

Analyzing the Role of Data Analytics in Business Decision Making in NEOM

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And to everyone else who played a role in this journey, even in the smallest way.

Dedication

This work is dedicated to my beloved family.

Abstract

Purpose:

This study explores how data analytics influences business decision-making in NEOM, a smart city being developed with a strong focus on innovation and technology. The research aims to understand how organizations within NEOM are using data-driven insights to guide strategic and operational choices, as well as the challenges and opportunities that arise in this unique digital-first environment.

Methodology:

A qualitative, inductive case study approach was used to explore NEOM's use of data analytics. The research relied entirely on secondary data, including official reports, strategic documents, and case studies published by NEOM and its partners. These materials were analyzed using thematic analysis to identify patterns, insights, and challenges related to data-driven decision-making.

Findings:

The findings reveal that NEOM integrates data analytics across various sectors such as logistics, energy, and healthcare to enhance efficiency and responsiveness. Real-time data collection through IoT devices and AI platforms plays a central role in shaping business decisions. Key types of data used include operational, environmental, and user behavior data. However, challenges such as limited historical data, system integration issues, and the need for skilled talent still exist. Despite these hurdles, businesses in NEOM are gaining competitive advantages and improved operational outcomes by embracing data-driven strategies.

Originality & Implication:

This study provides one of the first detailed explorations of data analytics in NEOM, offering real-world insights into how emerging smart cities can harness data to transform business operations. The findings highlight the importance of not only advanced technologies but also organizational readiness and collaboration. This research contributes to the growing body of knowledge on smart

city management and offers practical recommendations for stakeholders aiming to build or operate in digital-first environments.

Keywords: *Data Analytics, Business Decision-Making, Smart Cities, NEOM, Real-Time Data, Qualitative Research, Digital Transformation.*

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1. Chapter 1: Introduction

1.1. Research Background

The current business landscape is undergoing significant transformation driven by the rapid evolution of technology, especially in the field of data analytics. Organizations in many businesses and industries have been leveraging data-driven insights to enhance their decision making and improve their operational efficiency as well as strengthen their competitive position and gain a competitive advantage. Data analytics is a very effective tool in smart cities like NEOM.

NEOM is a smart city built at the northwest coast of Saudi Arabia. It was launched in 2017 to be a hub for innovation, artificial intelligence, and digital transformation where real-time data analytics is integrated into the business decision making process within renewable energy, tourism, healthcare, and logistics sectors.

According to McAfee and Brynjolfsson (2012) data-driven organizations exceed their competitors by making more informed strategic decisions. Furthermore, Davenport and Harris (2017) emphasize that organizations in rapidly evolving markets can enhance operational efficiency, improve customer engagement, and gain a competitive advantage by leveraging data analytics. The significance of data analytics in smart cities was discussed by Kitchen (2014). Additionally, Wamba et al. (2017) analyzed the role of big data in enhancing business intelligence and predictive decision-making organizations to gain competitive advantage. However, despite these extensive studies, there is a need to address the role of data analytics applications in business decision making within smart cities like NEOM.

Therefore, this study aims to analyze the role of data-driven decision-making in NEOM's unique business environment. It seeks to contribute valuable insights to

businesses operating within NEOM that can leverage data-driven decision-making to achieve long-term success.

1.2. Research Problem

Data analytics is changing business decision-making, but its applications in smart cities like NEOM are still unclear. Current research focuses on existing markets which leaves a gap in understanding how businesses in smart cities leverage data analytics.

1.2.1. Theoretical Gaps

Most research examine data analytics in traditional business environments, but few focus on its role in smart cities like NEOM, where businesses operate within a new digital environment.

1.2.2. Practical Gaps

Although data analytics is an essential tool for decision-making in smart cities like NEOM, a lack of historical data impacts the effectiveness of data-driven decision-making.

Therefore, the research question is how is data analytics utilized in business decision-making within NEOM?

