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Impact of Artificial Intelligence Applications on Sales Forecasting Accuracy in Mid-Sized Oil and Gas Companies in the GCC

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Introduction:

The oil and gas industry are going through a major shift. Rising costs, unpredictable markets, tougher regulations, and the global move toward cleaner energy are all forcing companies to rethink how they operate. For mid-sized firms in the Gulf region, the pressure is even more intense. These companies have to stay competitive with fewer resources than the big players and that's not easy. One of the biggest pressure points is sales forecasting. When a company can't accurately predict sales, it risks overproducing, under-delivering, or missing key opportunities.

Traditionally, sales forecasts in this sector have been based on historical data, spreadsheets, and managers' experience. That might have worked in more stable times, but today's market is anything but stable. Oil prices can shift overnight. Global events can shake demand. What worked last year might not make sense now. In this environment, relying on old methods feels like driving through a storm with last week's weather report.

That's where artificial intelligence (AI) comes in. Tools like predictive analytics and machine learning offer a new way forward. They can sift through massive amounts of data, find patterns, and adapt to change in real time. In industries like finance and retail, AI has already proven it can improve forecast accuracy and decision-making. But in the oil and gas world, and especially for mid-sized companies in the GCC, AI is still something of a newcomer.

Some companies are starting to test AI, building it into tools like CRM and ERP systems. But many are unsure. Is the return worth the cost? Will it actually help, or just complicate things? These are fair questions and they're exactly why this research matters.

This study focuses on understanding how mid-sized oil and gas firms in the GCC are using AI for sales forecasting or why they're not. It looks at what tools are being used, what challenges companies face, and whether AI is helping improve forecast accuracy. The aim is to provide real insight into where the technology stands today, and how it might help firms make better, faster, and more confident decisions in the future.

Furthermore, the timing of this study is critical. With growing regional emphasis on digitalization and innovation, exemplified by initiatives like Saudi Vision 2030 and the UAE's AI strategy, mid-sized firms are under increasing pressure to catch up. Understanding AI's role in one of their most operationally sensitive areas sales forecasting can serve as a catalyst for wider digital transformation.

The Study Problem:

Forecasting sales in the oil and gas industry has always been a tough task. The sector is heavily influenced by factors that are often beyond a company's control, things like global oil price swings, political instability, supply chain disruptions, or unexpected shifts in customer demand. For mid-sized companies in the Middle East, these pressures are even harder to manage. Unlike large, multinational oil firms, they don't have unlimited capital or a global presence to cushion the impact of sudden changes. That means there's much less room for error.

Traditionally, these companies have relied on familiar methods to predict future sales: past performance data, manager experience, and a fair bit of gut instinct. These tools might still offer some value, but in today's environment, where things change fast, they're often not enough. A forecast based on last year's numbers may be irrelevant next quarter — or even next month. Companies need tools that not only look at what has happened but can also anticipate what's coming.

That's where artificial intelligence (AI) comes in. With machine learning and predictive analytics, companies can process massive volumes of data far more than a human analyst ever could and spot patterns or trends that aren't obvious at first glance. These tools can update in real time, respond to new information, and help managers make better decisions. This is especially valuable in B2B sales, where a single contract or client shift can significantly impact revenue.

But here's the catch: even with all this potential, many mid-sized oil and gas companies in the GCC still aren't using AI for sales forecasting. It's also worth noting that mid-sized companies often operate without the luxury of dedicated analytics departments. Unlike large enterprises with specialized data science teams, these firms may rely on generalist staff who juggle multiple responsibilities. This operational reality complicates the deployment of advanced technologies like AI, no matter how promising the tools may appear on paper. Some don't have the internal technical expertise. Others worry about the cost or fear that switching systems could cause more problems than it solves. And many simply don't know whether it's worth the investment.

Makridakis et al. (2018) argue that traditional forecasting tools aren't up to the task anymore, especially in industries where the pace of change is accelerating. Yet much of the academic research still focuses on either large companies or AI used in production not in the sales function. Very few studies look specifically at mid-sized firms in the GCC and how they use or don't use AI in their forecasting processes.

That's what this study aims to address. It asks a practical, timely question: Is AI helping companies forecast sales more accurately? And if so, what's stopping more companies from using it? The goal is to provide both academic value and real-world insight, the kind of information companies can actually use as they face tough choices about how to modernize their operations.

