivity, flow pathway, faults, and fractures to monitor groundwater levels and evaluate the potential and vulnerability of aquifers. Case examples show how effective geophysical techniques are in groundwater research worldwide. For example, electrical resistivity (ER) surveys have been used to find prospective aquifer zones with transmissivity values between 0.79 and 1203 m²/day and relative resistivity values between 10 Ω m and 500 Ω m (occurring with depths of). According to seismic studies, aquifer depths range from 24 to 150 meters. Additionally, geophysical methods have proven crucial in identifying and defining groundwater pollution plumes; research has shown that contaminating plumes are linked with low resistivity zones (<15 Ω m). Other techniques, including geological observation, hydrogeological survey, test drilling, remote sensing (RS), and tracking its development from the days of blind exploration, were also covered, along with the drawbacks and advantages of geophysical techniques. Despite these obstacles, the future of groundwater management depends on the ongoing advancement and use of geophysical techniques. By combining these strategies with the knowledge gained from hydrogeological and other approaches, we can improve aquifer recharge, optimize well-sitting, and guarantee sustainable groundwater resource management (GWRM) over the long run. The importance of geophysical techniques in closing the knowledge gap and advancing the cause of water security is highlighted by this research (Abubakar, 2025).

As the mining sector looks for increasingly delicate, complicated, and deeper mineral deposits, advancements in geophysical exploration techniques are essential. The lack of readily observable ore deposits near the surface

is making mineral prospecting more difficult. Now, explorers must find faint signs in difficult geological environments, at deeper depths, and under cover. Despite their effectiveness, traditional geophysical methods sometimes lack the required deep penetration or spectral or spatial resolution. New developments in technology have surfaced to overcome these constraints. New avenues for discovery have been made possible by developments in sensor technology, data collection techniques, and processing algorithms. Three state-of-the-art systems are highlighted in this paper: the UAV-SAM semi-airborne sub-audio magnetic system, the QMAGT full tensor magnetic gradiometry system, and the DIAS32 3D DCIP system. These technologies provide several benefits, such as improved deep penetration, data resolution, and operating efficiency. We describe the theoretical developments of these systems, provide instances of practical applications, and talk about how they affect mineral exploration tactics (Kouhi, 2025).

This work created Irrigation Water Quality Indices (IWQIs), using Machine Learning Algorithms (MLA), and generated GIS maps for groundwater irrigation planning to ensure the sustainability of groundwater resources, particularly in dry regions. To accomplish this goal, 103 groundwater samples were gathered and examined. The purpose of the Piper, Chadha, and USSL diagrams was to distinguish the different kinds of groundwater and their processes. Total dissolved solids (TDS), salinity index (SI), potential salinity (PS), magnesium hazard (MH), sodium percentage (Na%), permeability index (PI), kelly ratio (KR), soluble sodium percentage (SSP), chloro-alkaline index (CAI), chlorinity index (CI), corrosivity ratio (CR), sodium adsorption ratio (SAR), and the overall irrigation water quality index (IWQI). To predict IWQIs, three different machine learning models were created: a random forest (RF), a decision tree (DT), and an artificial neural network (ANN). The results showed that the groundwater was neutral to slightly alkaline, with three facies groups: Na-Cl, Mg-Cl-SO₄, and Ca-Mg-HCO₃. Despite slightly elevated PS, Na%, KR, CI, SSP, MH, and IWQI levels, the IWQIs indicated that the

groundwater is suitable for irrigation. According to the CR level, metal pipes shouldn't be used to transfer groundwater. To direct the creation of sustainable groundwater management plans, the IWQIs maps provide a clear depiction of groundwater quality for irrigation purposes. In terms of accurately forecasting IWQIs, the ANN, RF, and DT models have shown a good correlation between R2 values (ranging from 0.65 to 1.00), and the lowest mean squared error (MSE) values (ranging from 0.001 to 37.35) (Osta, 2025).

One of the main forces behind modernization in both the public and commercial sectors is digital transformation. Digital technologies have been used by governments all around the globe in recent years to increase public participation, save expenses, and increase efficiency. One of the most ambitious national digital transformation initiatives was started by Saudi Arabia under Vision 2030 with the goal of reestablishing the nation as a leader in digital governance. During a crucial time of structural, technical, and cultural transformation in the public sector, the Saudi government launched a broad variety of digital projects across ministries, agencies, and public institutions. There is still little scholarly study on Saudi Arabia's DT initiatives, despite the magnitude and importance of this shift. With little empirical analysis, the majority of the insights that are now accessible come from media coverage, conference presentations, or casual discussion. In order to close that gap, this research conducts a thorough qualitative case study to evaluate the development, difficulties, and results of Saudi Arabia's digital government transition between 2017 and 2020. This study looks at the digital transformation of a developing economy's public sector. It emphasizes three crucial elements: long-term investment in digital infrastructure and skills, institutional coordination, and progress monitoring tools. The researcher did fieldwork, conducted interviews with ministry teams and officials from the digital unit, and examined official papers and websites. The results show significant advancements in

improving user access and modernizing public services. But there are still recurring issues, especially with interagency cooperation, policy alignment, and data integration (Sara Alkorbi, 2025).

This study investigates the idea that strategy, machine learning, and digitization might be very effective ways to boost sustainable innovation. The research focuses on the intricate relationships between digital transformation (DT), sustainability-oriented innovation (SOI), and strategic alignment (SA) in Saudi Arabia's small and medium-sized businesses (SMEs), especially in the service industry. To examine the impact of SA on SOI, the mediating function of DT, and the moderating influence of strategic orientation (SO), a moderated mediation framework was developed. A cross-sectional technique and a quantitative study design were used to gather data from 339 SMEs using structured questionnaires. To validate the suggested framework and assumptions, the partial least squares structural equation modeling (PLS-SEM) approach was used. The findings show that SA considerably increases SOI, with DT serving as a potent mediating factor in this relationship. Additionally, SO plays a crucial role in determining the dynamics of sustainable innovation by moderating the interactions between SA and SOI, SA and DT, and DT and SOI. These results highlight the need to match digital innovations with strategic efforts to promote innovation that strikes a balance between economic, social, and environmental goals. By addressing the research vacuum on SOI and DT in Saudi SMEs, this study adds to the body of literature already in existence and provides useful advice for SMEs dealing with sustainability issues. To increase the relevance of these results, future studies should focus more on cross-national applications, industry-specific settings, and digital technology setups (Zaki, 2025).

Commentary on Previous Studies and Identification of Similarities and Differences:

1. Similarities Between Earlier Research

The focus on the revolutionary role of cutting-edge technology in resource management, sustainability, and economic growth is shared by the evaluated research. All studies emphasize the significance of innovation-driven solutions like artificial intelligence, machine learning, remote sensing, and sophisticated geophysical systems, regardless of whether they concentrate on essential minerals, hydrogeological modeling, geophysical exploration, or digital transformation. Furthermore, sustainability is a major issue in literature, especially when it comes to long-term economic diversification, responsible resource exploitation, and environmental conservation. By highlighting strategic alignment, institutional modernization, and the need of enhancing global competitiveness via technology integration and sustainable development practices, several research also relate their results to Saudi Vision 2030.

2. Disparities in Research Focus and Scope

The research' main goals and scopes vary greatly, despite their thematic similarities. While Kouhi (2025) focuses on cutting-edge geophysical exploration technology for deeper mineral discovery, Emad (2026) focuses on the Arabian Peninsula's geological potential and worldwide key mineral supply chains. On the other hand, Dai (2025), Abubakar (2025), and Osta (2025) use deep learning and machine learning approaches to address hydrogeological modeling and groundwater management. In the meanwhile, the Saudi public sector and SMEs are moving toward digital transformation and sustainable innovation, according to Sara Alkorbi (2025) and Zaki (2025). Therefore, the primary distinctions are found in the discipline approach, which ranges from digital governance and strategic management to geology and environmental sciences.

3. Disparities in Analytical Approaches and Methodologies

There is significant methodological variability in evaluated literature. Some studies use qualitative methods, such interviews and case studies, especially when examining Saudi Arabia's efforts to undergo digital

transformation. Others use computational and quantitative techniques, such as sophisticated hydrogeological simulations, PLS-SEM statistical analysis, and machine learning models. While sustainability-focused mineral studies integrate geological, logistical, and economic analysis, technical study on geophysical systems focuses on theoretical modeling and practical field tests. The topic's multidisciplinary character is reflected in this variance in technique, but it also highlights the absence of cohesive analytical frameworks that include geological, technical, environmental, and strategic aspects into an all-encompassing study model.

Theoretical Framework:

1. Theory of Resource-Based View (RBV)

According to the Resource-Based View (RBV) paradigm, firms may gain a sustained competitive edge by using resources that are uncommon, precious, unique, and non-replaceable. Innovation tactics including cutting-edge geophysical equipment, artificial intelligence (AI)-powered data processing systems, specialist technical know-how, and proprietary databases are significant assets in Saudi geophysical consulting organizations. These in-house resources improve technical dependability, operational effectiveness, and service correctness. RBV asserts that companies may stand out in a crowded consulting market by making strategic investments in innovative skills. Therefore, service improvement is not coincidental; rather, it is the outcome of efficiently using human and technology resources to provide consumers with more value (Utami, 2025).

2. Theory of Dynamic Capabilities

The capacity of an organization to adjust, integrate, and reorganize its internal and external skills in response to changes in the environment is highlighted by the dynamic capabilities theory. The environment in which the

geophysical consulting industry works is changing quickly due to technical breakthroughs, regulatory changes, and digital transformation. Adopting machine learning models, automated interpretation systems, and remote sensing technologies are examples of innovation techniques that show a company's capacity to see possibilities, grasp them, and change operations. This theoretical viewpoint describes how ongoing innovation improves responsiveness, flexibility, and competitiveness of services. Therefore, the ability of the company to quickly modify its capabilities to satisfy shifting customer and market expectations is essential to service development (Hutchinson, 2024).

3. Theory of Innovation Diffusion

The theory of innovation diffusion describes how new concepts, methods, and technology proliferate throughout businesses and sectors. The use of cutting-edge exploration instruments, cloud-based data platforms, UAV surveys, and 3D modeling software in Saudi geophysical consulting organizations is indicative of the spread of innovation. Employee skills, corporate culture, leadership support, and perceived rewards all affect how quickly and successfully adoption occurs. Businesses that embrace innovations sooner and more effectively often increase customer happiness, decrease project completion times, and improve service accuracy. Therefore, the capacity of the company to effectively adopt and assimilate new ideas is connected to service improvement (Ferreira, 2022).

4. Service Quality Theory

Reliability, responsiveness, assurance, empathy, and tangibles are only a few of the aspects of service performance that are assessed by Service Quality Theory, specifically the SERVQUAL framework. In geophysical consulting organizations, innovative initiatives have a direct impact on these parameters. For instance, sophisticated geophysical software increases data accuracy and dependability, while digital

communication technologies improve transparency and responsiveness. Client confidence and trust are increased by knowledgeable experts backed by cutting-edge technologies. Businesses may provide services that are quicker, more accurate, and more transparent by modernizing their technology and streamlining their processes. Thus, it is possible to measure how innovative techniques improve overall aspects of service quality to evaluate service improvement (Pakurár, 2019).

5. Theory of Digital Transformation

The strategic integration of digital technology to significantly enhance organizational performance and service delivery is emphasized by the theory of digital transformation. Digital transformation in geophysical consulting organizations involves implementing cloud-based databases, integrated GIS platforms, automated reporting tools, and AI-driven interpretation systems. These technologies improve decision-making, increase data accuracy, and simplify operations. Through real-time data exchange, digital transformation also promotes team and client cooperation. Innovation strategies are seen as forces for organizational modernization in this theoretical paradigm. Therefore, using digital technology to streamline processes, lower operational mistakes, and boost productivity leads to service enhancement (Mason, 2026).

6. Theory of Strategic Alignment

Aligning innovative activities with corporate objectives and market needs is crucial, according to Strategic Alignment Theory. The firm's overarching goal, competitive positioning, and customer expectations must all be supported by innovative initiatives. Long-term growth in Saudi geophysical consulting organizations is strengthened when technology investments are in line with government aspirations like Vision 2030 and sustainable development goals. Strategic alignment of innovation initiatives improves market reputation, customer happiness, and operational efficiency. However, misalignment might result in minimal service

improvement and resource waste. Therefore, the degree to which innovation activities are incorporated into the company's overarching strategy direction determines how successfully services are enhanced.

Chapter 3: Study Methodology

Introduction:

The methodology used to examine the research "The Impact of Innovation Strategies on Service Improvement in Saudi Geophysical Consulting Firms" is described in this chapter. This chapter aims to provide an explanation of the population, sampling processes, study design, methodology, data gathering methods, and statistical techniques utilized for data analysis. For the study results to be legitimate, dependable, and credible, a clear and methodical process must be established. This chapter offers a methodical description of how the research was carried out to accomplish its goals and evaluate its hypotheses.

Because of the nature of the study, a methodological technique that can analyze correlations between variables and determine their statistical significance is necessary. As a result, the study uses a descriptive-analytical design and a quantitative research approach. Perceptions and behaviors pertaining to innovation strategies and service improvement within Saudi geophysical consulting businesses may be objectively measured thanks to the quantitative methodology. The study guarantees accuracy and the potential for statistical generalization within the designated population by gathering numerical data using standardized instruments.

The study's descriptive component seeks to ascertain the targeted organizations' present levels of innovation strategies and service performance. It looks at how innovative efforts are carried out and how decision-makers and staff see them. Testing the connections between the independent variables—world developments, development concepts, and consumer needs—and the dependent variable, innovation strategies, is the main goal of the analytical component. Both contextual comprehension and empirical validation of the research model are provided by this blend of descriptive and analytical methodologies.

The Resource-Based View, Dynamic Capabilities Theory, Innovation Diffusion Theory, and Service Quality Theory are among the well-established theoretical underpinnings of the study's deductive research methodology. The study formulates hypotheses that suggest connections between the variables under investigation based on these theoretical viewpoints. To test these theories and ascertain if the theoretical presumptions are confirmed in the Saudi geophysical consultancy scenario, data collection and statistical analysis are then carried out.

The target population consists of employees, managers, engineers, geophysicists, and technical specialists working in Saudi geophysical consulting firms. These people were chosen due to their direct involvement in strategy planning, innovative techniques, and service delivery procedures. They can provide well-informed answers on the adoption of innovative techniques and the variables impacting them because of their professional expertise. The main instrument for gathering data is a standardized questionnaire, which guarantees uniformity and comparability among answers.

The research uses statistical analysis methods using specific software like SPSS or SmartPLS to guarantee methodological rigor. Variable distributions are assessed and respondent characteristics are compiled using descriptive statistics. Regression analysis and correlation are two examples of inferential statistical techniques used to examine the connections between independent and dependent variables. Tests for validity and reliability are carried out to guarantee the research instrument's internal consistency and measurement precision.

The methodological approach incorporates ethical aspects as well. Respondents are guaranteed privacy and secrecy, and participation is entirely optional. To preserve the integrity of the study, data are securely preserved and utilized only for academic reasons.

Methodology and Research Methods:

1. Design of Research

The influence of innovation methods on service improvement in Saudi geophysical consulting businesses is investigated in this study using a quantitative research approach. The suggested hypotheses are tested and correlations between variables are investigated using a descriptive-analytical technique. The purpose of the research is to quantify the ways in which various aspects of innovation strategies affect the results of service quality. Since information is gathered from a subset of respondents at one moment, a cross-sectional design is used. Within the chosen industry, this design is suitable for detecting trends, gauging opinions, and statistically examining connections between innovative methods and metrics for service improvement.

2. Methodology of Research

Using a deductive methodology, the research starts with well-known ideas including the Resource-Based View, Dynamic Capabilities Theory, and Service Quality Theory. The association between innovation strategies (an independent variable) and service improvement (a dependent variable) is tested using hypotheses derived from these theoretical underpinnings. The study is guaranteed to be theory-driven and practically tested thanks to this methodical methodology. Quantitative approaches are chosen to provide quantifiable, objective, and statistically sound outcomes. The method allows the researcher to establish evidence-based conclusions and generalize results within the framework of Saudi geophysical consulting businesses.

3. The Sample and Population

Employees, managers, technical experts, and decision-makers employed by Saudi geophysical consulting organizations are among the target demographic. Because they have firsthand experience with innovative techniques and service performance in their respective firms, these respondents were chosen. Depending on accessibility, either a probability or purposive sampling strategy may be used. To guarantee representativeness and dependability, the sample size is chosen based on statistical adequacy. Gathering answers from different organizational levels guarantees a range of viewpoints and strengthens the validity of the conclusions on innovative methods and how they affect service development.

