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DOCTORAL THESIS

THE IMPACT OF BUSINESS INTELLIGENCE ON CUSTOMER LOYALTY IN TELECOMMUNICATIONS COMPANIES

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“Whoever says ‘I can do it’ has achieved it.” Then I can do it, and if I resist, I will bring it and achieve it. Today, I have embraced great glory. I did it after it seemed impossible. The paths were tough and the roads cost me a lot, but I “arrived.” Praise be to God, with love, thanks and gratitude. Praise be to God, and thanks to Him, I have reached the highest goals. I look at myself and my success as one looks at a miracle, a long-awaited dream. This thesis is not the end, but the beginning. It is the result of the work and effort I have put in over the past years. However, we will not give up, but rather achieve another success.

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Resumen

En la actualidad, el sector de las telecomunicaciones en Jordania está experimentando notables transformaciones como consecuencia del desarrollo tecnológico acaecido en la industria y su correlación con las demandas y expectativas de los consumidores. Este ámbito desempeña una función crucial en el progreso socioeconómico y en la conexión con la comunidad global. No obstante, al igual que en muchos otros países, se enfrenta a diversos desafíos para adaptarse al cambiante panorama de las telecomunicaciones.

Los desafíos que confronta el sector de las telecomunicaciones en Jordania en cuanto a la retención de clientes son considerablemente significativos. Destaca en este contexto el papel fundamental que desempeñan los sistemas de inteligencia empresarial para mantener y fomentar la fidelidad de los clientes, así como para garantizar su satisfacción. La presente tesis doctoral se centró en la investigación de tres aspectos relacionados con las prácticas empresariales en el sector de telecomunicaciones, abordando cuestiones específicas en cada caso.

El primer estudio analizó el impacto del *Business Intelligence* en la fidelización de los clientes en las empresas de telecomunicaciones. Se adoptó un enfoque cuantitativo para la recopilación y evaluación de datos primarios, los cuales se utilizaron para contrastar las hipótesis propuestas. La población de estudio estuvo conformada por los empleados del sector de telecomunicaciones en Jordania. Los resultados indicaron que el uso del *Business Intelligence* tiene efectos positivos sobre la calidad de los servicios electrónicos, la gestión electrónica de las relaciones con los clientes, el boca a boca electrónico y las plataformas de redes sociales. Asimismo, se identificó su impacto en la satisfacción del cliente y su fidelización, aspectos cruciales en un contexto competitivo como el de las telecomunicaciones.

En el segundo estudio se examinaron los usos potenciales del *Big Data* para mejorar la posición competitiva de las empresas de telecomunicaciones en base a la Teoría de la Visión Basada en los Recursos. Tras estimar un modelo de ecuaciones estructurales los resultados indicaron que el *Big Data Analytics*

mejora las plataformas de redes sociales, el boca a boca electrónico y la gestión electrónica de las relaciones con los clientes, que influyen, a su vez, positivamente en el rendimiento del mercado y, en última instancia, aumentan la ventaja competitiva.

El tercer estudio investigó la influencia del *Marketing Intelligence* y del *Business Intelligence* sobre la innovación de productos y servicios, examinando específicamente el papel del conocimiento experiencial del cliente como mecanismo mediador. Los resultados revelaron relaciones positivas significativas entre el *Marketing Intelligence*, el *Business Intelligence*, el conocimiento experiencial del cliente y la innovación de productos y servicios. Además, el conocimiento de la experiencia del cliente resultó ser un mediador significativo. Estos resultados ponen de relieve la importancia de aprovechar las estrategias basadas en la inteligencia y los conocimientos de los clientes para impulsar la innovación en las empresas.

Así pues, en conjunto, estos estudios contribuyen a comprender el papel crucial del *Business Intelligence* en la industria de las telecomunicaciones en Jordania, promoviendo un enfoque más flexible y adaptable ante los constantes requisitos tecnológicos y del mercado.

Abstract

The telecommunications sector in Jordan is currently undergoing significant transformations as a result of technological developments in the industry and their correlation with consumer demands and expectations. This field plays a crucial role in socio-economic progress and in connecting with the global community. However, as in many other countries, it faces a number of challenges in adapting to the changing telecommunications landscape.

The challenges facing the telecommunications sector in Jordan in terms of customer retention are considerably significant. It highlights in this context the critical role of business intelligence systems in maintaining and fostering customer loyalty, as well as ensuring customer satisfaction. This dissertation focused on investigating three aspects related to business practices in the telecommunications sector, addressing specific issues in each case.

The first study analyzed the impact of Business Intelligence on customer loyalty in telecommunications companies. A quantitative approach was adopted for the collection and evaluation of primary data, which were used to test the proposed hypotheses. The study population consisted of employees in the telecommunications sector in Jordan. The results indicated that the use of Business Intelligence has positive effects on the quality of e-services, electronic customer relationship management, electronic word of mouth and social media. It also identified its impact on customer satisfaction and customer loyalty, crucial aspects in a competitive context such as telecommunications.

The second study examined the potential uses of Big Data to improve the competitive position of telecommunications companies based on the Resource-Based View Theory. After estimating a structural equation model the results indicated that Big Data Analytics improves social media, electronic word-of-mouth and electronic customer relationship management, which in turn positively influence market performance and ultimately increase competitive advantage.

The third study investigated the influence of Marketing and Business Intelligence on product and service innovation, specifically examining the role of customer experiential knowledge as a mediating mechanism. The results revealed

significant positive relationships between Marketing and Business Intelligence, customer experiential knowledge and product and service innovation. In addition, customer experiential knowledge proved to be a significant mediator. These results highlight the importance of leveraging intelligence-based strategies and customer insights to drive innovation in companies.

Thus, these studies contribute to understanding the crucial role of Business Intelligence in the telecommunications industry in Jordan, promoting a more flexible and adaptive approach in the face of constant technological and market requirements.

Thesis structure

This thesis begins with an introduction that provides an overview of the research context, explaining the research problem and the objectives of this work. In the first chapter, the reader is introduced to the subject of the thesis, the problem that motivated the study, as well as the primary and secondary objectives. The theoretical and scientific significance of the research is also outlined. Additionally, this chapter addresses the justifications for conducting the study and presents the broad structure of the thesis.

The second chapter constitutes the theoretical framework. It discusses telecommunications companies, the evolution of the telecommunications sector, and the most important technological milestones. Furthermore, it provides a conceptual framework for data analysis, identifying its characteristics and applications, as well as explaining the concept, characteristics, and tools of business intelligence.

The third chapter presents the first study, where we analyze the impact of business intelligence on customer loyalty in telecommunications companies. In this chapter, we also explore variables that mediate customer satisfaction and loyalty.

The fourth chapter introduces the second study, which examines the influence of big data analytics on competitive advantage.

The fifth chapter covers the third study, where we investigate the effects of marketing and business intelligence on product and service innovation, particularly focusing on innovations based on customers' experiential knowledge.

Finally, the sixth and last chapter presents the conclusions, implications, limitations, and future research directions.

The structure of this thesis is summarized in Figure 1.

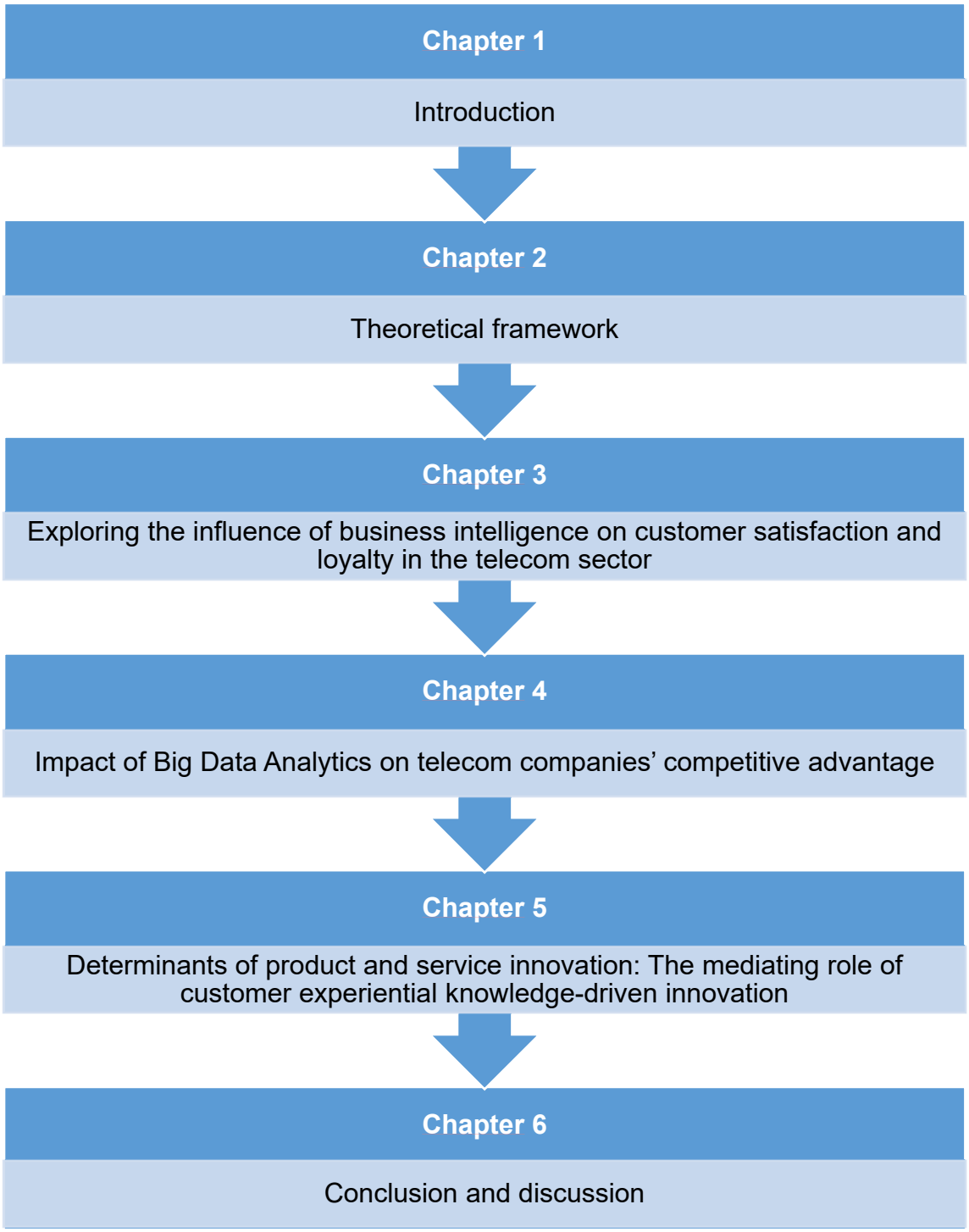

Figure 1. Thesis structure

Chapter 1

Introduction

1.1 Introduction

This chapter serves as the entry point into our research topic, exploring the background of the study, which consists of several components. First, we present the justifications for conducting this research. Following this, we delve into the value of the study, grounded in a review of existing literature, and establish connections between the studies we conducted to achieve the objectives. We also explain the core objectives and how they were met through the three studies.

In the telecommunications industry, Jordanian companies today face intense competition, with customer loyalty being a pivotal factor in their success. Given the abundance of options available to customers, these companies must constantly address the challenge of retaining their existing customer base while attracting new subscribers. In this landscape, business intelligence (BI) is emerging as a transformative tool, providing valuable insights and strategies to enhance customer loyalty (Bharadiya, 2023a). Additionally, the analysis of big data in telecommunications highlights the importance of utilizing large volumes of structured and unstructured data to derive actionable insights. Through advanced analytical technologies, telecom companies can gain real-time understanding of customer behaviors and market trends, allowing them to predict consumer demands and optimize network performance (Rath et al., 2024). This study emphasizes big data analytics as a strategic necessity for telecom companies aiming to remain agile and responsive in a constantly evolving industry.

In today's rapidly advancing telecommunications sector, marked by fierce competition and swift technological progress, companies are continuously seeking methods to boost customer loyalty, gain a competitive edge, and drive innovation (Muhuni & Ouma, 2024). Numerous studies have explored various facets of this complex industry, with a focus on business intelligence's role in customer loyalty, big data analytics, competitive advantage, and the impact of marketing intelligence on product and service innovation through customer experience-driven strategies (Ahmad et al., 2023; Khrisat et al., 2023; Niu et al., 2021; Tong-On et al., 2021).

The concept of competitive advantage is crucial for understanding how telecom companies differentiate themselves in the marketplace. By effectively using business intelligence, big data analytics, and other strategic resources (Gupta et al., 2021), companies can surpass their competitors by offering superior products, services (Shah, 2022), and customer experiences. This study underscores the importance of implementing data-driven strategies to outperform competitors and sustain market leadership (Mikalef et al., 2020).

Business intelligence includes a broad range of techniques and processes designed to analyze raw data and convert it into actionable insights for informed decision-making (Bharadiya, 2023b). In the telecommunications sector, BI is a powerful tool that helps companies deeply understand customer behaviors, preferences, and needs (Paradza & Daramola, 2021). By employing advanced analytics, predictive modeling, and data visualization techniques, telecom companies can extract valuable insights from vast datasets, enabling them to tailor their services and engagement strategies to meet customer expectations (Rehman et al., 2022).

The impact of business intelligence on customer loyalty within telecommunications firms is both complex and substantial. Companies can effectively segment their customer base, identifying unique demographics, usage trends, and preferences (Shobana et al., 2023). This segmentation allows telecom providers to customize their services, offering targeted promotions, pricing strategies, and service bundles that cater to specific customer segments (Wardana et al., 2023). Such personalization enhances customer satisfaction and fosters loyalty by demonstrating the company's responsiveness to individual needs (Wirtz & Kowalkowski, 2023).

Moreover, business intelligence supports proactive customer relationship management by allowing telecom companies to predict and address customer issues before they escalate (Alexander, 2024). By analyzing historical data and real-time interactions, BI systems can detect potential signs of churn, such as reduced usage patterns or complaints, enabling timely retention strategies (Lissy

et al., 2024). These may include personalized offers, proactive support, or service enhancements, empowering companies to reduce churn and strengthen customer loyalty (Fatima et al., 2024).

Business intelligence also enables telecom companies to improve service delivery and customer experiences. By analyzing network performance data, customer feedback, and service usage metrics, BI systems can identify areas for improvement and innovation (Choi et al., 2020). Whether it's enhancing network coverage, optimizing customer support processes, or introducing new service features, insights driven by BI help companies continuously adapt to meet evolving customer expectations (Revathy et al., 2023). Consistently delivering superior experiences allows telecom providers to cultivate lasting customer loyalty (Shahzad et al., 2021).

In Jordan's telecommunications sector, business intelligence programs help companies improve customer relationship management practices. By mediating the relationship between business intelligence and customer satisfaction, these programs address variables that significantly affect loyalty, such as social media, electronic word of mouth, and the quality of e-services. Through the analysis of historical data and real-time interactions, BI systems can detect early signs of dissatisfaction, enabling proactive interventions such as personalized offers, targeted marketing campaigns, or improved customer support initiatives. These strategies help reduce churn, strengthen customer relationships, and foster lasting loyalty.

Additionally, BI facilitates continuous improvement and innovation in service delivery. By analyzing network performance data, customer feedback, and market trends, telecom companies can optimize network infrastructure, streamline processes, and introduce innovative products and features that align with customer preferences. This commitment to excellence allows companies to stand out in a competitive market, leading to increased customer satisfaction and loyalty.

In this dynamic environment, where technological progress and competition are constantly increasing, customer loyalty is becoming crucial for the sustainable

success of telecom companies in Jordan (Hajar et al., 2022). The strategic application of business intelligence is essential for shaping customer relationships, boosting loyalty, and ensuring long-term viability (Keshavarz et al., 2021).

The integration of marketing intelligence with business intelligence amplifies the impact of big data analytics by providing a comprehensive understanding of customer needs and preferences (Charles et al., 2023). Through advanced segmentation, predictive modeling, and sentiment analysis, telecom companies can tailor their marketing strategies and promotions to specific customer segments (Hajli et al., 2020). This combined use of marketing and business intelligence helps identify high-value customers, personalize interactions, and build deeper relationships, enhancing both customer satisfaction and loyalty (Rane, 2023).

The convergence of big data analytics, marketing intelligence, and business intelligence also drives product and service innovation in Jordanian telecom companies. By leveraging experiential knowledge from customer interactions, companies can identify weaknesses, unmet needs, and opportunities for differentiation. This customer-centric approach to innovation allows telecom companies to develop new products, services, and features that meet evolving market demands. Constantly iterating and improving offerings based on real-time insights helps companies maintain a competitive advantage and drive long-term growth in a dynamic market.

This thesis addresses gaps in existing research by providing an in-depth analysis of the impact of business intelligence on customer loyalty, competitive advantage, and service innovation, with a focus on the Jordanian telecommunications sector. It seeks to fill several research gaps, including how big data analytics can be used strategically to achieve and maintain a competitive advantage, and how business intelligence insights can enhance customer loyalty in the telecommunications industry. Finally, this thesis provides a comprehensive analysis of how marketing intelligence and business intelligence work together to foster innovation and meet evolving customer needs.

By addressing these research gaps, this thesis contributes to the current body of knowledge on data analysis and business intelligence in telecommunications. The findings will be particularly relevant for stakeholders in the Jordanian telecommunications sector, offering a framework for enhancing customer loyalty, competitive advantage, and service innovation through the effective use of business intelligence.

1.2 Research justification

This study on the impact of data analysis and business intelligence (BI) in Jordanian telecommunications companies is crucial for several reasons. The telecommunications sector in Jordan is both highly competitive and rapidly evolving, driven by technological advancements and increased customer expectations. Given this environment, telecommunications companies need effective strategies to differentiate themselves, retain customers, and attract new ones. The use of big data analytics and business intelligence offers a powerful approach to achieving these objectives. It allows companies to make informed decisions, better understand customer behavior, and anticipate market changes, ensuring that their products and services remain relevant and competitive.

The Jordanian telecommunications market is a cornerstone of the national economy, with significant reliance on mobile phone and internet services. As customer choices expand, it becomes increasingly important for companies to adopt proactive strategies that focus on customer needs and satisfaction. Business intelligence can help companies analyze customer preferences, identify emerging trends, and deliver personalized services, fostering customer loyalty and competitive advantage.

In the global context of digital transformation, where industries are increasingly data-driven, Jordanian telecom companies need to adopt modern technologies like big data analytics and business intelligence. This ensures they remain agile and innovative, enabling them to sustain their market position and meet the evolving demands of consumers.

In our current study, three significant research gaps were investigated. The first research gap seeks to enrich the resource-based view (RBV) theory by showing how big data analytics can be considered a strategic resource for telecom companies. This study demonstrates that the dynamic management of big data can lead to sustainable competitive advantages, particularly by expanding its application in telecommunications. Additionally, the research emphasizes the role of big data in enhancing companies' dynamic capabilities, which enables them to respond to market changes quickly. By focusing on the telecommunications industry and cross-cultural factors, this study fills a gap in understanding how big data analytics can contribute to competitive advantage in this sector.

The second gap highlights a disconnect between the theoretical understanding of customer loyalty and its practical implementation through data analysis and business intelligence in telecom companies. While there has been research on data analytics, business intelligence, and customer loyalty separately, there is limited understanding of how these elements work together to influence customer retention. This study provides a comprehensive framework for explaining how big data analytics and business intelligence affect customer loyalty in telecom companies, with the goal of helping companies improve their customer retention strategies.

The third research gap examines how marketing and business intelligence can foster product and service innovation by leveraging customers' experiential knowledge. While many studies focus on the role of technology in driving innovation, this study emphasizes the importance of customer knowledge in shaping innovation. It investigates how the interplay between marketing intelligence, business intelligence, and customer insights contributes to product and service development in telecom companies.

The main objectives of this study include:

- Evaluating the impact of business intelligence, data analysis, and marketing intelligence on product and service innovation within Jordanian telecommunications companies.

- Investigating the mediating role of customer experiential knowledge in the relationship between business intelligence and product/service innovation.
- Assessing the impact of electronic word of mouth, electronic customer relationship management (e-CRM), online service quality, and social media on customer loyalty and competitive advantage.
- Providing actionable insights for Jordanian telecom companies on how to leverage big data and business intelligence for long-term competitive advantage and customer loyalty.

By addressing these research gaps, this study contributes to the existing body of knowledge on the strategic role of business intelligence in telecommunications. It highlights the importance of integrating marketing intelligence and business intelligence with customer insights to drive innovation and maintain a competitive edge in the market. This research is particularly relevant to the Jordanian telecom sector, where competition is fierce, and innovation is key to sustaining market leadership.

1.3 Background of the study

In the telecommunications industry, where rapid technological advancements and shifting market dynamics are the norm, maintaining a loyal customer base is crucial for long-term success (Hajar et al., 2022). Telecommunications companies are constantly developing strategies to enhance customer loyalty, recognizing its pivotal role in driving profitability, sustaining competitive advantage, and promoting sustainable growth (Kumar et al., 2011).

Business Intelligence (BI) has emerged as a key tool in this endeavor, offering telecom companies powerful insights into customer behaviors, preferences, and needs (Osakwe et al., 2023). BI involves methodologies, tools, and practices that convert raw data into actionable insights to guide decision-making. In the telecommunications sector, BI enables companies to harness vast data streams from customer interactions, network performance, and market trends, giving them a comprehensive understanding of their customer base (Enholm et al., 2022; Skyrius, 2021).

Studying the role of data analysis and BI in improving customer loyalty is critical for telecommunications companies aiming to enhance customer satisfaction and reduce churn. Through BI, these companies can design services and engagement strategies that not only meet but exceed customer expectations, thus fostering loyalty. BI systems allow for the segmentation of the customer base, the identification of unique customer groups, and the development of personalized marketing strategies. This customization builds customer satisfaction, and loyal customers are more likely to advocate for the company, contributing to brand reputation and competitive advantage.

In an era of evolving customer expectations, it is vital to understand their preferences, behaviors, and pain points. BI provides telecom companies with tools to analyze large data sets and extract actionable insights, allowing them to tailor their products and engagement strategies to meet customers' unique needs (Saniuk et al., 2020). This deepened customer understanding is essential for sustaining loyalty and staying competitive.

Innovation is a key determinant of competitive advantage in the telecommunications sector. BI plays a crucial role in identifying market trends, customer feedback, and technological capabilities that drive product and service innovation. Particularly, customer experiential knowledge is critical in guiding innovation efforts. BI systems enable telecom companies to systematically gather and analyze customer feedback and usage data, ensuring that innovations align with customer needs and market demand. This customer-focused innovation helps companies stay relevant and competitive.

In Jordan’s competitive telecommunications landscape, customers increasingly demand personalized experiences (Al-Hawwari & Obaidat, 2021). BI allows companies to effectively segment their customer base, offering targeted promotions, pricing plans, and services that enhance satisfaction and loyalty (Wolniak & Grebski, 2023). Furthermore, BI insights enable companies to differentiate themselves from competitors by offering unique, tailored solutions that resonate with customers.

Customer churn poses a significant challenge to telecom companies, directly impacting revenue and profitability (Zhao et al., 2021). BI helps companies proactively identify churn indicators and implement retention strategies, such as personalized offers and proactive customer support, to prevent churn and enhance customer relationships. Focusing on customer retention maximizes customer lifetime value, supporting long-term growth (Mitchell, 2020).

In addition to improving customer-facing activities, BI enhances internal processes and resource allocation. By analyzing operational data and performance metrics, telecom companies can identify inefficiencies, streamline operations, and allocate resources more effectively. This not only boosts operational efficiency but also improves service quality and customer satisfaction (Aung et al., 2024).

In a dynamic market environment, informed decision-making is vital. BI provides telecom companies with real-time insights into market trends, competitor activities, and customer preferences, enabling them to make data-driven decisions that align with business goals (Stone et al., 2020). This ability to make informed, strategic choices helps companies adapt to market changes and capitalize on new opportunities (Adewusi et al., 2024).

Examining the impact of data analysis and business intelligence on customer loyalty in the telecommunications sector is crucial for understanding how data-driven strategies can improve customer satisfaction, retention, and advocacy in an increasingly competitive market. BI empowers telecom companies to develop products and services that directly address customer pain points, creating innovative solutions that strengthen the relationship between the customer and the company. Customers feel valued and heard, which fosters loyalty. As a result, innovation based on experiential knowledge becomes a strategic asset, helping telecom companies stand out and achieve sustainable competitive advantage. By focusing on BI, telecom companies in Jordan and beyond can drive long-term customer relationships, enhance operational efficiency, and position themselves for sustainable growth.