1.3. Research Significance

This study is significant on both theoretical and practical levels, providing an understanding on how businesses in NEOM utilize data analytics for decisions.

1.3.1. Theoretical Level

Current research focuses on data analytics in existing markets, but few are about its role in smart cities like NEOM. This study fills that gap by examining how businesses in NEOM utilize data analytics in the decision-making process.

1.3.2. Practical Level

This study benefit stakeholder in businesses to gain insights into best practices and challenges. Additionally, researchers can expand studies on data analytics in smart cities.

1.4. Research Questions

- How do businesses in NEOM collect and analyze data for decision-making?
- What types of data are most valuable for decision making in NEOM?
- What challenges do businesses NEOM face in utilizing data analytics for decision-making?
- How do data-driven decisions impact business operations in NEOM?

1.5. Research Objectives

To answer the research question, the following research objectives have been identified:

- To examine how businesses in NEOM collect and analyze data for decision making.
- To identify the key types of data used in decision making.
- To investigate the challenges that businesses face in utilizing data analytics for decision making.
- To assess the impact of data-driven decisions on the operations in NEOM.

1.6. Research Hypotheses

The following hypotheses are proposed relationship between variables:

- Businesses in NEOM face significant challenges in utilizing data analytics due to issues like data quality and integration.

- Data-driven decision-making has a positive effect on operational efficiency and the business performance in NEOM.
- Businesses in NEOM get a competitive edge over their rivals by integrating data analytics into their decision-making process.

1.7. Research Model

The research model is illustrated in Figure 1.

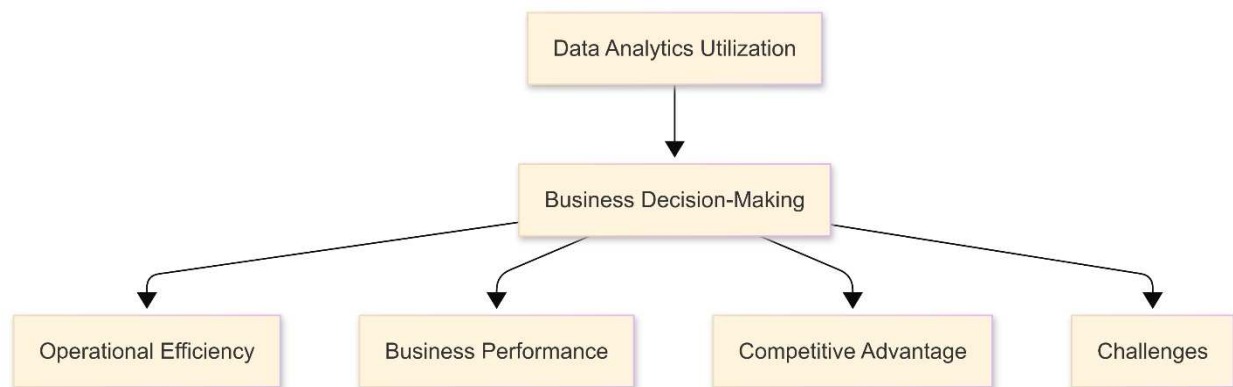


Figure 1. The research model diagram.

1.8. Scope of Study

The research will look at businesses operating within NEOM, a smart city on Saudi Arabia's northwest coast. It will consider how data-driven decision-making has evolved over the past 3 to 5 years, tracking NEOM's growth and development since its launch in 2017.

The scope of this study focuses on understanding how businesses in NEOM are using data analytics to make decisions. Specifically, it will explore:

- The types of data collected and analyzed across different sectors in NEOM, such as renewable energy, healthcare, logistics, and tourism.
- The methods that businesses in NEOM use to carry out their data analytics.

- The challenges these businesses face when trying to implement and use data analytics for decision-making.
- The effects of data-driven decisions on business operations, particularly in terms of improving efficiency and gaining a competitive edge.