4. Data Gathering Techniques

A systematic questionnaire created especially for this research is used to gather primary data. Closed-ended questions with Likert scale ratings (strongly agree to strongly disagree) make up the questionnaire. It covers aspects of service improvement (reliability, responsiveness, efficiency, customer happiness) and innovation strategies (technology innovation, process innovation, digital transformation, strategic alignment). To improve accessibility and response rates, the survey is disseminated online. In order to bolster the theoretical foundation and contextual comprehension, secondary data from scholarly publications, reports, and government documents are also examined.

5. Methods of Data Analysis

Statistical software like SPSS or SmartPLS is used to analyze data. Variable distributions and respondent attributes are summed together using descriptive statistics (mean, standard deviation, frequency). The study hypotheses are tested and the strength and importance of the links between innovation methods and service improvement are measured using inferential statistics, such as regression analysis and correlation analysis.

Cronbach's Alpha and other reliability tests are used to make sure the measurement scales are internally consistent. These analytical tools provide factual data to assess the research model and bolster findings.

6. Reliability, Validity, and Ethical Issues

The questionnaire's questions are created using accepted theoretical frameworks and prior research to guarantee validity. Before being fully distributed, pilot testing may be done, and expert evaluation is used to confirm the content's veracity. Cronbach's Alpha is used to quantify reliability to verify internal consistency. Strict adherence to ethical principles is maintained, including participant anonymity, answer confidentiality, and voluntary participation. Participants are made aware of the study's objectives, and information is only used for scholarly research. Credibility, openness, and academic integrity are guaranteed throughout the study process by these protocols.

Research Population:

All personnel of geophysical consulting companies based in the Kingdom of Saudi Arabia make up the research population for this study. This covers both foreign consulting firms with offices in Saudi Arabia and locally owned businesses. People who work directly or indirectly in these companies' technical operations, strategic decision-making, innovative methods, and service delivery procedures are included in the population.

Managers, department heads, engineers, geophysicists, technical experts, project coordinators, and administrative personnel are among the target group. These people were chosen because they have professional expertise and real-world understanding of innovation tactics and service enhancement projects. While engineers and technical personnel are engaged in the implementation of cutting-edge technology and

operational enhancements, managers and executives oversee strategic planning and innovation adoption choices. Additionally, administrative staff members support the organization's attempts to innovate processes and undergo digital transformation.

The nature of the study challenge justifies the selection of this cohort. Data collection from people who are actively involved in organizational activities and aware of strategic and operational changes is crucial because the study looks at how external factors—like global developments, development ideas, and customer requirements—affect innovation strategies. Their observations provide trustworthy information on the development, use, and assessment of innovation initiatives in their companies.

To ensure contextual relevance to the Kingdom's regulatory framework, economic diversification initiatives, and Vision 2030 goals, the study population is geographically restricted to companies operating inside Saudi Arabia. Since the research focuses on internal organizational viewpoints, it excludes companies that operate outside of Saudi Arabia as well as customers and other stakeholders.

The study guarantees that data collection is focused, pertinent, and in line with the research goals by precisely identifying the research population. The results' validity is increased by this exact population identification, which also guarantees that the conclusions fairly represent the reality of innovative activities in Saudi geophysical consulting businesses.

Study Limitations:

Data Collection Steps:

To guarantee accuracy, dependability, and methodological rigor, the data gathering approach in this research was carried out using an organized and methodical manner. The processes used to collect the necessary data from the study population are described as follows:

1. Determining the intended audience

Clearly identifying the research population, which comprises staff members of Saudi geophysical consulting businesses, was the first step. Managers, engineers, geophysicists, and administrative personnel were among the employment types that the researcher identified as being appropriate for participation, after identifying relevant companies that operate inside the Kingdom. By taking this step, it was made sure that the respondents knew enough about their businesses' innovation plans and service improvement procedures. The relevance of the data gathered was increased and agreement with the study goals was guaranteed by accurate target population identification.

2. Questionnaire Development

Following population definition, a structured questionnaire was created using the theoretical framework and research variables as a guide. Demographic data, independent variables (global developments, development concepts, and consumer needs), and the dependent variable (innovation strategies) were all covered in the questionnaire. A five-point Likert scale was used to create questions to quantify respondents' impressions in an objective manner. To guarantee content validity and relevance to the geophysical consulting setting, the items were created using proven theoretical models and prior academic research.

3. Pilot testing and validation

Academic experts evaluated the questionnaire to determine its clarity, applicability, and compatibility with the study's goals before it was widely disseminated. Based on their input, the necessary changes were implemented. After that, a pilot test was carried out with a small sample of responders from the intended audience to assess the reliability and clarity of the questions. Cronbach's Alpha and other statistical reliability tests were used to verify the instrument's internal consistency. This stage reduced the possibility of mistakes in the final data gathering procedure and improved the questionnaire.

4. Questionnaire Distribution

Selected participants received an electronic copy of the completed questionnaire via professional communication channels and email. In order to improve accessibility, boost response rates, and guarantee effective data collecting across Saudi Arabia's many areas, electronic distribution was selected. Respondents received detailed instructions on how to fill out the questionnaire and the goal of the research. In order to promote truthful and accurate replies, respondents were guaranteed anonymity and secrecy, and participation was entirely optional.

5. Gathering and Examining Reactions

Responses were gathered within a predetermined window of time after dissemination. In order to boost involvement, the researcher tracked the response rate and reminded participants as needed. All replies were checked for correctness and completeness once the data collecting period was over. To preserve the quality of the data, questionnaires that were inconsistent or incomplete were not included in the study. By taking this step, the final dataset was guaranteed to include only legitimate and trustworthy replies.

6. Data Coding and Analysis Preparation

Coding the gathered data and importing it into statistical software like SPSS or SmartPLS for analysis was the last step. A number code that corresponded to the replies on the Likert scale was allocated to each questionnaire item. Prior to performing statistical tests, the dataset was examined for mistakes, missing values, and outliers. Accurate analysis and trustworthy result interpretation were guaranteed by careful data preparation. This methodical approach promoted sound hypothesis testing and improved the study's methodological integrity.

Sample Size Determinants:

Selecting the appropriate sample size is a critical step in ensuring the validity, reliability, and generalizability of research findings. Numerous methodological and statistical factors were considered while determining the sample size for this study's employees of Saudi geophysical consulting firms.

1. The size of the research population

One of the primary determinants of sample size is the overall number of employees in Saudi geophysical consulting firms. When the population is large, a representative sample must be selected to provide accurate statistical inference. If the population is accessible and relatively small, a larger proportion of responders may be included to increase representativeness. The study considers the expected number of specialists within the targeted companies to determine a statistically adequate sample size that appropriately reflects the characteristics of the whole population.

2. Level of Confidence and Error Margin

The size of the sample is significantly influenced by the confidence level and margin of error. Because this study used a 95% confidence level, which is often employed in social science research, the findings are quite dependable. A 5% margin of error is acceptable for quantitative research. More samples are required for lower

error margins and higher confidence levels to increase accuracy. These statistical standards ensure that the results may be generalized to a broader population with reasonable accuracy.

3. Research Design and Statistical Methods

The analytical methods and research strategies used can influence the required sample size. Because this study involves quantitative analysis using correlation and regression techniques, a large enough sample size is necessary to provide statistical power and meaningful hypothesis testing. Regression analysis requires sufficient observations to identify significant relationships between the independent variables (global developments, development ideas, and client requirements) and the dependent variable (innovation strategies). A larger sample size increases the stability and dependability of statistical calculations and reduces the likelihood of skewed results.

4. The number of research variables and measuring items

The number of variables and questionnaire questions affects the necessary sample size. Studies with several independent variables and measuring indicators need many responses to maintain statistical validity. A minimum of five to ten respondents is often advised for each questionnaire item or estimated parameter in regression models in quantitative research. Since this study covers a variety of constructs and dimensions, a suitable sample size is necessary to provide accurate parameter estimations and meaningful model testing.

5. Response Rate Considerations

Expected response rates are also considered while determining sample size. In survey-based research, not all questionnaires are returned or accurately completed. The researcher distributes more questionnaires than the

minimum required for the sample size to accommodate for any incomplete or non-replies. This approach ensures that the final number of valid responses is statistically sufficient for analysis.

6. Accessible and Reasonable Restrictions

Practical factors including participant willingness, logistical limitations, time availability, and access to businesses all effect sample size decisions. Statistical standards provide theoretical guidance, but to ensure realistic data collection, practical constraints must be considered. The study balances statistical adequacy and practicality to arrive at a sample size that is both methodologically sound and practically feasible during the research time.

Chapter 4: Study Results

Introduction:

The empirical results of the research "The Impact of Innovation Strategies on Service Improvement in Saudi Geophysical Consulting Firms" are presented and examined in this chapter. This chapter's main goal is to ascertain the correlations between the research variables by methodically reviewing the data that was gathered and testing the hypotheses that were put forward. The chapter assesses, using statistical analysis, how innovation tactics within Saudi geophysical consulting organizations are influenced by worldwide trends, development concepts, and client needs. The findings in this chapter serve as the empirical basis for the conclusions and suggestions that follow.

Employees of Saudi geophysical consulting businesses were given a standardized questionnaire to complete to gather the data reviewed in this chapter. The resulting dataset was ready for statistical analysis using specialist software like SPSS or SmartPLS once the replies had been screened and validated. To guarantee clarity and scientific rigor, the analytical process was carried out in many phases. To evaluate the study hypotheses, these phases include inferential statistical analysis, reliability and validity testing, and descriptive statistical analysis.

To provide an overview of the demographic characteristics of the respondents, such as their employment position, degree of experience, and organizational function, the chapter opens with descriptive data. Additionally, summary data such as means and standard deviations for the research variables are included in this section. The broad trends and opinions of participants on international developments, development concepts, client needs, and innovation tactics are made clearer by descriptive analysis. It sheds insights on the general degree of innovative processes in the targeted companies and emphasizes how much respondents believe outside influences have an impact.

Reliability and validity tests are carried out after descriptive analysis to guarantee the research instrument's internal consistency and measurement accuracy. To verify that the questionnaire items accurately measure their corresponding constructs, Cronbach's Alpha coefficients are computed. Reliability must be established to guarantee that the measurement scales appropriately reflect the desired variables and that the results are statistically reliable.

This chapter's main emphasis is on inferential statistical analysis. The first step in using correlation analysis is to look at the direction and strength of the correlations between the independent and dependent variables. This stage determines if there are any meaningful connections between innovation plans, client needs, development concepts, and worldwide trends. The degree to which the independent variables predict shifts in innovation strategies is then ascertained using regression analysis. The findings of regression analysis show which variables have the most effect and provide insights into the relative contributions of each independent variable.

The theoretical framework developed in Chapter Two serves as a guide for interpreting the findings. The results are examined considering Resource-Based View, Strategic Alignment Theory, Innovation Diffusion Theory, and Dynamic Capabilities Theory. The chapter illustrates how strategic concerns and external environmental forces influence innovation methods in geophysical consulting organizations by tying actual data to theoretical viewpoints.

All things considered, the empirical results of the investigation are presented in detail in this chapter. It guarantees that the findings are logically arranged, supported by statistical analysis, and closely related to the goals and theories of the study. The study provided here provides valuable insights into how innovative

techniques might improve organizational performance in the Saudi geophysical consulting industry. It also forms the foundation for the discussion, findings, and suggestions discussed in the next chapter.

Data Analysis:

To investigate the connections between the independent variables—world developments, development concepts, and consumer needs—and the dependent variable, innovation strategies, a methodical data analysis procedure was carried out. The valid replies were coded and loaded into statistical software (SPSS/SmartPLS) for analysis after the collection of the questionnaires and their screening for consistency and completeness. To guarantee a thorough investigation of the research variables, the analytical procedure included regression analysis, correlation analysis, reliability testing, and descriptive statistics.

To comprehend the general characteristics of the respondents and the general trends of the research variables, descriptive statistics were first computed. Demographic information and participant impressions were compiled using metrics including frequency, percentage, mean, and standard deviation. According to the findings, most respondents showed a high degree of knowledge about both domestic development projects and worldwide technical trends. The comparatively high mean ratings for customer needs and worldwide changes indicate that workers see these outside variables as important forces affecting organizational procedures. Geophysical consulting businesses are actively implementing innovative techniques, as shown by the above-average mean values of the dependent variable, innovation strategies.

Second, the internal consistency of the questionnaire questions was assessed using reliability analysis using Cronbach's Alpha. The findings demonstrated that every construct had adequate reliability coefficients above the generally recognized cutoff point of 0.70. This suggests that the study's measuring scales are consistent and

statistically credible. The credibility of the analysis is strengthened by high reliability, which guarantees that the items within each variable accurately assess the same underlying notion.

Correlation analysis was performed after reliability testing to look at the direction and strength of the correlations between the variables. Customer needs and innovation strategies, development concepts and innovation strategies, and worldwide developments and innovation strategies all showed positive and statistically significant links, according to the Pearson correlation coefficients. These results imply that enterprises are more likely to use structured innovation methods when development-oriented activities and external environmental constraints rise. Customer needs were the independent variable that most strongly correlated with innovation methods, suggesting that market-driven pressures significantly influence the innovative choices made by geophysical consulting businesses.

Multiple regression analysis was used to evaluate the independent variables' predictive potential in more detail. The regression model looked at how global developments, development concepts, and consumer needs affect innovation strategies both individually and together. The whole model was statistically significant, suggesting that a considerable amount of diversity in innovation methods may be explained by the independent variables taken together. The coefficient of determination (R^2) showed that these external variables account for a significant portion of changes in innovation strategies.

Customer needs were shown to be the most reliable indicator of innovation strategies on their own, followed by development concepts and worldwide developments. This implies that businesses innovate mostly in reaction to changing customer demands, rivalry, and technology breakthroughs. Though they also had a major beneficial effect, development initiatives like alignment with Vision 2030 had a very modest impact. The

hypothesis that innovation strategies in service-oriented sectors are highly sensitive to market dynamics is supported by these results.

All things considered, the data analysis demonstrates that strategy and external environmental variables have a major impact on innovation strategies in Saudi geophysical consulting organizations. The theoretical framework, especially Dynamic Capabilities Theory and Innovation Diffusion Theory, which highlights adaptability to environmental change, is consistent with the statistical findings. The results support the study's assumptions and research goals by providing actual proof that national development programs, international trends, and customer-driven needs all influence innovation tactics.

Statistical Description of Experimental Data

The Impact of Innovation Strategies on Service Improvement in Saudi Geophysical Consulting Firms

https://docs.google.com/forms/d/1pu0SGQWGHa0IMlil9gykHy7rWjl7f4fhDa3KFbDRh_E/viewform?edit_requested=true

- **Descriptive statistics**

The descriptive statistics table shows that the study sample consisted of **190 respondents**. The demographic results indicate that the mean score for **age** was **2.94** (SD = 1.304), suggesting that most participants were concentrated around the third age category. The mean score for **gender** was **1.54** (SD = 0.500), reflecting a tendency toward the second category, while the **educational degree** recorded a mean of **3.38** (SD = 1.503), indicating concentration around the fourth educational level. Regarding the study statements, the mean scores

ranged between **2.33 and 2.81**, reflecting responses between disagreement and neutrality. The highest means were recorded for the flexibility of the work environment (**2.81**) and customer confidence (**2.72**), indicating relatively positive perceptions. In contrast, lower means appeared in statements related to reliance on modern technologies, suggesting weaker agreement in this area. Overall, the results indicate moderate perceptions, with some strengths in service quality and innovation, alongside concerns about technological advancement.

Statistics					
	N	Mean	Std. Error of Mean	Median	Std. Deviation
	Valid				
Age	190	2.94	0.095	3.00	1.304
Gender	190	1.54	0.036	2.00	0.500
Degree	190	3.38	0.109	4.00	1.503
The company relies on modern technologies in conducting geophysical studies.	190	2.55	0.108	2.00	1.493
The company invests in continuously upgrading its hardware and software.	190	2.53	0.103	2.00	1.417
The company uses advanced data analysis tools to improve the accuracy of results.	190	2.58	0.110	2.00	1.516
The company keeps pace with global developments in geophysical exploration technologies.	190	2.61	0.112	2.00	1.549
Digital transformation contributes to improving the efficiency of operations within the company.	190	2.54	0.109	2.00	1.500
Senior management supports a culture of innovation within the company.	190	2.57	0.110	2.00	1.516
The company encourages employees to submit new development ideas.	190	2.58	0.110	2.00	1.512
Clear policies are in place to support innovative initiatives.	190	2.53	0.107	2.00	1.475

Continuous training is provided to enhance employees' innovation skills.	190	2.57	0.108	2.00	1.485
The work environment is flexible enough to adopt innovative work methods.	190	2.81	0.112	3.00	1.548
The company develops new services that meet the needs of the Saudi market.	190	2.64	0.115	2.50	1.580
Geophysical solutions are customized according to client requirements.	190	2.53	0.106	2.00	1.457
The company employs innovative methods in presenting results to clients.	190	2.53	0.104	2.00	1.435
Service delivery procedures are improved based on client feedback.	190	2.48	0.106	2.00	1.461
The company's services are characterized by a high degree of accuracy and reliability.	190	2.60	0.105	2.00	1.447
The company adheres to professional standards in project implementation.	190	2.51	0.105	2.00	1.454
Reports are delivered on time.	190	2.62	0.112	2.00	1.544
Innovations contribute to enhancing the quality of technical results.	190	2.65	0.108	2.00	1.486
Customers feel confident in the work deliverables.	190	2.72	0.112	3.00	1.541
The company relies on modern technologies in conducting geophysical studies.	190	2.33	0.104	2.00	1.432

Table 1 : Statistical description of experimental data.