1.4 Statement of the problem

The competition in the telecommunications industry has evolved beyond merely competing for market share; it now revolves around securing customer loyalty as a key driver of sustainable growth. As customers become more aware and their preferences continually shift, Jordanian telecommunications companies must adopt strategic practices that not only retain customers but also build competitive advantages through innovation and differentiation. The focus on customer loyalty has grown even more critical as technological developments, environmental concerns, and regulatory standards influence business operations and customer service.

The problem this study addresses is to determine the extent to which business intelligence (BI) systems and big data analytics impact customer loyalty in Jordanian telecommunications companies, creating a competitive advantage. While BI and data analytics offer great promise for personalizing customer experiences, increasing satisfaction, and promoting retention, many challenges must still be overcome for these technologies to be effectively utilized in the Jordanian telecom market.

Based on these considerations, the main challenges faced by telecommunications companies in Jordan are identified:

- **Changing consumer behaviors and needs**: Jordanian telecom companies operate in a market with constantly evolving consumer preferences. Despite the immense data generated by customer interactions, network performance, and market trends, there is a lack of comprehensive understanding of customer needs and preferences. As a result, companies may struggle to offer personalized experiences that resonate with diverse customer segments (Al-Zayoud et al., 2021). Customer experiential knowledge, which is crucial for innovation and loyalty, is underutilized, affecting the companies' ability to cater to specific customer pain points and expectations (Rane et al., 2021).
- **Ineffective data utilization:** Although telecom companies generate massive amounts of data, they often face challenges in managing and analyzing this data effectively. Issues like poor data management practices and a lack of

analytical capabilities hinder their ability to convert raw data into actionable insights (Al-waely et al., 2024). This results in missed opportunities for crafting data-driven strategies aimed at improving customer loyalty and satisfaction.

- **Limited integration of Business Intelligence into strategic decision-making:** While business intelligence holds the potential to transform strategic decision-making, many Jordanian telecom companies face difficulties integrating Business Intelligence tools into their decision-making processes. Challenges include a misalignment between Business Intelligence initiatives and overall business goals and a lack of a data-driven culture across organizational levels (Ahmed et al., 2020). Companies may fail to leverage BI insights to identify opportunities for innovation, differentiation, and customer retention (Al-waely et al., 2024).
- **Competitive pressures:** The Jordanian telecommunications market is highly competitive, with major established players and new entrants constantly vying for market share (Al-waely et al., 2024). In this environment, telecom companies need to innovate continuously to differentiate themselves and retain existing customers while attracting new ones. Without effectively leveraging Business Intelligence, these companies risk failing to identify opportunities for innovation and unique service offerings that could enhance customer loyalty and set them apart from competitors (Hajar et al., 2022).
- **Regulatory and compliance concerns:** Telecom companies in Jordan must navigate a complex regulatory landscape, particularly concerning data privacy and consumer rights (Al-Nasser et al., 2022). Balancing the need to use Business Intelligence to gain customer insights with strict legal requirements regarding customer privacy is a significant challenge. Companies must find ways to extract valuable data-driven insights while adhering to privacy standards and regulatory obligations (Al-Ghazawi et al., 2024).

1.5 Objectives of the research

The primary objective of this thesis is to explore data analysis as a means of creating competitive advantage and to study the impact of business intelligence on customer loyalty and product/service innovation based on experiential

customer knowledge within telecommunications companies in Jordan. This objective is achieved by synthesizing findings from three distinct research areas, thereby providing a comprehensive understanding of how data-driven strategies enhance organizational success and customer satisfaction in the telecommunications sector.

1. **Identify the concept of Business Intelligence:** Investigate its impact on customer loyalty within Jordanian telecommunications companies.
2. **Examine data analysis:** Analyze its influence on business processes in the telecommunications industry.
3. **Clarify the meaning and dimensions of Business Intelligence:** Understand how to leverage it to drive strategic decisions and improve business performance to achieve customer satisfaction.
4. **Assess the value of Business Intelligence and Big Data Analytics**: Explore their role in fostering customer loyalty.
5. **Explore product and service innovation**: Examine how innovation based on customers' experiential knowledge influences the development of products and services.

This research aims to study the interconnections between business intelligence, customer loyalty, and product/service innovation within Jordanian telecommunications companies. By synthesizing findings from the aforementioned research areas, the goal is to provide a comprehensive understanding of how data-driven strategies can enhance organizational success and customer satisfaction in this sector.

To achieve these objectives, three studies were conducted:

- The first study investigated the influence of business intelligence on customer satisfaction and loyalty within the telecom sector, evaluating how insights derived from business intelligence can lead to better customer relationships, increased satisfaction, and higher retention rates.
- The second study addressed the impact of big data analytics on the competitive advantage of telecommunications companies. This research examined how extracting actionable insights from large datasets helps

telecom firms predict market trends, improve network performance, and enhance operational efficiency.

- The third study explored the impact of marketing and business intelligence on product and service innovation through customers' experiential knowledge. It highlighted how the integration of marketing intelligence with business intelligence can drive innovation by identifying unmet customer needs and differentiation opportunities.

1.6 Importance of the study

The practical significance of this study lies in its potential to substantially impact the operations and strategies of telecommunications companies. By examining the influence of data analysis and business intelligence on customer loyalty, competitive advantage, and service innovation, this research provides actionable insights that telecom companies can implement to enhance their performance and market positioning.

The study offers practical strategies for leveraging business intelligence to understand customer behaviors and preferences, enabling telecom companies to tailor their services and marketing efforts to better meet customer needs, ultimately leading to increased satisfaction and loyalty. Practical applications include personalized service offerings, targeted promotions, and proactive customer support, all of which contribute to reducing churn and fostering long-term customer relationships.

Integrating big data analytics with business intelligence allows telecom companies to optimize their operations, identify inefficiencies, predict maintenance needs, and enhance service reliability, resulting in improved operational efficiency and cost savings. By providing a framework for incorporating business intelligence into strategic planning, the research aids telecom companies in making informed decisions that align with market trends and customer demands, ensuring they remain agile and responsive in a rapidly evolving industry.

Furthermore, this research emphasizes the importance of experiential knowledge in driving innovation. By utilizing customer feedback and insights, telecom companies can develop new products and services that address unmet needs and enhance user experiences. This customer-centric innovation process not only differentiates companies in a crowded market but also builds stronger customer loyalty and brand reputation.

Through effective utilization of business intelligence and big data analytics, telecom companies can achieve a sustainable competitive advantage by gaining deep market insights, anticipating consumer demands, and staying ahead of their competitors.

The scientific importance of this study is multifaceted, contributing to the advancement of knowledge in the fields of data analysis and business intelligence within telecommunications. It enriches the existing body of literature by exploring the interplay between business intelligence, customer loyalty, competitive advantage, and service innovation, thereby expanding the scope for future research. By integrating various aspects of business intelligence and its impact on telecom companies, the study aids in the development of comprehensive theoretical frameworks that can guide future research and provide a structured approach to analyzing similar topics in different contexts.

Additionally, the study introduces innovative methodologies for examining the role of business intelligence in telecommunications, encouraging researchers to explore this topic from various perspectives and fostering a deeper understanding of how business intelligence can be leveraged for business success. The findings and theoretical contributions provide a solid foundation for future inquiries, allowing scholars to explore related topics, test proposed frameworks in different settings, and further refine the understanding of the impact of business intelligence in telecommunications and other industries.

In summary, this study offers practical tools and strategies for telecom companies to enhance their operations and competitiveness while contributing valuable theoretical insights to the academic community. The practical importance of this research is especially pronounced in the Jordanian telecommunications sector.

By identifying the benefits of data analysis and business intelligence, this study highlights how these tools can be effectively utilized to enhance various aspects of business operations.

Understanding the strengths and weaknesses in influencing customer loyalty enables telecom companies to tailor their strategies for fostering long-term relationships with customers, ultimately reducing churn and increasing retention. This is achieved through personalized service offerings, targeted promotions, and proactive customer support, all derived from comprehensive insights into customer behaviors and preferences.

Moreover, the study explores the determinants of product and service innovation based on customers' experiential knowledge. By analyzing customer feedback and usage patterns, telecom companies can identify unmet needs and improvement opportunities, leading to the development of innovative products and services that not only meet but also exceed customer expectations. This customer-centric approach to innovation allows companies to differentiate themselves in a competitive market, thereby enhancing brand reputation and customer loyalty.

The knowledge gained from this study provides actionable insights that can strengthen the telecommunications industry in Jordan by facilitating informed decision-making and strategic improvements. Telecom companies can leverage data analysis and business intelligence to optimize their operations, predict maintenance needs, and enhance service reliability, leading to improved operational efficiency and cost savings. Additionally, integrating business intelligence into strategic planning enables companies to make data-driven decisions that align with market trends and customer demands, ensuring they remain agile and responsive in a rapidly evolving industry.

Overall, this study presents practical tools and strategies for telecom companies to enhance their performance and competitiveness. By effectively utilizing business intelligence and big data analytics, these companies can gain deep market insights, anticipate consumer demands, and stay ahead of their competitors, achieving sustainable competitive advantage. The findings of this

research are particularly relevant for stakeholders in the Jordanian telecommunications sector, offering a framework for enhancing customer loyalty, competitive advantage, and service innovation through the effective use of business intelligence. This strategic utilization of data positions companies to thrive in a competitive landscape and ensures their long-term growth and success in the digital age.

1.7 Outline of the thesis

The structure of this thesis consists of six cohesive chapters. The introductory chapter outlines the construction and organization of the thesis. It begins with an introduction, followed by a statement of the problem, the aims and objectives of the research, and a justification for the study. The second chapter focuses on the theoretical framework of the thesis, providing an overview of telecommunications companies and the relevant theoretical aspects. Moving to the third chapter, which represents the first study, the impact of business intelligence on customer satisfaction and loyalty in the telecommunications sector is explored. The fourth chapter presents the second study, analyzing big data and its influence on competitive advantage within telecommunications companies. In the fifth chapter, corresponding to the third study, the focus shifts to examining the impact of marketing and business intelligence on product and service innovation, particularly through innovation based on customers' experiential knowledge. Finally, the sixth chapter serves as a conclusion, summarizing the implications derived from the research findings.

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"*When something is important enough, you do it even if the odds are not in your favor*"
(Elon Musk)

Chapter 2

Theoretical framework

In this section of the thesis, we will examine the telecommunications sector with a particular emphasis on Jordan. We will investigate the challenges and opportunities present in this sector, highlighting the significance of big data by elucidating its concept, techniques, and applications within communications. Additionally, we will focus on business intelligence, providing a comprehensive understanding of its principles and methodologies, as well as discussing its applications in the telecommunications industry.

This section will also address related concepts, including electronic word of mouth, electronic customer relationship management, electronic service quality, customer satisfaction, and loyalty, which will be elaborated upon in subsequent sections. The aim is to establish a robust theoretical foundation that will guide the analysis of big data and business intelligence in telecommunications companies.

By doing so, this stage will offer a comprehensive understanding of how these tools are transforming the telecommunications industry while also highlighting the advantages and characteristics of telecommunications companies globally and, specifically, in Jordan.

2.1 Telecom sector

The telecommunications sector is a crucial component of modern society, enabling global communication, connectivity, and data transmission. Characterized by rapid technological advancements, regulatory complexities (Malvik, 2021), and intense competition, this industry increasingly leverages big data and business intelligence to enhance operational efficiency, improve customer experience, and drive innovation (Adewusi et al., 2024).

The transformative journey of telecommunications began in the 19th century with the invention of the telegraph, which revolutionized long-distance communication and laid the groundwork for modern telecommunications (Tworek, 2020). Companies such as Western Union in the United States played a pivotal role in establishing telegraph networks, facilitating rapid transmission across vast distances (Fitsanakis & Fitsanakis, 2020). Early telecommunications giants,

including the Bell Telephone Company (later known as AT&T), were instrumental in developing the infrastructure and technology that enabled global connectivity (Schiuma et al., 2022).

The 20th century introduced significant innovations, such as radio and television broadcasting, which brought wireless communication and mass media to the forefront (Loubere, 2021). Regulatory bodies and technological standards were established to promote the growth of telecommunications as a regulated industry, balancing competition with public interest. The latter half of the century witnessed the rise of satellite communications, which provided extensive global coverage and enabled international broadcasting and telecommunications services (Bathgate, 2020). This period also marked the onset of the digital revolution, characterized by digital switching and fiber optic technologies that significantly enhanced the capacity and quality of telecommunications networks (Malvik, 2021).

The advent of the internet in the 1990s heralded a transformative era, evolving telecommunications companies into providers of diverse digital services (Onuoha, 2023). This convergence of telecommunications, information technology, and media gave rise to integrated service providers delivering voice, data, and multimedia services over a unified network (Balbi & Fickers, 2023). In the 21st century, the expansion of mobile communications and advancements in wireless technologies, including 4G and 5G, have driven significant growth in telecommunications firms (Mendonça et al., 2023). These innovations have facilitated widespread connectivity, spurred the adoption of smartphones and the Internet of Things, and promoted advancements in sectors such as healthcare, education, and entertainment.

Today, telecommunications companies are at the forefront of technological innovation, driving the digital economy and shaping the future of global connectivity (Adetunji & Moses, 2022). They continue to invest in cutting-edge technologies like artificial intelligence, cloud computing, and 5G to meet the growing demand for high-speed, reliable, and secure communication services. The historical evolution of telecommunications companies underscores their

essential role in connecting people and fostering global economic and social development (Sami et al., 2020).

In conclusion, the development of the telecommunications sector—from the early days of the telegraph and telephone to the digital and mobile revolution—confirms its pivotal role in modern communication systems. The industry's continuous innovation and adaptation to new technologies have profoundly impacted global connectivity, economic growth, and social development, demonstrating its indispensable role in shaping the future.

2.1.1 Telecommunications sector in Jordan

The telecommunications sector in Jordan assesses major telecom companies using various criteria, categorizing them based on customer numbers, network coverage, and internet speed. The leading telecommunications providers in Jordan are Zain Jordan, Orange Jordan, and Umniah Jordan, each with unique strengths and weaknesses.

By the end of 2022, Zain Jordan held the largest market share, boasting approximately 45.2 million subscribers. Orange Jordan followed with around 5 million subscribers, while Umniah Jordan accounted for approximately 3 million customers. This distribution of subscribers provides valuable insights into the competitive landscape and market penetration of these companies within the Jordanian population.

Analyzing network coverage, Zain Jordan is distinguished by its extensive and modern network infrastructure, ensuring widespread connectivity. Since 2010, Orange Jordan has achieved significant growth in its network, now covering over 70% of urban areas, reflecting its strategic expansion efforts. In contrast, Umniah Jordan's network coverage is more limited, primarily focused on specific regions.

When evaluating internet speed, Orange Jordan leads by offering speeds of up to 14 Mbps, showcasing its commitment to high-quality service. Zain Jordan, recognized for its impressive internet speeds across the Middle East, ranks second, with recent data positioning Jordan third among Arab countries in terms

of internet speed. Umniah Jordan's internet service is hindered by its constrained network coverage and occasional speed fluctuations, affecting its overall performance. This comprehensive assessment underscores the strengths and challenges faced by these leading telecommunications providers in Jordan.

Each telecommunications company in Jordan boasts distinct features. Zain Jordan is renowned for its extensive range of wholesale solutions, including VPN, VPLS, IP access, IPX, and IX services, complemented by a robust cloud network infrastructure. This diverse portfolio positions Zain as a versatile provider catering to various business needs. Orange Jordan is lauded for its comprehensive 3G services available to all customers, high-speed ADSL internet, and advanced support for visual communication services and virtual gaming, demonstrating its commitment to cutting-edge technology. Umniah Jordan stands out for its wide array of phone and internet services, coupled with a notable loyalty program and its innovative initiative, "The Tank," which fosters creativity and entrepreneurship.

Despite their strengths, these companies also encounter challenges. Orange Jordan struggles with frequent internet outages, disrupting customer connectivity and productivity. Meanwhile, Umniah Jordan faces issues related to weak network coverage and slower internet speeds in several areas, which detracts from the overall user experience.

Thus, this thesis provides a thorough analysis of the telecommunications industry in Jordan. Data was collected through a survey research design involving three Jordanian telecom companies and a sample of managerial-level employees, highlighting the competitive landscape, strengths, weaknesses, and challenges faced by these leading telecommunications companies. This information is valuable for academics, researchers, and industry stakeholders seeking a deeper understanding of the telecommunications sector in Jordan.

The early history of telecommunications in Jordan began with the establishment of fundamental telephone services. The primary provider during this era was the state-owned Jordan Telecommunications Company, founded in the 1970s. JTC was responsible for delivering fixed-line telephony services across the country. However, during this initial phase, the telecommunications infrastructure was

rudimentary, and accessibility was quite restricted. Telephony services were predominantly available in urban areas, leaving rural regions with limited or no access to these essential communication tools. This period marked the foundational stage of Jordan's telecommunications development, setting the stage for future advancements and expansion.

In the 1990s, Jordan undertook significant reforms to liberalize its telecommunications sector. The telecommunications law of 1995 was pivotal, leading to the establishment of the Telecommunications Regulatory Commission (TRC) to oversee the industry. These reforms facilitated the privatization of the Jordan Telecommunications Company, which was partially privatized in 2000 and later fully acquired by France Telecom, becoming Jordan Telecom Group, now known as Orange Jordan. The mid-1990s witnessed a revolution in mobile communications with the launch of Fastlink (now Zain Jordan), the country's first mobile operator. This success spurred the entry of other operators, including Orange Jordan and Umniah, fostering competition and market growth.

The early 2000s marked rapid expansion in internet and broadband services, driven by an increase in internet service providers and substantial investments in infrastructure, including fiber-optic networks and 3G and 4G services. More recently, Jordan has continued to advance technologically, with the introduction of 4G in 2014 by Zain Jordan and plans announced in 2020 for 5G deployment by the TRC. The TRC plays a crucial role in shaping the regulatory and policy framework, focusing on competition, fair access, consumer protection, and innovation.

The telecommunications sector has significantly affected Jordan's social and economic development, enhancing access to information, education, and healthcare, and driving economic growth and job creation. Looking forward, the sector is poised for further growth and innovation, with 5G technology expected to unlock new opportunities in IoT, smart cities, and digital services.

The historical development of telecommunications in Jordan can be outlined as follows: Early development began with postal and telegraph services, and the first telephone exchange was established in the early 1900s (Al-Roweilly, 2020).

Privatization and liberalization in the late 1990s and early 2000s saw the partial privatization of JTC, later rebranded as Orange Jordan. Major players now include Orange Jordan, the largest fixed-line and leading mobile operator; Zain Jordan, a major mobile operator preparing for 5G; and Umniah, a rapidly growing company in the mobile and broadband markets since its launch in 2005.

The regulatory environment in Jordan's telecommunications sector is governed by the TRC, which ensures fair competition and addresses issues such as spectrum allocation, licensing, and consumer protection (Decker & Chiambaretto, 2022). Future developments and prospects are promising, with Jordan actively upgrading its infrastructure to support 4G and preparing to deploy 5G. This advancement will enhance mobile broadband services and facilitate new applications in the Internet of Things, smart cities, and digital transformation (Mahdi et al., 2021). Efforts to expand fiber-optic networks are ongoing, aiming to improve high-speed Internet access for both individuals and businesses.

Over the years, Jordan's telecommunications sector has seen significant development, benefiting from liberalization, technological progress, and investments from both local and international companies. The future looks bright with the imminent launch of 5G technology and further digital transformation initiatives (Ismail & Buyya, 2022).

In conclusion, Jordan's telecommunications sector has evolved remarkably, transitioning from basic telephony to an advanced ecosystem of communication services. This transformation has been driven by strategic reforms, technological advancements, and a commitment to fostering a competitive and innovative market. As Jordan continues to embrace digital transformation, the telecommunications sector will play a pivotal role in shaping the country's future.

2.1.2 Challenges and opportunities in the telecommunications sector

The telecommunications sector worldwide faces significant challenges, primarily in keeping pace with rapid technological advancements. The swift evolution of technologies like 5G, artificial intelligence (Ochuba et al., 2024), and the Internet

of Things demands substantial investments and ongoing innovation. However, adopting these technologies can create avenues for new services and enhance operational efficiencies (Jabeen & Ishaq, 2024).

Navigating diverse and complex regulatory environments across different regions poses another challenge, often requiring considerable legal and administrative resources. Proactive compliance and engagement with regulators can lead to favorable policies and competitive advantages. The telecom industry is highly competitive, with numerous players vying for market share, resulting in price wars and reduced profit margins. Companies that excel in customer service, offer innovative products, and form strategic partnerships can thrive in this crowded market (Ezeigweneme et al., 2024; Maleka & Matli, 2024; Simsek & Urmee, 2020).

Cybersecurity threats present a critical challenge, as defending against increasingly sophisticated cyberattacks is essential to prevent significant financial and reputational damage. Investing in robust cybersecurity measures not only mitigates losses but also builds customer trust and loyalty (Cardinale, 2022). Additionally, infrastructure costs remain a major challenge, especially in remote or underserved areas, where building and maintaining telecom infrastructure is expensive and time-consuming (Shahzad et al., 2021). Public-private partnerships and innovative funding models can help distribute these costs and expedite infrastructure development (Tataria et al., 2021).

Despite these challenges, the telecommunications sector offers numerous growth opportunities. Emerging markets present substantial growth potential due to rising demand for connectivity and digital services (Bhatti et al., 2021). Telecom companies can significantly contribute to the digital transformation of other industries by providing services that enhance efficiency and productivity. Diversifying services is another promising opportunity; expanding into areas like cloud computing, data analytics, and managed IT services can create new revenue streams for telecom companies (Gustavsson et al., 2021). Moreover, utilizing big data and artificial intelligence to understand and meet customer needs can improve customer satisfaction and retention (Ezeigweneme et al., 2024).

In Jordan, the telecommunications sector faces unique challenges. Providing telecom services to rural and remote areas is difficult due to high costs and logistical issues. Economic constraints, including limited financial resources and high operational expenses, can impede the sector's growth and modernization (Abdalla & Mohamed, 2020; Jalghoum et al., 2021; Nusairat et al., 2021). The local regulatory landscape in Jordan is complex, with frequent changes and compliance requirements posing significant challenges (Alawamleh et al., 2023). Additionally, protecting against cyber threats and ensuring data privacy for users is an increasing concern, necessitating substantial investment in security infrastructure (Alghzawi et al., 2020).

However, there are significant opportunities within the Jordanian telecommunications sector. The deployment of 5G technology promises enhanced connectivity (Ashal et al., 2021), faster internet speeds, and new service offerings. Increasing internet penetration, particularly in underserved areas, can drive the growth of digital services and applications (Khdour et al., 2021). Government initiatives aimed at improving digital infrastructure and the regulatory environment can foster a more conducive atmosphere for telecom growth (Al Ajaleen & Saadon, 2023). The rising demand for digital services such as e-commerce, e-government, and online education presents new revenue streams for telecom companies (Al-Abbadi et al., 2021). Collaborating with international telecom companies and technology providers can bring expertise, technology, and investment to the Jordanian telecom sector. Furthermore, Jordan's young and tech-savvy population can drive the adoption of new technologies and services, fostering growth in the telecom sector.

In conclusion, while the telecommunications sector in Jordan faces several challenges, there are numerous opportunities for growth and innovation. By addressing these challenges and leveraging opportunities, the sector can continue to evolve and play a vital role in the country's economic and social development.

2.2 Big Data

In the digital age, the extensive generation of data from sources such as social media, e-commerce transactions, sensor networks, and scientific research has ushered in what is commonly referred to as the "Big Data" era. This term encompasses not only the massive volumes of data produced but also its complexity and the rapid pace at which it is generated, processed, and analyzed (Olabode et al., 2022). The emergence of big data has profound implications across various domains, including business, healthcare, and finance, by driving innovation, enhancing decision-making processes, and presenting new opportunities and challenges (Pham, 2018).

Big data refers to extremely large datasets that are complex and difficult to manage using traditional data processing methods (Luengo et al., 2020). This concept is defined by five characteristics, often referred to as the "5 Vs": volume, variety, velocity, veracity, and value. These characteristics delineate the scope of big data and influence how data is analyzed and utilized across various applications (Mohamed et al., 2020).

The theoretical framework for a thesis on big data offers a structured approach to exploring its multifaceted nature. This framework is crucial for grounding research in a solid conceptual foundation, guiding analysis, and contextualizing findings within the broader academic discourse. It typically includes key concepts, theories, and models that highlight the characteristics, challenges, and practical applications of big data, thereby fostering a comprehensive understanding of this phenomenon.