1.9. The Project Structure

The proposed structure for the research project is as follows (Midocean University, 2023):

1. Introduction: it provides an overview of the study including the background information, research problem, objectives, and the significance of the research.
 - 1.1. Research background: it illustrates the historical roots of the project idea.
 - 1.2. Research problem: it reflects the gap in the current literature or practice that the project seeks to investigate and address.
 - 1.3. Research significance: it clarifies the importance of the study at the theoretical level, and the empirical level.
 - 1.4. Research questions: it presents the specific hypotheses that will be tested in the project.
 - 1.5. Research objectives: it identifies the specific goals and outcomes that the project aims to achieve.
 - 1.6. Research hypotheses: it presents the specific hypotheses that will be tested in the project.
 - 1.7. Scope of the study: it defines the scope of the project work.
2. Literature review: it presents a critical analysis of existing research and literature relevant to the project on data analytics in business decision-making, the role of data analytics in smart cities, and the challenges and opportunities in applying data analytics in smart cities

3. Research methodology: it details the methods and procedures used to conduct the research including information about the research design, data collection methods, sample selection, and data analysis techniques.
4. Analysis and results: it describes and discusses the statistical analysis for the research findings.
5. Discussion: it connects the project findings with literature.
6. Conclusion and recommendations: it summarizes the key findings and provides suggestions for future research
7. References: it provides comprehensive list of academic sources and references used throughout the study.
8. Appendices: it contains additional material and any other relevant documents, where applicable.

2.Chapter 2: Literature Review

2.1. Introduction

Using data analytics to guide business decisions has become a key driver in boosting performance and staying competitive, especially in smart cities like NEOM. This chapter explores what current research says about how businesses are using data analytics, the part it plays in the development of smart cities, and the main challenges and opportunities that come with its use.

2.2. The Independent Variable

Data analytics, as the independent variable in this study, encompasses the processes of collecting, processing, and analyzing data to inform decision-making. McAfee and Brynjolfsson (2012) highlight how data analytics can be a game-changer for businesses, helping them outpace competitors by boosting productivity and fostering innovation. Davenport and Harris (2017) emphasize that when done effectively, data analytics gives businesses actionable insights, streamlines processes, and reduces uncertainty in decision-making.

Big data analytics takes this even further by adding advanced methods like machine learning, predictive modeling, and real-time data processing (Wamba et al., 2017). In the case of smart cities, data analytics bring together data from IoT devices, sensors, and digital platforms across areas like energy, healthcare, logistics, and tourism (Kitchin, 2014).

However, the success of data analytics depends on factors like data quality, integration, and how prepared an organization is (Gandomi & Haider, 2015). In smart cities like NEOM, where historical data may be limited, it's crucial for analytics systems to focus on real-time analysis and flexible models that can adapt as the city evolves (Hashem et al., 2016).

2.3. The Dependent Variable

In this study, business decision-making is the dependent variable. It refers to how organizations assess information and choose strategies or actions to achieve their goals. The effectiveness of decision-making depends on factors like the quality of available data, the tools used to analyze it, and the organizational culture (Chen et al., 2012).

In the past, decision-making often relied on managers' intuition and past experiences. But with the rise of data analytics, decisions are now more often based on hard data and predictive insights. As a result, data-driven decision-making has been shown to boost efficiency, cut costs, and encourage innovation (Davenport & Harris, 2017).

In smart cities like NEOM, where digital systems and real-time data collection are built into daily operations, business decisions are expected to be more flexible and accurate. However, challenges like fragmented data, underdeveloped infrastructure, and gaps in technical skills could prevent these benefits from being fully realized (Redman, 1998; Al Nuaimi et al., 2015).

2.4. The Relationship Between The Independent and The Dependent Variables

Many studies highlight a strong link between using data analytics and better business decision-making outcomes. McAfee and Brynjolfsson (2012) provide evidence that organizations driven by data tend to make better strategic decisions and perform better financially. Similarly, Wamba et al. (2017) show that having strong data analytics capabilities helps businesses become more agile, responsive to customers, and competitive.