1. Age

The statistical description of age shows that the study sample of 190 respondents was distributed across five age categories. The largest group was the **40–50 years** category, representing **36.3%** of the sample, indicating that most participants were middle-aged and likely to possess considerable work experience. This was followed

by the **20–30 years** group at **18.9%**, and the **60 years and above** category at **16.3%**. The **30–40 years** group accounted for **14.7%**, while the **50–60 years** category represented **13.7%** of the respondents. Overall, the results reflect a workforce mainly concentrated in the middle-age category, with reasonable representation across other age groups.

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-30	36	18.9	18.9	18.9
	30-40	28	14.7	14.7	33.7
	40-50	69	36.3	36.3	70.0
	50-60	26	13.7	13.7	83.7
	60+	31	16.3	16.3	100.0
	Total	190	100.0	100.0	

Table 2 : Statistical description of Age.

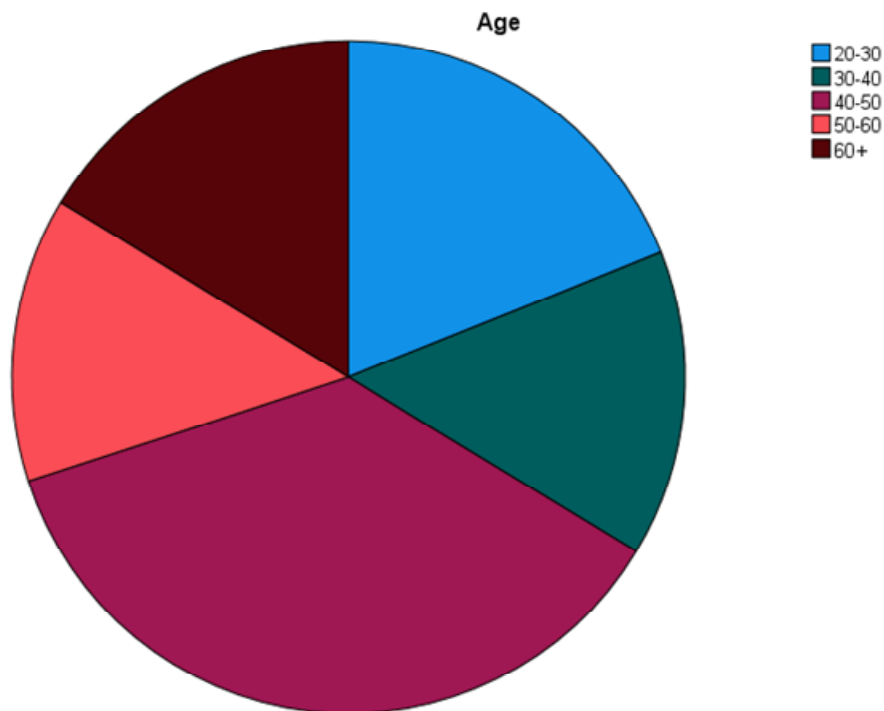


Figure 1 : Graphical representation of Age

2. Gender

The statistical description of gender shows that the study sample consisted of **190 respondents**, with a slight majority of males. Males represented **54.2%** of the sample, while females accounted for **45.8%**. This distribution indicates a relatively balanced gender composition, although males formed the larger proportion. The cumulative percentages confirm that both groups were well represented in the study. Overall, the results suggest an even participation between male and female respondents, with a modest dominance of males within the sample.

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	87	45.8	45.8	45.8
	Male	103	54.2	54.2	100.0
	Total	190	100.0	100.0	

Table 3 : Statistical description of Gender.

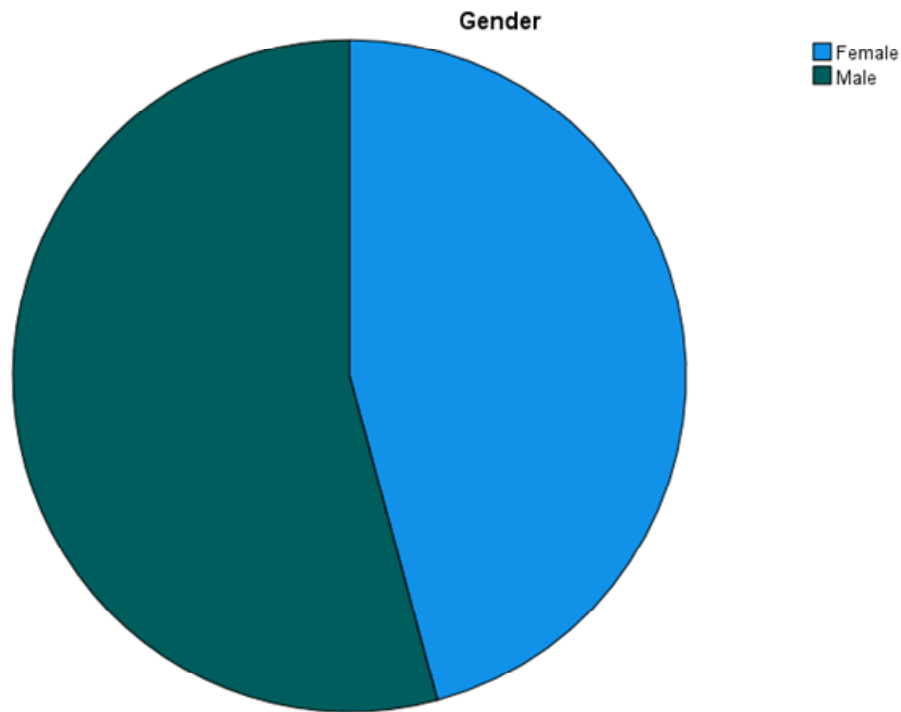


Figure 2 : Graphical representation of Gender

3. Educational degree

The statistical description of educational degree indicates that the study sample of 190 respondents had varied academic backgrounds. The largest group held a **master's degree**, representing 35.3% of the sample, suggesting a highly educated workforce. This was followed by respondents with a **Doctoral degree** at 18.4%, and those with a **bachelor's degree** at 17.4%. Participants with **less than high school education** accounted for 15.8%, while those holding a **Diploma or associate degree** represented 13.2% of the sample. Overall, the results show that a significant portion of respondents possess postgraduate qualifications, reflecting a strong educational profile within the study population.

Educational degree				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Bachelor's degree	33	17.4	17.4	17.4
	Diploma/Associate degree	25	13.2	13.2	30.5
	Doctoral degree	35	18.4	18.4	48.9
	Less than high school	30	15.8	15.8	64.7
	Master's degree	67	35.3	35.3	100.0
	Total	190	100.0	100.0	

Table 4 : Statistical description of educational degree.

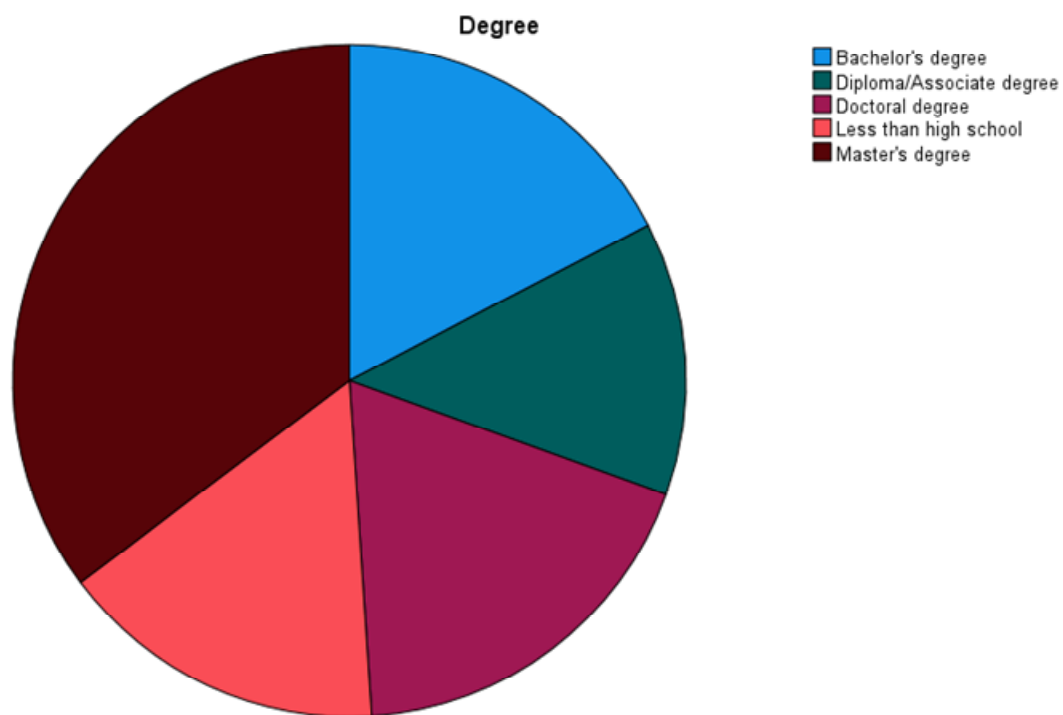


Figure 3 : Graphical representation of educational degree

4. The company relies on modern technologies in conducting geophysical studies

The statistical description shows that **37.4%** of respondents agreed that the company relies on modern technologies in conducting geophysical studies, representing the largest group. Additionally, **14.2%** highly agreed, indicating that more than half of the sample held a positive perception. In contrast, **16.8%** disagreed and **16.8%** highly disagreed, reflecting a considerable segment with negative views. Meanwhile, **14.7%** of

respondents remained neutral. Overall, the results suggest a moderately positive perception of the company's reliance on modern technologies, although a notable portion of employees expressed disagreement or uncertainty.

The company relies on modern technologies in conducting geophysical studies					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	71	37.4	37.4	37.4
	Disagree	32	16.8	16.8	54.2
	Highly agree	27	14.2	14.2	68.4
	Highly Disagree	32	16.8	16.8	85.3
	neutral	28	14.7	14.7	100.0
	Total	190	100.0	100.0	

Table 5 : Statistical description of the company relies on modern technologies in conducting geophysical studies.

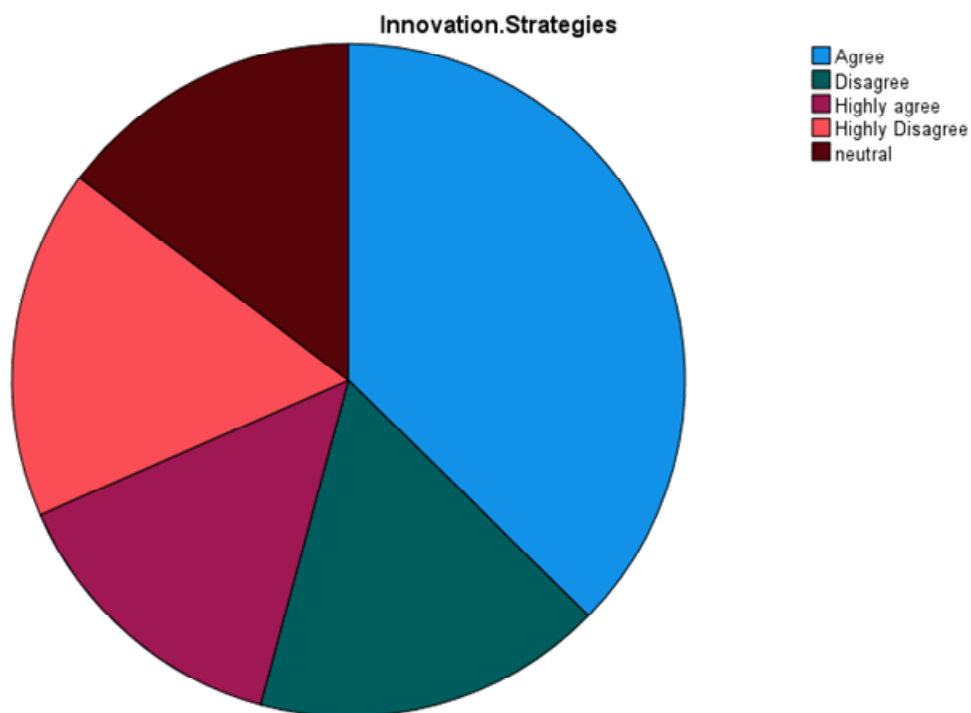


Figure 4 : Graphical representation of the company relies on modern technologies in conducting geophysical studies

5. The company invests in continuously upgrading its hardware and software

The statistical description indicates that **35.3%** of respondents agreed that the company invests in continuously upgrading its hardware and software, representing the largest proportion. Additionally, **17.4%** highly agreed, suggesting that just over half of the sample held a positive perception. In contrast, **17.4%** disagreed and **18.9%** highly disagreed, reflecting a considerable segment with negative views. Meanwhile, **11.1%** of respondents remained neutral. Overall, the results suggest a moderately positive but somewhat divided perception regarding the company's investment in upgrading its hardware and software.

The company invests in continuously upgrading its hardware and software					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	67	35.3	35.3	35.3
	Disagree	33	17.4	17.4	52.6
	Highly agree	33	17.4	17.4	70.0
	Highly Disagree	36	18.9	18.9	88.9
	neutral	21	11.1	11.1	100.0
	Total	190	100.0	100.0	

Table 6 : Statistical description of the company invests in continuously upgrading its hardware and software.

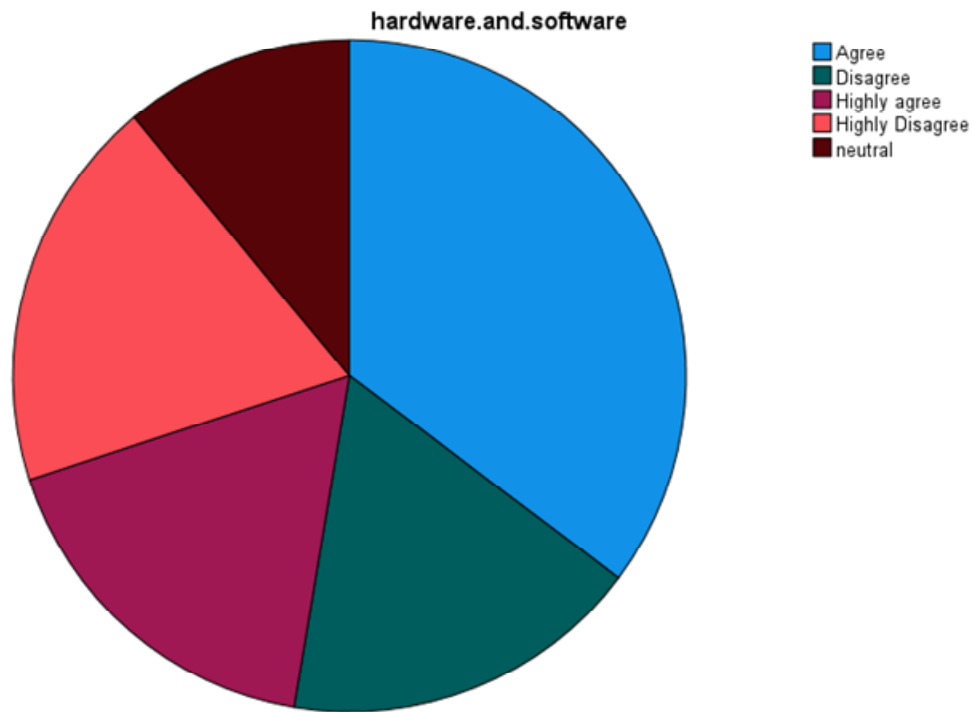


Figure 5 : Graphical representation of the company invests in continuously upgrading its hardware and software

6. The company uses advanced data analysis tools to improve the accuracy of results

The statistical description shows that **37.4%** of respondents agreed that the company uses advanced data analysis tools to improve the accuracy of results, representing the largest group. In addition, **16.3%** highly agreed, indicating that more than half of the sample held a positive perception. On the other hand, **15.3%** disagreed and **14.2%** highly disagreed, reflecting a notable segment with negative views. Meanwhile, **16.8%** of respondents remained neutral. Overall, the results suggest a moderately positive perception of the company's use of advanced data analysis tools, although some employees expressed disagreement or uncertainty.