2.2.1 Concept of Big Data and Big Data Analytics

Big data refers to datasets so vast and complex that traditional data processing techniques are inadequate for their management and analysis. Characterized by the five Vs—Volume, Variety, Velocity, Veracity, and Value—big data underscores the intricate nature and potential benefits of handling extensive datasets (Shamim et al., 2020). These datasets are not only extraordinarily large

and complex but also grow at an accelerating rate, surpassing the capabilities of conventional data processing tools (Kou, 2017). Defined by their high volume, rapid velocity, and diverse variety, big data necessitates innovative processing approaches to enhance decision-making, uncover insights, and improve processes (Hancock & Khoshgoftaar, 2020). This includes datasets that exceed the capacity of standard software tools to efficiently capture, organize, manage, and process within a reasonable timeframe (Rani et al., 2023).

Analyzing big data involves examining vast and varied datasets to uncover hidden patterns, unknown relationships, market trends, customer preferences, and other valuable business insights. This process requires advanced data processing techniques and tools capable of handling substantial volume, speed, and complexity (Manikandan et al., 2023). Methods designed to extract meaningful insights and knowledge from large datasets often employ sophisticated analytical tools such as machine learning, statistical analysis, and data mining (Nair, 2023). Big data analytics applies algorithms, predictive models, and various analytical techniques to large-scale datasets, aiming to derive actionable insights that support strategic decision-making, enhance operational efficiency, and foster competitive advantages (Hou et al., 2020).

Key concepts in big data analytics include the 5 Vs (Herschel, 2021; Ibtisum, 2020; Orhean, 2022):

- Volume refers to the immense scale of data, often quantified in terabytes, petabytes, or exabytes.
- Variety encompasses structured, semi-structured, and unstructured data, highlighting the diversity of data forms and sources.
- Velocity indicates the rapid rate at which data is generated and processed, necessitating real-time analytics capabilities.
- Veracity pertains to the reliability and accuracy of data, essential for ensuring quality and trustworthiness in analysis.
- Value represents the potential insights and benefits derived from analyzing big data, crucial for enhancing decision-making processes and strategic outcomes.

Understanding the data lifecycle of big data involves tracing its journey from initial generation and collection through storage, processing, and ultimately analysis. This concept encompasses efficient data management practices and addresses critical aspects such as data governance and ethical considerations related to data utilization (Agael, 2020). The lifecycle emphasizes the importance of maintaining data integrity and security while ensuring that the data can be effectively used to generate actionable insights. By managing the data lifecycle effectively, organizations can harness the power of big data to drive innovation and achieve competitive advantages.

2.2.2 Big data applications

Big data has become a vital resource for telecommunications companies, offering significant opportunities to enhance operational efficiency, improve customer experiences, and drive innovation. This theoretical framework examines the various applications of big data within telecommunications firms, focusing on key areas such as customer analytics, network management, operational optimization, and strategic decision-making (Tamiminia et al., 2020).

Three primary dimensions characterize big data: volume, velocity, and variety. Volume refers to the immense amounts of data generated and collected from diverse sources, including network traffic, customer interactions, and operational systems. Velocity addresses the speed at which data is generated, necessitating real-time or near-real-time processing. Variety encompasses the different types of data, such as structured, semi-structured, and unstructured data, originating from sources like social media, sensors, and enterprise systems (Wang et al., 2020).

In discussing the role of Big Data in telecommunications, we highlight the following applications (Phudech, 2024; Rane, 2023):

- **Customer experience management:** The application of big data allows telecommunications companies to conduct comprehensive analyses of customer behaviors, preferences, and sentiments. This capability facilitates

the personalization of services, prediction of customer churn, and enhancement of overall customer satisfaction. Through advanced data analytics, telecommunications firms can gain deeper insights into customer interactions and tailor their offerings to meet individual needs. By leveraging big data, companies can proactively identify at-risk customers, implement targeted retention strategies, and improve service quality, ultimately leading to a more satisfying customer experience.

- **Network optimization**: The integration of big data analytics has revolutionized the telecommunications industry. It enables detailed analyses of customer behaviors and network performance, facilitating proactive failure prediction and effective resource management to meet varying demands.
- **Operational efficiency**: Big data analytics enhances operational efficiency by streamlining processes, optimizing resource allocation, and reducing costs through automated decision-making.
- **Product development and innovation**: Telecommunications companies utilize big data insights to introduce new services and improve existing offerings, maintaining competitiveness in a rapidly evolving market.
- **Data-Driven marketing strategies**: Advanced customer segmentation and behavioral analysis techniques enabled by big data allow for precise targeting, cross-selling, and upselling.
- **Regulatory compliance and cybersecurity**: Big data analytics supports regulatory compliance efforts, facilitates regulatory reporting, and strengthens cybersecurity measures, ensuring the protection of sensitive customer information and compliance with regulatory standards.

In summary, the strategic application of big data analytics in the telecommunications industry fosters enhanced customer experience management, network optimization, operational efficiency, product development, and innovation, while supporting robust data-driven marketing strategies and reinforcing regulatory compliance and cybersecurity measures.

2.2.3 Big data applications in telecommunications

Telecommunications companies employ a structured framework for leveraging big data across various operational domains. Data acquisition involves gathering information from diverse sources, such as customer interactions, network logs, IoT devices, and external data like social media and market trends (Surbakti et al., 2020). Subsequently, the use of scalable storage solutions and robust data management platforms ensures efficient handling of large volumes of structured and unstructured data (Diène et al., 2020). Advanced analytics techniques, including machine learning, artificial intelligence, and predictive modeling, are applied during the data processing and analysis phases to extract actionable insights. These insights are effectively communicated through data visualization tools and dashboards, facilitating informed decision-making at all organizational levels (Diène et al., 2020). Finally, integrating big data insights into operational processes and continuously monitoring performance metrics allows for real-time adjustments and strategic refinements (Fedushko et al., 2020).

2.2.4 Theoretical foundations

Information theory provides a foundational understanding of the efficient transmission, compression, and storage of data, which is crucial for addressing the complexities associated with big data challenges (Torre, 2021). Conversely, systems theory explores the interconnectedness and interdependencies within complex systems, offering insights into the interaction among various data sources and analytical processes within big data ecosystems. Decision theory supplies principles and methodologies for making informed decisions in the face of uncertainty, a critical aspect supported by big data analytics (Pietsch, 2021). Furthermore, data science and analytics encompass a wide range of techniques, including statistical analysis, machine learning, data mining, and predictive analytics, all essential for extracting meaningful insights from big data (Fettweis & Boche, 2021).

The data lifecycle involves several fundamental models and frameworks that guide the management and application of big data. The DIKW pyramid (Data-Information-Knowledge-Wisdom pyramid) illustrates the evolution of data from its raw state to valuable insights, highlighting its transformative journey through various stages (Bratianu & Bejinaru, 2023). Additionally, the big data maturity model assesses an organization's ability to adopt and integrate advanced analytics. This model not only evaluates current maturity levels but also provides a roadmap for improving big data practices and achieving strategic objectives (Okuyucu & Yavuz, 2020).

2.2.5 Challenges and considerations

Big data applications in telecommunications encompass several critical dimensions. Privacy and security measures are paramount, ensuring compliance with data privacy regulations and safeguarding customer data against breaches and unauthorized access. Addressing data quality and integration challenges is essential to ensure data accuracy, consistency, and seamless integration across systems to support reliable analysis and decision-making (Demirdöğen, 2021). Additionally, developing and retaining skilled talent in big data analytics, data science, and emerging technologies is crucial for effectively leveraging data insights. Investing in scalable infrastructure, cloud computing solutions, and advanced analytics tools supports the robustness and scalability of big data initiatives (Persaud, 2021). These strategies collectively enable telecommunications companies to optimize operations, enhance customer service, and foster innovation (Holmlund et al., 2020; Jagatheesaperumal, 2021; Mariani & Wamba, 2021; Mikalef & Krogstie, 2020).

Big data plays a crucial role in various operational and strategic areas within telecommunications. In customer experience management, it allows for the personalization of services based on individual preferences, predicts customer churn for retention, and analyzes feedback to improve service quality (Mariani & Wamba, 2021). Network optimization leverages big data to manage data traffic efficiently, predict and prevent network failures, and plan network capacity to

meet demand (Rane, 2023). Revenue assurance and fraud detection utilize real-time data to identify revenue leaks and detect fraudulent activities (Phudech, 2024). In product development and innovation, big data analyzes market trends and usage patterns to create new products and enhance existing ones (Rane, 2023). Operational efficiency is achieved by optimizing resource allocation and improving supply chain management (Demirdöğen, 2021). Marketing and sales optimization benefit from targeted advertising and cross-selling strategies informed by customer data. Furthermore, big data ensures regulatory compliance and reporting by adhering to regulations and enhancing data security (Phudech, 2024). In customer care and support, automated systems deliver efficient service and monitor service quality (Sankar & David, 2023). Location-based services utilize geospatial analysis for targeted promotions and to improve network coverage (Shiode et al., 2002). Finally, predictive maintenance employs big data to monitor equipment health and predict failures, thereby reducing maintenance costs (Cezar, 2023).

By harnessing the power of big data, telecommunications companies can vastly improve their operational efficiency, boost customer satisfaction, and foster innovation in their services. Big data provides these companies with unparalleled opportunities to revolutionize their operations, enrich customer experiences, and drive strategic innovation. Employing a theoretical framework for big data, firms can effectively address challenges, seize opportunities, and sustain growth in a competitive, data-driven industry. This approach enables them to make informed decisions, optimize processes, and maintain a competitive edge by continuously adapting to emerging trends and customer needs.

2.3 Business intelligence

Business intelligence represents a pivotal paradigm shift in how organizations harness data to drive strategic decisions, operational efficiencies, and competitive advantages in today's dynamic business landscape. This theoretical framework delves into the multifaceted realm of business intelligence, exploring

its foundational concepts, methodologies, and transformative potential across various industries.

In the digital age, where data has become the lifeblood of organizations, the concept of business intelligence stands as a beacon of strategic empowerment and competitive advantage. Business intelligence encompasses a set of methodologies, processes, architectures, and technologies that transform raw data into meaningful, actionable insights. These insights enable companies to make informed decisions, improve operations, and drive growth in increasingly complex and competitive environments (Phillips-Wren, 2021).

The development and importance of business intelligence can be traced back to the need for organizations to extract value from the growing amounts of data generated by their operations. Initially, business intelligence focused on reporting and querying capabilities to analyze historical data stored in databases (Bharadiya, 2023). Over time, it has evolved into a sophisticated system that integrates advanced analytics, data visualization, and predictive modeling to uncover patterns, trends, and interrelationships within the data (Paradza & Daramola, 2021).

Today, artificial intelligence plays a pivotal role in shaping organizational strategies by providing decision-makers with relevant and timely information. By harnessing business intelligence tools and technologies, companies can gain deeper insights into customer behavior, market dynamics, operational performance, and emerging trends (Olszak & Ziemba, 2006). These insights empower leaders to proactively identify opportunities, mitigate risks, and enhance business operations to achieve sustainable growth and competitive advantage (Bharadiya, 2023).

2.3.1 Definition of business intelligence

Business Intelligence emerged as a concept in 1958, introduced by researcher Hans Peter Luhn, with the aim of using information and data to aid organizational decision-making through graphical representations that help both employees and

company owners quickly understand and improve performance (Fernandez & Gallardo-Gallardo, 2021). Business intelligence is often compared to an escalator in a large space, providing a swift and efficient way to reach desired goals, much like how organizations use business intelligence tools to stay ahead in the competitive landscape (Soni et al., 2021).

Business intelligence encompasses technologies, applications, practices, and processes that organizations use to collect, integrate, analyze, and present business information. The primary goal of business intelligence is to facilitate data-driven decision-making by offering insights into business operations, trends, and opportunities. From data collection and storage to advanced analytics and visualization, business intelligence supports organizations in optimizing performance, improving efficiency, and gaining a competitive edge through informed decision-making based on reliable and actionable data insights (Kerpedzhiev et al., 2020; Modgil & Hannibal, 2022).

The key components and capabilities of business intelligence encompass a variety of essential elements that collectively empower organizations to derive value from their data. Data integration and management involve consolidating data from diverse sources, including internal databases, enterprise systems, and external platforms like social media and IoT devices. Effective data management processes ensure data quality, consistency, and accessibility for analysis (Wu et al., 2023).

Analytics and reporting utilize advanced techniques such as descriptive, diagnostic, predictive, and prescriptive analytics to explore data, uncover insights, and support data-driven decision-making. Reporting functionalities transform insights into visualizations, dashboards, and reports, facilitating comprehension and communication across the organization (Al-Okaily, 2023). Business Performance Management aids in monitoring and managing organizational performance by defining and tracking key performance indicators and metrics, offering a comprehensive view of progress toward strategic goals (Ranjan & Foropon, 2021). Data visualization and dashboards employ tools that convert complex datasets into intuitive visual representations, enabling

stakeholders to interactively explore data and gain deeper insights into trends and patterns (Niu, 2021).

However, implementing effective business intelligence initiatives poses challenges; organizations must tackle issues related to data quality, integration complexity, technology infrastructure readiness, and effective data management. Additionally, cultivating a data-driven culture and aligning business intelligence strategies with organizational objectives are crucial factors for maximizing the return on business intelligence investments (Conboy et al., 2021).

2.3.2 Business intelligence tools

Business intelligence tools encompass software applications and platforms specifically crafted to streamline the collection, integration, analysis, and visualization of organizational data. This includes various commercial activities such as sales, employee salaries, strategic planning, and internal processes known only to employees and management. These tools are essential for converting raw data into actionable insights that aid in informed decision-making and strategic planning (Bany et al., 2021; Hadhoud et al., 2020; Tavera et al., 2021).

Business intelligence tools offer a variety of essential features that facilitate the collection, integration, analysis, and visualization of organizational data. They are designed to integrate data from diverse sources, such as databases, spreadsheets, cloud services, and enterprise applications, providing a unified view of organizational data (Nwosu, 2024). Many of these tools include data warehousing capabilities, enabling the storage of vast amounts of both structured and unstructured data in centralized repositories for comprehensive analysis (Martins et al., 2020). These tools often support data modeling and schema design, allowing users to define relationships between data elements and optimize data structures for better analysis (Vera-Olivera et al., 2021).

Business intelligence tools typically offer intuitive interfaces for querying data and generating customizable reports, empowering users to create ad-hoc queries or

predefined reports to extract specific insights (Srivastava & Venkataraman, 2020). Advanced analytics functionalities, such as statistical analysis, predictive modeling, and machine learning, help identify trends, patterns, and correlations within the data. Visualization features enable the creation of interactive dashboards, charts, graphs, and maps, enhancing data comprehension and facilitating the communication of findings (Delen, 2020). Performance monitoring features track key performance indicators in real-time, with alerts to notify stakeholders of significant changes (Schutte, 2021).

Increasingly, business intelligence tools support self-service capabilities, allowing business users to explore and analyze data independently, thus promoting agility in decision-making (Passlick et al., 2020). Additionally, many modern business intelligence tools offer mobile access, enabling users to view dashboards and reports on smartphones and tablets, ensuring access to critical insights anytime, anywhere (Li, 2024).

In today's data-driven business environment, effectively leveraging business intelligence tools is crucial for organizations aiming to maintain a competitive edge. These tools are designed to collect, analyze, and visualize data, transforming raw information into actionable insights that support strategic decision-making (Niu et al., 2021). They offer a range of functionalities, from data integration and reporting to advanced analytics and predictive modeling. As organizations increasingly recognize the value of data-driven insights, the adoption of business intelligence tools has become fundamental across various industries (Moinuddin et al., 2024).

This section explores some of the most popular business intelligence tools available on the market, examining their features, capabilities, and applications:

- **Tableau:** Renowned for its powerful data visualization capabilities and user-friendly interface, Tableau allows users to create interactive dashboards and reports (Batt et al., 2020).

- **Power BI:** Developed by Microsoft, Power BI integrates seamlessly with other Microsoft products and offers robust data connectivity, advanced analytics, and AI capabilities (Deckler, 2022).

- **QlikView/Qlik Sense:** QlikView provides associative data indexing and in-memory data processing, while Qlik Sense offers self-service analytics and AI-driven insights (Schiavone, 2022).
- **IBM Cognos Analytics:** IBM's business intelligence platform offers comprehensive reporting, dashboards, and AI-powered analytics to support enterprise-wide decision-making (Schiavone, 2022).
- **MicroStrategy:** Known for its enterprise-grade business intelligence capabilities, MicroStrategy provides scalable analytics solutions with embedded AI and mobile capabilities (Yılmaz, 2021).
- **SAP Business Objects:** SAP's business intelligence suite includes tools for reporting, ad-hoc queries, and predictive analytics, tightly integrated with SAP's ERP and other enterprise applications (Kahila, 2023).

2.3.3 Benefits of applying business intelligence and data analysis in the telecommunications sector

Business intelligence provides telecom companies with crucial insights derived from data analysis, enabling informed decision-making based on accurate, real-time information rather than intuition or guesswork (Solanki et al., 2024). These tools significantly enhance operational efficiency by optimizing resource allocation, refining processes, and reducing costs through a detailed understanding of performance metrics and the identification of operational bottlenecks (Nwosu, 2024).

Additionally, business intelligence helps identify revenue opportunities by examining customer usage patterns, uncovering cross-selling and upselling possibilities, and optimizing pricing strategies based on market trends and competitor analysis (Zakaria et al., 2024). Predictive analytics within business intelligence can forecast customer churn by detecting early warning signs and supporting proactive retention strategies, thereby reducing attrition and maintaining revenue. Furthermore, business intelligence tools evaluate network

performance data, forecast capacity needs, optimize traffic management, and predict network failures, resulting in improved service reliability and increased customer satisfaction (Mathu, 2020). They also assist in regulatory compliance by providing visibility into regulatory requirements, ensuring that telecom companies meet industry standards and avoid penalties (Bowen & Panagiotopoulos, 2020). Lastly, business intelligence enables telecom companies to track market trends, assess competitor strategies, and identify new opportunities for market expansion or product innovation (Ochuba et al., 2024).

The advantages of business intelligence for telecommunications companies are significant, enabling them to optimize operations, enhance customer service, and achieve strategic goals more efficiently (Al-Alwan et al., 2022; Vugec et al., 2020). Key benefits include real-time insights into network performance metrics such as latency, bandwidth usage, and service availability, which facilitate proactive network management and optimization. Business intelligence also supports customer segmentation by demographics, usage patterns, and preferences, enabling targeted marketing efforts and personalized promotions. Moreover, business intelligence tools aid in fraud detection by identifying unusual usage patterns that may indicate fraudulent activities, allowing telecom companies to implement preventive measures and safeguard revenue streams (Vugec et al., 2020). Additionally, business intelligence helps track and improve service quality metrics like call drop rates and service interruptions, fostering continuous service enhancement initiatives (Al-Alwan et al., 2022). Business intelligence dashboards provide executives with comprehensive views of KPIs, operational metrics, and financial performance, empowering data-driven strategic planning and decision-making. Furthermore, predictive analytics in business intelligence can forecast equipment maintenance needs based on usage data, minimizing downtime and optimizing maintenance schedules for uninterrupted service delivery (Trujillo et al., 2023).

The telecommunications sector, driven by rapid technological advancements and intense competition, increasingly depends on big data and business intelligence to maintain a competitive edge. Big data involves vast and complex datasets characterized by their size, diversity, speed, veracity, and value, which surpass

the capabilities of traditional data processing methods (Abir et al., 2020; Alshawawreh et al., 2024). Business intelligence utilizes advanced analytical techniques to interpret this complex data, aiding strategic decision-making (Trujillo et al., 2023). When integrated into telecom operations, big data and business intelligence enable the analysis of extensive datasets, the identification of trends, and informed decision-making that drive improved performance.

Incorporating big data and business intelligence into electronic customer relationship management systems allows telecom companies to manage customer interactions more effectively. This integration leads to personalized services and enhanced communication strategies, boosting customer satisfaction and loyalty through targeted marketing campaigns (Ahmad, 2015; Al-Zadjali et al., 2018). Additionally, these technologies support the monitoring and analysis of electronic service quality metrics, such as network performance and customer support efficiency, which are essential for improving service quality and reducing complaints (Al-Nimer, 2022; Bhatti et al., 2021).

Business intelligence and data analysis play an essential role in understanding and leveraging electronic word of mouth, customer relationship management, electronic service quality, and customer loyalty. Business intelligence tools analyze large volumes of data to gain insights into customer sentiments and brand perception, informing customer relationship management strategies to tailor interactions and enhance satisfaction (Alshawawreh et al., 2024). The improved quality of electronic service derived from business intelligence insights ensures superior service delivery, reducing complaints and increasing loyalty. Moreover, business intelligence helps identify key factors for product and service innovation by analyzing customer feedback and usage patterns. When combined with customers' experiential knowledge, these insights aid in developing offerings that meet market demands. This holistic approach establishes a continuous feedback loop where business intelligence-driven insights enhance customer relationship management and electronic service quality, leading to higher customer loyalty and ongoing innovation. Ultimately, this cycle drives business growth and significantly improves customer satisfaction (Alikhani et al., 2021).

Furthermore, big data and business intelligence empower telecom companies to

leverage electronic word of mouth by analyzing online reviews and social media comments. This analysis helps companies gauge public perception, address negative feedback, and capitalize on positive endorsements, thereby enhancing brand reputation and customer acquisition (Belhadi et al., 2023; Rahman et al., 2018). The strategic application of big data and business intelligence plays a crucial role in boosting customer satisfaction and loyalty. By examining customer data, telecom companies can develop personalized loyalty and incentive programs that promote retention and reduce churn rates (Hossain et al., 2020; Khondkar, 2023).

Thus, the application of big data and business intelligence in the telecommunications sector yields significant benefits, such as enhanced customer relationship management, improved service quality, and increased customer satisfaction and loyalty. Business intelligence tools are vital for converting data into actionable insights, facilitating data integration, analysis, visualization, and decision support. As data volume and complexity rise, these tools become crucial for organizational success, allowing telecom companies to leverage data effectively, enhance operational efficiency, and capitalize on market opportunities. By adopting big data and business intelligence strategies, telecom companies can stay competitive in a rapidly evolving industry while delivering superior services and customer experiences. This strategic approach enables them to navigate industry challenges, optimize resources, and create value-driven customer interactions, ensuring long-term growth and sustainability.

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"*I think if you show people the problems and the solutions, it will motivate them to act*" (Bill Gates)

Chapter 3

Exploring the influence of business intelligence on customer satisfaction and loyalty in the telecom sector

Abstract

The aim of this study is to investigate the impact of business intelligence on customer loyalty within telecom companies. A quantitative approach was employed to gather and analyze raw data, which was subsequently utilized to test hypotheses regarding key phenomena. The study encompassed all personnel within the Jordanian telecom industry as the target population. The final dataset comprised 304 accurately completed questionnaires. The model was analyzed through partial least squares structural equation modeling. The findings revealed that the utilization of business intelligence positively influences e-word-of-mouth platforms, electronic customer relationship management, the quality of e-services, and social media, but only the first two of these are significant antecedents to consumer satisfaction as a precursor to consumer loyalty. Consequently, the researcher suggests that telecom businesses stay abreast of recent advancements in business intelligence to effectively implement them, ultimately bolstering customer satisfaction and loyalty.

Keywords: Business intelligence, EWOM, ECRM, ESQ, social media, customer satisfaction, customer loyalty.

3.1 Introduction

The telecommunications industry is a dynamic and highly competitive sector that faces constant challenges in customer satisfaction and retention (Chee & Husin, 2020). In this environment, business intelligence has emerged as a crucial strategic tool for understanding and responding to customer needs and expectations through knowledge generation (Hmoud et al., 2023). In this regard, technological development is also witnessing rapid growth worldwide every day, enabling companies to conduct their businesses faster and with better quality, especially in the telecommunications sector.

Business intelligence refers to the process of collecting, analyzing, and utilizing data to make informed and strategic decisions (Shiau et al., 2023). In the context of telecommunications, business intelligence can encompass a wide range of

activities, from monitoring network performance metrics to analyzing customer feedback on social media platforms (Dwivedi et al., 2023). By harnessing the power of data analysis, telecommunications companies can identify trends, patterns, and opportunities that allow them to improve customer experience and strengthen loyalty.

Business intelligence (BI) is a driver of business performance that measures companies' ability to deliver their services and products (Nithya and Kiruthika, 2021). Business intelligence includes many systems that help companies understand what makes them successful, such as customer needs and desires (Huang et al., 2022). Jafari et al. (2023) also indicated in their study that business intelligence and integration play an important role in achieving better supply chain performance and all operations within companies, as business intelligence has the greatest impact on supply chain performance. Additionally, business intelligence has a positive and significant impact on supply chain integrity and speed, which has a positive impact on customer loyalty (Quach et al., 2022). As a business, intelligence systems play an important role in the company's strategic planning process, which in turn provides solutions, expectations, and future insights to improve the company's services or products (Rahchamani et al., 2019). Currently, companies use business intelligence systems directly to understand their relationships with customers and promote their loyalty.