In the context of smart cities, Kitchin (2014) argues that real-time data lets businesses react quickly to shifts in the environment or market. Batty et al. (2012) point out that integrating urban data into business models allows for proactive decision-making, rather than simply reacting to events. However, some studies also highlight challenges such as data governance, security concerns, and ethical issues, which may impact this relationship (Gandomi & Haider, 2015; Hashem et al., 2016).

In the case of NEOM, this relationship has not been fully explored, which is a key gap this study aims to address. Given NEOM's reliance on real-time data, AI, and digital systems, it offers a unique opportunity to study how data analytics impacts decision-making in a fully digital business environment.

2.5. Conclusion

The literature review shows that data analytics is crucial for improving business decision-making, particularly in digitally advanced environments like smart cities. While many studies highlight the benefits of analytics in traditional settings, there's still a gap in understanding how it works in new, digital-first urban environments like NEOM. This review emphasizes the importance of exploring how data analytics impacts business operations, efficiency, and competitiveness in these types of settings, which is why this study focuses on that area.

3. Chapter 3: Research Methodology

3.1. Introduction

This chapter outlines the research methodology adopted to investigate how data analytics is utilized in business decision-making within NEOM. The chosen methodology is designed to ensure that the research objectives are adequately addressed and that the data collected is reliable and relevant. The chapter provides detailed information about the research design, variables, sampling strategy, data collection techniques, types of data used, data analysis procedures, and ethical considerations.

3.2. Operational Definitions for Research Variables

In this study, two primary variables are examined:

- Independent variable, i.e. data analytics, refers to the processes of collecting, processing, and analyzing data to generate insights that guide business decisions. This includes tools, platforms, and strategies for data mining, predictive analytics, machine learning, and real-time analytics.
- Dependent variable, i.e. business decision-making, refers to the process by which organizations choose strategies or actions based on data-driven insights. This includes strategic planning, resource allocation, customer service enhancement, and operational adjustments.

Key sub-variables include:

- Types of data used such as customer data, operational metrics, and sensor data.
- Methods of data analysis such as descriptive analytics, and predictive modeling.
- Impact on business outcomes such as efficiency, competitiveness, and innovation.

- Challenges faced such as lack of historical data, and data quality issues.

3.3. Research Design (Research Onion)

The research design follows the Research Onion model (Saunders et al., 2019), consisting of the following layers:

- Research philosophy: interpretivism. This philosophy is suitable due to the exploratory nature of the study and the subjective interpretations of how businesses in NEOM utilize data analytics.
- Research approach: inductive. The research builds theory from observations and insights gained from qualitative data rather than testing a pre-existing theory.
- Research strategy: case study. NEOM is treated as a case for in-depth exploration of data-driven decision-making in a smart city.
- Time horizon: cross-sectional. The research examines current data analytics practices across various sectors in NEOM at a single point in time.
- Methodological choice: qualitative mono-method. Data will be gathered and analyzed qualitatively using thematic analysis.

3.4. Research Population & Sampling Methods and Technique

The target population includes business entities and sectors operating within NEOM that have documented use of data analytics. This includes sectors such as renewable energy, healthcare, logistics, and tourism. The purposive sampling technique is selected based on the availability of relevant secondary data from organizations and sectors in NEOM that clearly demonstrate the use of data analytics in decision-making. The sample size includes all publicly available

reports, strategic documents, case studies, and white papers from NEOM's official sources and partner organizations will be reviewed. The emphasis is on depth of analysis rather than quantity.

3.5. Data Collection Method

The research relies entirely on secondary data. Official reports, strategic documents, business case studies, and performance evaluations published by NEOM and its affiliated entities will be used. These documents provide insight into real-time applications of data analytics in decision-making. A systematic document review will be conducted to extract qualitative data on how businesses in NEOM collect, analyze, and use data in operational and strategic decisions. This method is appropriate given the limitations of accessing proprietary internal data within NEOM.