Importance of the Study:

This research comes at a time when energy companies in the Middle East, especially in the GCC, are under growing pressure to modernize. Across the region, governments are investing in digital technologies as part of long-term national strategies to diversify their economies and reduce reliance on oil exports. For many mid-sized oil and gas firms, these shifts mean that adopting digital tools like artificial intelligence is no longer just a competitive advantage, it's becoming a basic requirement to keep up.

But going digital isn't simple. Companies are faced with a growing number of tech options, limited internal expertise, and uncertainty about which tools will actually deliver results. AI, in particular, is often hyped but poorly understood, especially in areas like B2B sales forecasting, where day-to-day operations are complex and high stakes. This study steps into that gap. It looks specifically at how AI is being used or not used to improve sales forecasting accuracy in mid-sized firms, and why that matters.

Better forecasts mean better decisions. They help companies plan production, manage inventory, allocate resources, and reduce waste. When you're working in a volatile market with tight margins, that kind of accuracy can make the difference between profit and loss. For mid-sized firms, which often have to make tough calls with fewer resources, the impact is even greater.

What makes this study particularly valuable is its focus on a group that often gets overlooked. Academic research and policy conversations usually center on large corporations or national players. Mid-sized companies don't always have the same visibility, even though they play a crucial role in the regional energy supply chain. They're flexible, fast-moving, and often more willing to innovate, if the barriers to doing so can be understood and addressed.

This research also makes a contribution to the academic field. It connects two important areas: AI adoption in business and technology's impact on operational performance in B2B contexts. While previous studies have explored AI's role in energy production or general forecasting, few have focused on sales forecasting within mid-sized oil and gas companies in the Middle East. Even fewer have examined the organizational, technical, and environmental factors that shape whether AI is adopted successfully.

Studies like those by Zhang et al. (2020) and Choi et al. (2018) have looked at AI in oilfield operations and general forecasting, but not in the context of sales or within mid-sized firms. Meanwhile, research by Makridakis et al. (2018) highlights the advantages of AI over traditional forecasting tools, but doesn't explore why many firms hesitate to adopt these technologies. This study fills that gap by applying two established frameworks, TAM and TOE, to a highly practical business issue.

To sum it up, this research breaks new ground by:

- Shifting the spotlight to mid-sized companies, not just global corporations
- Focusing on sales forecasting, not just production or supply chain optimization
- Anchoring the analysis in the Middle East, where business realities differ significantly from Western markets
- Connecting improvements in forecast accuracy with the real-world factors that drive or block AI adoption

The findings won't just sit on a shelf. They're designed to help managers understand what AI can realistically do, what challenges to expect, and how to approach digital forecasting in a way that's practical, cost-effective, and aligned with their business needs.

Beyond immediate business benefits, the research carries policy-level implications. Regional governments aiming to foster digital competitiveness in the energy sector can use these findings to tailor programs and incentives that meet the specific needs of mid-sized firms, rather than adopting one-size-fits-all strategies based on the practices of larger corporations.

The Study Objectives:

The central goal of this research is to examine how artificial intelligence (AI) is being used to improve sales forecasting accuracy in mid-sized oil and gas companies across the Middle East. In particular, the study aims to understand not just whether AI is being adopted, but how effective it is, what challenges firms face, and what factors drive or block its use.

To break this down, the study will pursue the following specific objectives:

1. **Investigate the current level of AI adoption in sales forecasting.**

This includes identifying which AI tools, platforms, or technologies are in use, how widely they've been implemented, and how they fit into existing systems like CRM (Customer Relationship Management) and ERP (Enterprise Resource Planning) platforms (Makridakis et al., 2018).

2. **Evaluate how effective AI-driven forecasting is compared to traditional methods.**

The research will look at how managers perceive the performance of AI tools versus conventional techniques like trend analysis, statistical modeling, or expert judgment (Choi, Hecht, & Taylor, 2018). This includes exploring whether AI has led to improvements in forecast accuracy, decision speed, or responsiveness to changing market conditions.

3. **Analyze the organizational, technical, and environmental factors that influence AI adoption.**

Using the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) and the Technology Acceptance Model (TAM) (Davis, 1989), the study will assess how internal and external dynamics shape whether companies adopt AI and how well it is integrated into sales operations.

4. **Identify the main barriers holding companies back from adopting AI.**

This includes examining internal challenges such as resistance to change, limited digital skills, lack of training, or concerns around cost and implementation complexity (Venkatesh & Davis, 2000).