In this regard, different studies propose the importance of certain variables as determinants of customer satisfaction and their relevance to customer loyalty. Firstly, electronic customer relationship management (ECRM) has become the reason for retaining existing and potential customers (Ferrer-Estévez & Chalmeta, 2023) as it is the strategy through which a company can interact with a potential customer over a long period and allow them not only to make relationship transactions but also to convert them into a potential customer source of multiple future transaction profits. In line with this, it is also essential to monitor consumer opinions through the Internet and social media networks (electronic word of mouth) as it will allow many consumers to use those reviews through different media to assess the quality of the product and service before purchasing, especially based on their own experiences with the products learning

about customer experiences and perceptions to improve customer service (Litvin & Hoffman, 2018) improving their satisfaction and loyalty. Thirdly, service quality (EQS) and the trend to advise others, especially in electronic service, have become the most important type of service provided in our time, especially in telecommunications companies (Kalia & Paul, 2021). Finally, social media platforms have become useful in facilitating consumer experiences, being considered a fundamental element in improving consumer satisfaction and subsequent loyalty (Hamid et al., 2024).

In view of this new reality, we have detected a research gap considering it essential to analyze the implications of business intelligence and how it can improve customer satisfaction and loyalty in telecommunications companies given the limited number of studies that have proposed it.

To cover this gap, the present research proposes the following objectives. Firstly, the importance of business intelligence in the Resource-Based View Theory framework will be analyzed to determine customer satisfaction and loyalty. Secondly, it is proposed to analyze the impact of business intelligence on electronic customer relationship management, electronic word of mouth, electronic service quality, and social media sites. Thirdly, the importance of consumer satisfaction is studied from the previous variables and their relationship with loyalty. Finally, the research provides valuable information to industry experts and contributes to current knowledge on business intelligence and customer loyalty in the telecommunications sector.

The novelty of the proposed research focuses on the holistic conception of a model that defines customer loyalty in the telecommunications sector based on evaluations by employees related to the commercial area. This approach is innovative as they have direct knowledge of customers due to their close relationship with them and the technical knowledge derived from their own position in the organization.

To meet these objectives, an online survey was conducted obtaining a final sample of 304 employees from a Jordanian telecommunications company with an average experience between three and five years. The results determined that

business intelligence has a significant relationship with all proposed variables, but of these, only ECRM determined customer satisfaction prior to their loyalty.

The paper is structured as follows. Firstly, the theoretical framework and the variables to be included in the model are briefly explained. Secondly, the research model and working hypotheses are proposed. Thirdly, the study methodology used and its results are presented. Finally, the main conclusions of the study, management recommendations, limitations, and future lines of research are presented.

3.2 Theoretical framework

3.2.1 Resource-Based View Theory

The Resource-Based View (RBV) is a strategic theory that explains how companies can achieve sustainable competitive advantages by managing their resources and capabilities (Barney, 1991). Furthermore, the conception of business intelligence as a strategic resource underpins companies' capabilities to drive performance improvement, generating greater loyalty and profitability (Rahman, 2023; Singh et al., 2022).

In our case, the variables BI, EWOM, ECRM, ESQ, and social media can be considered valuable internal resources that influence customer satisfaction and loyalty. These resources, when effectively managed, can significantly contribute to the company's competitive position in the telecommunications market. EWOM is recognized as a significant source of feedback from consumers, which enriches both products and services, fostering trust among customers and amplifying competitive advantage (Alshawawreh et al., 2024). On the other hand, ECRM systems provide companies with the ability to effectively manage and analyze customer data, strengthening relationships with them and enabling precise adaptation of marketing strategies (Choudhury & Harrigan, 2014). ESQ will determine customer satisfaction with the services provided and consequently their subsequent loyalty (Hayati et al., 2023). Finally, social media plays a

fundamental role as channels of communication and interaction with customers, favoring competitive advantages (Kamar et al., 2023).

3.2.2 Business intelligence

Bordeleau et al. (2019) introduced the concept of Data Analytics and Business Intelligence (BIandA) as a novel approach to real-time data assessment and production. This approach aids companies in making evidence-based management decisions, thereby demonstrating transformative potential within the organization and enhancing operational efficiency and competitive advantages (Contreras et al., 2021).

Vidal and Barros (2019) further highlighted that the optimal utilization of collected information during daily operations constitutes business intelligence. This process involves the collection and transformation of data into actionable insights for future decision-making (Poleto et al., 2017). Business intelligence poses a significant challenge for IT as a crucial management concern, particularly in developing analytics-driven decision-making capabilities, which are manifested in various programs and computer systems (Łabedzka, 2018).

While business intelligence utilizes both current and historical data, data analytics focuses on historical data to extract insights and drive business activities aimed at meeting customer needs and elevating the company's competitive position (Shakeel & Montenegro-Marin, 2021). Additionally, data analytics empowers managers to make informed decisions based on statistical evidence, thereby guiding future actions concerning market assessment and long-term competition (Yanfang et al., 2021).

Finally, Golestanizadeh et al. (2023) found that business intelligence and its associated tools offer companies a comprehensive understanding of organizational processes, enable effective responses to competitor behavior, and facilitate the identification of global customer needs through the optimization of the value chain.

3.2.3 Business intelligence and electronic word of mouth

Electronic word of mouth stands out as a significant marketing tool for achieving favorable customer outcomes and maintaining consistent performance (Matthews et al., 2021). A study conducted in the small hotel sector underscored the potential of EWOM in enhancing company performance by leveraging basic business intelligence systems to access analytics promptly. This accessibility enables small hotels to utilize reviews for informed decision-making and service quality enhancements, thereby indirectly bolstering positive EWOM transmitted by customers through various communication platforms (Matthews et al., 2021).

Moreover, Zhou et al. (2021) emphasized the importance of high-quality EWOM content in sustaining the effectiveness of influencer marketing strategies. Successful hotels proactively employ EWOM data analytics to inform business strategies and enhance service offerings, thus providing hotel management with a long-term vision for service development and improvement (Zhou et al., 2021). Additionally, Maune (2019) advocated for a computer-based approach to analyzing consumer demand through EWOM, recognizing consumers' opinions as invaluable assets for companies. This approach acknowledges that understanding consumers' needs cannot be automatic and underscores the significance of consumers sharing their opinions and ratings of products and services through EWOM channels (Hussain et al., 2018; Maune, 2019).

3.2.4 Business intelligence and electronic customer relationship management

Electronic Customer Relationship Management strategies have gained significant importance in contemporary business environments, particularly amidst the Internet era and rapid technological advancements. In this context, the adoption of electronic customer relationship management has emerged as a crucial prerequisite for success in companies. Kristaung and Murtanto (2019) conducted a study examining the impact of business intelligence on organizational performance and devised a conceptual framework to assess its influence. This framework incorporated customer relationship management as a moderating factor and highlighted the positive correlation between the adoption

of business intelligence systems and electronic customer relationship management. The integration of business intelligence management within customer relationship management practices offers notable benefits for banks and companies, thereby facilitating their progress within the competitive business landscape (Nithya & Kiruthika, 2021). Pettifor et al. (2020) also emphasized the role of ECRM systems in helping organizations evaluate the actual costs associated with acquiring and retaining individual customers, which are pivotal for fostering customer loyalty. The effectiveness of ECRM systems relies significantly on the quality of services provided and their implementation methods. By leveraging an electronic customer relationship management system, organizations can allocate resources and time efficiently, maximizing profitability (Carmen & Marius, 2016).

3.2.5 Business intelligence and social media

Business intelligence intersects with social media platforms, which serve as significant marketing avenues for companies across all sectors to showcase their products and services (Choi et al., 2020). The effective utilization of social networking sites enables companies to propel their business forward (Lanza-Cruz et al., 2024). As highlighted by Gioti et al. (2018) in their examination of social business intelligence, the integration of business intelligence tools with social media has given rise to a substantial platform known as Social Business Intelligence, representing a relatively recent system. Currently, there is a notable convergence between social media and business intelligence, with this fusion already yielding new organizational processes and bolstering business capabilities for companies. By leveraging data and employing business intelligence tools for analysis, organizations can generate value-added information, including customer profiles, demographic insights, and social behaviors (Gioti et al., 2018; Kurnia, 2018).

3.3 Research model and hypotheses development

3.3.1 Business intelligence and electronic word of mouth

The relationship between Business Intelligence utilization and EWOM can be explained by social influence theory, which suggests that people have more trust in information from other individuals than that provided by companies (Hennig-Thurau et al., 2004). In this regard, the use of business intelligence can assist companies in identifying and better understanding the preferences and needs of their customers, which may result in an improvement in the quality of products and services offered (Lemon & Verhoef, 2016). Consequently, this may increase the likelihood of customers sharing positive feedback about the company and its products on online platforms, thereby contributing to an increase in EOM (Verhoef et al., 2009).

Additionally, social influence theory also indicates that people tend to trust information provided by their peers more than that provided by companies. Therefore, the use of business intelligence can be useful for companies to identify and address potential customer issues or concerns, which could help reduce the likelihood of customers sharing negative feedback about the company and its products online (Khoirunnisa & Albari, 2023). Consequently, the following research hypothesis is proposed:

H1. Business intelligence has a positive impact on electronic word of mouth.

3.3.2 Business intelligence and electronic customer relationship management

Ahmed (2021) demonstrated that electronic customer relationship management systems enable companies to comprehend customer behavior, thereby enhancing the effectiveness and reliability of marketing strategies and internal decision-making processes. Employing both business intelligence and ECRM concurrently can empower businesses to develop a deeper understanding of their customer base and deliver more personalized services. Through this understanding of customer requirements and preferences, companies can tailor

their services, ultimately fostering enhanced customer loyalty and satisfaction, consequently resulting in increased sales and profitability (Shahraki et al., 2013). business intelligence serves as a valuable tool for analyzing customer data, enabling businesses to identify patterns and trends that inform decisions related to customer service (Al-Zadjali & Al-Busaidi, 2018). Based on these approaches, the following research hypothesis is proposed:

H2. Business intelligence has a positive effect on electronic customer relationship management.

3.3.3 Business intelligence and e-service quality

Business intelligence and e-service quality have been extensively studied in the literature. Lufti et al. (2024) focus on ESQ for Big Data and emphasize the importance of analyzing data from various public sector agencies to improve service quality and innovation. This underscores the significance of using business intelligence systems for data analysis to enhance service quality (Manikam et al., 2017). Optimizing business intelligence usage is crucial for developing databases that offer high-quality electronic services, as indicated by Wiradarma et al. (2017). Business intelligence has been found to positively impact e-Service quality by enabling companies to better understand customer behavior and preferences, leading to tailored services and improved customer satisfaction (Al-Zadjali & Al-Busaidi, 2018; Rebollo & Hinlayagan, 2023). Additionally, BI provides insights into the effectiveness of current e-Service strategies, aiding companies in identifying areas for improvement and reducing operational costs through process automation (Lim et al., 2013; Vejjanugraha et al., 2022). Therefore, we propose the following hypothesis:

H3. Business intelligence has a positive effect on e-service quality.

3.3.4 Business intelligence and social media

Business intelligence constitutes a broad term encompassing diverse procedures, applications, and methodologies aimed at gathering, storing, accessing, and interpreting data to extract insights crucial for decision-making (Olszak, 2016). The utilization of BI tools for gathering and analyzing data from social networking sites can aid enterprises in advancing their operations, supporting decision-making processes, and facilitating ease of operation for decision-makers by providing timely and valuable information (Meske et al., 2019). According to Umar (2014), effective social media analytics software can enhance performance management initiatives across various business functions. He advocated for adopting a business intelligence perspective for social media analytics to guide companies in aligning their social media software, processes, and technologies with the organization's overall strategic objectives. More recent research has studied sentiment analysis on social networks (Rabie & Sturm, 2014), content on Facebook and Twitter to prevent cyberbullying and cyberharassment on social networks (Kanan et al., 2020), and even to evaluate the mental health of network users (Vioules et al., 2018) or happiness (Kanan et al., 2023). Consequently, the following research hypothesis is proposed:

H4. Business intelligence has a positive effect on social media.

3.3.5 Electronic word of mouth and customer satisfaction

Various research has proposed and tested the relationship between information provided by other consumers (i.e., WOM) and overall satisfaction in a wide variety of contexts and environments (Castañeda et al., 2007). Through digital channels, companies can now engage directly with customers and promptly receive feedback in the form of likes, clicks, and comments (Naveen et al., 2021). Customers use e-commerce websites, social networking sites, and weblogs to share their opinions and experiences regarding purchased items and services, contributing to the phenomenon of e-WOM (Srivastava & Sivaramakrishnan, 2021). Building robust customer relationships has become a priority for companies, particularly in competitive markets, as emphasized by Deng et al.

(2010). Strengthening customer relations is essential for increasing market share, gaining a competitive edge, and fostering company growth (Almazroi et al., 2021). Maintaining customer loyalty is paramount for business sustainability, given the high cost associated with acquiring new customers compared to retaining existing ones (Li-Wei, 2011).

Electronic word of mouth, encompassing reviews, ratings, tweets, images, and blog posts, holds greater credibility than traditional media, providing valuable feedback for businesses to better meet customer needs and enhance loyalty (Baker et al., 2020). Kuo and Nakhata (2019) argue that customer satisfaction is influenced by EWOM, thereby affecting purchasing decisions. Furthermore, they stress the importance of evaluating e-WOM's potential impact on customer satisfaction and its subsequent effect on customer loyalty (Belhadi et al., 2023). Thus, we propose the following hypothesis:

H5. Electronic word of mouth has a positive effect on customer satisfaction.

3.3.6 Electronic customer relationship management and customer satisfaction

Electronic Customer Relationship Management is a strategy that involves the use of technology to manage and enhance customer relationships (Haislip & Richardson, 2017). Various studies have demonstrated that ECRM improves service quality and responsiveness to customer needs, thereby leading to a positive perception of the company by customers and, consequently, their satisfaction (Kumar & Mokha, 2022). Noviana (2020) suggested that enhancing customer loyalty requires improving the quality and effectiveness of ECRM. Yuliati et al. (2021) found that ECRM and e-marketing impact customer loyalty, with customer satisfaction serving as an intervening variable. Soltani et al. (2018) concluded that e-CRM is a technology designed to enhance customer satisfaction, loyalty, and profitability by fostering strong customer relationships and interactions between stakeholders and their customers.

The foundational concept of customer relationship management stems from modern marketing's focus on customers as fundamental to achieving success,

growth, prosperity, and survival for companies (Ratković et al., 2013). As such, customer relationship management seeks to attain its objectives through customer satisfaction, leading to loyalty, and creating value for them. CRM emerged as a method for companies to enhance their ability to satisfy existing customers and bolster their relationship with them continually. This enables them to deliver services and products that provide value to consumers (Abtin & Pouramiri, 2016). Establishing a relationship between customers and the company through repeated purchases or interactions is an indicator of customer satisfaction, leading to loyalty (Taylor & Hunter, 2014).

Customer loyalty is a critical corporate strategy, as numerous studies have highlighted that securing loyalty from clients is paramount for achieving desired profits and ensuring the longevity of companies. Bathla et al. (2023) indicated that customer loyalty is a strategy aimed at increasing customer satisfaction, fostering repeat purchases, and enhancing their affinity to deal exclusively with the same company, bypassing competitors (Alshurideh et al., 2020). Consequently, the following research hypothesis is proposed:

H6. Electronic customer relationship management has a positive effect on customer satisfaction.

3.3.7 e-service quality and customer satisfaction

Mora (2011) states that there is a notable academic interest in the marketing literature regarding the connection between quality and satisfaction. This interest is primarily attributed to the fact that perceptions of quality and judgments regarding satisfaction are fundamental aspects in understanding consumer behavior. Several studies have precisely established this relationship in different contexts (Mamakou et al., 2024; Pozón-López et al., 2021; Román et al., 2014). Electronic service quality refers to the set of evaluations a customer makes regarding the provision of electronic services in online purchases (Lee & Lin, 2005; Venkatakrishnan et al., 2023). Satisfaction is one of the most important variables in the business-to-consumer online environment (Shin et al., 2013). If a company succeeds in providing its customers with quality services, it will enhance

their level of satisfaction and, consequently, they are likely to make repeat purchases and recommend their experience (Rita et al., 2019). Therefore, we propose the following hypothesis:

H7. e-service quality has a positive effect on customer satisfaction.

3.3.8 Relationship between social media and customer's satisfaction

Social media interaction not only allows companies to respond to customer inquiries and complaints quickly and efficiently, but also provides them with the opportunity to establish a more personalized connection with them. In this regard, companies that use social media to share relevant content, respond to questions and comments, and exhibit an authentic personality tend to generate higher satisfaction among their followers and customers (Marino & Lo Presti, 2018; Sabah & Altalbe, 2022).

Chang and Lee (2022) investigated the impact of social media on customer relationships and found a positive influence on customer satisfaction. Similarly, Wallace et al. (2004) conducted a study in the banking sector in Africa, revealing that the use of social networking sites contributes to increased customer loyalty. Social media platforms serve as channels for businesses to nurture connections with customers, with timely and effective responses to customer feedback and suggestions on social media platforms promoting satisfaction and trust (Ngo et al., 2021). Furthermore, engaging with customers via social media platforms can lead to service improvements, as customer feedback can be integrated (Barari et al., 2021). Therefore, we propose the following hypothesis:

H8. Social media has a positive impact on customer satisfaction.

3.3.9 Customer satisfaction and customer loyalty

Numerous studies have consistently demonstrated that satisfied customers are more likely to demonstrate loyalty towards a brand or company (Camilleri et al.,

2023; Hsu et al., 2023; Lu et al., 2019). In this regard, companies must focus on the needs and desires of the customer and translate them into specific specifications in the product or service provided. This can be achieved through an interactive relationship with the customer, using certain tools and strategies designed to create long-term customer loyalty. Customer satisfaction is a fundamental component in the marketing exchange process, as it undoubtedly contributes to the success of service providers (Darian et al., 2001). Furthermore, satisfaction is among the crucial factors in predicting consumer behavior, particularly repeat purchase (Martín-Consuegra et al., 2007). Consumers are more likely to repeat their purchases at the same establishment when their expectations are met to a greater extent during the purchase or service usage (Wong & Sohal, 2003). Thus, customer satisfaction, along with other precursors, are essential factors in acquiring loyal customers who also recommend their regular provider of products or services to others (Abbasi et al., 2024). Therefore, consumer satisfaction leads to customer loyalty, and the following hypothesis is proposed:

H9. Customer satisfaction has a positive effect on customer loyalty

Figure 3.1 shows the conceptual model and the research hypotheses.

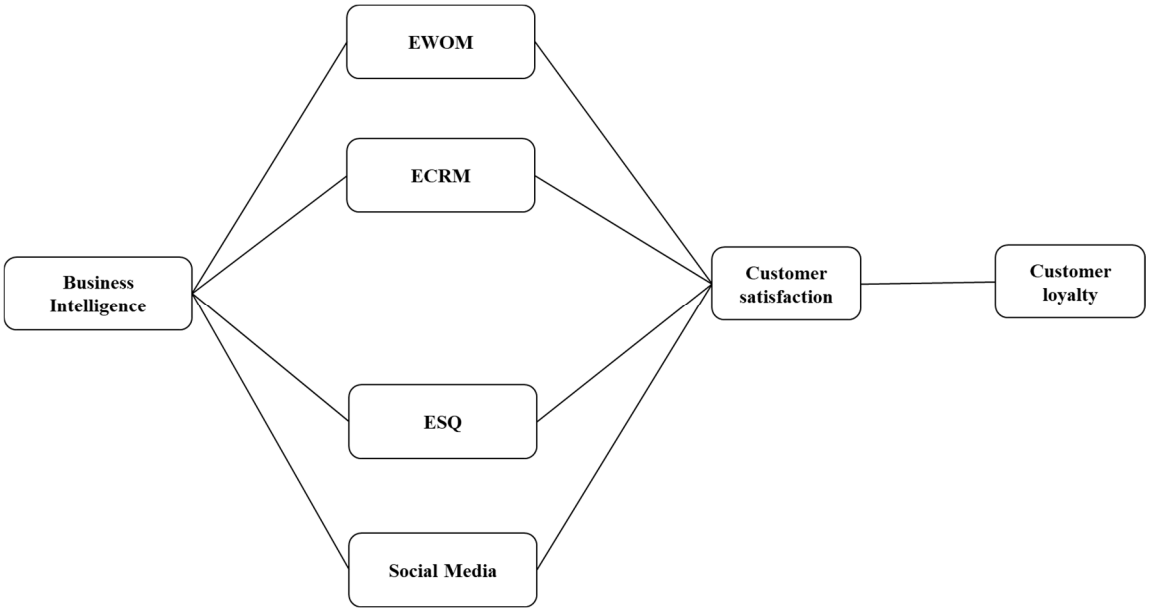

Figure 3.1. Conceptual model

3.4. Research Methodology

3.4.1 Data collection

The purpose of this study is to shed light on the role that business intelligence plays in influencing the amount of client loyalty experienced by telecommunications organizations. In order to accomplish this objective, a quantitative approach was used to collect and analyze primary data. The data were collected in October, 2022.

Prior to the launch of the survey, a pretest was carried out involving 5 experts and 50 respondents to ensure understanding of the questionnaire and its alignment with the research objectives. After this initial stage, a pilot test was conducted to validate the scales defined in the previous phase. This step focused on evaluating and improving the questionnaire to ensure its acceptability, as well as the dimensionality, reliability and validity of the proposed scales. Once the scales had been confirmed, the actual data collection was carried out.

After a validation process, the sample used for the analysis yielded 304 completed surveys out of a pool of 384 Jordanian telecommunications companies, with a response rate of 79.16%. Table 3.1 provides details of the sample.

Table 3.1. Sample characteristics

		Frequency	Percent
Gender	Female	151	49.7
	Male	153	50.3
Age	Under 26	22	7.2
	26-35	131	43.1
	36-45	93	30.6
	46-55	52	17.1
	56 and over	6	2
Education	Elementary	7	2.3
	High School	33	10.9
	Bachelor's Degree	203	66.8

	Postgraduate studies	61	20.1
How long have you been working at your current job?	Less than 1 year	13	4.3
	1 -3 Years	73	24.0
	3- 5 Years	71	23.4
	5- 7 Years	46	15.1
	7 -10 Years	51	16.8
	more than 10 Years	50	16.4
Career level within the company	HR staff	57	18.8
	Junior management staff	47	15.5
	Marketing Officer	89	29.3
	Office boys	1	.3
	Receptionist	38	12.5
	Sales Officer	36	11.8
	Senior management employee	36	11.8
Type of telecommunication firm	Cable company	61	20.1
	Internet service provider	106	34.9
	Satellite Company	43	14.1
	Telephone operator	94	30.9
Firm size	Large company	194	63.8
	Medium company	92	30.3
	Small company	18	5.9
Which, if any, of the following Business Intelligence? (software or application tools are used in the firm)	Analyzer	59	19.4
	Arcplan	48	15.8
	Fine BI	63	20.7
	i Cloud	101	33.2
	Tableau Cloud	4	1.3
	ZRobot	29	9.5

3.4.2 Measurements

The proposed variables for the analysis were assessed using reflective measurement scales that had been validated in previous research and adapted

to the context of our research. For the Business intelligence variable, we adopted items from scales proposed by Chen and Lin (2021). Sun et al. (2021) and Yoo et al. (2013) provided the items for the EWOM variable, while Khanh et al. (2021) and Chi (2021) provided the items for the ECRM variable. Pop et al. (2022) provided the inspiration for the Social Media elements. The customer satisfaction scale was created based on the research of Huang et al. (2022), Pei et al. (2020) and Li et al. (2021). Whereas, the scale of Customer Loyalty was adapted from the study of Iglesias et al. (2020) and Krystallis and Chrysochou (2014). Finally, the ESQ elements were adapted from Rita et al. (2019). All variables were evaluated on a 7-point Likert scale, where a score of 1 corresponded to “totally disagree”, and a score of 7 to “totally agree”.

3.4.3 PLS methodology

Structural Equation Modeling (SEM) with Partial Least Squares (PLS) was utilized to validate and assess the proposed theoretical model. Smart PLS software was employed for testing the scales and the structural model (Ringle, et al., 2015). Unlike covariance-based methods, PLS does not make assumptions about the distribution of variables or the independence of observations. PLS focuses on variance and is recommended for situations where there is limited theoretical knowledge, few previous theories, untested research questions, and exploratory analyses. It is particularly suitable for complex theoretical models, as covariance-based methods may yield poorer model fit. PLS was chosen for this study for its demonstrated statistical power with small samples (Hair et al., 2014) and because it allows for the evaluation of the model based on explained variance, facilitating assessment of its characteristics (Hair et al., 2011). Bootstrapping was employed to assess the significance of coefficients measured in the preceding PLS analysis. This method generates subsamples by randomly selecting observations with replacement (Hair et al., 2014).