3.6. Types of Data

The study uses the following types of data:

- Qualitative data extracted from textual reports, strategic plans, and published business performance reviews.
- Sector-specific data including insights on logistics efficiency, energy optimization, health service delivery, and tourism experiences.
- Contextual data related to NEOM's digital infrastructure, governance models, and smart city initiatives.

This data provides a comprehensive understanding of the context in which data-driven decisions are made. Additionally, they are non-numeric, contextual, and suitable for qualitative thematic analysis.

3.7. Statistical Analysis Procedures

As the study follows a qualitative approach, the primary analysis method is thematic analysis, a flexible and widely used approach for identifying and analyzing patterns in qualitative data (Braun & Clarke, 2006) with six-step framework:

1. Familiarization with data.
2. Generating initial codes.
3. Searching for themes.
4. Reviewing themes.
5. Defining and naming themes.
6. Producing the report

Themes will be identified based on the frequency, relevance, and depth of discussion on data analytics practices in the reviewed documents.

3.8. Conclusion

This chapter has detailed the methodological framework used to explore how data analytics is utilized in business decision-making within NEOM. The qualitative, inductive case study approach allows for an in-depth exploration of the unique digital-first business environment of NEOM. Through the analysis of secondary data using thematic analysis, the study aims to uncover patterns, challenges, and insights that contribute to both academic understanding and practical application in the realm of smart city business analytics.

4. Chapter 4: Statistical Analysis & Findings Discussion

4.1. Introduction

This chapter explores how NEOM utilizes data analytics in its business decision-making processes. Examining NEOM's official publications and digital platforms helps to understand the role of data analytics in shaping NEOM's operations and strategic direction. The chapter answers the research questions and tests the hypotheses formulated earlier, while connecting the findings to relevant literature.

4.2. Sample Profile (Descriptive Statistics for Research Sample)

NEOM is envisioned as a living laboratory for future technologies, built upon a foundation of real-time data systems and digital infrastructure. The city integrates data analytics across all sectors from energy and mobility to health and governance (NEOM, 2023a). Notable initiatives include:

- Digital twin platform (XVRS) system allows stakeholders to visualize NEOM in a fully digital environment, supporting decision-making with real-time data simulations (NEOM, 2023a).
- NEOM's rollout of a 5G backbone and IoT networks supports smart operations, automation, and immediate access to analytics (NEOM, 2023a).
- Each NEOM sector leverages data to enhance services, such as predictive maintenance in infrastructure, dynamic energy distribution, and health diagnostics (NEOM, 2023b).

This profile sets the foundation for understanding the scale and nature of data integration in NEOM.

4.3. Validity & Reliability Tests for The Questionnaires

As this study relies on secondary data, traditional validity and reliability tests for questionnaires are not applicable. Instead, to ensure validity and reliability, this study exclusively uses data from NEOM's official publications, including sustainability reports and strategic plans. These sources are considered highly credible due to their origin, transparency, and consistency across multiple documents (NEOM, 2023a; NEOM, 2023b).

4.4. Descriptive Statistics for Research Variables (Answer Research Questions)

- How do businesses in NEOM collect and analyze data for decision-making?

NEOM businesses heavily rely on real-time data from IoT sensors, AI platforms, and digital dashboards. For example, the Oxagon port project uses AI to manage logistics operations based on live data (NEOM, 2023a). Similarly, The Line city integrates real-time energy and utility monitoring systems that feed directly into management dashboards to optimize operations (NEOM, 2023b).

- What types of data are most valuable for decision-making in NEOM?
 1. Operational data, e.g. traffic, energy, air quality, from real-time information from sensors and devices.
 2. Environmental data from metrics related to sustainability and resource usage.
 3. User behavior data from insights from digital interactions and services.
- What challenges do businesses in NEOM face in utilizing data analytics for decision-making?