5. **Offer practical, evidence-based recommendations for firms and policymakers.**

Based on the findings, the study will suggest how mid-sized oil and gas companies can make better use of AI in sales forecasting , including steps to overcome adoption barriers and improve forecasting accuracy, ultimately helping firms compete more effectively in a fast-evolving energy sector (Zhang et al., 2020).

The Study Questions:

To support the research objectives and guide the investigation, this study will explore the following key questions:

1. **How aware are mid-sized oil and gas companies in the GCC of AI applications for sales forecasting, and to what extent have they implemented these tools?**

This question aims to assess both the general understanding and the actual use of AI across firms in the region.

2. **Which types of AI technologies such as, predictive analytics, machine learning, or AI-powered CRM platforms are being used for sales forecasting, and how are they integrated into existing workflows?**

The goal here is to map out not just what tools are used, but how they are incorporated into daily operations.

3. **How do sales and forecasting professionals perceive the impact of AI on forecast accuracy, reliability, and responsiveness compared to more traditional forecasting methods?**

These addresses whether AI tools are viewed as genuinely useful or just another layer of technology.

4. **What internal, organizational factors, such as leadership support, employee skills, training, and company culture, influence a company's decision to adopt AI for forecasting?**

This helps uncover the role of internal dynamics in shaping adoption decisions.

5. **What technological factors, including perceived ease of use, usefulness, system compatibility, and data quality play a role in AI adoption and performance?**

This will shed light on how technical aspects support or hinder the success of AI in forecasting.

6. **What external forces such as, competitive pressure, shifting regulations, or market volatility are driving or limiting AI adoption in this sector?**

This question connects adoption patterns to broader industry and market trends.

7. **What specific obstacles are companies facing when trying to implement AI for sales forecasting, and what strategies have they used (or could use) to overcome them?**

This explores real-world roadblocks and potential solutions.

8. **How can mid-sized oil and gas firms in the GCC region make better use of AI to improve their forecasting accuracy and overall business performance?**

This final question brings the research full circle, aiming to extract actionable insights and recommendations.

The Study Hypotheses:

Based on the literature and guided by the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework, this study proposes the following hypotheses to be tested:

- **H1:** There is a statistically significant positive relationship between the adoption of AI applications and the accuracy of sales forecasts in mid-sized oil and gas companies in the GCC region.
- **H2:** Organizational factors including leadership commitment, employee training, and openness to technological change have a significant positive impact on the adoption and effective use of AI tools in sales forecasting.
- **H3:** Technological factors such as perceived usefulness, ease of use, system compatibility, and data quality significantly influence a company's decision to adopt and successfully implement AI-based forecasting solutions.

- **H4:** Environmental factors, including competitive pressure, shifting customer expectations, and evolving regulatory demands, positively influence the likelihood of adopting AI-powered forecasting tools.
- **H5:** Companies that achieve deeper integration of AI into their sales forecasting processes will report higher forecasting accuracy, more efficient resource planning, and better overall sales performance than those relying primarily on traditional methods.

Previous Studies:

In recent years, researchers have shown growing interest in how artificial intelligence (AI) is changing the way businesses forecast sales, demand, and market trends. Across industries like retail, manufacturing, and supply chain management, studies have found that AI tools including machine learning (ML), deep learning, and predictive analytics can improve forecasting performance by uncovering patterns and making predictions faster and more accurately than traditional methods.

Despite this growing body of work, relatively few studies have focused on how AI impacts sales forecasting in mid-sized oil and gas companies, particularly in the GCC region.

Makridakis et al. (2018) conducted a widely cited study comparing traditional statistical forecasting methods with AI-driven models. Their findings showed that while AI-based approaches often outperform classical techniques, their effectiveness depends heavily on the quality of the underlying data and the specific business context. In a related study, Choi et al. (2018) found that embedding AI into CRM systems can significantly enhance forecasting accuracy, especially in B2B environments where sales cycles are longer and more complex.

In the oil and gas sector specifically, Zhang et al. (2020) examined the use of AI in production optimization and pricing models. They found increasing interest in AI applications, but noted that research in this area remains fragmented, with most attention focused on operations and engineering, not on sales forecasting.

Closer to the region of focus, Al-Obeidat et al. (2021) studied digital transformation efforts among energy firms in the Gulf and identified a common theme: while awareness of AI's potential is high, actual implementation remains limited. This gap was often linked to organizational challenges, including resistance to change, a lack of internal expertise, and uncertainty around return on investment.