3.5. Results

3.5.1 Measurement assessment: Reliability and validity

Individual item reliability is assessed by examining the simple correlations of the indicators with their respective variable. A value greater than 0.7 implies that the shared variance between the construct and its indicators is greater than the error variance (Barclay et al., 1995). Table 3.2 gathers the items that reached the recommended threshold. To measure the reliability of the scales, composite reliability is used. Nunnally and Bernstein (1994) suggest 0.7 as the minimum level for acceptable reliability. All values exhibit levels higher than the recommended threshold. Furthermore, the reliability of the variable evaluates the rigor of the items when measuring the same latent variable (internal consistency). For this purpose, we employ Cronbach's Alpha coefficient (Cronbach, 1951) and the composite reliability index (CR, composite reliability) (Nunnally & Bernstein, 1994). To assess convergent validity, the analysis of extracted variance (AVE, average variance extracted) (Fornell & Larcker, 1981) is employed. AVE allows estimating the amount of variance that a construct obtains from its indicators, relative to the variance due to measurement error. In our case, the AVE value exceeds the proposed minimum of 0.5.

Table 3.2. Variable descriptive statistics, reliability and convergent validity

Item	Mean	Standard Deviation	Skewness	Kurtosis	Stand. coefficient	α	CR	AVE
BI1	5.773	1.099	-0.085	-0.765	0,767	0.826	0.878	0.590
BI2	5.671	1.248	1.121	-1.114	0.740			
BI3	5.668	1.297	0.214	-0.918	0.785			
BI4	5.618	1.388	0.717	-1.066	0.753			
BI5	5.688	1.297	0.040	-0.895	0.792			
CL1	5.365	1.533	0.312	-0.966	0.843			
CL2	5.332	1.508	0.211	-0.930	0.915			
CL3	5.385	1.493	0.642	-1.041	0.786	0.878	0.914	0.726
CL4	5.155	1.502	0.129	-0.833	0.837			
CS1	5.329	1.651	0.243	-1.024	0.842	0.860	0.905	0.704

CS2	5.211	1.734	0.065	-1.019	0.842			
CS3	5.434	1.625	0.632	-1.102	0.857			
CS4	5.487	1.664	0.746	-1.201	0.815			
ECRM1	5.411	1.528	-0.137	-0.893	0.764	0.859	0.895	0.586
ECRM2	5.339	1.583	0.171	-1.039	0.769			
ECRM3	5.618	1.416	0.626	-1.035	0.785			
ECRM4	5.641	1.473	1.124	-1.225	0.766			
ECRM5	5.664	1.435	0.632	-1.089	0.782			
ECRM6	5.714	1.386	0.982	-1.152	0.729			
ESQ1	5.286	1.528	-0.406	-0.774	0.850	0.867	0.901	0.602
ESQ2	5.424	1.431	0.085	-0.931	0.773			
ESQ3	5.424	1.421	-0.025	-0.847	0.778			
ESQ4	5.372	1.434	0.243	-0.921	0.763			
ESQ5	5.586	1.509	0.422	-1.069	0.736			
ESQ6	5.513	1.446	0.884	-1.141	0.750			
EWOM1	5.355	1.495	0.265	-1.009	0.859	0.867	0.909	0.715
EWOM2	5.283	1.539	-0.237	-0.847	0.849			
EWOM3	5.046	1.597	-0.155	-0.855	0.833			
EWOM4	5.132	1.592	-0.210	-0.816	0.841			
SM1	5.487	1.464	-0.219	-0.820	0.820	0.816	0.879	0.645
SM2	5.628	1.415	0.358	-0.987	0.829			
SM3	5.595	1.461	0.585	-1.073	0.760			
SM4	5.355	1.672	0.277	-1.079	0.802			

Note: BI: Business Intelligence, CL: Customer Loyalty, CS: Customer Satisfaction, ECRM: Electronic Customer Relationship Management, ESQ: Electronic Service Quality, EWOM: Electronic Word of Mouth; and SM: Social Media.

Finally, for the evaluation of discriminant validity, which refers to confirming that a construct measures a concept distinct from other constructs, in PLS (Partial Least Squares) analysis, three methods are used: (a) cross-loadings analysis, which compares whether the average shared variance between a dimension and its items is greater than the shared variance with other dimensions of the model (Barclay et al., 1995), (b) Fornell-Larcker criterion analysis, which examines whether the correlations between dimensions are lower than the square root of the AVE (Fornell & Larcker, 1981), and (c) HTMT (heterotrait-monotrait) ratio

analysis, which measures the correlations between pairs of constructs and should be less than 0.9 (Henseler et al., 2014). In our case, the values are close to the recommended values in the scientific literature. Due to the presented results, discriminant validity in the model is considered satisfactory (see Table 3.3).

Table 3.3. Discriminant validity

	BI	CL	CS	ECRM	ESQ	EWOM	SM
BI	**0.768**	0.883	0.799	0.745	0.776	0.827	0.806
CL	0.749	**0.852**	0.777	0.827	0.782	0.803	0.804
CS	0.675	0.675	**0.839**	0.828	0.756	0.786	0.807
ECRM	0.797	0.805	0.800	**0.766**	0.702	0.817	0.801
ESQ	0.827	0.854	0.741	0.889	**0.776**	0.868	0.779
EWOM	0.788	0.771	0.683	0.794	0.842	**0.846**	0.836
SM	0.795	0.765	0.702	0.849	0.824	0.707	**0.803**

Note: The square roots of the AVEs are in bold on the main diagonal. The Fornell-Larcker criterion is depicted below the main diagonal. The heterotrait-monotrait (HTMT) ratio is above the main diagonal. BI: Business Intelligence, CL: Customer Loyalty, CS: Customer Satisfaction, ECRM: Electronic Customer Relationship Management, ESQ: Electronic Service Quality, EWOM: Electronic Word of Mouth; and SM: Social Media.

3.5.2 Structural model assessment

To assess the structural model, it is recommended to start with the evaluation of the coefficient of determination (R^2), which indicates the amount of variance in the construct explained by the model. Falk and Miller (1992) suggest that an appropriate value should be greater than or equal to 0.1. In our case, the R^2 value for the 'customer loyalty' variable is 0.456, significantly exceeding the recommended minimum.

Secondly, we proceeded to examine the standardized regression weights, which show the relative weight of the factors on the endogenous variables. According to Chin (1998), values greater than 0.3 are advisable, although values above 0.2

are acceptable in exploratory studies or when applied across different sectors. In our case, the relationships between ESQ and customer satisfaction, EWOM and customer satisfaction, and SM and customer satisfaction did not exceed the established threshold, although the second of the mentioned relationships did prove to be significant.

Furthermore, the effect size (f^2) also confirmed the appropriateness of the proposed model. This coefficient measures whether an independent latent variable has a substantial impact on a dependent latent variable. f^2 values between 0.02 and 0.15, between 0.15 and 0.35, and 0.35 or higher indicate that an exogenous latent variable has a small, medium, or large effect, respectively (Chin, 1998). Three relationships detailed in Table 4 show a small or negligible effect, one has a medium effect, while the rest indicate a large effect.

Finally, the value of the SRMR (standardized root mean square residual) ratio (Henseler et al., 2014) allows for the testing of the difference between the observed and predicted correlations as a measure of model fit. A value below 0.08 is considered acceptable. Our model exhibits a value close to that threshold (SRMR=0.068), suggesting that the fit of the proposed model is partially correct.

Table 3.4. Results of hypotheses testing

	Path coefficient (β)	t-value	p-value	f^2	Support	R^2
H1:BI → EWOM	0.788	26.599	0.000	1.633	**Yes**	
H2: BI → ECRM	0.797	23.543	0.000	1.736	**Yes**	
H3: BI → ESQ	0.827	26.435	0.000	2.168	**Yes**	
H4: BI → SM	0.795	33.938	0.000*	1.719	**Yes**	
H5: ECRM → CS	0.619	6.891	0.000	0.176	**Yes**	
H6: EWOM → CS	0.104	1.759	0.079	0.009	No	
H7: ESQ → CS	0.053	0.648	0.518	0.001	No	
H8: SM → CS	0.060	0.991	0.322	0.003	No	
H9: CS → CL	0.675	11.087	0.000	0.838	**Yes**	
CL						0.456
CS						0.647
ECRM						0.634

ESQ	0.684
EWOM	0.620
SM	0.632

Note: BI: Business Intelligence, CL: Customer Loyalty, CS: Customer Satisfaction, ECRM: Electronic Customer Relationship Management, ESQ: Electronic Service Quality, EWOM: Electronic Word of Mouth; and SM: Social Media.

3.5.3 Hypotheses testing

The results obtained show that six out of the nine proposed hypotheses receive empirical support. Our first hypothesis posited a positive relationship between business intelligence and EWOM, which was confirmed ($\beta = 0.788$; $p < 0.05$), consistent with previous research (Hennig-Thurau et al., 2004). The second hypothesis, which linked business intelligence positively with CRM, was also confirmed ($\beta = 0.797$; $p < 0.05$), similarly to previous studies (Al-Zadjali & Al-Busaidi, 2018). The third hypothesis, which referred to the positive effect of business intelligence on ESQ, is also significant ($\beta = 0.827$; $p < 0.05$), in line with the propositions of Al-Zadjali and Al-Busaidi (2018) or Rebollo and Hinlayagan (2023). Finally, the fourth hypothesis proposing a relationship between business intelligence and social media was also confirmed ($\beta = 0.795$; $p < 0.05$), consistent with another research (Kanan et al., 2023). As observed, business intelligence is fundamental in relation to EWOM, CRM, ESQ, and social media.

On the other hand, concerning the antecedents of customer satisfaction, only the fifth hypothesis proposing a positive relationship between CRM and satisfaction could be confirmed ($\beta = 0.619$; $p < 0.05$), consistent with another research (Belhadi et al., 2023). The rest of the hypotheses could not be confirmed; specifically, the antecedents of EWOM ($\beta = 0.104$; $p > 0.05$), ESQ ($\beta = 0.053$; $p > 0.05$), and social media ($\beta = 0.060$; $p > 0.05$) against another research. These results confirm that only CRM presents a significant relationship with customer satisfaction.

Finally, the ninth hypothesis proposing a positive relationship between customer satisfaction and loyalty was confirmed ($\beta = 0.675$; $p < 0.05$), in line with previous research (Abbasi et al., 2024).

3.6 Discussion

The findings of our study provide valuable insights into the role of business intelligence (BI) in shaping customer satisfaction and loyalty within the telecommunications industry. By investigating the relationship between BI and various factors such as electronic word of mouth (EWOM), customer relationship management (CRM), electronic service quality (ESQ), and social media, we have shed light on the intricate dynamics influencing customer perceptions and behaviors in this sector.

Firstly, our results affirm the pivotal role of BI in driving positive customer outcomes. The significant positive relationships between BI and EWOM, CRM, ESQ, and social media underscore the multifaceted impact of BI on customer-related factors. These findings align with previous research highlighting the importance of BI in understanding customer needs, enhancing service quality, and leveraging digital platforms for communication and engagement.

The confirmation of the relationship between BI and EWOM suggests that telecommunications companies utilizing BI tools are more likely to stimulate positive electronic word of mouth among customers. This finding emphasizes the importance of leveraging data-driven insights to foster favorable online discussions and recommendations, thereby amplifying the company's reputation and customer advocacy.

Similarly, the positive association between BI and CRM highlights the instrumental role of BI in enhancing customer relationship management practices. By harnessing BI capabilities, telecommunications companies can gain deeper insights into customer preferences, behavior patterns, and interactions, enabling them to tailor their services and communication strategies more effectively.

Moreover, our study confirms the positive impact of BI on electronic service quality and social media engagement. By leveraging BI tools to analyze customer feedback and market trends, telecommunications companies can identify areas for service improvement, innovate service offerings, and engage with customers proactively through social media channels. This integrated approach enables companies to deliver superior service experiences and foster meaningful connections with customers in the digital landscape.

However, our findings also reveal some notable insights regarding the antecedents of customer satisfaction. While CRM demonstrates a significant positive relationship with customer satisfaction, the relationships between EWOM, ESQ, and social media with satisfaction were not statistically significant. These results suggest that while these factors may influence customer perceptions and experiences, their direct impact on overall satisfaction may be less pronounced in the context of telecommunications.

Nevertheless, it is important to note that customer satisfaction remains a key determinant of customer loyalty, as evidenced by the positive relationship between satisfaction and loyalty in our study. This finding underscores the critical importance of delivering exceptional service experiences and meeting customer expectations to foster long-term loyalty and advocacy among telecommunications customers.

3.7 Conclusions and recommendations

The results of our study highlight the strategic importance of business intelligence in the telecommunications industry for enhancing customer satisfaction and loyalty. The confirmation of significant relationships between BI and key factors such as EWOM, CRM, ESQ, and social media underscores the fundamental role of BI in effectively managing customer relationships and leveraging digital opportunities.

From a managerial perspective, these findings have important implications for telecommunications companies. Firstly, they emphasize the need to invest in BI

technologies and systems that enable them to collect, analyze, and use data effectively to understand customer needs and preferences. By adopting a data-driven approach, companies can enhance their ability to personalize services, anticipate market demands, and deliver exceptional customer experiences.

Additionally, our results highlight the importance of integrating BI capabilities into customer relationship management practices. By leveraging BI tools to analyze customer behavior and improve market segmentation, companies can strengthen customer relationships, increase retention, and maximize customer lifetime value.

In terms of electronic service quality, our conclusions support the notion that BI can play a pivotal role in continuously improving service quality. By monitoring and analyzing customer feedback, companies can identify areas for improvement and implement corrective measures to ensure the delivery of high-quality services that meet customer expectations.

Finally, the importance of social media in the digital age cannot be underestimated. Our findings indicate that companies strategically using social media and harnessing BI tools for data analysis can significantly enhance their online presence, engage with customers more effectively, and generate positive EWOM that drives customer loyalty.

3.8 Limitations and future research

Despite the significant findings obtained in this study, it is important to acknowledge some limitations that could inform areas for future research. Firstly, the cross-sectional nature of our research design limits our ability to establish causal relationships between the variables studied. Future research could employ longitudinal or experimental designs to further examine the temporal and causal effects of BI on customer satisfaction and loyalty over time.

Additionally, the sample used in this study comes from a single telecommunications company in Jordan, which may limit the generalizability of

our results to broader contexts and populations. Future research could replicate this study in different companies and countries to assess the robustness and external applicability of our findings.

Another potential limitation lies in the measurement of the variables used in this study. While we used validated and reliable measures, other alternative measures may capture additional or more specific aspects of the constructs studied. Future research could explore different measures and measurement techniques to enhance the accuracy and comprehensiveness of construct assessment.

Furthermore, this study primarily focused on the relationship between BI, customer satisfaction, and loyalty in the context of the telecommunications industry. However, the role of other factors, such as product quality, technological innovation, and pricing strategies, may also be important. Future research could examine how these factors interact with BI to influence customer outcomes.

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3.10 Appendix: Scales

Business intelligence

- The firm provides appropriate reports and analysis that cover the information needs of managers on a regular and continuous basis.
- The firm studies the data collected about competitors, which provides information on industry trends to improve the decision-making process.
- The firm has a solid and robust information system that is updated regularly.
- The firm uses business intelligence systems to improve and raise the efficiency of operational processes
- The firm uses business intelligence systems that provide many innovative solutions to solve the various problems it faces.

E-WOM

- Customers get information about the brand they want through social media and the internet.
- Customers obtain information about the brand they want to buy via social media and the internet.
- Customers write their opinion about the products presented in the designated places on the site.
- Customers write positive comments about our product's brand on social media.

E-CRM

- The company closely monitors and evaluates the level of commitment to providing electronic services to customers
- The firm provides electronically after-sales services to a large extent..
- The firm develops strategies to increase customer value.
- E-CRM system helps the firm increase sales.
- E-CRM system helps the firm reduce costs.
- E-CRM system helps the firm improve its image and increase its prestige.

E-SQ

- The firm has an interactive website that provides all the information with the customer's needs.
- The firm's website has simple and secure procedures when making electronic payments.
- The company provides various electronic methods to facilitate customer communication.
- The quality of technical services provided by the firm is satisfactory and well supported.
- The firm treats all personal information of customers with the strictest confidence
- The firm provides guarantees about the products and services offered through electronic stores or through its website.

Social media

- Social media used by the firm are trustworthy.
- Social media used by the firm are reliable.
- Social media used by the firm are honest.
- Consumers trust the information provided by the firm on social media.

Customer satisfaction

- Customers are satisfied with the services provided by the firm.
- Customers are satisfied with the products offered by the firm.
- Customers are satisfied with the speed of delivery of products by the firm.
- Customers are satisfied with the shopping environment provided by the firm.

Customer loyalty

- Our Customers continue to use the firm's services on a regular basis.
- Our Consumers maintain long-term relationship with the firm.
- Our Customers continue to use the products offered by the company.
- When our customers decide to buy, they think of our products first.

Chapter 4

Impact of Big Data Analytics on telecom companies' competitive advantage

Abstract

The aim of this study is to explore the potential uses of Big Data for enhancing the competitive position of telecommunication companies based on Resource-Based View Theory. To achieve it; a quantitative approach was employed to collect and analyze primary data from 304 telecommunications companies, which was then utilized to test hypotheses related to the targeted phenomena.

A structural equation model was proposed to analyze the effects of Big Data Analytics BDA on achieving a competitive advantage. The results indicated that BDA improves online recommendations, electronic word of mouth (e-WOM), and electronic customer relationship management (e-CRM). Furthermore, it was found that BDA improves social media platforms. In addition, e-WOM, e-CRM, and social media were found to improve market performance, ultimately boosting competitive advantage.

This research underscores the significance of analyzing BDA to achieve a competitive advantage among competing telecommunication firms.

Keywords: Big Data Analytics, e-WOM, e-CRM, social media, market performance, competitive advantage, Resource-Based View Theory.

4.1 Introduction

The information technology revolution has permeated all fields, becoming integrated into activities worldwide. Companies' data is continuously expanding in size, type, and speed, along with the implementation of smart manufacturing processes (Gao et al., 2020). This data assists companies in realizing internal and external changes, facilitating scientific analysis, and making significant contributions to decision-making processes by predicting improvements in production processes for both goods and services, ultimately resulting in cost reduction (Klein et al., 2021).

Business Analytics (BA) can provide a company with broad and valuable insights to optimize decision-making by generating a deep understanding of business environments and customer behavior patterns (Min et al., 2021).

Despite the growing prominence of BA, many companies still maintain some skepticism regarding its intrinsic value. Specifically, the incorporation of BA to address big data issues, such as data integration, manipulation, and integrity, may require a substantial amount of time before its potential benefits are fully realized, despite numerous successful examples in this regard (Ahmed et al., 2017). Min (2016) defines BA in relation to the use of various analytical tools, including statistical techniques, data extraction, optimization tools, and simulation supported by a query and reporting mechanism that facilitates decision-making for business leaders.

Simultaneously, Big Data (BD) plays an essential role in creating new business patterns, such as accurate marketing and targeted service allocation, leading to economic growth. Recent advancements in artificial intelligence and business intelligence (Johnson et al., 2021) have significantly improved Big Data Analytics, effectively mining both kinds of industrial data into intelligent manufacturing. This has become a new research milestone (Mena et al., 2019), and continuous learning from Big Data in manufacturing systems enables systems to self-learn, self-improve, and self-regulate (Parisi et al., 2019). Further development of Big Data Analytics will significantly impact systems for providing services and goods (Zhong et al., 2016).

Big Data has been a popular research topic since the beginning of this century, and researchers consider it an attractive topic due to the revolution in technology that allows for analyzing all available data. However, Big Data is both an opportunity and a challenge since its value lies not in its variability or size, but rather in how it is analyzed and utilized to make better decisions, thus transforming it into valuable information (Charles & Gherman, 2013).

In this manner, with the evolution of new tools, the term Big Data Analytics (BDA) has emerged, combining two primary dimensions: big data and business analytics (Waqar & Paracha, 2023). Through the application of BDA, valuable

information will be uncovered to help improve business process decisions, providing a competitive advantage to companies that employ it (Dahiya et al., 2022).

According to a recent report by Fortune Business Insights (2023), the global BDA market size was valued at $271.83 billion in 2022. The market is projected to grow from $307.52 billion in 2023 to $745.15 billion by 2030, exhibiting a CAGR of 13.5% during the forecast period.

Given the importance of this term, it is essential to determine the factors that lead to a competitive advantage in organizations. Therefore, this research proposal poses the following research questions:

RQ1: What role does BDA play in the strategy for creating competitive advantages in companies?

RQ2: What are the antecedents that condition competitive advantages through the use of BDA?

BDA analysis plays an essential role in promoting e-WOM, as the vast amount of data collected from customer opinions, observations, and recommendations has a positive impact. This, in turn, feeds into the data warehouse, generating predictions and future visions for providing services and goods to customers.

To manage electronic customer relationships, it is crucial to use data analysis to communicate with customers and understand their expectations (Kumar et al., 2011). There is a reciprocal relationship between customers and CRM, where CRM provides data to the data store in the company and vice versa, providing performance forecasts in the markets and information about customer needs and market performance (Bahrami et al., 2012; Gupta et al., 2020).

Companies, especially telecommunications ones, should provide high-quality electronic services as BDA reduces service-related problems and enables customized services for each customer based on the company's owned data analysis (Muharam et al., 2021).

Currently, BDA is mainly linked to social media, which is the largest feeder of data warehouses in companies (Ferdaous & Gouider, 2022). BDA is also linked to the type of electronic services collected by social media, which is one of the most important pillars of electronic word of mouth (Barreto, 2014). Few studies have addressed these aspects, and this research aims to bridge the gap between social media and BDA, as recommended by Kasztelnik and Delanoy (2020). Analyzing BDA in conjunction with social media can shape a creative automated business pattern in real business cases and provide a competitive advantage among companies (Gupta et al., 2021).

The purpose of this research is threefold. First, it addresses a gap in the current literature regarding the application of BDA in the telecommunications sector in Jordan (Ranjan & Foropon, 2021). While BDA has been analyzed in other sectors such as the tourism sector (Agrawal et al., 2022; Kitsios et al., 2022), the logistics sector (Jahani et al., 2023; Zamani et al., 2023), the healthcare sector (Kumari et al., 2023; Singh et al., 2023), and the banking sector (Alexopoulos et al., 2022; Hussain et al., 2023), we are not aware of any research proposing an analysis in this specific sector.

Secondly, the study proposes the application of a holistic model based on the principles of the Resource-Based View Theory (Barney, 1986), which includes BDA, e-WOM, e-CRM, social media, and market performance to determine organizational competitive advantage. Finally, a series of recommendations are proposed for companies in the telecommunications sector with the aim of improving their management in the use of BDA and the attainment of competitive advantages.

The remainder of the paper is organized as follows. First, a theoretical framework is presented to establish the theoretical underpinnings of the research, followed by a series of hypotheses articulating that expected outcomes of the study. The subsequent section provides a detailed description of the research methodology employed. Next, we present a summary of our results. Finally, the study concludes with a discussion of the findings, conclusions, limitations of the study, and recommendations for future research.

4.2 Theoretical framework

4.2.1 Resource-Based View Theory

The Resource-Based View (RBV) Theory is a widely used theoretical framework for understanding competitive advantages, which posits that a company's competitive advantage results from its unique and valuable resources and capabilities (Barney, 1986; Hamel & Prahalad, 1996).

Organizations today are striving to be more responsive to technological instability by incorporating various technologies to address unforeseen circumstances (Mehmood et al., 2023). Typically, technologies provide sustainable competitive advantages to organizations, improving their market position in various sectors and countries (Khan et al., 2024; Razzaque et al., 2023; Schreieck et al., 2022).

Specifically, within our study's variables, Big Data Analytics (BDA) is considered a unique resource. BDA enables companies to collect, process, and analyze extensive data, empowering them to gain insights and make informed decisions. e-WOM is viewed as a source of valuable information generated by consumers, enhancing products or services, building customer trust, and improving competitive advantage.

e-CRM systems provide companies with the ability to manage and analyze customer data, strengthening customer relationships and tailoring marketing efforts. Social media serves as a channel for communication and interaction with customers. Ultimately, market performance is a direct outcome of the effective utilization of resources such as BDA, e-WOM, e-CRM, and social media, contributing to a competitive advantage.

4.2.2 Big Data and Big Data Analytics

The concept of Big Data (BD) entails a massive amount of information that requires novel developments and paradigms to efficiently extract and analyze data. This form of data implies that data sets are constantly evolving and often

become challenging to manage using conventional database tools and concepts (Satyanarayana, 2015).