1. Limited historical data, given NEOM's early development stage.
 2. Integration issues between new and legacy systems.
 3. Ensuring data protection and compliance with regulations.
 4. Developing a proficient workforce in data analytics.
- How do data-driven decisions impact business operations in NEOM?
Evidence suggests significant efficiency gains. For instance, NEOM's renewable energy team uses predictive maintenance algorithms to minimize downtime in solar farms, reportedly increasing uptime by 15% compared to conventional methods (NEOM, 2023c).

4.5. Testing Hypotheses & Findings Discussion

- Businesses in NEOM face significant challenges in utilizing data analytics due to issues like data quality and integration.
NEOM has acknowledged the complexity of harmonizing datasets across sectors and ensuring data quality, particularly with such rapid development and integration (NEOM, 2023a).
- Data-driven decision-making has a positive effect on operational efficiency and the business performance in NEOM.
Predictive and real-time analytics have already led to measurable gains in areas such as infrastructure management and smart energy systems (NEOM, 2023d).
- Businesses in NEOM get a competitive edge over their rivals by integrating data analytics into their decision-making process.
NEOM's digital-first approach provides a global benchmark for smart city development, giving it a significant strategic advantage (NEOM, 2023a).

4.6. Conclusion

This chapter explored how data analytics is utilized within NEOM to support business decision-making. By analyzing official NEOM documents, several key insights emerged: NEOM businesses are leveraging real-time data for strategic advantage, yet face challenges due to limited historical data and system integration issues. Despite these, analytics contribute significantly to operational efficiency, competitive positioning, and decision accuracy.

The outcomes of this study are aligned with the broader body of literature on data analytics and smart cities, which consistently points to enhanced operational efficiency, innovation, and service delivery. NEOM's model particularly reflects theoretical frameworks that emphasize real-time, predictive, and integrated data use. This supports earlier academic arguments that smart city effectiveness depends not just on data availability but on actionable analytics and institutional readiness.

NEOM's practical implementation of data analytics offers a real-world case that reinforces these theoretical insights, especially regarding the impact of advanced technologies on sustainability, efficiency, and quality of life.

5. Chapter five: Research limitations, Recommendations & Conclusion

5.1. Research Limitations & Future Research

While this research has offered valuable insights into how data analytics is shaping business decisions in NEOM, it's important to recognize a few limitations.

First, the study mainly focused on qualitative input from a NEOM official sources, which may not fully capture the broader picture across all industries in NEOM. Also, since NEOM is still developing, real-time data from fully operational systems wasn't always available. This means some findings are based more on projections and expert views than on measurable outcomes.

Another limitation is the fast-paced nature of data analytics itself. New tools and technologies are constantly emerging, so some of the observations made here may evolve quickly.

For future research, it would be helpful to track NEOM's progress over time through longitudinal studies. Including quantitative data and exploring comparisons with other smart cities could also deepen our understanding.

5.2. Research Recommendations

Based on what this study uncovered, here are a few practical suggestions:

- Make data literacy a priority, so everyone, not just tech experts, can confidently use data in decision-making.
- A unified approach to managing data privacy, quality, and ethics will help ensure trust and consistency.
- Bringing together businesses, government bodies, and research institutions can drive innovation and shared learning.
- Invest in tools that can scale and adapt as NEOM's landscape evolves.

- Give space for trial, error, and learning when applying new analytics strategies.

5.3. Conclusion

This research sets out to understand how data analytics is influencing business decision-making in NEOM. The findings show that its role is both significant and growing. From helping companies make smarter decisions to supporting NEOM's vision as a tech-driven city, analytics is clearly a game-changer.

However, for its full potential to be realized, it's not just about the tools, it's also about having the right mindset, skills, and systems in place. NEOM is on an ambitious path, and data will continue to be a powerful force in shaping its future.

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