The company uses advanced data analysis tools to improve the accuracy of results					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	71	37.4	37.4	37.4
	Disagree	29	15.3	15.3	52.6
	Highly agree	31	16.3	16.3	68.9
	Highly Disagree	27	14.2	14.2	83.2
	neutral	32	16.8	16.8	100.0
	Total	190	100.0	100.0	

Table 7 : Statistical description of the company uses advanced data analysis tools to improve the accuracy of results.

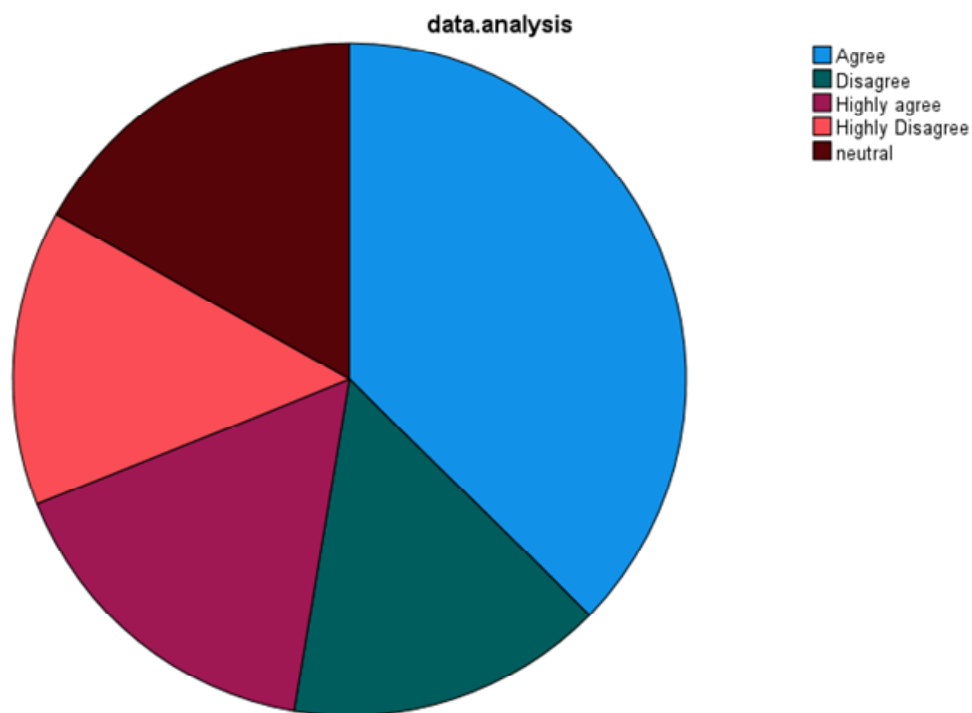


Figure 6 : Graphical representation of the company uses advanced data analysis tools to improve the accuracy of results

7. The company keeps pace with global developments in geophysical exploration technologies

The statistical description indicates that **37.9%** of respondents agreed that the company keeps pace with global developments in geophysical exploration technologies, representing the largest proportion. Additionally, **13.2%** highly agreed, suggesting that just over half of the sample held a positive perception. In contrast, **15.3%** disagreed and **15.8%** highly disagreed, reflecting a noticeable segment with negative views. Meanwhile, **17.9%** of respondents remained neutral. Overall, the results suggest a moderately positive but somewhat mixed perception regarding the company's alignment with global technological developments in geophysical exploration.

The company keeps pace with global developments in geophysical exploration technologies					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	72	37.9	37.9	37.9
	Disagree	29	15.3	15.3	53.2
	Highly agree	25	13.2	13.2	66.3
	Highly Disagree	30	15.8	15.8	82.1
	neutral	34	17.9	17.9	100.0
	Total	190	100.0	100.0	

Table 8 : Statistical description of the company keeps pace with global developments in geophysical exploration technologies.

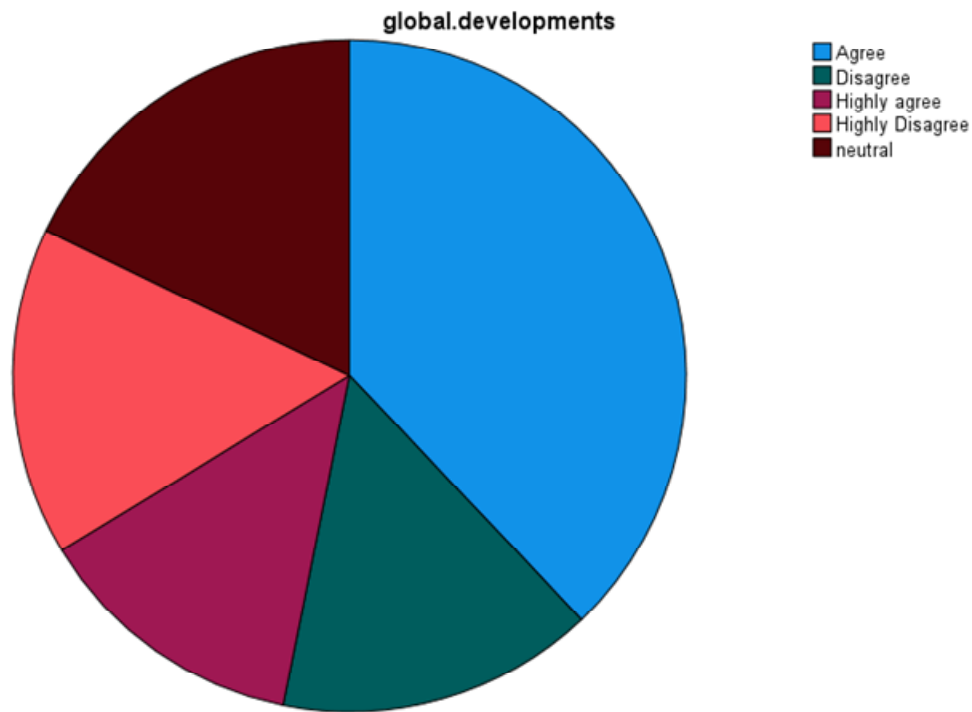


Figure 7 : Graphical representation of the company keeps pace with global developments in geophysical exploration technologies

8. Digital transformation contributes to improving the efficiency of operations within the company

The statistical description shows that **39.5%** of respondents agreed that digital transformation contributes to improving operational efficiency, representing the largest group. Additionally, **19.5%** highly agreed, indicating that nearly three-fifths of the sample held a positive perception of the role of digital transformation. In contrast, **11.6%** disagreed and **14.2%** highly disagreed, reflecting a smaller segment with negative views. Meanwhile, **15.3%** of respondents remained neutral. Overall, the results suggest a generally positive perception of the contribution of digital transformation to improving operational efficiency within the company.

Digital transformation contributes to improving the efficiency of operations within the company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	75	39.5	39.5	39.5
	Disagree	22	11.6	11.6	51.1
	Highly agree	37	19.5	19.5	70.5
	Highly Disagree	27	14.2	14.2	84.7
	neutral	29	15.3	15.3	100.0
	Total	190	100.0	100.0	

Table 9 : Statistical description of Digital transformation contributes to improving the efficiency of operations within the company.

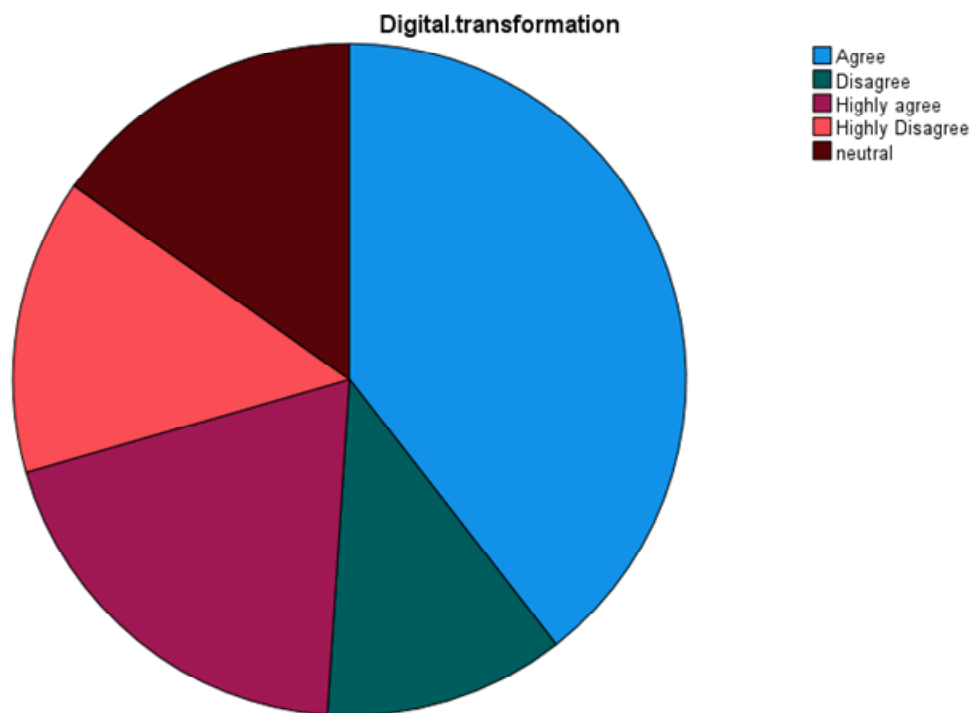


Figure 8 : Graphical representation of Digital transformation contributes to improving the efficiency of operations within the company

9. Senior management supports a culture of innovation within the company

The statistical description indicates that **38.4%** of respondents agreed that senior management supports a culture of innovation within the company, representing the largest proportion. Additionally, **14.2%** highly

agreed, showing that just over half of the sample held a positive perception. In contrast, **14.2%** disagreed and **17.9%** highly disagreed, reflecting a considerable segment with negative views. Meanwhile, **15.3%** of respondents remained neutral. Overall, the results suggest a moderately positive but somewhat divided perception regarding senior management's support for a culture of innovation within the company.

Senior management supports a culture of innovation within the company					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	73	38.4	38.4	38.4
	Disagree	27	14.2	14.2	52.6
	Highly agree	27	14.2	14.2	66.8
	Highly Disagree	34	17.9	17.9	84.7
	neutral	29	15.3	15.3	100.0
	Total	190	100.0	100.0	

Table 10 : Statistical description of Senior management supports a culture of innovation within the company.

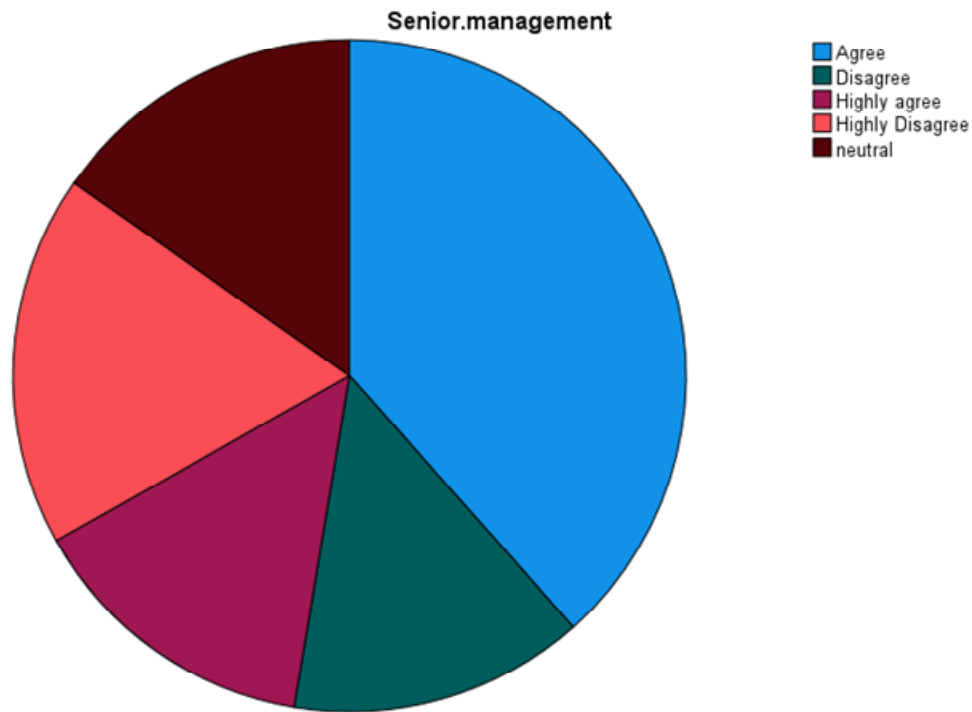


Figure 9 : Graphical representation of Senior management supports a culture of innovation within the company

10. The company encourages employees to submit new development ideas

The statistical description shows that **35.3%** of respondents agreed that the company encourages employees to submit new development ideas, representing the largest group. Additionally, **13.2%** highly agreed, indicating that less than half of the sample held a positive perception. In contrast, **20.0%** disagreed and **14.2%** highly disagreed, reflecting a considerable segment with negative views. Meanwhile, **17.4%** of respondents remained neutral. Overall, the results suggest a moderately positive but somewhat divided perception regarding the company's encouragement of employees to contribute new development ideas.

The company encourages employees to submit new development ideas

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	67	35.3	35.3	35.3
	Disagree	38	20.0	20.0	55.3
	Highly agree	25	13.2	13.2	68.4
	Highly Disagree	27	14.2	14.2	82.6
	neutral	33	17.4	17.4	100.0
	Total	190	100.0	100.0	

Table 11 : Statistical description of the company encourages employees to submit new development ideas.

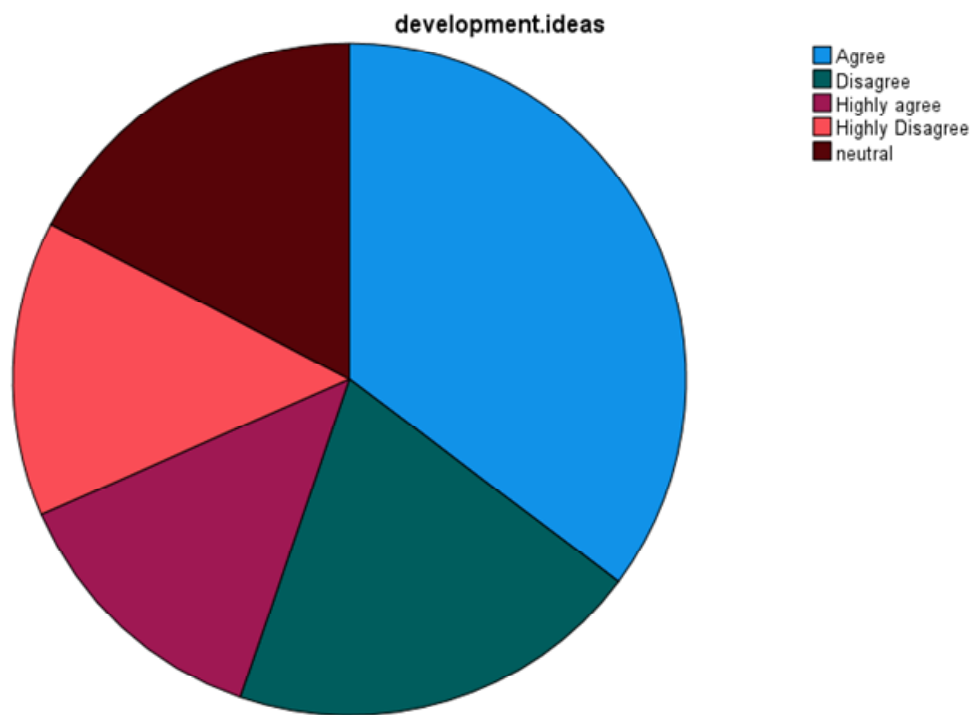


Figure 10 : Graphical representation of the company encourages employees to submit new development ideas

11. Clear policies are in place to support innovative initiatives

The statistical description indicates that **37.9%** of respondents agreed that clear policies are in place to support innovative initiatives, representing the largest proportion. Additionally, **17.9%** highly agreed, showing that

more than half of the sample held a positive perception. In contrast, **14.7%** disagreed and **15.3%** highly disagreed, reflecting a notable segment with negative views. Meanwhile, **14.2%** of respondents remained neutral. Overall, the results suggest a moderately positive perception of the presence of clear policies supporting innovation, although some respondents expressed disagreement or uncertainty.