Fonseca and Marcinkowski (2014) indicate that BD refers to the organization, assurance, and processing of inputs to enable accurate prediction of the future in terms of time and precision. However, Bhadani and Jothimani (2016) argue that the definition of BD is not mainly based on the size of the data but rather the aggregation of data and the speed of data analysis (Sivarajah et al,.2017).

Big Data (BD) defines the basic concepts, principles, and guidelines that underpin the analysis, management, and use of large and complex datasets (Arunachalam et al., 2018). It is characterized by its volume (Hariri et al., 2019), velocity (Jabbar et al., 2020), diversity, and veracity (Adnan & Akbar, 2019).

The theoretical framework of big data provides an organized approach to address the challenges and opportunities it presents (Gupta et al., 2020). Fonseca and Marcinkowski (2014) indicate that Big Data refers to the organization, assurance, and processing of inputs to enable accurate future predictions in terms of time and precision.

In this context, Albahri et al. (2023) emphasize the importance of ensuring data quality and reliability since information sources may contain errors, inconsistencies, or biases. The identification of data sources, including social networks, sensors, Internet of Things devices, websites, and customer relationship management feedback, is crucial (Kumar et al., 2023).

On the other hand, Big Data Analytics (BDA) is a field of study that has gained significant attention in recent years due to its potential to transform decision-making processes and create competitive advantages for various industries (Agrawal et al., 2022). BDA captures any type of data in real-time, enabling companies to make efficient decisions (Pham & Stack, 2018). Companies will use these tools to process and analyze data resources, make decisions, and gain a competitive advantage (Dong & Yang, 2020).

The use of big data analytics requires aligning big data storage technologies, analytical talent, and management knowledge, which could pose a technical

challenge for companies lacking the ability to extract valuable insights from data (Li et al., 2022).

It is worth noting that the adoption of BDA in a company may also pose challenges in managing personal and confidential data, which can have negative implications from privacy and security perspectives (Chatterjee et al., 2023). Recent studies have highlighted that BDA, combined with the dynamic capability enabled by artificial intelligence (AI), can ensure better operational performance to improve service quality, reduce costs, produce new products at lower costs, and mitigate market risks (Dubey et al., 2020), further enhancing the importance of this tool for businesses.

In summary, Big Data refers to both the infrastructure and the data itself, while Big Data Analytics (BDA) concentrates on the process of analyzing that data to extract valuable information. BDA will be essential for maximizing the potential of large datasets and making evidence-based decisions in various disciplines, as in our case, determining the importance of the competitive advantage that its implementation will bring to companies.

4.2.3 Electronic customer relationship management

Electronic Customer Relationship Management (e-CRM) is currently undergoing significant growth as it empowers companies to engage with customers and address concerns related to products and services, ultimately enhancing customer satisfaction.

E-CRM facilitates the collection of customer data, and with recent advancements, companies have amassed substantial data repositories. Kumar et al. (2019) highlight a positive relationship between Big Data analysis in companies and relationship management. Efficient management of e-CRM through Big Data Analytics (BDA) and predictive solutions substantially contributes to a company's growth and sustainability in delivering products and managing customer relationships (Gupta et al., 2020).

BDA technologies enable companies to analyze data and respond to customers swiftly and on a larger scale, potentially allowing for personalized services at a low cost. This transformative capability has the potential to enhance the overall customer service experience (Hoyer et al., 2020; Kaplan & Haenlein, 2019).

4.2.4 Social media

Social media facilitates easy access and searchability of views and interactions among individuals in society, while also enabling companies to collect and utilize user-generated data for decision-making purposes (Susanto et al., 2021). The vast amounts of data collected through social media platforms, such as Facebook, Twitter, and LinkedIn, are traceable and can be transformed into behavioral models that capture users' actions, connections, and preferences, thus providing valuable insights for analysis (Tan et al., 2013).

Telecom companies are leveraging these data to forecast future services and products for their customers based on insights gleaned from the analysis of this information (Felt, 2016). This trend has been dubbed the "gold data rush" due to the significant amount of data available to companies about their customers (Kennedy et al., 2015).

4.2.5 Electronic word of mouth

The emergence of new communication channels in recent years has provided opportunities for electronic word of mouth (e-WOM) communication. Several research studies have confirmed that when making purchasing decisions, users place more trust in online reviews posted by unknown consumers than in traditional media (Cheung & Thadani, 2012). e-WOM has proven to be an effective way to create a competitive advantage for companies, according to Kitsios et al. (2021) and Mariani and Borghi (2021), who highlight how the analysis of BDA can help organizations better understand their customers, thereby enhancing their market performance through differentiation from competitors. In particular, the analysis of BDA has been found to have a positive

impact on e-WOM, as noted by Mukhopadhyay et al. (2022) in a bibliometric analysis of the fields of management and business.

4.3 Research model and hypotheses development

4.3.1 Big Data Analytics and electronic word of mouth

The use of BDA in the telecommunications industry has the potential to positively impact on e-WOM by providing companies with valuable insights into consumer behavior and preferences. By analyzing data collected from customer feedback and opinions, companies can gain a better understanding of what consumers are saying about their products and services online, and use this information to enhance their offerings and increase customer satisfaction (Mariani & Borghi, 2021).

BDA can also identify new information and unique patterns that may not be detected by normal data, thus enhancing customer preferences and improving e-WOM (Akbari et al., 2022). Recent research has shown that BDA can be effectively used to track and analyze e-WOM. Studies have found that BDA can identify key opinion leaders, analyze sentiment and spread of e-WOM, and develop targeted marketing strategies that resonate with customers (Kim et al., 2019; Xing et al., 2022). Overall, BDA has the potential to positively impact e-WOM by providing companies with insights into consumer behavior and preferences. Based on this evidence, it is reasonable to hypothesize that BDA has a positive effect on e-WOM. Therefore, the following hypothesis is proposed:

H1: Big Data Analytics has a positive effect on electronic word of mouth.

4.3.2 Big Data Analytics and electronic customer relationship management

E-CRM is considered a critical aspect of organizational market performance and customer satisfaction, with electronic customer relationship management playing

a pivotal role in understanding customer needs to achieve satisfaction (Bahrami et al., 2012).

In this sense, BDA has become a popular tool for businesses to gain valuable insights into customer behavior and preferences, enabling them to better understand their customers and improve their e-CRM strategies through data analysis.

Research shows that businesses using BDA are more likely to improve customer retention and satisfaction compared to those that do not (Zhang et al., 2018). BDA enables businesses to identify customer needs and preferences, allowing them to tailor their e-CRM strategies to better meet those needs. Furthermore, BDA can also help businesses improve their customer segmentation and targeting strategies by identifying patterns and trends in customer data, resulting in more effective e-CRM strategies (Kou et al., 2017).

Additionally, BDA can help businesses improve their customer service and support strategies by identifying common customer issues and providing more accurate and efficient responses (Kou et al., 2017). Overall, the evidence suggests that BDA has a positive impact on e-CRM. It enables businesses to better understand their customers, tailor their e-CRM strategies to meet their needs, and ultimately improve customer retention, satisfaction, and service. Therefore, we propose the following hypothesis:

H2: Big Data Analytics has a positive effect on electronic customer relationship management.

4.3.3 Big Data Analytics and social media

Social networks are Internet interaction platforms that enable people to share and consume information with each other (Rahman & Reza, 2022). In this regard, social media has become a significant source of data due to the growing use of platforms for exchanging information and data among users, resulting in a massive increase in data volume (Joseph et al., 2018). The application of Big Data Analytics (BDA) to the information obtained from social networks will be

crucial in subsequent decision-making based on customer insights (Ghasemaghaei & Calic, 2019).

BDA can assist companies in identifying key influencers and targeting specific customer segments by analyzing social media data. Companies can also use insights gained from analyzing social media data to improve their social media marketing efforts and identify and address customer complaints and concerns in a timely manner, which can increase customer satisfaction and loyalty (Kaufman, 2018).

In conclusion, using BDA in telecommunication companies can improve their social media marketing efforts by providing insights into customer behavior and preferences and allowing them to quickly respond to customer complaints and concerns. Therefore, we propose the following hypothesis:

H3: Big Data Analytics has a positive effect on social media.

4.3.4 Electronic word of mouth and market performance

Positive electronic word of mouth (e-WOM) is a key determinant of marketing success for companies. e-WOM is related to increased customer satisfaction with the products or services provided by a company (Raguseo & Vitari, 2017). Several studies have confirmed the positive relationship between e-WOM and market achievements, as customers' opinions about products or services can lead to new market shares and increased sales volumes (Napawut et al., 2022).

A growing body of research suggests that e-WOM has a positive impact on market performance in the telecommunication industry. e-WOM involves the sharing of experiences and ideas about products or services through digital channels such as social media and review pages/sites (Teng et al, 2017).

In the telecommunication industry, e-WOM can play an important role in the consumer purchase process and overall market performance. A study by Lee and Cheung (2016) found that positive e-WOM had a significant positive influence on consumer purchase intentions in the telecommunication industry, while negative

e-WOM had a significant negative influence. Park et al. (2018) stated that e-WOM can also influence brand loyalty in the telecommunication industry. Positive e-WOM had a significant positive influence on brand loyalty, while negative e-WOM had a significant negative influence. Kim et al. (2019) found that e-WOM has a significant impact on customer satisfaction in the telecommunication industry. Positive e-WOM had a significant positive influence on customer satisfaction, while negative e-WOM had a significant negative influence.

In conclusion, the hypothesis that e-WOM has a positive effect on market performance in the telecommunication industry is supported by a growing body of research. Studies have found that positive e-WOM can lead to increased sales, brand loyalty, and customer satisfaction, which can ultimately improve market performance for telecommunication companies. Based on the above, the following hypothesis is proposed:

H4: Electronic word of mouth has a positive impact on market performance.

4.3.5 Customer relationship management and market performance

Various studies have found that companies focusing on building strong relationships with customers through the development of organizational capabilities can enhance their market performance, and that electronic customer relationship management (e-CRM) can be particularly effective in this regard (Ardyan & Sugiyarti, 2018; Harliyanto & Soediantono, 2022). By engaging customers in operational activities while taking individual privacy into account and building strategic relationships, companies can increase customer loyalty (Haudi et al., 2022) and ultimately achieve higher market share and improved market performance (Mokha & Kumar, 2022).

The hypothesis that e-CRM has a positive impact on market performance in the telecommunication industry is supported by a growing body of research. For instance, Kavitha and Duraisamy (2018) found that e-CRM practices in Indian telecommunication companies led to higher customer satisfaction and loyalty, resulting in improved market performance. Similarly, Al-Khatib and Al-Khatib

(2019) observed that e-CRM strategies in Jordanian telecommunication companies led to reduced customer churn and increased customer retention.

Furthermore, a recent study by Al-Khatib and Al-Khatib (2020) indicated that e-CRM practices in Saudi Arabian telecommunication companies resulted in improved customer satisfaction and increased market share. These findings provide compelling evidence that e-CRM practices can positively impact market performance in the telecommunication industry.

By improving customer satisfaction, loyalty, and retention, companies with strong e-CRM practices can enhance their competitive position and achieve higher market share and revenue growth. Thus, we propose the following hypothesis:

H5: Electronic customer relationship management has a positive effect on market performance.

4.3.6 Social media and market performance

In today's commercial landscape, social media has become one of the most effective aspects for companies and managers to focus on (Obermayer et al., 2022), having transformed the e-commerce industry globally (Guan et al., 2022). The use of social media in marketing operations can enhance a company's ability to enter new markets, thereby improving its market performance (Khamaludin et al., 2022).

Several studies have supported the hypothesis that social media positively affects market performance in telecommunication companies. Jibril et al. (2019) found that social media engagement was positively associated with increased brand awareness and customer loyalty. They suggest that social media provides an efficient platform for companies to engage with customers, share information, and build trust. In another study, Liao and Lee (2019) found a positive relationship between social media usage and increased market share and revenue growth. The authors propose that using social media platforms can be a beneficial way for businesses to increase their visibility and attract potential customers. Similarly, Schniederjans (2013) found that social media usage was positively related to

increased market performance, specifically in terms of stock price and return on investment. They also suggest that social media can be a valuable tool for companies to communicate with stakeholders and enhance their reputation. Thus, as a company obtains valuable information from social networks, it will enhance its market performance, as these platforms are widely used by users to express their opinions and convey certain intentions. Therefore, we propose the following hypothesis:

H6: Social media has a positive impact on market performance.

4.3.7 Market performance and competitive advantage

Market performance is crucial for creating unique competitive advantages that did not exist before, as it leads to improved levels of sales, growth, and product development, thereby creating new opportunities in the markets. This can help companies and organizations gain a new competitive edge that was previously absent (Chowdhury & Quaddus, 2021).

In the dynamic and competitive telecommunication industry, firms are constantly seeking ways to gain an advantage over their rivals. One key factor that has a significant impact on a company's ability to achieve competitive advantage is its market performance. Research has shown that companies with strong market performance are more likely to achieve a competitive advantage (Chen, 2019).

This is because such firms are better positioned to generate higher revenues and profits, which can then be reinvested in new technologies, improved customer service, and expansion into new markets. Moreover, firms with strong market performance are more likely to be perceived as industry leaders by customers, investors, and other stakeholders, which can enhance customer loyalty and trust and provide a significant competitive advantage (Zhang, 2019).

Overall, the literature suggests that market performance is a critical factor in achieving competitive advantage in the telecommunication industry. Companies with strong market performance are better placed to generate higher revenues

and profits, attract and retain talented employees, and be perceived as industry leaders. Based on the above, we propose the following hypothesis:

H7: Market performance has a positive effect on competitive advantage.

4.3.8 Big Data Analytics and competitive advantage

The use of Big Data Analytics (BDA) technologies allows companies to enhance their existing applications by offering business-centric practices and methodologies that provide a competitive advantage (Chen et al., 2012; Côrte-Real et al., 2017). By using data to make informed strategic decisions, companies can make more accurate and timely choices regarding market strategies, product development, and resource allocation, which can positively impact market performance (Bharadiya, 2023).

Companies that effectively utilize BDA are often better positioned to outperform their competitors. Furthermore, they can identify market trends, understand customer preferences, and optimize their offerings, giving them a competitive advantage that can lead to improved market performance (Grimaldi et al., 2023).

BDA also provides valuable insights into customer behaviors and preferences. A more detailed understanding of the target market allows companies to tailor their products and services, leading to increased customer satisfaction and loyalty, which ultimately affects market performance (Chong & Patwa, 2023). BDA offers insights into customer behaviors, market dynamics, and emerging trends, enabling companies to adapt, innovate, and excel in the market.

The impact of BDA on market performance is supported by practical applications and empirical evidence, demonstrating its significance in modern business strategy and performance enhancement. Therefore, the following hypothesis is proposed:

H8: Big Data Analytics has a positive effect on competitive advantage.

4.3.9 Mediating effect of electronic customer relationship management

The implementation of BDA provides companies with an abundance of valuable data. However, mere access to data does not guarantee improvements in market performance (Li et al., 2022). This is where e-CRM plays a crucial role in effectively channeling and managing this data, enabling the analysis and application of relevant information for strategic decision-making (Chen et al., 2022). Furthermore, e-CRM also facilitates the personalization of customer interactions through precise customer segmentation using data collected through BDA. This personalization can enhance customer satisfaction and ultimately increase customer retention, an essential factor in market performance (Singh et al., 2023).

Effective customer relationship management, driven by e-CRM, is intrinsically linked to customer retention and loyalty. The retention of loyal customers significantly contributes to increased sales and word-of-mouth brand promotion, positively influencing market performance (Hallikainen et al., 2020). Moreover, e-CRM enables more informed decision-making by providing a structured framework for data analysis derived from BDA.

Strategic decisions based on data insights through e-CRM can impact the effectiveness of marketing strategies and resource optimization, affecting market performance (Olabode et al., 2022). Additionally, e-CRM provides tools to measure and track the impact of marketing strategies and customer retention, facilitating the assessment of how data-driven initiatives, such as those derived from BDA, are influencing the market and allowing adjustments as needed (Aljumah et al., 2021). Based on the above discussion, we propose the following hypothesis:

H9: Electronic Customer relationship management mediates the effect of BDA on market performance.

Figure 4.1 shows the conceptual model and the research hypotheses.

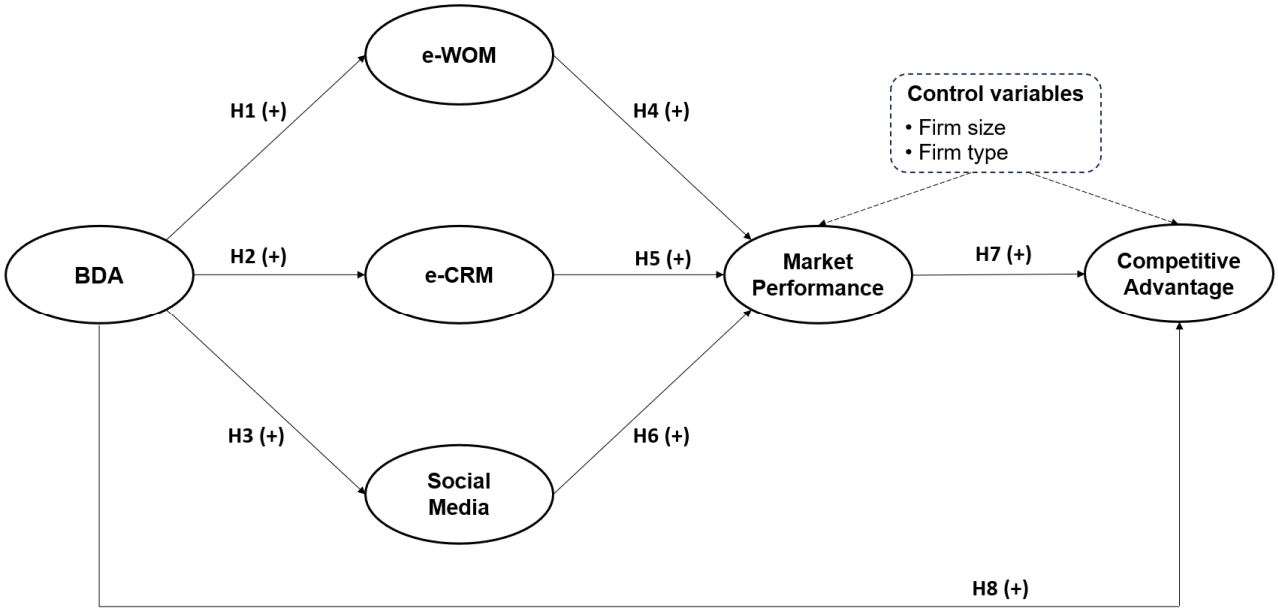

Figure 4.1. Research model

4.4 Research methodology

The aim of this study is to explore the potential of BDA for enhancing the competitive advantage of telecommunication companies. To achieve this goal, a quantitative research approach was employed to gather and analyze primary data, which enabled the development of hypotheses related to the research questions.

The use of a quantitative method was deemed appropriate since it allowed for a large sample size to be surveyed. The estimation of a structural equation model (SEM) was carried out using AMOS software.

The coefficients and the level of statistical significance allowed us to analyze the relationships between the constructs. As a final step, a mediation analysis was performed using the PROCESS macro for SPSS (Hayes, 2013). Bootstrapping was used to determine the significance of the indirect associations in the model, employing 10000 replications and a 95% confidence range.

4.4.1 Measurements

The research instrument used in this study consisted of a questionnaire divided into two parts. The first part collected information regarding the sample's characteristics, while the second part included paragraphs that measured the variables of interest. These variables included Big Data Analytics, e-WOM, e-CRM, social media, market performance, and competitive advantage. The present study employed a seven-point Likert scale with answer choices ranging from “strongly disagree” to “strongly agree”.

The questionnaire was developed by adapting scales from previous studies, ensuring that the items were relevant and appropriate for the variables being measured in this study. For example, for the Big Data Analytics variable, we adapted items from the scales developed by Al-Khatib (2022) and Shamim et al. (2020).

The items for the e-WOM variable were based on the research of Sun et al. (2021) and Yoo et al. (2013), while those for e-CRM were adapted from Moreno and Melendez (2011). The items for social media were based on Pop et al. (2022). The scale for Market Performance was developed based on the studies of Chowdhury and Quaddus (2021) and Olabode et al. (2022). Finally, the items for Competitive Advantage were adapted from Al-Khatib (2022) and Tu and Wu (2021).

This study also included firm size and firm type as control variables to mitigate influences from firms’ characteristics. Firm size included three categories: companies with fewer than 50 employees are categorized as small businesses, those with 50-250 employees are classified as medium-sized enterprises, whereas large companies have more than 250 employees (Hayajneh et al., 2022; Ozdemir et al., 2022; Zapletalová, 2023). Firm type was a dummy variable coded as 0 if the level of technological innovation in the firm was low, and 1 if the level of technological innovation was high (Adomako & Tran, 2022).

4.4.2 Data collection

For the empirical testing of the hypothesis, a cross-sectional data collection system was adopted through the administration of an online questionnaire among managers and directors of Jordanian telecommunications firms. Only managers and directors of the sample companies were included in the data collection, assuming that these subjects have a more global view of the business processes and, consequently, are able to assess the overall impact of Big Data Analytics on competitive advantage.

After a validation process, the sample used for the analysis yielded 304 completed surveys out of a pool of 384 Jordanian telecommunications companies, with a response rate of 79.16%. This randomly selected sample included large (63.8%), medium (30.3%), and small (5.9%) firms from different regions of the country. Most of the companies analyzed are Internet service providers (34.9%), followed by telephone operators (30.9%), cable companies (20.1%) and satellite companies (14.1%).

4.4.3 Common method and non-response bias

As self-report is the only data source for this study, a common method bias test was conducted to determine the significance of common method variance (Podsakoff et al., 2003). We included a single common latent factor in the model and compared the model without a common method factor with the model with a common method factor. We found that the path coefficient of the main model did not change after the inclusion of the model without a common method factor. Thus, common method variance was not a concern in this study.

Similarly, in the present study, the potential concern of non-response bias was tested by comparing late and early participant responses (Rogelberg & Stanton, 2007). The t-test reported a non-significant association between both groups, demonstrating that non-response bias did not affect the results of this research.

4.5 Results

4.5.1 Measurement assessment

To ensure the reliability and validity of the measures used in this study, we followed the guidelines provided in the classic literature (Hair et al., 2006). We began by establishing one-dimensionality in all constructs, which was assessed by examining the pattern of standardized residuals and modification indices generated from the confirmatory factor analysis (CFA) using the maximum likelihood method with AMOS. The CFA consisted of six latent variables, and the results were found to be adequate according to previous literature. All the confirmatory factor loadings were higher than 0.7 and significant at a 0.001 level.

To assess the internal consistency of multiple measures, we used composite reliability (CR) and average variance extracted (AVE) after removing items from the scales that did not reach adequate values. For an exploratory study, researchers generally recommend 0.70 and 0.50 for CR and AVE, respectively, as adequate reliability. As shown in Table 4.1, all values for both indicators complied with the established requirements (Hair et al., 2006). Also, the Cronbach alpha values for each scale were above 0.8. Therefore, the reliability of the construct can be considered satisfactory.

Table 4.1. Confirmatory factor analysis.

Constructs and items	Loading
Big Data Analytics – BDA (α = 0.938, CR = 0.938, AVE = 0.836)	
The firm holds strategic partnerships with companies operating in the big data sector to exchange experiences and knowledge in this field.	0.890
The firm has long experience in data processing and eliciting decisions from it.	0.922
The firm has teams working to take advantage of big data analytics to gain new insights through unstructured data.	0.930
Electronic Word of Mouth – EWOM (α = 0.889, CR = 0.891, AVE = 0.732)	
Customers get information about the brand they want through social media and the internet.	0.895

Our customers obtain information about the brand they want to buy via social media and the internet.	0.847
Our customers write their opinion about the products presented in the designated places on the site.	0.823
Electronic Customer Relationship Management – ECRM (α = 0.894, CR = 0.893, AVE = 0.736)	
The company closely monitors and evaluates the level of commitment to providing electronic services to customers.	0.868
The firm provides electronically after-sales services to a large extent.	0.834
The firm develops strategies to increase customer value.	0.871
Social Media – SM (α = 0.878, CR = 0.882, AVE = 0.714)	
Information obtained from social networks is trustworthy.	0.880
Information obtained from social networks is reliable.	0.873
Information obtained from social networks is honest.	0.779
Market Performance – MP (α = 0.917, CR = 0.922, AVE = 0.798)	
Compared to competitors, the firm market share has increased during the last period.	0.922
Compared to competitors, the firm has seized opportunities in foreign markets and expanded in these markets.	0.918
Compared to competitors, sales volume has increased over the past period.	0.838
Competitive Advantage – CA (α = 0.884, CR = 0.884, AVE = 0.719)	
The firm has fine and excellent reputation in the market.	0.848
The firm is interested in building long-term strategic relationships with its partners.	0.897
The firm responds to changes in supply and demand.	0.795

Discriminant validity was examined to ensure that each construct is distinct from its neighboring constructs (Hair et al., 2006). To conduct this analysis, we evaluated the correlation matrix of latent constructs, with the diagonal elements representing the square roots of the average variance extracted (AVE). The correlations between constructs are presented in the cells outside the lower left diagonal of the matrix. In this analysis, the shared variance between a construct

and its measures must be greater than the variance shared between the constructs and other constructs in the model. Hence, discriminant validity is achieved when the diagonal elements (square root AVE) are greater than the off-diagonal elements in the same row and column, as demonstrated in Table 4.2.