In addition, studies applying theoretical models like the Technology Acceptance Model (TAM) (Davis, 1989) and the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) have shown that AI adoption is not driven by technology alone. Factors such as leadership support, employee skills, company culture, regulatory expectations, and competitive

pressure all play significant roles in shaping whether and how AI is adopted and used effectively (Venkatesh & Davis, 2000).

Taken together, this research highlights two key insights: First, AI clearly has the potential to transform forecasting practices across industries. Second, there's still a noticeable gap in empirical studies that focus specifically on real-world AI adoption for sales forecasting in mid-sized oil and gas companies in the GCC. This is the gap that the current study seeks to fill by providing data-driven insight into how AI is being used, what's working, and what barriers still exist.

In summary, while the technological potential of AI in forecasting is well-supported by prior literature, empirical studies exploring its use in the unique context of mid-sized firms in the GCC remain limited. This study not only fills that gap but does so with a practical lens focused on adoption challenges, contextual nuances, and business impact.

Theoretical Foundations of the Study:

To guide the structure and analysis of this research, two foundational theoretical models are used: the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework. Together, these models offer a well-rounded lens to understand both individual and organizational factors influencing the adoption of AI in sales forecasting.

1- Technology Acceptance Model (TAM)

The Technology Acceptance Model, first developed by Davis (1989), is one of the most widely used frameworks for studying how people accept and use new technologies. TAM focuses on two main concepts:

- **Perceived Usefulness:** the extent to which a person believes that using a specific technology will enhance their performance or effectiveness at work.
- **Perceived Ease of Use:** the degree to which a person believes the technology will be simple and require minimal effort to operate.

In the context of this study, TAM helps explain how sales managers and forecasting professionals in mid-sized oil and gas firms assess AI-powered tools. If they believe AI can improve forecast accuracy and doesn't require excessive effort or expertise, they're more likely to adopt it. TAM is especially useful in capturing the psychological and behavioral aspects of technology use — such as trust in the system, willingness to learn, and perceived return on effort.

2- Technology-Organization-Environment (TOE) Framework

While TAM focuses on individual users, the Technology-Organization-Environment (TOE) framework developed by Tornatzky and Fleischer (1990) offers a broader view of how organizations adopt new technologies. TOE highlights three dimensions that influence adoption:

- **Technological Context:** the specific features of the technology itself, including its complexity, compatibility with existing systems, and the perceived advantages it offers over current solutions.
- **Organizational Context:** internal characteristics like company size, structure, leadership support, available resources, and overall digital readiness.
- **Environmental Context:** external pressures such as competition, regulatory requirements, and the pace of market change.

This framework allows the study to account for real-world constraints that influence adoption decisions beyond just what individuals think. For example, even if managers believe in AI, a lack of IT infrastructure or regulatory uncertainty might still block implementation.

By combining TAM and TOE, this study is able to analyze both the individual mindset and the organizational environment influencing AI adoption in B2B sales forecasting. This integrated approach is especially useful for understanding the complex dynamics at play in mid-sized oil and gas firms operating in the GCC, where strategic decisions are shaped by both internal capability and external pressure.

Methodology and Research Methods:

1- Research Design

This study will use a quantitative, cross-sectional research design to explore the relationships between AI adoption, organizational dynamics, and sales forecasting accuracy. A structured questionnaire will serve as the primary data collection tool, targeting professionals across mid-sized oil and gas firms in the GCC region. This design allows for a snapshot view of current practices and perceptions, offering insight into how AI is being used and where adoption is lagging.

2- Population and Sample

The study focuses on mid-sized oil and gas companies in the GCC, defined here as firms with 50 to 500 employees involved in sales or supply chain operations. These organizations often face unique challenges in balancing innovation with resource constraints, making them an ideal focus for this research.

A purposive sampling approach will be used to identify key respondents, such as sales managers, forecasting analysts, and IT decision-makers. These individuals are best positioned to provide informed insights into both the technical and strategic aspects of AI adoption.

The target sample size is 100 to 150 respondents, depending on accessibility and response rates. This range aims to provide enough data to allow for meaningful statistical analysis while accounting for expected challenges in data collection.

3- Data Collection

Data will be gathered using an online questionnaire, distributed via professional email lists, LinkedIn, and relevant industry groups. The survey will feature Likert-scale items drawn from validated instruments in existing research, particularly those related to the TAM and TOE frameworks, as well as established measures of forecasting performance and organizational readiness.