Clear policies are in place to support innovative initiatives					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	72	37.9	37.9	37.9
	Disagree	28	14.7	14.7	52.6
	Highly agree	34	17.9	17.9	70.5
	Highly Disagree	29	15.3	15.3	85.8
	neutral	27	14.2	14.2	100.0
	Total	190	100.0	100.0	

Table 12 : Statistical description of Clear policies is in place to support innovative initiatives.

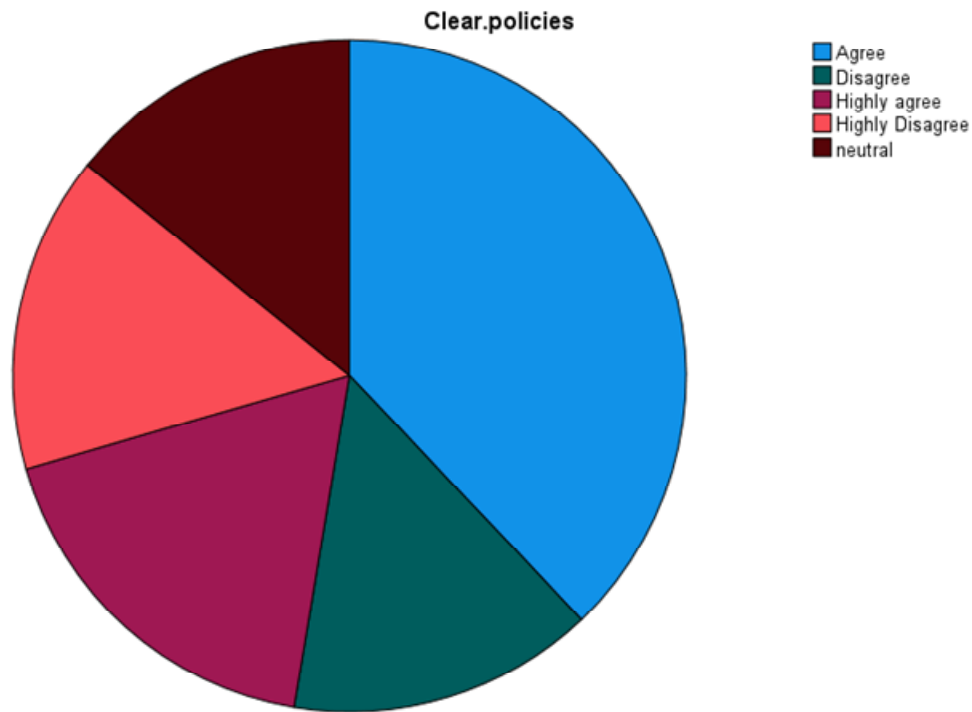


Figure 11 : Graphical representation of Clear policies is in place to support innovative initiatives

12. Continuous training is provided to enhance employees' innovation skills

The statistical description shows that **35.3%** of respondents agreed that continuous training is provided to enhance employees' innovation skills, representing the largest group. Additionally, **15.3%** highly agreed, indicating that about half of the sample held a positive perception of training efforts. In contrast, **18.9%** disagreed and **14.7%** highly disagreed, reflecting a considerable segment with negative views. Meanwhile, **15.8%** of respondents remained neutral. Overall, the results suggest a moderately positive but somewhat divided perception regarding the availability of continuous training to support employees' innovative skills.

Continuous training is provided to enhance employees' innovation skills					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	67	35.3	35.3	35.3
	Disagree	36	18.9	18.9	54.2
	Highly agree	29	15.3	15.3	69.5
	Highly Disagree	28	14.7	14.7	84.2
	neutral	30	15.8	15.8	100.0
	Total	190	100.0	100.0	

Table 13 : Statistical description of Continuous training is provided to enhance employees' innovation skills.

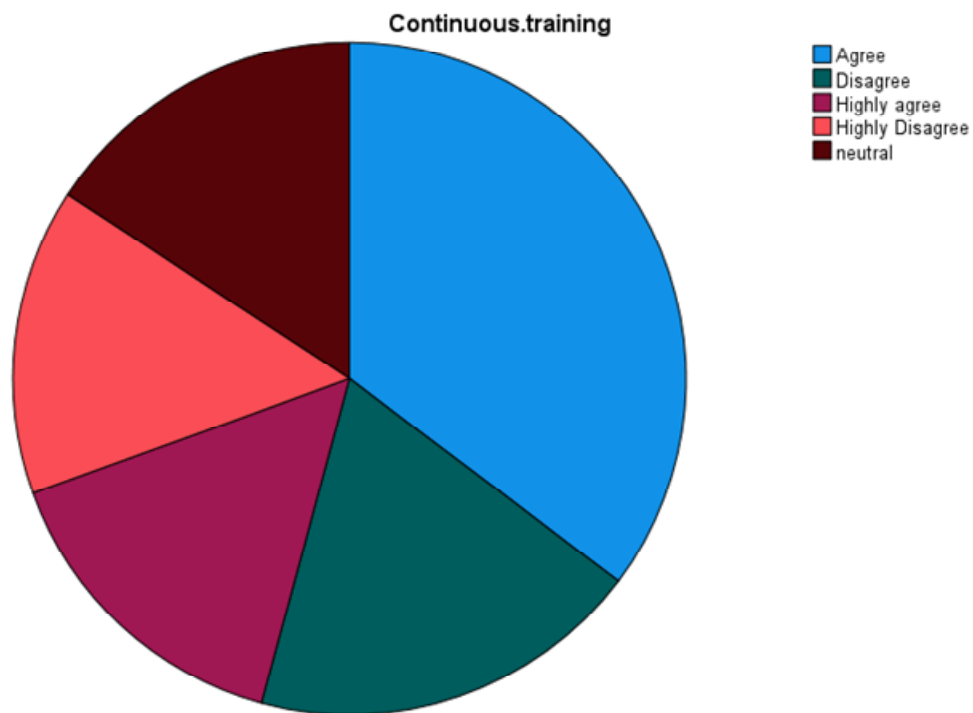


Figure 12 : Graphical representation of Continuous training is provided to enhance employees' innovation skills

13. The work environment is flexible enough to adopt innovative work methods

The statistical description indicates that **31.6%** of respondents agreed that the work environment is flexible enough to adopt innovative work methods, representing the largest group. Additionally, **12.6%** highly agreed, suggesting that less than half of the sample held a positive perception. In contrast, **15.8%** disagreed and **20.0%** highly disagreed, reflecting a considerable segment with negative views. Meanwhile, **20.0%** of respondents remained neutral. Overall, the results suggest a mixed and somewhat divided perception regarding the flexibility of the work environment to support innovative work methods.

The work environment is flexible enough to adopt innovative work methods					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	60	31.6	31.6	31.6
	Disagree	30	15.8	15.8	47.4
	Highly agree	24	12.6	12.6	60.0
	Highly Disagree	38	20.0	20.0	80.0
	neutral	38	20.0	20.0	100.0
	Total	190	100.0	100.0	

Table 14 : Statistical description of the work environment is flexible enough to adopt innovative work methods.

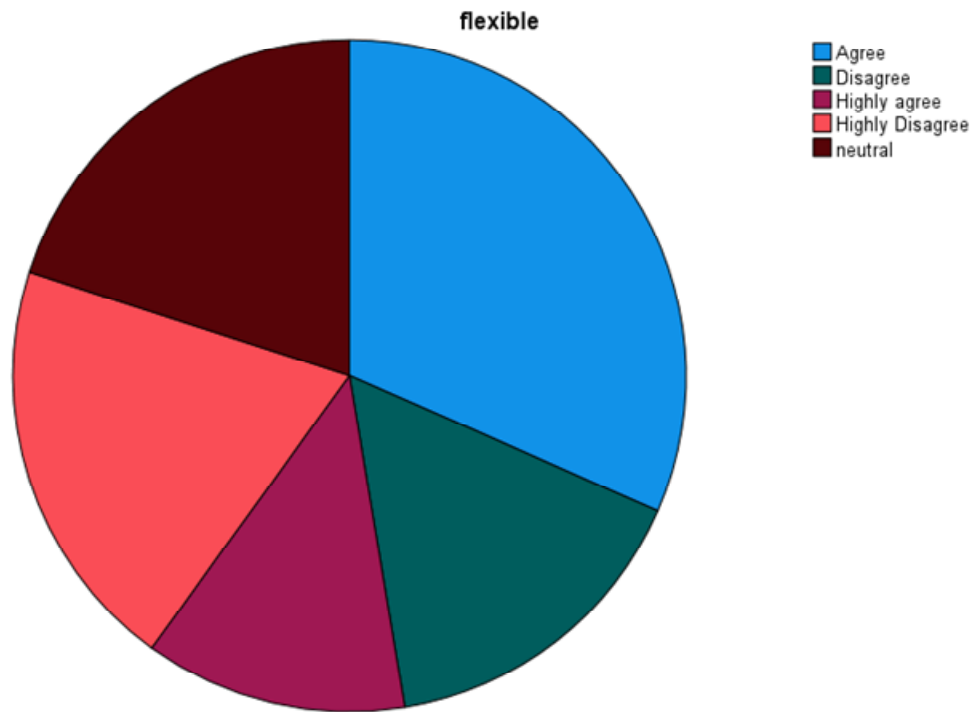


Figure 13 : Graphical representation of the work environment is flexible enough to adopt innovative work methods

14. The company develops new services that meet the needs of the Saudi market

The statistical description shows that **38.9%** of respondents agreed that the company develops new services that meet the needs of the Saudi market, representing the largest proportion. Additionally, **17.4%** highly agreed, indicating that more than half of the sample held a positive perception. In contrast, **11.1%** disagreed and **12.1%** highly disagreed, reflecting a smaller segment with negative views. Meanwhile, **20.5%** of respondents remained neutral. Overall, the results suggest a moderately positive perception of the company's ability to develop services that meet market needs, although a notable portion of respondents remained neutral.

The company develops new services that meet the needs of the Saudi market

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	74	38.9	38.9	38.9
	Disagree	21	11.1	11.1	50.0
	Highly agree	33	17.4	17.4	67.4
	Highly Disagree	23	12.1	12.1	79.5
	neutral	39	20.5	20.5	100.0
	Total	190	100.0	100.0	

Table 15 : Statistical description of the company develops new services that meet the needs of the Saudi market.

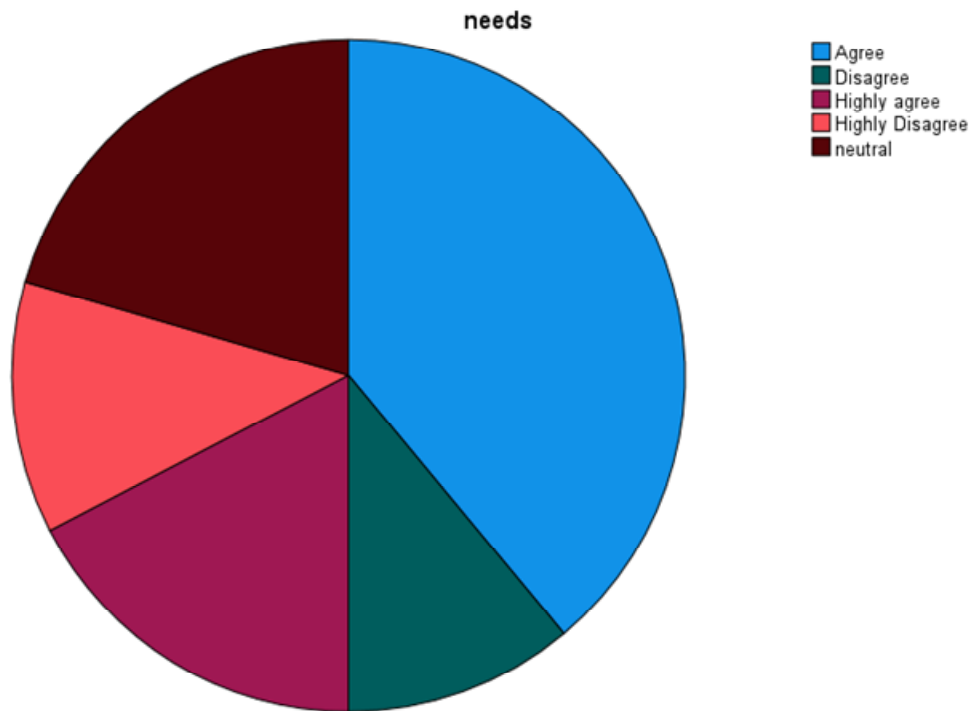


Figure 14 : Graphical representation of the company develops new services that meet the needs of the Saudi market

15. Geophysical solutions are customized according to client requirements

The statistical description indicates that **37.9%** of respondents agreed that geophysical solutions are customized according to client requirements, representing the largest proportion. Additionally, **21.1%** highly

agreed, showing that nearly three-fifths of the sample held a positive perception. In contrast, **13.2%** disagreed and **14.2%** highly disagreed, reflecting a noticeable segment with negative views. Meanwhile, **13.7%** of respondents remained neutral. Overall, the results suggest a generally positive perception of the company's ability to customize geophysical solutions to meet client requirements.

Geophysical solutions are customized according to client requirements					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	72	37.9	37.9	37.9
	Disagree	25	13.2	13.2	51.1
	Highly agree	40	21.1	21.1	72.1
	Highly Disagree	27	14.2	14.2	86.3
	neutral	26	13.7	13.7	100.0
	Total	190	100.0	100.0	

Table 16 : Statistical description of Geophysical solutions is customized according to client requirements.

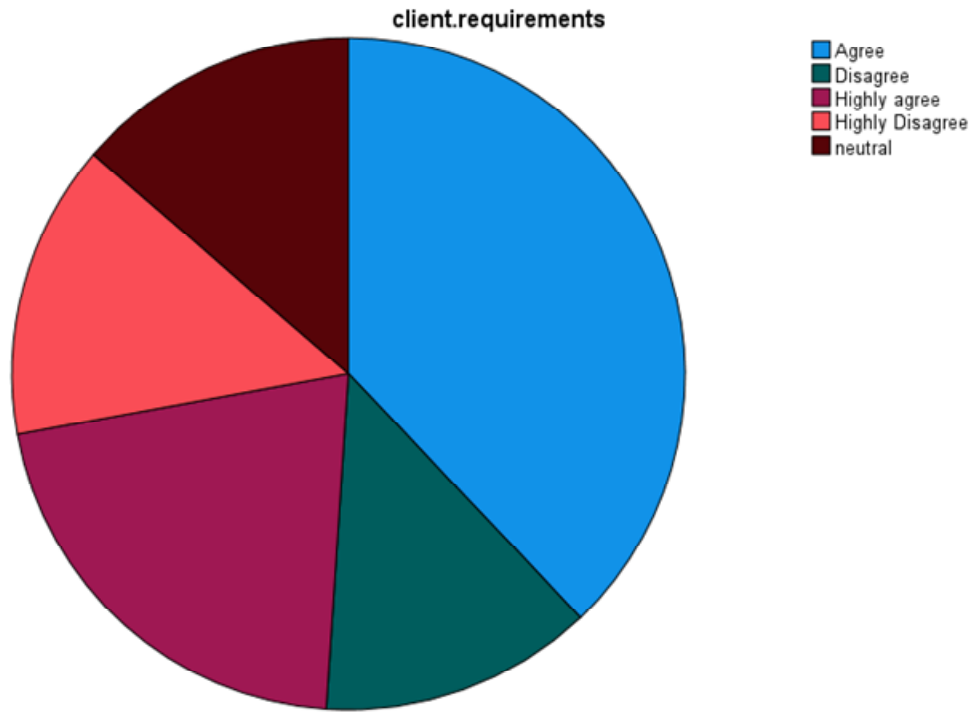


Figure 15 : Graphical representation of Geophysical solutions is customized according to client requirements

16. The company employs innovative methods in presenting results to clients

The statistical description shows that **34.7%** of respondents agreed that the company employs innovative methods in presenting results to clients, representing the largest group. Additionally, **13.7%** highly agreed, indicating that less than half of the sample held a positive perception. In contrast, **20.5%** disagreed and **18.9%** highly disagreed, reflecting a considerable segment with negative views. Meanwhile, **12.1%** of respondents remained neutral. Overall, the results suggest a mixed and somewhat divided perception regarding the company's use of innovative methods in presenting results to clients.

The company employs innovative methods in presenting results to clients					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	66	34.7	34.7	34.7
	Disagree	39	20.5	20.5	55.3
	Highly agree	26	13.7	13.7	68.9
	Highly Disagree	36	18.9	18.9	87.9
	neutral	23	12.1	12.1	100.0
	Total	190	100.0	100.0	

Table 17 : Statistical description of the company employs innovative methods in presenting results to clients.