Table 4.2. Discriminant validity

	BDA	EWOM	ECRM	SM	MP	CA
BDA	0.914					
EWOM	0.553	0.856				
ECRM	0.675	0.769	0.858			
SM	0.729	0.489	0.604	0.845		
MP	0.835	0.525	0.608	0.707	0.894	
CA	0.825	0.555	0.714	0.730	0.735	0.848

As the sample did not present a multivariate normal distribution, the bootstrapping technique was applied for 500 consecutive steps or samples, and a significance level of 5%. Specifically, the Bollen-Stine's corrected p-value was used, testing the null hypothesis that the model is correct. The model presented a good overall fit (GFI = 0.909; NFI= 0.949; TLI = 0,965; CFI = 0.973; AGFI = 0.871; RMSEA = 0.031) according to the recommended thresholds (Bollen, 1989; Lai & Li, 2005).

4.5.2 Structural model and hypotheses testing

To evaluate the SEM, the statistical significance of its structural loads was analyzed. Table 4.3 shows the results of the applied structural equation analysis and the results of the research hypotheses regarding direct effects. In this research all relationships are significant since the p-value associated to each of them is less than the significance level.

Table 4.3. Hypothesized relationships

Hypotheses		β	S.E.	C.R.	Result
H1:	Big Data Analytics → e-WOM	0.598***	0.061	10.618	Supported
H2:	Big Data Analytics → e-CRM	0.724***	0.058	13.094	Supported
H3:	Big Data Analytics → Social media	0.792***	0.056	14.612	Supported
H4:	e-WOM → Market performance	0.110*	0.057	2.144	Supported
H5:	e-CRM → Market performance	0.215***	0.065	3.758	Supported
H6:	Social media → Market performance	0.584***	0.074	9.235	Supported
H7:	Market performance → Competitive advantage	0.177**	0.047	3.060	Supported
H8:	Big Data Analytics → Competitive advantage	0.715***	0.064	10.952	Supported

*Note: *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$*

Hypothesis 1 proposed a positive relationship between Big Data Analytics and electronic word of mouth, which was confirmed by the literature and supported by the statistical results ($\beta = 0.598$; $p \leq 0.001$). Similarly, the results obtained supported the relationship between BDA and electronic customer relationship management that Hypothesis 2 suggested ($\beta = 0.724$; $p \leq 0.001$), validating other recent studies in the literature. With regard to the relationship between BDA and social media put forward by Hypothesis 3, the results from this study were strongly supportive ($\beta = 0.792$; $p \leq 0.001$), as already suggested in the literature. Hypothesis 4 proposed a positive relationship between e-WOM and market performance, which was confirmed by the literature and supported by the statistical results ($\beta = 0.110$; $p \leq 0.05$). In the case of Hypothesis 5, the results also supported the relationship between e-CRM and market performance ($\beta = 0.215$; $p \leq 0.001$), as previous research revealed. Furthermore, Hypothesis 6 proposed a positive impact of social media on market performance, which was supported by the statistical results ($\beta = 0.584$; $p \leq 0.001$) and consistent with prior research. Also, the results obtained confirmed the positive impact of market performance on competitive advantage that Hypothesis 7 proposed ($\beta = 0.177$; $p \leq 0.01$), being in line with recent previous studies. Another important finding is that the relationship between Big Data Analytics and competitive advantage is

positive and significant (β = 0.715; $p \leq 0.001$); therefore, Hypothesis 8 is supported.

Furthermore, the BDA → e-CRM → MP path was found positive (β = 0.071) and significant since the bias-corrected confidence intervals did not include zero (0.007, 0.139); then, Hypothesis 9 is confirmed. Thus, results of mediation analysis confirmed electronic customer relationship management as a mediator of the relationship of Big Data Analytics and market performance.

Finally, the effects of firm size and firm type were analyzed as control variables. The results indicate that firm size has a significant effect on market performance (β = 0.294; $p \leq 0.001$) and competitive advantage (β = 0.131; $p \leq 0.05$). Furthermore, the effects of firm type on market performance (β = 0.527; $p \leq 0.001$) and competitive advantage (β = 0.161; $p \leq 0.01$) are also significant.

4.6 Discussion

4.6.1 Theoretical implications

The primary objective of this study was to explore the potential of Big Data Analytics (BDA) in enhancing the competitiveness of telecom companies. A quantitative survey was administered online, resulting in 304 completed responses. Overall, respondents exhibited a positive outlook on the factors under investigation, with BDA garnering the highest proportion of affirmative responses.

The utilization of BDA demonstrated a favorable impact on electronic Word of Mouth (e-WOM) and electronic Customer Relationship Management (e-CRM), concurrently influencing social media platforms positively. Notably, e-WOM was identified as contributing to sales, while e-CRM exhibited a positive effect on market performance. The study further uncovered a positive correlation between social media usage and enhanced market performance. Importantly, robust market performance was identified as a significant driver of competitive advantage.

Specifically, the study demonstrates the potential of BDA to establish a more cohesive strategy for enhancing a company's competitive advantage. The results were consistent with previous studies, such as Akbari et al. (2022), which suggested that BDA can improve consumer preferences and e-WOM by providing new information and unique patterns not found in traditional data sources. The findings also agreed with Libai et al. (2020) and Muharam et al. (2021), who emphasized the importance of BDA in evaluating customer data in novel ways and guiding the development of tailored services.

The study found that a positive relationship exists among e-WOM, E-CRM and social media, and market performance. This information can be leveraged by telecom firms to improve their market standing. These findings align with previous research by Ardyan and Sugiyarti (2018), Harliyanto and Soediantono (2022), and Purwanto (2022), which demonstrated the importance of organizational capabilities in building strong customer relationships and increasing market share. Khamaludin et al. (2022) also found that social media can increase businesses' capacity to expand into new markets, improving their market performance.

The study also confirmed that market performance has a positive influence on competitive advantage. This finding aligns with Chowdhury and Quaddus (2021), who argued that improved market performance can lead to unique competitive advantages and new opportunities in the market. As a result, businesses can acquire a new competitive edge that was previously lacking.

Our study findings also confirm the positive impact of Big Data Analytics on competitive advantage. This is in line with Bag, Dhamija, Luthra, and Huisingh (2023), who state that Big Data Analytics adoption can help managers to focus management attention upon resources, capabilities and competencies to achieve competitive advantage.

Furthermore, this study gives a contribution to the literature by demonstrating the mediating role exerted by e-CRM in the BDA-MP relationship. Thus, Big Data Analytics can help businesses improve their electronic customer relationship management actions, then allowing firms to develop more effective marketing

strategies, which benefit market performance (Kou et al., 2017; Liu & Chen, 2023).

4.6.2 Practical implications

The fundamental conclusion of our study is that the strategic use of Big Data Analytics (BDA) has a significant impact on the competitive advantage of telecommunications companies. The ability to effectively collect, analyze, and apply large volumes of data, including aspects like electronic word-of-mouth (e-WOM), customer relationship management (e-CRM), and social media, has become a critical differentiator in this highly competitive sector. By adopting a well-planned Big Data strategy, companies can gain valuable insights to enhance their market performance.

In this context, effective Big Data management allows telecommunications companies to optimize their internal operations. This includes identifying inefficiencies, optimally allocating resources, and improving processes. By eliminating inefficiencies and reducing operational costs, companies can provide high-quality services at competitive prices, giving them a significant advantage in the market.

The use of Big Data translates into a tangible improvement in the customer experience. By analyzing and understanding customer preferences and behavior, companies can personalize their offerings and services. This leads to increased customer satisfaction and long-term retention, which is crucial in a market where customer loyalty plays a fundamental role in success.

Furthermore, in a highly competitive market, differentiation is essential. Companies that effectively adopt Big Data strategies can stand out by offering innovative services tailored to the changing needs of customers. This provides them with a sustainable competitive advantage and the ability to lead the market rather than simply following the competition.

A critical element highlighted in our conclusions is the importance of ensuring data quality. Companies must implement robust methods to distinguish between

authentic data and false or low-quality data. Data integrity and accuracy are essential for informed decision-making and for avoiding decisions based on incorrect information.

In summary, the strategic use of Big Data has become an invaluable asset for telecommunications companies in their pursuit of sustainable competitive advantage. By optimizing operations, improving the customer experience, differentiating themselves in the market, and ensuring data quality, these companies can not only survive but thrive in a highly competitive environment. The conclusions emphasize the importance of continued investment in Big Data analytics capabilities to maintain and strengthen their position in the telecommunications industry.

4.6.3 Limitations and avenues for future research

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customer satisfaction and long-term retention, which is crucial in a market where customer loyalty plays a fundamental role in success.

Furthermore, in a highly competitive market, differentiation is essential. Companies that effectively adopt Big Data strategies can stand out by offering innovative services tailored to the changing needs of customers. This provides them with a sustainable competitive advantage and the ability to lead the market rather than simply following the competition.

A critical element highlighted in our conclusions is the importance of ensuring data quality. Companies must implement robust methods to distinguish between authentic data and false or low-quality data. Data integrity and accuracy are essential for informed decision-making and for avoiding decisions based on incorrect information.

In summary, the strategic use of Big Data has become an invaluable asset for telecommunications companies in their pursuit of sustainable competitive advantage. By optimizing operations, improving the customer experience, differentiating themselves in the market, and ensuring data quality, these companies can not only survive but thrive in a highly competitive environment. The conclusions emphasize the importance of continued investment in Big Data analytics capabilities to maintain and strengthen their position in the telecommunications industry.

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Chapter 5

Determinants of product and service innovation: The mediating role of customer experiential knowledge-driven innovation

Abstract

This study investigates the influence of marketing and business intelligence on product and service innovation, specifically examining the role of customer experiential knowledge as a mediating mechanism. Employing a quantitative research approach, data were collected from a sample of 251 telecommunications companies from Jordan. Smart PLS software was used to estimate a structural equation model and conduct mediation analysis. The findings reveal significant positive relationships between business intelligence, marketing intelligence, customer experiential knowledge, and product and service innovation. Moreover, customer experiential knowledge emerged as a significant mediator between marketing and business intelligence and product and service innovation. These results highlight the importance of leveraging intelligence-driven strategies and customer insights to drive innovation within organizations. The study contributes to both theory and practice by elucidating the complex interplay between intelligence, customer knowledge, and innovation processes.

Keywords: Marketing intelligence, business intelligence, product and service innovation, customer experiential knowledge.

5.1 Introduction

In today's customer-centric landscape, the complex relationship between marketing, business intelligence, and innovation is critical to organizational success. This dynamic synergy underscores the indispensable role of knowledge, highlighting the substantial impact of customer experiences on corporate innovation (Falahat et al., 2020). Various pivotal theories, such as the Resource-Based View, the Innovation Diffusion Theory, and the Open Innovation Theory, emphasize the importance of harnessing customer knowledge (Tran et al., 2022). Moreover, the Service-Dominant Logic perspective highlights the proactive involvement of customers in co-creating value during the innovation process. Many studies converge on the intersection of marketing, business

intelligence, and innovation, fostering an environment conducive to customer-led innovation in the ever-evolving business landscape (Niu et al., 2021; Wang et al., 2020).

Marketing and business intelligence play crucial roles in influencing customers' experiential knowledge (An et al., 2021; Popovič et al., 2019). Marketing intelligence aids organizations in understanding customer needs, preferences, and behaviors, enhancing marketing strategies and overall customer experiences (Carson et al., 2020). Conversely, business intelligence enables data-driven decisions that enhance operational efficiency, product quality, and customer satisfaction (Al-Okaily et al., 2023). Analyzing customer data through business intelligence reveals patterns and trends, informing product development, marketing campaigns, and customer service initiatives for improved experiences and knowledge (Helm et al., 2020). Additionally, customer experiential knowledge encapsulates customers' tacit understanding of consumption experiences influenced by socio-cultural factors and subjective influences (Ietto et al., 2021). Shaped by emotions, ingenuity, instincts, and senses, it is pivotal for understanding and managing customer experiences, contributing valuable insights for customer knowledge management (Hyun et al., 2022; Wambalaba et al., 2019). According to Ietto et al. (2021), customer experiential knowledge profoundly influences customer behaviors and experiences across industries, emphasizing the significance of businesses to meet customer expectations and preferences for authentic experiences.

While contemporary studies recognize the transformative impact of technologies like artificial intelligence, big data, and augmented reality on marketing practices and the notable impact of business and marketing intelligence on innovation (Alimamy & Nadeem, 2022; Rejeb et al., 2023), there is a discernible gap in the theoretical literature concerning the specific role of customers' experiential knowledge. This knowledge, stemming from direct customer experiences, holds untapped potential as a mediating factor intricately linking business intelligence and marketing intelligence, thereby influencing the innovation trajectory of products and services (Keiningham et al., 2020). Previous research needs more adequate exploration of this aspect. Studies have mainly focused on broader

themes like market knowledge acquisition, customer participation in virtual communities, and the role of customer knowledge management in product innovation (Wang, 2022). However, it is necessary to specifically address the mediating role of customers' experiential knowledge in the dynamic interplay between marketing and business intelligence.

Despite recognizing the transformative influence of new technologies, there appears to be a gap in understanding how these advancements, especially in business intelligence, redefine marketing research and practices. This study aims to bridge this gap by exploring how the dynamic interaction between marketing and business intelligence influences the product and service innovation through the customer experiential knowledge within telecommunications companies. It identifies areas for improvement, integrating various facets to provide a more holistic understanding of their combined impact on innovation.

Much of the existing literature on new product and service innovation concentrates on manufacturing sectors (Blichfeldt & Faullant, 2021; Crowley, 2017; Wallin et al., 2015), leaving a gap in addressing innovation in essential sectors like telecommunications. The limited practical applications across diverse sectors prompt a need for more broadly applicable insights, particularly in understanding innovation dynamics, such as communications, in modern business landscapes.

The contributions of this study are threefold. First, the proposed model contributes to the literature by identifying the determinants of product and service innovation. Second, this study proposes the mediating effect of customer experiential knowledge on the relationship between marketing and business intelligence and product and service innovation. Third, this study makes several recommendations to help organizations in driving innovation across product and service offerings.

5.2 Theoretical background

The Resource-Based View emphasizes the pivotal role of knowledge in leveraging distinctive organizational resources (Moreno et al., 2012; Pereira & Bamel, 2021) and suggests that companies gain a competitive advantage by possessing unique and valuable resources (Haider & Kayani, 2021). Marketing and business intelligence are considered strategic resources that contribute to the development of customer experiential knowledge and, subsequently, innovation (Sahoo et al., 2023). Customer experience management assists in managing and optimizing customers' interactions, with marketing and business intelligence shaping customer experience and influencing experiential knowledge (Valentine, 2022).

Within marketing literature, various initiatives unfold to innovate products and services. For instance, design-driven innovation integrates product and service development (Conti & Chiarini, 2021), emphasizing collaboration and value creation. Meanwhile, a customer-centered approach emphasizes understanding customer differences (Mandal, 2019), and the Open Innovation Theory underscores collaboration and coordination in product development through open innovation activities (Jaziri & Rather, 2022). Moreover, the augmentation of innovation capabilities encompasses formalized routines, while social media is harnessed for organizational learning and innovation in new product development (Zhan et al., 2020).

Examining prior research, Desouza et al. (2008) delved into customer, emphasizing the integration of customer experiential knowledge into the innovation process. Their findings focus on leveraging customer experiential knowledge for product and service development. Zahid et al. (2019) explored Big Data Analytics in telecommunications, illuminating the role of emerging marketing and business intelligence technologies in leveraging customer experiential knowledge. Kumar (2022) conducted a systematic review of augmented reality in online retail, complementing the investigation into how technological advancements enhance customer experiences and drive innovation in retail. Gustafsson et al. (2012) delved into customer co-creation in service innovation, providing insights into the dynamics of customer engagement in co-creating

services. Lastly, Kurtuluş and Cengiz (2022) explored how customer experiential knowledge influences innovation in the healthcare sector, offering a roadmap for MedTech innovations as a practical application of integrating customer knowledge in medical technology development.

Furthermore, the Knowledge Management Theory explores tacit knowledge gained from customers, emphasizing the interconnectedness between customer experience and innovation management (Reeves, 2018). Customer experiential knowledge, as a driver of innovation, is treated as a valuable external knowledge asset in customer knowledge management (Jaziri-Bouagina & Jamil, 2017). This knowledge informs critical processes, such as new product development and improvement (Haider & Kayani, 2021; Khosravi et al., 2022), underscoring customers' role as valuable fountains of knowledge in the innovation process. The extended perspective of the Knowledge-Based View from the Resource-Based View stresses the importance of understanding and leveraging knowledge derived from customer experiences as a driving force for organizational innovation.

The Innovation Diffusion Theory, proposed by Rogers (1995), highlights the role of customers' experiential knowledge as a potential source for the adoption and diffusion of innovative ideas within companies (Jamshidi & Kazemi, 2020; Min et al., 2021). Researchers such as Jaziri-Bouagina and Triki (2015), Ietto et al. (2021) and Jaziri (2019) advocate integrating customer experiential knowledge into knowledge management. This integration acts as a catalyst for innovation, inspiring product development, service enhancement, and the generation of new business ideas. Utilizing customer experiential knowledge enables organizations to align products and services with customer needs and preferences (Jaziri & Rather, 2022; Xie et al., 2023).

Moreover, the Service-Dominant Logic perspective emphasizes the active role of customers in the innovation process, co-creating value through interactive processes (Daskou et al., 2022; Jaziri, 2019). Innovation based on experiential knowledge of customers gives priority to understanding customer experiences, preferences, and needs. By putting the customer at the center of the innovation process, companies can develop products and services that directly address

customers' pain points and aspirations, leading to more relevant and impactful innovations (Grassi et al., 2022).

5.3 Hypotheses development

5.3.1 Marketing intelligence and product and service innovation

Marketing intelligence, which has been identified as a critical strategic resource, plays a key role in driving organizational innovation (Carson et al., 2020). Rosário and Dias (2023) indicated that marketing intelligence entails collecting and analyzing data about the market, competitors, and consumer preferences, which enables companies to identify innovation opportunities by understanding market trends and gaps. This is supported by the Resource-Based View, which emphasizes the competitive advantage gained by organizations through the effective use of unique and valuable resources, with marketing intelligence being an integral part (Aripin et al., 2022; Haider & Kayani, 2021). It is suggested that organizations equipped with strong marketing intelligence capabilities are more likely to demonstrate increased innovation in their product and service offerings (Ismaeel et al., 2023). Therefore, we propose the following hypothesis:

H1. Marketing intelligence positively influences product and service innovation.

5.3.2 Marketing intelligence and customer experiential knowledge

Beyond its role in traditional product and service innovation, marketing intelligence is an important driver of innovation based on experiential customer knowledge (Velayati et al., 2020). Insights derived from marketing intelligence are essential for understanding customer needs and preferences, enhancing competitive advantage (Belhadi et al., 2023). Marketing information supports continuous improvement initiatives by providing feedback loops that enable companies to improve their products and services based on real-time customer feedback and experiential knowledge (Dwivedi et al., 2023). This approach fosters a culture of continuous innovation centered around the customer

experience and informs strategic decision-making, supports continuous improvement initiatives and forms the basis for innovative strategies to enhance end-to-end customer experiences (Comer, 2023; Daskou et al., 2022). Organizations that are adept at leveraging marketing intelligence are not only more likely to innovate in products and services, but also to influence the dynamics of customer engagement, interactions and experiences (Kumar, 2022). Thus, we propose the following hypothesis:

H2. Marketing intelligence positively influences customer experiential knowledge.

5.3.3 Customer experiential knowledge and product and service innovation

Customer experience knowledge, which is known to be a direct contributor to organizational innovation, is aligned with the Service-Dominant Logic perspective (Motta-Filho, 2021). Experiential knowledge provides customers with valuable insights into actual usage, perceptions, and satisfaction levels associated with current products and services (Shiau et al., 2020). Grønkjær and Lauridsen (2021) indicated that these comments serve as a rich source of information to identify areas of improvement, uncover unmet needs, and generate ideas for innovative solutions that better match customer expectations (Jacob et al., 2022). Involving customers in the innovation process through co-creation initiatives allows companies to benefit from their experiential knowledge in a better way. Kamal and Himel (2023) stated that by collaborating with customers to envision, design, and test new products and services, companies can ensure that their innovations are relevant and resonate deeply with their target audience. Thus, the following hypothesis is proposed:

H3. Customer experiential knowledge positively influences product and service innovation.

5.3.4 Business intelligence and product and service innovation

Business intelligence is recognized as a strategic resource that significantly contributes to organizational innovation (Usman et al., 2024). This is supported by the Resource-Based View, which highlights the competitive advantage gained through the effective use of unique and valuable resources (Mortezaei et al., 2022). Organizations equipped with business strong commercial intelligence capabilities are likely to show increasing innovation in their product and service offerings (Ogbeibu et al., 2021). Ramakrishnan et al. (2020) also state that business intelligence positively impacts product and service innovation by the ability of business intelligence to enable data-driven decision making, enhance market understanding, monitor performance, and facilitate predictive analytics. By leveraging business intelligence effectively, organizations can drive innovation processes that lead to the development of innovative products and services that meet market demand and drive business success (Yiu et al., 2020). Thus, we propose the following hypothesis:

H4. Business intelligence positively influences product and service innovation.

5.3.5 Business intelligence and customer experiential knowledge

Business intelligence extends its influence beyond traditional product and service innovation to influence innovation based on customers' experiential knowledge (Daskou et al., 2022). By providing insights into customer behavior and preferences, business intelligence contributes to informed decisions in customer-related strategies (Jayawardena et al., 2022; Reeves, 2018). Business intelligence enables organizations to segment their customer base based on various criteria such as demographics, purchase history, and preferences. By analyzing customer segments, organizations can gain a deeper understanding of the experiential knowledge of different customer groups, allowing them to customize innovation initiatives to suit the needs and preferences of specific customer segments (Mariani & Nambisan, 2021; Volberda et al., 2021). Business intelligence provides organizations with the data-driven insights needed to understand customer experiential knowledge, design innovation initiatives

according to customer needs and preferences, collect real-time feedback, and support (Chaudhuri et al., 2021). Thus, we propose the following hypothesis:

H5. Business intelligence positively influences customer experiential knowledge.

5.3.6 The mediating role of customer experiential knowledge

Based on the Knowledge Management Theory, it is assumed that the impact of marketing intelligence on product and service innovation is through innovation based on experiential knowledge of customers (Al-Hashem, 2022; López-Cabarcos et al., 2020; Migdadi, 2020). Marketing information provides the information needed to identify innovation opportunities (Sarstedt et al., 2022), while experiential knowledge of customers leads to the development of innovative solutions that meet customer needs and preferences (Witell et al., 2020). This theory emphasizes the pivotal role of customers' experiential knowledge in the innovation process, suggesting that marketing intelligence influences product and service innovation indirectly through its influence on customer-driven innovative practices (Anning-Dorson, 2018; Reeves, 2018). Thus, the following hypothesis is proposed:

H6. Customer experiential knowledge positively mediates the effect of marketing intelligence on product and service innovation.

The Open Innovation Theory suggests that external ideas, including customer ideas, are valuable inputs to a company's innovation processes (Anning-Dorson, 2018), and in this context business intelligence influences product and service innovation on shaping customer experiences (Malodia et al., 2023). López-Cabarcos et al. (2020) also indicated that innovation based on experiential knowledge of customers positively mediates the effect of business intelligence on product and service innovation. Business intelligence provides the data-based insights needed to identify market opportunities and understand customer needs (Chintalapati & Pandey, 2022), while innovation based on customers' experiential knowledge takes advantage of these insights to develop innovative solutions that

effectively meet customer expectations. Therefore, we propose the following hypothesis:

H7. Customer experiential knowledge positively mediates the effect of business intelligence on product and service innovation.

The conceptual model of the research is shown in Figure 5.1.