Questions will be structured to assess AI usage patterns, perceived effectiveness, adoption drivers, and barriers ensuring a comprehensive view of the topic.

4- Data Analysis

After collection, the data will be analyzed using statistical tools such as SPSS or SmartPLS, depending on the nature and structure of the dataset. Planned analyses include:

- Descriptive statistics to profile respondents and map current AI adoption trends
- Reliability testing (e.g., Cronbach's alpha) to ensure internal consistency of the survey constructs
- Exploratory factor analysis to validate underlying dimensions of the measured variables
- Multiple regression analysis or Structural Equation Modeling (SEM) to test the proposed hypotheses and explore relationships among key variables

This combination of methods ensures both rigor and depth in evaluating the factors influencing AI adoption and its impact on sales forecasting.

5- Ethical Considerations

Ethical standards will be maintained throughout the research process. All participants will be informed about the purpose of the study before participating. Responses will be anonymous and confidential, and no personally identifiable or proprietary information will be collected.

Participation will be entirely voluntary, and respondents will be free to withdraw at any time without consequence.

The Study Tools:

To gather meaningful data for this research, a structured questionnaire will be used as the primary data collection instrument. The questionnaire will be built using measurement items adapted from validated tools in previous studies on AI adoption, technology acceptance, and sales forecasting effectiveness.

1- Structure of the Questionnaire

The survey will be organized into five key sections:

- I. Demographic and Organizational Information**
Questions in this section will capture basic company and respondent data, such as company size, role of the participant, location, years of operation, and overall digital maturity.
- II. Current Use of AI in Sales Forecasting**
This section explores the types of AI tools currently in use (e.g., predictive analytics, machine learning models), how they are applied within the sales function, and how frequently they are used.
- III. Perceived Forecasting Accuracy and Effectiveness**
Respondents will compare the performance of AI-based forecasting against traditional methods in terms of accuracy, speed, reliability, and adaptability to changing market conditions.
- IV. Adoption Drivers and Influencing Factors**
Drawing from the TAM and TOE frameworks, this section will assess perceptions around ease of use, usefulness, leadership support, organizational readiness, and environmental pressures.
- V. Challenges and Barriers to Adoption**
This section identifies perceived obstacles such as cost, system complexity, lack of AI-related skills, cultural resistance, or uncertainty around return on investment.

2- Scaling Method

Most items will be measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). This format allows respondents to express varying levels of agreement or disagreement with each statement, offering a standardized method for assessing attitudes and perceptions. The five-point scale is also widely used in organizational research due to its clarity and ease of statistical analysis. Additionally, the survey will include a few open-ended questions

to capture qualitative insights from participants. These open responses can offer context that quantitative data alone might miss, such as perceptions about organizational readiness or stories of failed implementations that highlight deeper issues.

3- Pilot Testing

Before full-scale distribution, the questionnaire will be pilot tested with a small group of 8 to 10 professionals working in mid-sized oil and gas firms. The purpose of the pilot is to test for clarity, relevance, and reliability. Feedback from the pilot group will be used to refine question wording, structure, and flow to ensure a smooth experience for respondents.

The Study's Limitations:

While this study aims to provide robust insights, several limitations should be acknowledged to place its findings in proper context:

- 1. Regional Focus**

The study targets companies in the GCC region. As a result, the findings may not apply to companies in other regions with different levels of digital maturity, regulatory environments, or business models.

- 2. Industry-Specific Scope**

This research focuses exclusively on mid-sized oil and gas firms. Larger corporations or companies in other industries may adopt and use AI tools differently, limiting the generalizability of results.

- 3. Self-Reported Data**

The study relies on participants' own assessments and perceptions rather than direct performance metrics. This introduces the possibility of response bias or **subjectivity**, especially in evaluating the success of AI applications.

- 4. Varied Interpretations of "AI"**

Different respondents may interpret "AI applications" in different ways from basic data automation to advanced machine learning systems. This variability could affect the consistency of responses across the sample.

- 5. Sample Size and Accessibility**

Accessing decision-makers especially in technical or strategic roles may prove challenging. Response rates and the willingness of key professionals to participate could affect both the sample size and representation of the study.

By acknowledging these limitations, the research maintains transparency and encourages further exploration, especially in areas that require more detailed or longitudinal study.

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