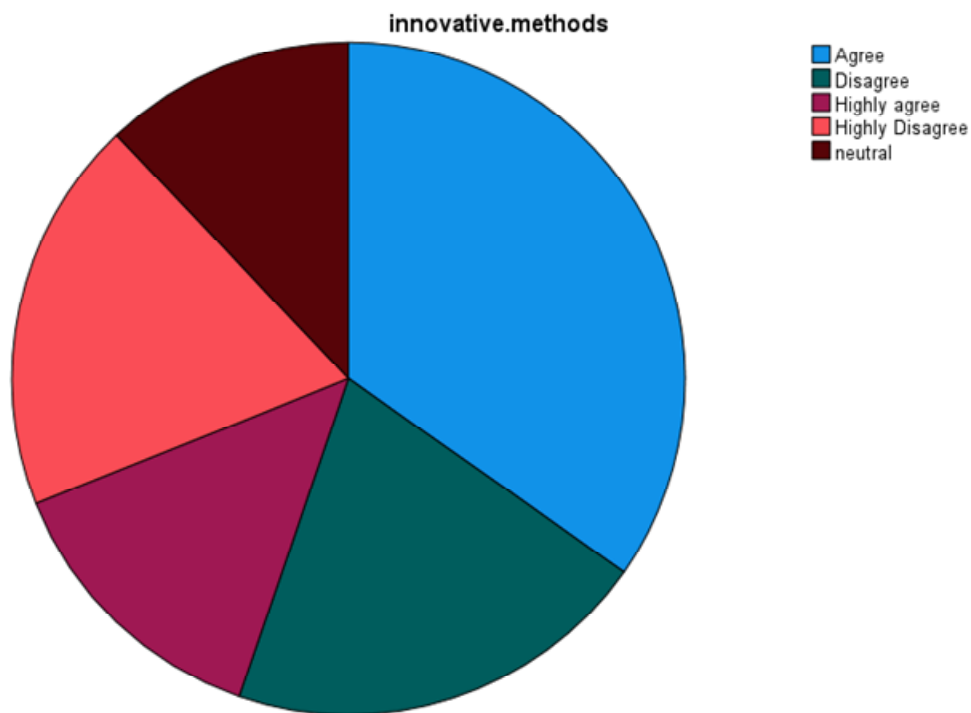


Figure 16 : Graphical representation of the company employs innovative methods in presenting results to clients

17. Service delivery procedures are improved based on client feedback

The statistical description indicates that **36.8%** of respondents agreed that service delivery procedures are improved based on client feedback, representing the largest group. Additionally, **16.8%** highly agreed, showing

that more than half of the sample held a positive perception. In contrast, **20.0%** disagreed and **11.1%** highly disagreed, reflecting a notable segment with negative views. Meanwhile, **15.3%** of respondents remained neutral. Overall, the results suggest a moderately positive perception of the company's efforts to improve service delivery based on client feedback, although some respondents expressed disagreement or uncertainty.

Service delivery procedures are improved based on client feedback					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	70	36.8	36.8	36.8
	Disagree	38	20.0	20.0	56.8
	Highly agree	32	16.8	16.8	73.7
	Highly Disagree	21	11.1	11.1	84.7
	neutral	29	15.3	15.3	100.0
	Total	190	100.0	100.0	

Table 18 : Statistical description of Service delivery procedures is improved based on client feedback.

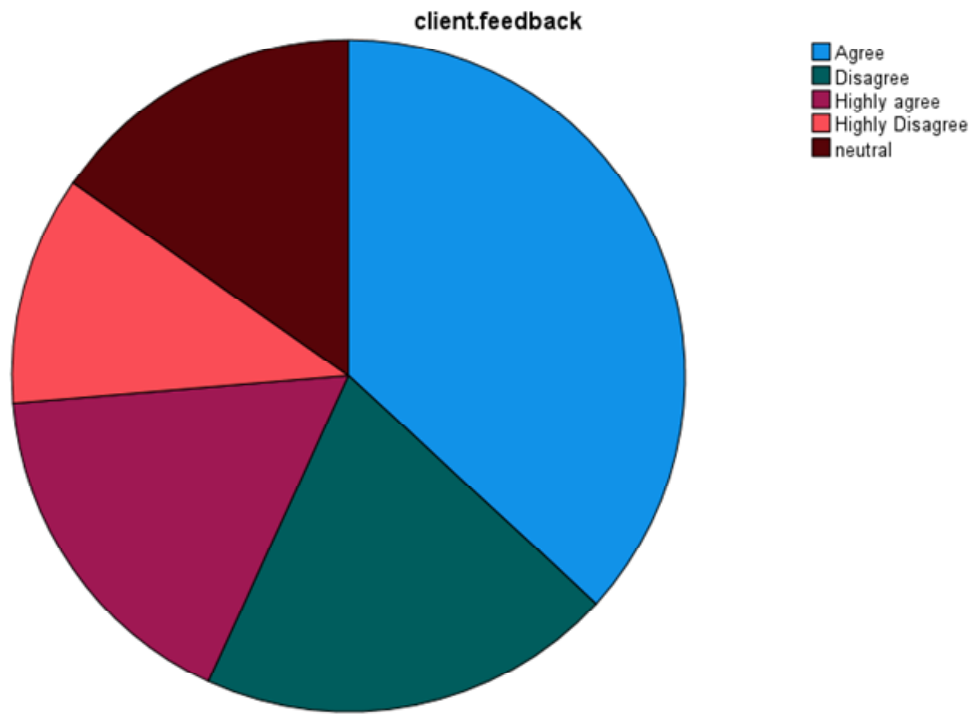


Figure 17 : Graphical representation of Service delivery procedures is improved based on client feedback

18. Innovations contribute to reducing project completion time

The statistical description shows that **32.6%** of respondents agreed that innovations contribute to reducing project completion time, representing the largest group. Additionally, **21.1%** highly agreed, indicating that more than half of the sample held a positive perception. In contrast, **18.4%** disagreed and **12.1%** highly disagreed, reflecting a noticeable segment with negative views. Meanwhile, **15.8%** of respondents remained neutral. Overall, the results suggest a moderately positive perception of the role of innovation in reducing project completion time, although some respondents expressed disagreement or uncertainty.

Innovations contribute to reducing project completion time					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	62	32.6	32.6	32.6
	Disagree	35	18.4	18.4	51.1
	Highly agree	40	21.1	21.1	72.1
	Highly Disagree	23	12.1	12.1	84.2
	neutral	30	15.8	15.8	100.0
	Total	190	100.0	100.0	

Table 19 : Statistical description of Innovations contributes to reducing project completion time.

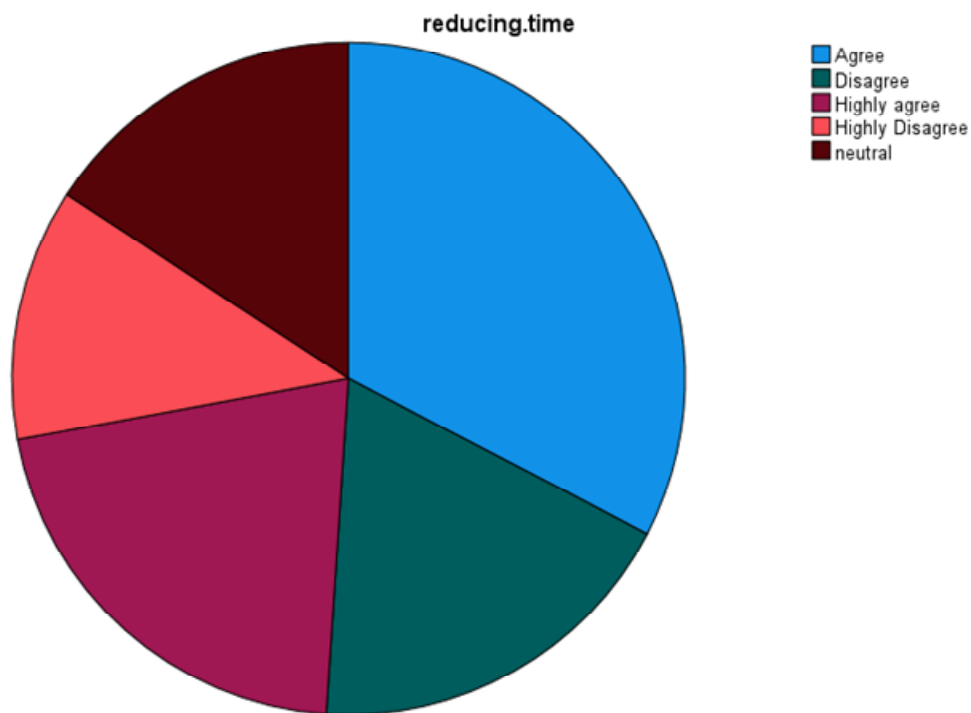


Figure 18 : Graphical representation of Innovations contributes to reducing project completion time

19. The company's services are characterized by a high degree of accuracy and reliability

The statistical description indicates that **37.4%** of respondents agreed that the company's services are characterized by a high degree of accuracy and reliability, representing the largest group. Additionally, **16.8%**

highly agreed, showing that more than half of the sample held a positive perception. In contrast, 16.8% disagreed and 15.8% highly disagreed, reflecting a considerable segment with negative views. Meanwhile, 13.2% of respondents remained neutral. Overall, the results suggest a moderately positive perception of the accuracy and reliability of the company's services, although some respondents expressed disagreement or uncertainty.

The company's services are characterized by a high degree of accuracy and reliability					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	71	37.4	37.4	37.4
	Disagree	32	16.8	16.8	54.2
	Highly agree	32	16.8	16.8	71.1
	Highly Disagree	30	15.8	15.8	86.8
	neutral	25	13.2	13.2	100.0
	Total	190	100.0	100.0	

Table 20 : Statistical description of the company's services are characterized by a high degree of accuracy and reliability.

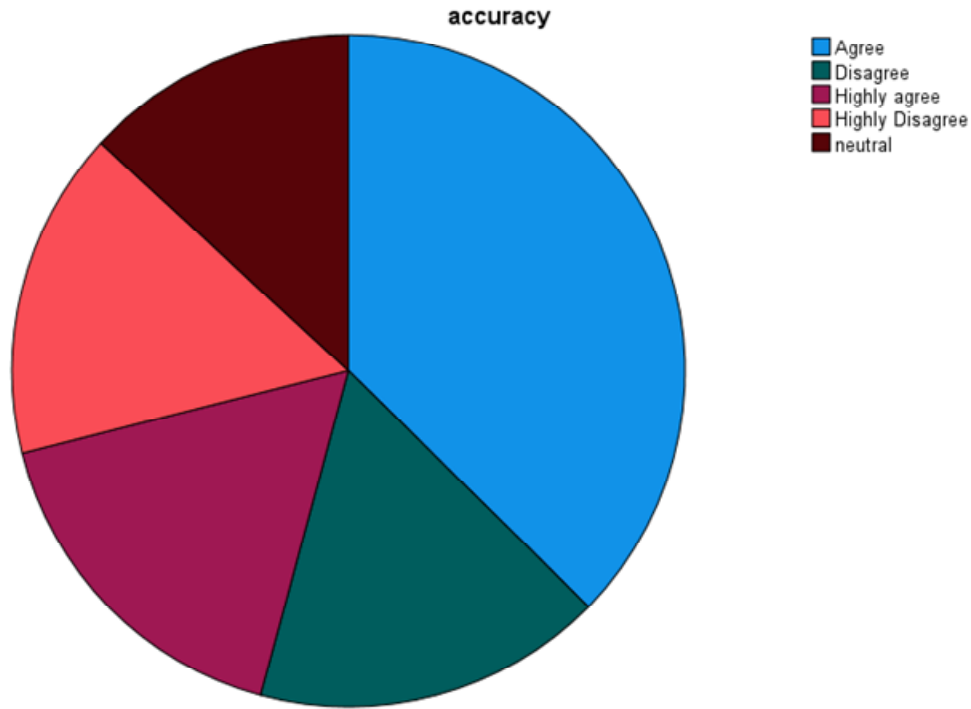


Figure 19: Graphical representation of the company's services are characterized by a high degree of accuracy and reliability

20. The company adheres to professional standards in project implementation

The statistical description shows that **37.4%** of respondents agreed that the company adheres to professional standards in project implementation, representing the largest group. Additionally, **14.2%** highly agreed, indicating that just over half of the sample held a positive perception. In contrast, **14.7%** disagreed and **15.8%** highly disagreed, reflecting a notable segment with negative views. Meanwhile, **17.9%** of respondents remained neutral. Overall, the results suggest a moderately positive but somewhat mixed perception regarding the company's adherence to professional standards in project implementation.

The company adheres to professional standards in project implementation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	71	37.4	37.4	37.4
	Disagree	28	14.7	14.7	52.1
	Highly agree	27	14.2	14.2	66.3
	Highly Disagree	30	15.8	15.8	82.1
	neutral	34	17.9	17.9	100.0
	Total	190	100.0	100.0	

Table 21 : Statistical description of the company adheres to professional standards in project implementation.

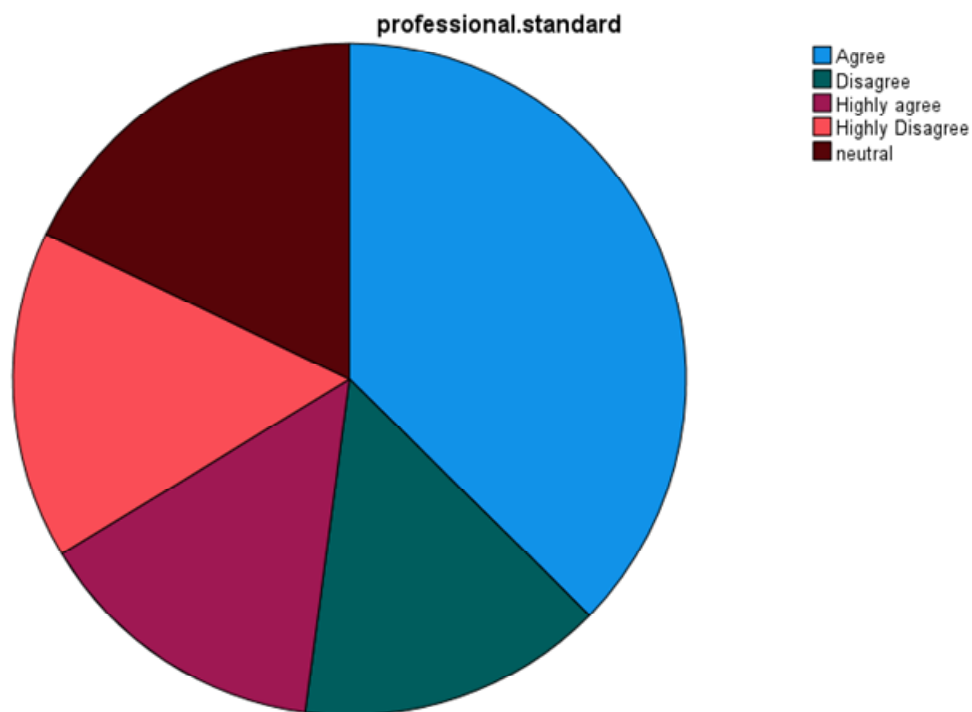


Figure 20 : Graphical representation of the company adheres to professional standards in project implementation

21. Reports are delivered on time

The statistical description indicates that **32.6%** of respondents agreed that reports are delivered on time, representing the largest group. Additionally, **13.7%** highly agreed, suggesting that less than half of the sample held a positive perception. In contrast, **19.5%** disagreed and **18.4%** highly disagreed, reflecting a considerable

segment with negative views. Meanwhile, **15.8%** of respondents remained neutral. Overall, the results suggest a mixed and somewhat divided perception regarding the timeliness of report delivery within the company.

Reports are delivered on time					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	62	32.6	32.6	32.6
	Disagree	37	19.5	19.5	52.1
	Highly agree	26	13.7	13.7	65.8
	Highly Disagree	35	18.4	18.4	84.2
	neutral	30	15.8	15.8	100.0
	Total	190	100.0	100.0	

Table 22 : Statistical description of Reports is delivered on time.

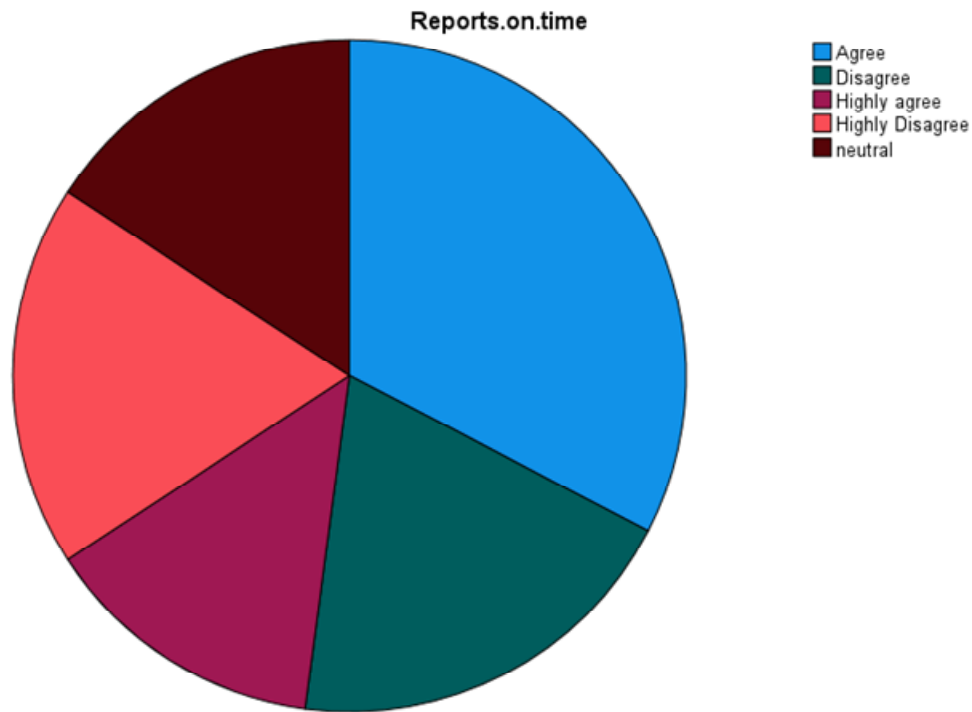


Figure 21 : Graphical representation of Reports is delivered on time

22. Innovations contribute to enhancing the quality of technical results

The statistical description shows that **35.3%** of respondents agreed that innovations contribute to enhancing the quality of technical results, representing the largest group. Additionally, **15.3%** highly agreed, indicating that about half of the sample held a positive perception. In contrast, **12.6%** disagreed and **18.9%** highly disagreed, reflecting a considerable segment with negative views. Meanwhile, **17.9%** of respondents remained neutral. Overall, the results suggest a moderately positive but somewhat divided perception of the role of innovation in improving the quality of technical results.

Innovations contribute to enhancing the quality of technical results					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	67	35.3	35.3	35.3
	Disagree	24	12.6	12.6	47.9
	Highly agree	29	15.3	15.3	63.2
	Highly Disagree	36	18.9	18.9	82.1
	neutral	34	17.9	17.9	100.0
	Total	190	100.0	100.0	

Table 23 : Statistical description of Innovations contributes to enhancing the quality of technical results.

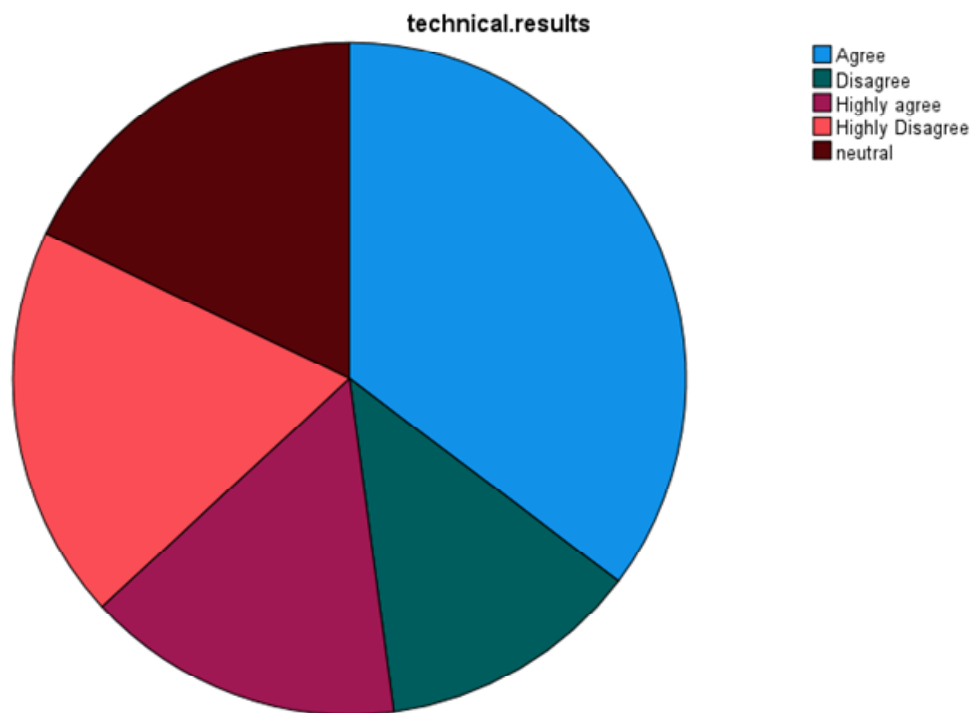


Figure 22 : Graphical representation of Innovations contributes to enhancing the quality of technical results

23. Customers feel confident about the work deliverables

The statistical description indicates that **42.1%** of respondents agreed that customers feel confident in the work deliverables, representing the largest proportion. Additionally, **14.7%** highly agreed, showing that more than

half of the sample held a positive perception of customer confidence. In contrast, **19.5%** disagreed and **11.1%** highly disagreed, reflecting a notable segment with negative views. Meanwhile, **12.6%** of respondents remained neutral. Overall, the results suggest a moderately positive perception of customer confidence in the company's work deliverables, although some respondents expressed disagreement or uncertainty.

Customers feel confident in the work deliverables					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	80	42.1	42.1	42.1
	Disagree	37	19.5	19.5	61.6
	Highly agree	28	14.7	14.7	76.3
	Highly Disagree	21	11.1	11.1	87.4
	neutral	24	12.6	12.6	100.0
	Total	190	100.0	100.0	

Table 24 : Statistical description of Customers feels confident in the work deliverables.

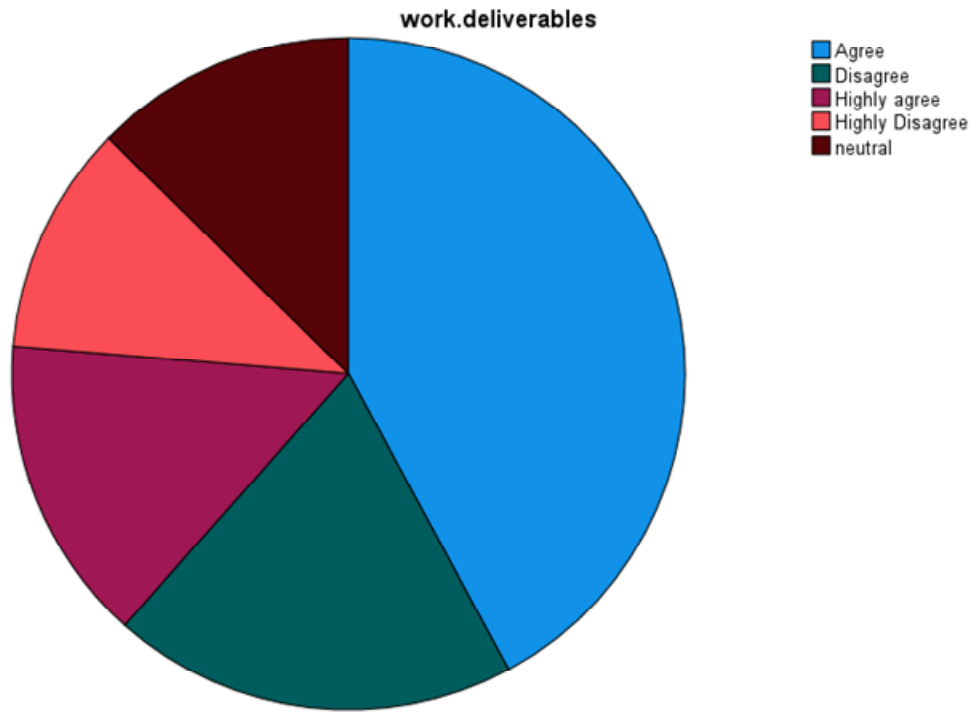


Figure 23 : Graphical representation of Customers feels confident in the work deliverables

- **Analysis of the reliability and credibility of the study data**

The case processing summary indicates that the total number of valid cases included in the analysis was **190**, representing **100%** of the sample. No cases were excluded, as shown by an exclusion rate of **0.0%**, which means that all responses were complete and suitable for statistical analysis. The use of listwise deletion confirms that only cases with complete data across all variables were considered, and since no cases were removed, the dataset can be regarded as fully valid. Overall, this result reflects a high level of data completeness, supporting the reliability and accuracy of the subsequent statistical analyses.

Case Processing Summary			
		N	%
Cases	Valid	190	100.0
	Excluded ^a	0	.0
	Total	190	100.0
a. Listwise deletion based on all variables in the procedure.			

Table 25 : Case Processing Summary.

The reliability statistics indicate that Cronbach's **Alpha** value for the study scale is **0.854**, while Cronbach's Alpha based on standardized items is **0.834**, across **23 items**. These values exceed the commonly accepted threshold of **0.70**, indicating good internal consistency among the questionnaire items. This suggests that the items reliably measure the same underlying construct and produce consistent results. The close values between the two alpha coefficients also reflect stability in the measurement regardless of item standardization. Overall, the results confirm that the scale used in the study is reliable and suitable for further statistical analysis.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.854	.834	23

Table 26 : Reliability Statistics.

- Cross table analysis

- **The role of innovation strategies in keeping pace with global advancements in geophysical exploration technologies**

The Chi-square test results indicate a statistically significant relationship regarding the role of innovation strategies in keeping pace with global advancements in geophysical exploration technologies. The **Pearson Chi-Square** value was **62.849** with **16 degrees of freedom**, and a significant level of **0.000**, which is below the accepted threshold of **0.05**. This confirms that the differences in responses are statistically significant and not due to chance. The **Likelihood Ratio** test also produced a significant value of **62.110** ($p = 0.000$), supporting the same conclusion. Additionally, the **Linear-by-Linear Association** value of **16.744** with a significant level of **0.000** indicates a significant linear relationship between the variables. Overall, the results confirm a statistically significant association between innovation strategies and alignment with global technological advancements.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	62.849 ^a	16	.000
Likelihood Ratio	62.110	16	.000
Linear-by-Linear Association	16.744	1	.000
N of Valid Cases	190		
a. 11 cells (44.0%) have expected count less than 5. The minimum expected count is 3.55.			

Table 27 : Kai Square tests for the role of innovation strategies in keeping pace with global advancements in geophysical exploration technologies.

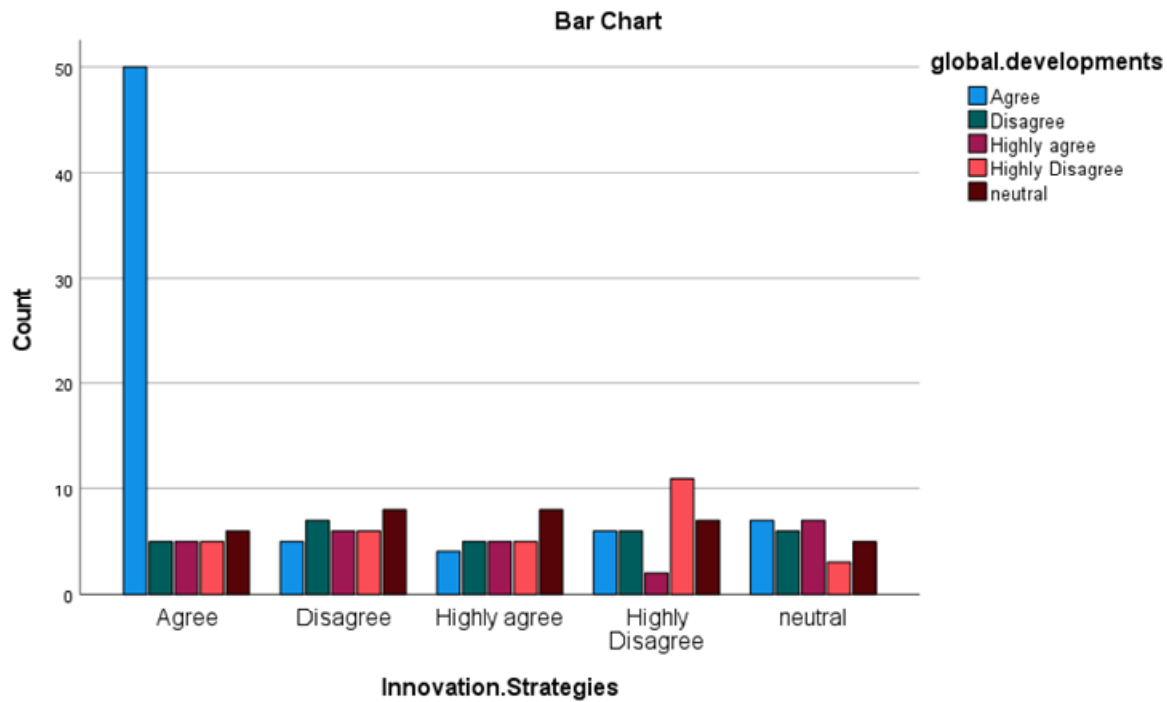


Figure 24 : Symmetric measures in cross-table analysis for the role of innovation strategies in keeping pace with global advancements in geophysical exploration technologies

- **The role of innovation strategies in encouraging employees**

The Chi-square test results indicate a statistically significant relationship regarding the role of innovative strategies in encouraging employees. The **Pearson Chi-Square** value was 50.656 with 16 degrees of freedom, and a significance level of **0.000**, which is below the accepted threshold of **0.05**. This confirms that the differences in responses are statistically significant and not due to chance. The **Likelihood Ratio** test also produced a significant value of 49.479 ($p = 0.000$), supporting the same conclusion. Additionally, the **Linear-by-Linear Association** value of 18.164 with a significance level of **0.000** indicates a significant linear

relationship between the variables. Overall, the results confirm a statistically significant association between innovation strategies and employee encouragement.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	50.656 ^a	16	.000
Likelihood Ratio	49.479	16	.000
Linear-by-Linear Association	18.164	1	.000
N of Valid Cases	190		

a. 10 cells (40.0%) have expected count less than 5. The minimum expected count is 3.55.

Table 28 : Kai Square tests for the role of innovation strategies in encouraging employees.

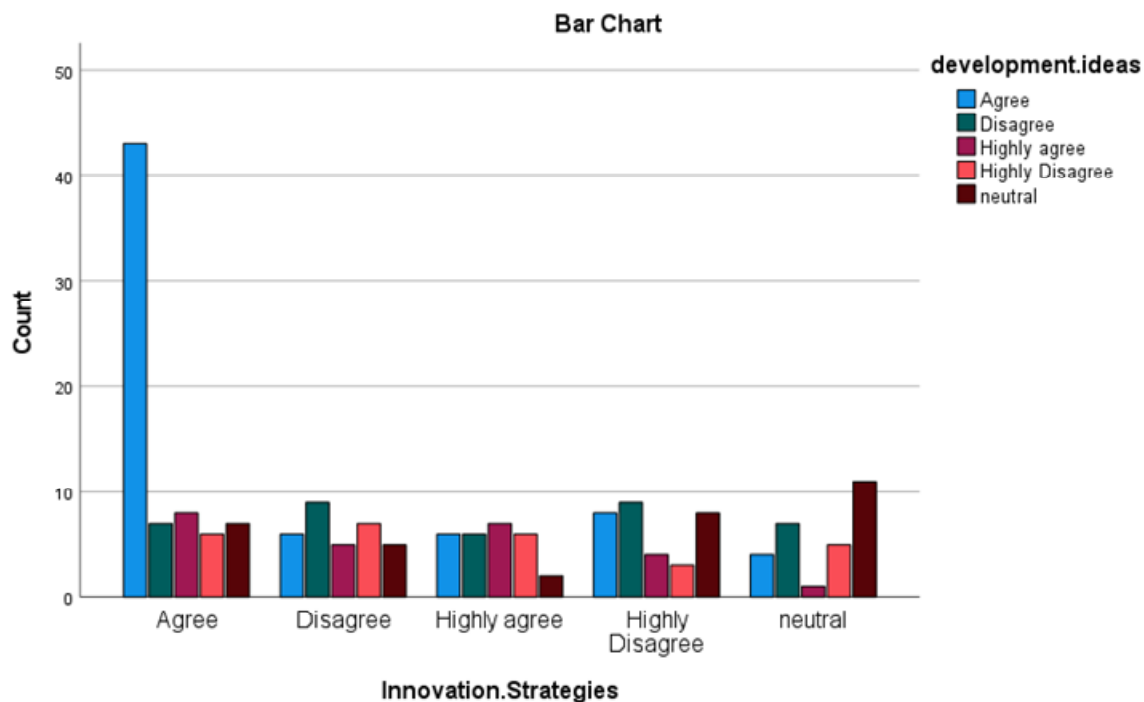


Figure 25 : Symmetric measures in cross-table analysis for the role of innovation strategies in encouraging employees

- **The role of innovation strategies in designing geophysical solutions tailored to client requirements**

The Chi-square test results indicate a statistically significant relationship regarding the role of innovative strategies in designing geophysical solutions tailored to client requirements. The **Pearson Chi-Square** value was **49.431** with **16 degrees of freedom**, and a significance level of **0.000**, which is below the accepted threshold of **0.05**. This confirms that the differences in responses are statistically significant and not due to random variation. The **Likelihood Ratio** test also produced a significant value of **48.131** ($p = 0.000$), supporting the same conclusion. Additionally, the **Linear-by-Linear Association** value of **17.547** with a significance level of **0.000** indicates a significant linear relationship between the variables. Overall, the results confirm a statistically significant association between innovation strategies and the design of customized geophysical solutions.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	49.431 ^a	16	.000
Likelihood Ratio	48.131	16	.000
Linear-by-Linear Association	17.547	1	.000
N of Valid Cases	190		
a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is 3.55.			

Table 29 : Kai Square tests for the role of innovation strategies in designing geophysical solutions tailored to client requirements.

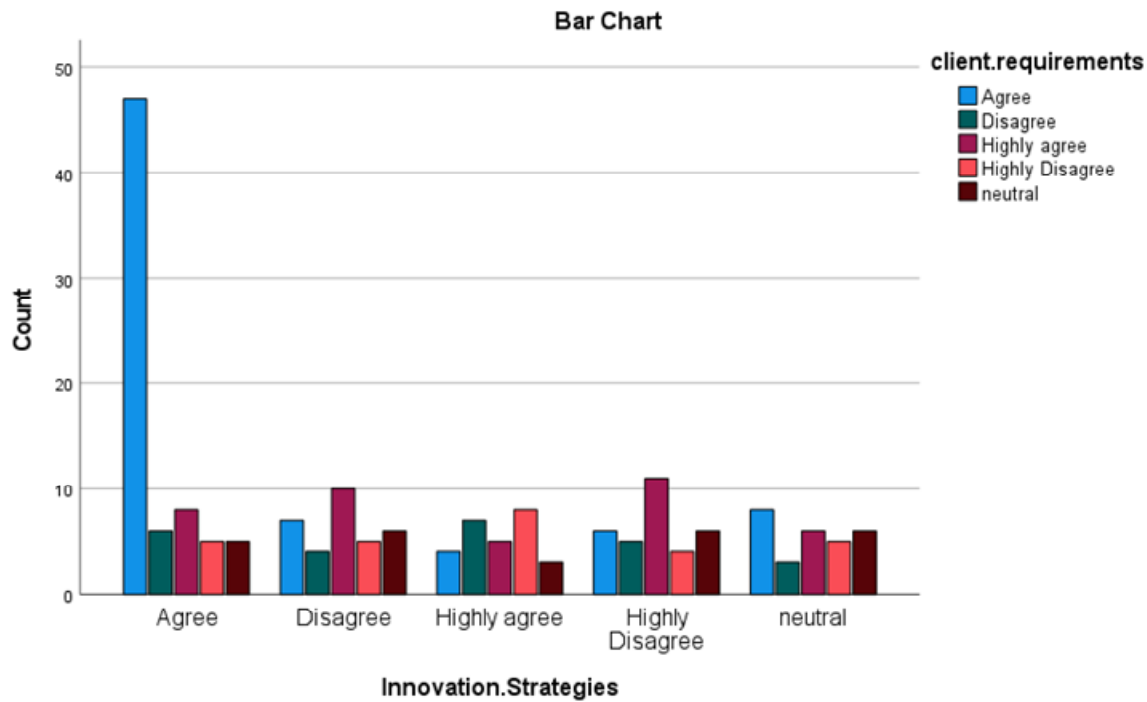


Figure 26 : Symmetric measures in cross-table analysis for the role of innovation strategies in designing geophysical solutions tailored to client requirements

- **One-Way ANOVA analysis**

The ANOVA results indicate a statistically significant effect of the independent variables on innovation strategies. The regression sum of squares was **97.411** with **12 degrees of freedom**, while the residual sum of squares was **323.663** with **177 degrees of freedom**. The calculated **F-value** was **4.439**, with a significance level of **0.000**, which is below the accepted threshold of **0.05**. This confirms that the overall regression model is statistically significant. It indicates that the independent variables—global developments, development ideas, and client requirements—have a meaningful combined effect on innovation strategies. Overall, the results suggest that the model explains a significant portion of the variance in innovation strategies, highlighting the importance of these factors.

ANOVA ^{a,b}					
Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	97.411	12	8.118	4.439	.000
Residual	323.663	177	1.829		
Total	421.074	189			
a. Dependent Variable: Innovation Strategies					
b. Model: (Intercept), global developments, development ideas, client requirements					

Table 30 : One-way analysis of variance.

The Bayes Factor model summary indicates evidence in favor of the proposed model compared to the null model. The **Bayes Factor** value was **2.054**, which suggests moderate evidence supporting the model that includes global development, development ideas, and client requirements as predictors of innovation strategies. The model achieved a correlation coefficient (**R**) of **0.481**, indicating a moderate relationship between the independent variables and the dependent variable. The **R Square** value of **0.231** shows that approximately **23.1%** of the variance in innovation strategies is explained by the model, while the **Adjusted R Square** of **0.179** reflects a moderate model fit after adjusting for the number of predictors. Overall, the results provide reasonable statistical support for the model's explanatory power.

Bayes Factor Model Summary ^{a,b}				
Bayes Factor ^c	R	R Square	Adjusted R Square	Std. Error of the Estimate
2.054	.481	.231	.179	1.35
a. Method: JZS				
b. Model: (Intercept), global developments, development ideas, client requirements				
c. Bayes factor: Testing model versus null model (Intercept).				

Table 31 : Summary of Bayes' Factor Model.

The Bayesian estimates of error variance indicate the level of unexplained variation in the model. The posterior **mode** of the error variance was **1.808**, while the **mean** was **1.850**, suggesting consistent estimates of the model's residual variability. The variance of the estimate was **0.040**, reflecting a relatively stable posterior distribution. The **95% credible interval** for the error variance ranged from **1.500** to **2.278**, indicating that the true error variance is likely to fall within this range. Overall, the results suggest a moderate level of unexplained variance in the model, with reasonably stable and reliable Bayesian estimates under the assumed standard reference priors.

Bayesian Estimates of Error Variance ^a					
Parameter	Posterior			95% Credible Interval	
	Mode	Mean	Variance	Lower Bound	Upper Bound
Error variance	1.808	1.850	.040	1.500	2.278
a. Assume standard reference priors.					

Table 32 : Bayesian estimates of error variance.

Results and Recommendations:

According to the official research publication, the results of this study are based on statistical analysis of data gathered from 190 workers of Saudi geophysical consulting organizations. Examining how innovation strategies affect service improvement and how global developments, development concepts, and consumer needs affect innovation strategies in the industry were the main goals.

According to the demographic statistics, the workforce was mature and experienced, with the majority of respondents (36.3%) being between the ages of 40 and 50. With 45.8% of participants being female and 54.2% being male, the gender distribution was comparatively equal. With 35.3% having master's degrees and 18.4% having doctorates, educational credentials were noticeably strong. The legitimacy of the replies is increased by this strong educational background, which also implies that participants have significant professional and technical experience related to innovative activities.

Perceptions of innovation tactics were found to be rather favorable, according to descriptive statistics. Most respondents said that their organizations use cutting-edge data analysis tools, stay up to date with international technology advancements, and reap the rewards of digital transformation programs. There was a comparatively high level of agreement about digital transformation, suggesting that its contribution to operational efficiency is acknowledged. On the other hand, differing opinions were noted on the use of contemporary technology, workplace flexibility, and ongoing technological investment. These results imply that while innovation is there, organizations do not always use it consistently.

The measuring scale has good internal consistency, as shown by the reliability analysis's Cronbach's Alpha rating of 0.854. This demonstrates that the constructions of innovative strategies and service improvement are accurately measured by questionnaire questions.

The study's results were further supported by inferential analysis. The statistical significance of the regression model ($F = 4.439$, $p < 0.05$) confirmed that innovation strategies are influenced by a combination of global trends, development concepts, and client needs. These independent factors account for around 23.1% of the variation in innovation methods, according to the R^2 value of 0.231. Despite having modest explanatory power, this demonstrates the significant impact of strategy and external variables.

Customer needs were shown to be the most powerful impacting factor among the predictors. This suggests that Saudi geophysical consulting companies are very sensitive to the needs of their clients, especially when it comes to precision, adaptability, and effectiveness. Additionally, there was a statistically significant positive correlation between global developments and innovation strategies, underscoring the need to stay up to date with global technology improvements. Ideas for development, such as alignment with Vision 2030, had a favorable but rather mild effect.

Chi-square examinations verified statistically substantial connections between innovation tactics and employee motivation, tailored service design, and alignment with worldwide developments. The primary premise that innovation techniques improve service performance is supported by these data.

Respondents had comparatively favorable opinions of service correctness, dependability, and customer trust in relation to service improvement results. Improvements based on customer input and customization of geophysical solutions were also well received. However, the timely delivery of reports and the complete incorporation of contemporary technology were weak points. These results point to operational flaws that might prevent innovation from having its full potential.

Several suggestions are put out considering these findings. To improve their competitive stance, businesses should first spend more on cutting-edge technology and AI-driven systems. Second, to increase workflow efficiency and shorten project completion times, digital transformation projects had to be enhanced. Third, by promoting employee involvement and implementing explicit innovation policies, top management may strengthen the innovation culture. Fourth, to improve technical abilities, ongoing professional training must be given top priority. Fifth, to better match innovation activities with consumer expectations, businesses should

use organized customer feedback mechanisms. Lastly, to promote sustainable sectoral development, innovation plans must be properly matched with the goals of Vision 2030.

Conclusion:

With a focus on the effect of global developments, development concepts, and customer needs, this research sought to investigate how innovation methods affect service improvement in Saudi geophysical consulting organizations. The crucial role that geophysical consulting businesses play in assisting with infrastructure development, mineral exploration, and sustainable resource management under Saudi Vision 2030, as well as the increasing significance of innovation in knowledge-intensive service industries, served as the driving forces behind the study.

The results validate the importance of innovative techniques in improving service performance in Saudi geophysical consulting organizations. Innovation strategies are significantly impacted by worldwide changes, development concepts, and client needs, according to statistical study. Customer needs stood up as the most reliable predictor among all variables, suggesting that client expectations and market-driven dynamics are the main causes behind the adoption of innovations. This demonstrates how service-oriented the sector is and how organizational procedures are greatly impacted by response to consumer needs.

The findings also showed that businesses employ innovative methods to a modest degree, especially when it comes to digital transformation, sophisticated data analysis tools, and geophysical solution customization. Most respondents concurred that innovation enhances consumer confidence, correctness, and dependability of services. The survey did note certain difficulties, however, such as uneven dependence on contemporary technology, a lack of workplace flexibility, and differing opinions on the prompt delivery of reports. These

results imply that while there are innovative initiatives, their execution is still not entirely optimized in all operational aspects.

The research backs up the tenets of the Resource-Based View, Dynamic Capabilities Theory, Innovation Diffusion Theory, and Strategic Alignment Theory from a theoretical standpoint. The findings show that companies are more likely to enhance services if they successfully use technology, adjust to changing conditions, promote internal innovation diffusion, and match their plans with national goals. As a result, innovation plans are strategic reactions influenced by both internal and external factors rather than discrete projects.

Practically speaking, the report emphasizes how Saudi geophysical consulting companies must improve their innovation infrastructure by investing more in cutting-edge technology, stepping up digital transformation projects, and involving employees in innovation processes in a disciplined manner. Long-term competitiveness and sustainable development in the industry may be further supported by coordinating innovation initiatives with Vision 2030 goals.

To sum up, innovative tactics play a big role in helping Saudi geophysical consulting businesses provide better services. Stronger organizational alignment, ongoing skill development, and a proactive reaction to global technical improvements and changing consumer expectations are necessary to maximize their influence. Geophysical consulting companies may improve service quality, operational effectiveness, and competitive positioning in domestic and global markets by using a methodical and strategic approach to innovation management.

المستخلص

نظراً للتغيرات التقنية والاقتصادية المتسارعة التي يشهدها قطاع الاستشارات الجيوفيزيائية، وارتباطه الوثيق بأهداف رؤية السعودية 2030، هدفت هذه الدراسة إلى بحث أثر الاستراتيجيات المبتكرة على تحسين الخدمات المقدمة في شركات الاستشارات الجيوفيزيائية بالمملكة العربية السعودية. وتكمن أهمية هذه الدراسة في الدور المحوري الذي تؤديه شركات الاستشارات الجيوفيزيائية في دعم تطوير البنية التحتية، واستكشاف المعادن، وتعزيز الإدارة المستدامة للموارد الطبيعية، الأمر الذي يستدعي تطبيق مناهج إبداعية تُسهم في رفع كفاءة وجودة الخدمات المقدمة.

استخدمت الدراسة منهجاً وصفيّاً تحليلياً ومنهجية كمية. وتم توزيع استبيان إلكتروني على عينة مكونة من 190 عاملاً في شركات الاستشارات الجيوفيزيائية بالمملكة لجمع البيانات. ولاختبار الفرضيات وتقييم أهمية العلاقات بين المتغيرات، تم تحليل البيانات باستخدام برنامج SPSS، مع توظيف تقنيات إحصائية مناسبة كالمتوسط الحسابي، والانحراف المعياري، ومعامل ألفا لكرونباخ، وتحليل الارتباط والانحدار، واختبار مربع كاي، وتحليل التباين (ANOVA).

ركز البحث بشكل أساسي على ثلاث متغيرات مستقلة - التطورات العالمية، ومفاهيم التنمية، ومتطلبات المستهلك - ومتغير تابع واحد - استراتيجيات الابتكار. وبمعامل تحديد ($R^2 = 0.231$)، أظهرت النتائج تأثيراً إحصائياً ذا دلالة إحصائية للمتغيرات المستقلة مجتمعة على استراتيجيات الابتكار، ما يعني أن هذه العوامل تُفسر حوالي 23% من التباين في استراتيجيات الابتكار. ونظراً لأن القطاع مُوجه نحو الخدمات ويعتمد بشكل كبير على تغير توقعات العملاء ورغباتهم، فقد وُجد أن متطلبات العملاء هي الجانب الأكثر أهمية.

كما أظهرت النتائج أن الشركات تبنت الابتكارات بمستوى متوسط إلى عالٍ، لا سيما فيما يتعلق بالتحول الرقمي، واستخدام أدوات تحليل البيانات المتطورة، وتعديل المنتجات الجيوفيزيائية لتلبية احتياجات العملاء. من ناحية أخرى، أثارت عدة عناصر إشكاليات تتعلق بمدى الاعتماد على التكنولوجيا المعاصرة، وقابلية بيئة العمل للتكيف، والالتزام بالمواعيد النهائية للتقارير، مما يشير إلى وجود مجال للتطوير التنظيمي والتشغيلي.

ووفقاً للتقرير، تُعزز التقنيات المبتكرة ثقة المستهلك، وتُحسن الكفاءة التشغيلية، وجودة الخدمة، وتزيد من دقة النتائج التقنية. تؤكد نتائج الدراسة على الأطر النظرية التي اعتمدتها، بما في ذلك نظرية الموارد والقيمة، ونظرية القدرات الديناميكية،

ونظرية انتشار الابتكار، ونظرية التوافق الاستراتيجي، والتي تُشدد على أهمية استغلال الموارد الداخلية والتكيف مع التغيرات البيئية لتحقيق ميزة تنافسية مستدامة.

وبناءً على هذه النتائج، تقترح الدراسة زيادة الاستثمار في التقنيات المتطورة، وتشجيع ثقافة الابتكار داخل الشركات، وإنشاء برامج تدريب مستمرة للكوادر الفنية، وتعزيز توافق استراتيجيات الابتكار مع أهداف رؤية السعودية 2030. ويُقدم هذا البحث مقترحات قيّمة تُساعد صُنّاع القرار على تحسين أداء شركات الاستشارات الجيوفيزيائية في المملكة، ويثري المعرفة في مجال إدارة الابتكار في قطاع الاستشارات الفنية المتخصصة.

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عنوان البحث:

أثر استراتيجيات الابتكار على تحسين الخدمات في شركات الاستشارات الجيوفيزيائية السعودية

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