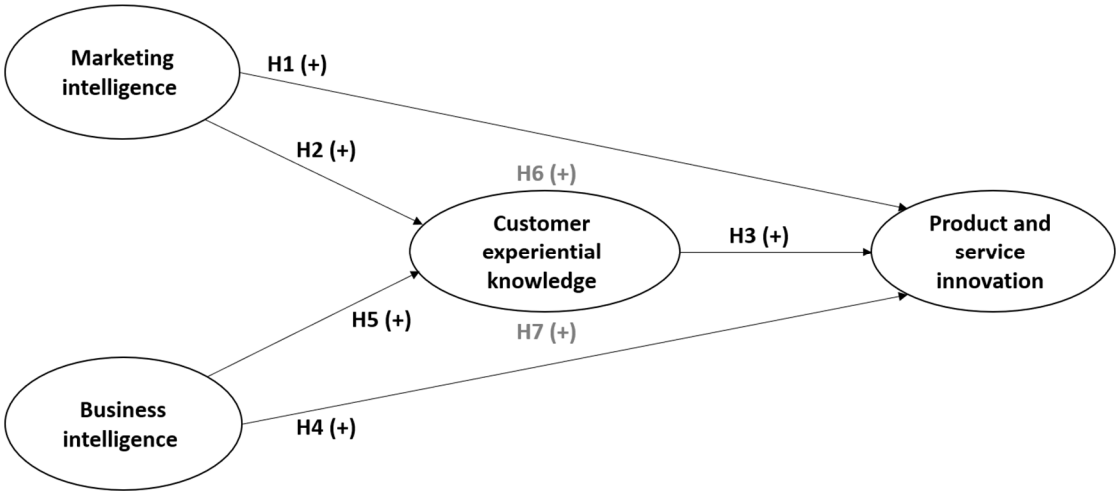

Figure 5.1. Conceptual model

5.4 Methodology

5.4.1 Data collection

Following prior studies (Dabić et al., 2021; Kamukama et al., 2010), data were collected using key informants in Jordanian telecommunications companies. In our study, the informants were the managers and directors due to their strategic roles in decision-making processes and their familiarity with the organization's intelligence and innovation activities. A stratified random sampling technique was employed to ensure representation across different departments and levels of seniority. An online survey was distributed, accompanied by a cover letter explaining the study's purpose and ensuring the confidentiality of the respondents' information. The survey period lasted for four weeks, with follow-up reminders sent to maximize response rates. A total of 251 usable responses were

obtained, reflecting a response rate of approximately 70%. Men comprise 71% of the sample, which indicates a significant male dominance in management positions within the telecommunications sector in Jordan. The most frequent age group are 35-44 years old (46%) and 45-54 years old (23%). Moreover, 85% of managers and directors have more than 5 years of experience.

5.4.2 Measures

The primary objective of this study is to investigate the impact of marketing and business intelligence on product and service innovation, specifically through customer experiential knowledge. To achieve this, well-established measurement scales were adapted from previous research to ensure validity and reliability. Marketing intelligence was measured using a five-item scale adapted from Gómez-Prado et al. (2022). For business intelligence, five items were adapted from Suša Vugec et al. (2020). A seventeen-item scale was adapted from Foroudi et al. (2016) to measure customer experiential knowledge. Finally, product and service innovation was measured with thirteen items adapted from Awuku et al. (2023). Each item was rated on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The measurement scales were pre-tested in a pilot study involving 30 respondents to ensure clarity and relevance, resulting in minor adjustments for improved comprehension.

5.4.3 Data analysis

The data analysis was conducted using Smart PLS software, which is well-suited for estimating complex models involving multiple constructs and mediating variables. Initially, descriptive statistics were computed to summarize the demographic characteristics of the sample. The measurement model was then assessed for reliability and validity. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR), with values exceeding the threshold of 0.70 indicating acceptable reliability. Convergent validity was

assessed using average variance extracted (AVE), with values above 0.50 deemed satisfactory (Hair et al., 2010).

Subsequently, the structural model was evaluated to test the hypothesized relationships. Path coefficients, *t*-values, and *p*-values were obtained to determine the significance of the direct effects. Mediation analysis was conducted using partial least squares structural equation modeling (PLS-SEM), employing bootstrapping with 10,000 replications and a 95% confidence interval to assess the significance of indirect effects. The mediation analysis aimed to ascertain the role of customer experiential knowledge in mediating the relationships between business intelligence, marketing intelligence, and product and service innovation. The results provided insights into both the direct and indirect associations among the constructs, contributing to a comprehensive understanding of the model.

5.5 Results

The collected data showed no signs of extreme skewness or kurtosis, and no missing values were identified. Moreover, a preliminary analysis revealed no significant outlier cases with an overall excessive influence among the valid 251 cases included in the study.

5.5.1 Measurement model

To analyze the measurement model, we used confirmatory factor analysis (CFA), following the procedure recommended by Hair et al. (2021). This involved initial scrutiny of factor loadings, along with the calculation of Cronbach's Alpha and composite reliability (CR). These measures are pivotal for gauging internal consistency reliability and establishing convergent and discriminant validities. Additionally, in line with the emphasis placed by Franke and Sarstedt (2019), the assessment of average variance extracted (AVE) values was conducted to ensure convergent validity of the measurement models. Table 5.1 shows the CFA results.

Table 5.1. Measurement model assessment

Construct	Item	Loading	Cronbach's Alpha	CR	AVE
Marketing Intelligence (MI)	MI1	0.811	0.872	0.907	0.662
	MI2	0.851			
	MI3	0.755			
	MI4	0.834			
	MI5	0.815			
Business Intelligence (BI)	BI1	0.820	0.863	0.901	0.646
	BI2	0.813			
	BI3	0.813			
	BI4	0.755			
	BI5	0.817			
Customer Experiential Knowledge (CEK)	CEK1	0.802	0.967	0.970	0.652
	CEK2	0.774			
	CEK3	0.808			
	CEK4	0.765			
	CEK5	0.827			
	CEK6	0.859			
	CEK7	0.844			
	CEK8	0.846			
	CEK9	0.809			
	CEK10	0.866			
	CEK11	0.774			
	CEK12	0.766			
	CEK13	0.803			
	CEK14	0.787			

	CEK15	0.833			
	CEK16	0.802			
	CEK17	0.754			
Product and Service Innovation (PSI)	PSI1	0.808	0.950	0.956	0.626
	PSI2	0.766			
	PSI3	0.754			
	PSI4	0.772			
	PSI5	0.769			
	PSI6	0.819			
	PSI7	0.809			
	PSI8	0.852			
	PSI9	0.833			
	PSI10	0.793			
	PSI11	0.804			
	PSI12	0.792			
	PSI13	0.708			

The loadings of all indicators were higher than the acceptable threshold of 0.70. Also, each construct exhibited commendable internal consistency reliability, as evidenced by Cronbach's Alpha values ranging from 0.863 to 0.967. Moreover, CR values ranging from 0.901 to 0.970 reinforced the reliability of the indicators in measuring the latent variables. Notably, all constructs demonstrated robust convergent validity, with AVE values higher than 0.5, indicating the constructs' abilities to capture substantial variance in their indicators while minimizing measurement error. These findings collectively underscored the validity and reliability of the measurement model, instilling confidence in the accurate representation of the underlying constructs in the study.

Discriminant validity was evaluated by examining the Heterotrait-Monotrait (HTMT) ratios. Henseler et al. (2017) suggested a threshold of 0.90 to check

whether the constructs suffer from a discriminant validity issue or not. As shown in Table 5.2, all the HTMT ratios were below the threshold, indicating that the constructs were well-discriminated. This suggested that each construct had a stronger relationship with its own indicators than with indicators of other constructs, affirming the discriminant validity of the model.

Table 5.2. Discriminant validity

Construct	MI	BI	CEK	PSI
MI	0.814			
BI	0.796	0.804		
CEK	0.766	0.848	0.808	
PSI	0.781	0.873	0.895	0.791

Moreover, we tested for multicollinearity, with the Variance Inflation Factor (VIF) values ranging from 2.725 to 4.363. As they were less than 5, there were no multicollinearity issues (Hair et al., 2013). Thus, the results of the collinearity assessment supported the stability of the estimates and contributed to the overall confidence in the reliability of the model for predicting the relationships among the studied constructs.

5.5.2. Hypotheses testing

To test the study hypotheses, the structural model with 10,000 bootstrapped samples was calculated to evaluate the significance and relevance of the path coefficients in the inner model. The direct effect test results are presented in Table 5.3.

Table 5.3. Testing of direct effects

Path	*β*	Mean	SD	*t*- statistic	*p*-value
MI → PSI	0.113	0.107	0.051	2.083	0.038*
MI → CEK	0.238	0.254	0.065	3.833	0.000***
CEK → PSI	0.511	0.512	0.072	7.183	0.000***
BI → PSI	0.349	0.354	0.067	5.265	0.000***
BI → CEK	0.660	0.646	0.06	10.764	0.000***

Note: *β* = path coefficient; SD = Standard Deviation; *$p < 0.050$, **$p < 0.010$, ***$p < 0.001$.

Table 5.3 reveals several key findings. Firstly, marketing intelligence exhibits a positive and significant effect on both product and service innovation ($\beta = 0.113$, $p < 0.05$) and customer experiential knowledge ($\beta = 0.238$, $p < 0.001$), supporting H1 and H2. While the influence of marketing intelligence on product and service innovation is weaker compared to other paths, it highlights the role of marketing intelligence in fostering innovation within organizations.

Furthermore, it is found that customer experiential knowledge plays a crucial role in driving product and service innovation ($\beta = 0.511$, $p < 0.001$), hence H3 is also supported. This underscores the importance of integrating customer experiential knowledge into the innovation process to enhance the development of innovative products and services.

The results also show support for H4, since there is a positive and significant impact of business intelligence on product and service innovation ($\beta = 0.349$, $p < 0.001$), indicating that organizations equipped with effective business intelligence systems are more adept at innovating in their product and service offerings.

Moreover, business intelligence positively affects customer experiential knowledge ($\beta = 0.660$, $p < 0.001$), thus supporting H5. This suggests that organizations with robust business intelligence capabilities are more likely to drive innovation through leveraging customer experiential knowledge.

As for the indirect effects, Table 5.4 shows the results of the mediation analysis.

Table 5.4. Testing of indirect effects

Path	*β*	Mean	SD	*t*- statistic	*p*-value
MI → CEK → PSI	0.128	0.127	0.039	3.262	0.001**
BI → CEK → PSI	0.335	0.34	0.059	5.713	0.000***

Note: *β* = path coefficient; SD = Standard Deviation; *$p < 0.050$, **$p < 0.010$, ***$p < 0.001$.

The results reveal that customer experiential knowledge mediates the relationship between marketing intelligence and product and service innovation ($\beta = 0.128$, $p < 0.010$), supporting H6. Furthermore, H7 is supported since customer experiential knowledge is also found to exert a mediating role between business intelligence and product and service innovation ($\beta = 0.335$, $p < 0.001$).

Finally, Table 5.5 summarizes the results of the hypotheses testing.

Table 5.5. Results of structural model evaluation

Effect	Hypothesis	Result
Direct	**H1.** Marketing Intelligence → Product and Service Innovation	Supported
	H2. Marketing Intelligence → Customer Experiential Knowledge	Supported
	H3. Customer Experiential Knowledge → Product and Service Innovation	Supported
	H4. Business Intelligence → Product and Service Innovation	Supported
	H5. Business Intelligence → Customer Experiential Knowledge	Supported
Indirect	**H6.** Marketing Intelligence → Customer Experiential Knowledge → Product and Service Innovation	Supported

H7. Business Intelligence → Customer Experiential Knowledge → Product and Service Innovation	Supported

5.6 Discussion

This study examines the intricate dynamics of organizational innovation, uncovering interconnected relationships among marketing intelligence, business intelligence, customer experiential knowledge and product and service innovation. The research was built upon established theoretical frameworks such as the Resource-Based View, the Knowledge-Based View, and the service-dominant logic, offering new insights into the strategic integration of intelligence capabilities and customer-centric innovation processes.

The findings of the study reveal a positive relationship between marketing intelligence and product and service innovation, which is consistent with previous research, such as Jan Lies (2019), which highlights the potential of marketing intelligence in the development of new products and services. The findings also indicate that marketing intelligence positively influences customer experiential knowledge. This emphasizes the strategic role of market insights in shaping innovative strategies tailored to evolving customer preferences (Rosário & Dias, 2023; Valentine, 2022). Marketing intelligence equips organizations with a comprehensive understanding of market dynamics, enabling them to adapt and innovate in response to changing customer needs.

Moreover, the robust positive influence of business intelligence on customer experiential knowledge underscores the pivotal role of advanced intelligence capabilities in fostering innovative practices grounded in deep customer insights (Haider & Kayani, 2021; Ismaeel et al., 2023). Organizations equipped with sophisticated business intelligence tools are adept at developing strategies informed by nuanced customer needs and behaviors, thus enhancing their innovation potential. The study also reaffirms the significant impact of business intelligence on product and service innovation, highlighting the importance of data-driven decision-making in shaping innovation outcomes (Aripin et al., 2022;

Haider & Kayani, 2021). Organizations leveraging business intelligence demonstrate agility in identifying market opportunities and guiding the development of novel products and services aligned with market demands.

Furthermore, the substantial influence of customer experiential knowledge on product and service innovation reveals the critical role of customer experiences in driving organizational innovation (Daskou et al., 2022). By actively integrating customer insights into innovation processes, businesses can create offerings that resonate deeply with customer expectations, thereby fostering higher levels of innovation.

While the study draws from prior research to frame its hypotheses, it extends beyond existing literature by integrating these insights within a comprehensive empirical framework. By empirically validating these relationships in the context of telecommunications companies, this research contributes new perspectives on how marketing intelligence and business intelligence synergistically enhance customer experiential knowledge and ultimately drive product and service innovation. Thus, organizations that leverage intelligence capabilities and customer insight can foster innovation and maintain competitive advantage in dynamic markets.

5.6.1 Theoretical implications

This study makes significant contributions to the theoretical frameworks of marketing, business intelligence, and innovation. It extends the Resource-Based View and the Knowledge-Based View by highlighting the critical role of intangible assets, such as customer experiential knowledge, in driving innovation. The findings emphasize how integrating marketing intelligence with business intelligence enhances an organization's ability to leverage customer experiential knowledge effectively, underscoring knowledge as a fundamental resource for competitive advantage and strategic success. These findings corroborate those of Sahoo et al. (2023), who also identified the pivotal role of knowledge resources in fostering innovation within organizations.

Moreover, the research advances the Service-Dominant Logic perspective by providing empirical evidence that value is co-created through interactive processes between customers and companies. It shows how marketing and business intelligence facilitate this co-creation, enabling companies to better understand and respond to customer needs, preferences, and behaviors. This expands the Service-Dominant Logic framework by incorporating the pivotal role of data-driven insights in fostering collaborative innovation, aligning with the findings of Grönroos and Voima (2013), who stressed the importance of customer interaction in value co-creation.

The study also integrates with Innovation Diffusion Theory by demonstrating how marketing and business intelligence can accelerate the adoption and spread of innovations. By leveraging these tools to gather and analyze customer data, companies can better anticipate market trends and customer responses, enhancing the diffusion process and making it more predictable. This integration suggests that effective use of business intelligence can mitigate uncertainties in innovation adoption, similar to the conclusions drawn by Rogers (1995), who emphasized the role of communication channels and social systems in the diffusion of innovations.

Additionally, the findings align with the principles of the Open Innovation Theory, showing how external knowledge, particularly customer experiential knowledge, can be harnessed through marketing and business intelligence. This emphasizes the importance of an open approach to innovation, where customer feedback and experiential knowledge are actively sought and incorporated into product and service development. This perspective supports the arguments made by Chesbrough (2006), who advocated for the integration of external ideas and knowledge to enhance innovation capabilities.

Lastly, this research positions customer experiential knowledge as a crucial conceptual framework for understanding the customer’s role in innovation. It highlights the multifaceted nature of customer experiential knowledge, which includes emotional, cognitive, and social dimensions, and underscores its potential to provide deep, actionable insights for innovation. By defining and illustrating the impact of customer experiential knowledge, the study offers a new

lens through which to view customer interactions and contributions, enriching the theoretical understanding of customer-driven innovation. This aligns with the findings of Prahalad and Ramaswamy (2004), who emphasized the value of customer experiences and interactions in the innovation process.

5.6.2 Practical implications

The findings of this study offer several practical implications for organizations aiming to enhance their innovation strategies through the integration of marketing and business intelligence.

Firstly, organizations can leverage marketing intelligence to gain a deeper understanding of customer needs, preferences, and behaviors, which can inform more targeted and effective marketing strategies. By systematically collecting and analyzing customer data, companies can tailor their offerings to meet specific customer demands, thereby improving customer satisfaction and loyalty. This practice can lead to more successful product launches and marketing campaigns that resonate with the target audience.

Secondly, the integration of business intelligence allows organizations to make data-driven decisions that enhance operational efficiency and product quality. By analyzing customer data, companies can identify patterns and trends that inform product development, marketing initiatives, and customer service improvements. This data-driven approach enables organizations to proactively address customer needs and preferences, leading to enhanced customer experiences and satisfaction.

Additionally, companies should focus on harnessing customer experiential knowledge to drive innovation. By capturing and analyzing customer experiential knowledge, organizations can gain valuable insights into how customers interact with their products and services. This understanding can inform the design and development of new products and services that better align with customer expectations and preferences.

Moreover, the study highlights the importance of a collaborative approach to innovation. Organizations should actively involve customers in the innovation process, leveraging their insights and feedback to co-create value. This can be achieved through various methods, such as customer workshops, focus groups, and online communities, where customers can share their experiences and ideas. By fostering a collaborative environment, companies can ensure that their innovations are customer-centric and more likely to succeed in the market.

This study also suggests that organizations should invest in training and development programs to enhance the skills of their marketing and business intelligence teams. By equipping employees with the necessary tools and knowledge to analyze and interpret customer data effectively, companies can improve their ability to make informed decisions that drive innovation. This investment in human capital can lead to a more agile and responsive organization that can quickly adapt to changing market conditions.

5.6.3 Limitations and suggestions for further research

Despite the valuable insights provided by the study, several limitations should be acknowledged. Firstly, the research is based on cross-sectional data collected from a specific sector, which may limit the generalizability of the findings to other contexts or sectors. Future studies could employ longitudinal research designs and incorporating multi-level data from diverse sectors. Comparative studies across different sectors could offer valuable insights into the contextual factors that influence innovation practices, enhancing the generalizability of the findings.

Moreover, the study focuses primarily on the direct and indirect effects of marketing intelligence, business intelligence, customer experiential knowledge, and product and service innovation. However, there may be other unexplored variables or contextual factors that influence innovation processes and outcomes. Future research could also explore additional mediators or moderators that may further elucidate the complex dynamics of innovation within organizations. Investigating the role of emerging technologies, such as artificial intelligence and

machine learning, in enhancing intelligence-driven innovation processes could also be a fruitful area of study.

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Chapter 6

Conclusion and discussion

6.1 Theoretical conclusions

Theoretical conclusions indicate that big data analytics significantly impacts competitive advantage. Companies leveraging big data gain strategic insights into market dynamics and customer preferences, which enable quick decision-making and enhanced operational efficiency. Furthermore, those utilizing big data analytics can differentiate their offerings and drive innovation, leading to a sustainable competitive advantage.

This thesis sheds light on the impact of big data analysis within telecommunications companies, demonstrating that the strategic use of data analysis enhances competitive advantage and significantly contributes to customer understanding. Effective management of big data allows telecom companies to improve internal processes, identify inefficiencies, optimize resource allocation, and reduce operating costs. By analyzing customer preferences and behavior, companies can tailor their offerings and services, thereby increasing customer satisfaction and retention.

Implementing big data strategies enables telecom companies to differentiate themselves by offering innovative services tailored to customer needs, ensuring a sustainable competitive advantage. Companies that leverage data analysis tools through business intelligence can gain strategic insights into market dynamics and customer preferences. However, business development requires managing large and complex datasets characterized by volume, diversity, speed, veracity, and value, often exceeding the capabilities of traditional data processing methods (Kou, 2017; Shamim et al., 2020). Our study indicates that companies employing business intelligence with advanced analytical methods can interpret this data, facilitating informed decision-making and enhancing operational efficiency (Hou et al., 2020).

Integrating big data and business intelligence into telecom operations allows companies to optimize internal processes, improve resource allocation, and reduce operating costs. By analyzing customer behavior and preferences, telecom companies can design services that enhance customer satisfaction and retention. Additionally, the strategic use of business intelligence in electronic

customer relationship management (e-CRM) and e-service quality contributes to personalized service delivery and improved service quality, which is critical for maintaining a competitive advantage.

Moreover, this thesis provides a detailed analysis of the impact of business intelligence on customer loyalty in Jordanian telecommunications companies, revealing a significant positive relationship between the implementation of business intelligence strategies and customer loyalty. This relationship is evident through various measures of customer loyalty, including the influence of mediating variables such as electronic word of mouth, electronic service quality, and social media, all of which positively affect customer satisfaction and loyalty. The study presents a conceptual framework for understanding how business intelligence affects customer loyalty in the telecommunications sector, emphasizing benefits such as comprehensive data analysis, streamlined operations, reduced costs, and increased long-term return on investment.

Business intelligence also positively influences electronic services, e-CRM, and social media platforms in the telecommunications industry. BI systems ensure reliable and accurate data processing, enabling executives to effectively pursue long-term strategic goals. Additionally, the development of electronic service quality—a critical foundation for business intelligence systems—provides competitive advantages to telecom companies. The theoretical exploration of business intelligence and data analysis confirms its profound impact on competitive advantage, especially in the telecommunications sector. BI encompasses technologies, applications, and practices designed to collect, integrate, analyze, and present business data. When applied effectively, business intelligence offers telecom companies strategic insights into market dynamics and customer preferences, facilitating quick decision-making and enhancing operational efficiency. This capability allows companies to adapt swiftly to market changes and improve their operations.

Big data analytics also contributes to competitive advantage by transforming large amounts of diverse, high-speed data into actionable insights. This process is particularly crucial in telecommunications, where data from customer interactions, social media platforms, and IoT devices must be efficiently managed

and analyzed. Research by Shamim et al. (2020) and Kou (2017) highlights the challenges of managing these complex datasets, emphasizing the need for sophisticated analytical tools capable of addressing the volume, diversity, velocity, veracity, and value of data. Companies that effectively exploit big data can differentiate their services, drive innovation, and establish a sustainable competitive advantage.

Furthermore, the effective use of business intelligence enhances operational efficiency by facilitating informed decision-making and streamlining operations. BI tools, combined with advanced analytics, enable telecommunications companies to interpret complex datasets, identify inefficiencies, and improve operations. Research has noted that companies utilizing business intelligence can enhance internal processes, improve resource allocation, and reduce operating costs, thereby improving overall performance and competitiveness.

In the field of communications, particularly within Jordanian telecommunications companies, integrating business intelligence and big data analytics is essential for enhancing various business functions. BI applications play a crucial role in improving internal operations by analyzing customer data to uncover deficiencies and areas for improvement. Data-driven insights can reveal underutilized resources or operational bottlenecks, allowing companies to implement targeted improvements. Additionally, business intelligence tools help reduce operating costs by identifying waste and implementing cost-saving measures, which are vital for maintaining profitability and competitiveness.

Our study’s theoretical conclusions reveal that the strategic application of business intelligence significantly enhances customer satisfaction and retention. By analyzing customer preferences and behaviors, telecom companies can design their services to better meet customer needs. Personalized service offerings, based on detailed data analysis, improve customer experiences and increase loyalty. This customer-focused approach not only enhances satisfaction but also strengthens customer retention, providing a sustainable competitive advantage.

The role of business intelligence in e-CRM and service quality is vital for maintaining high service standards and effectively meeting customer needs. BI tools facilitate the analysis of customer interactions, feedback, and service performance, allowing companies to develop customized communication strategies and improve service quality. A partnership between business intelligence, data analysis, and electronic service innovation aids in the continuous monitoring of service performance. BI helps identify areas for improvement, ensuring that service standards are consistently met, thus contributing to enhanced customer experiences and loyalty.

Moreover, the impact of business intelligence and data analysis on innovation is significant. Leveraging experiential customer knowledge through business intelligence enables telecom companies to drive innovation by identifying new market opportunities and developing products and services that align with customer needs. BI systems provide tools to analyze customer experiences and preferences, supporting the creation of innovative solutions that meet evolving market demands. Our study indicates a strong positive relationship between business intelligence and customer experiential knowledge-based innovation. Additionally, we explore the influence of marketing and business intelligence on product and service innovation through customer experiential knowledge. The findings reveal interconnected relationships between business intelligence, customer experiential knowledge-based innovation, marketing intelligence, and product and service innovation. The strong positive correlation underscores the role of advanced intelligence capabilities in fostering innovative practices rooted in customer experiences.

Companies that leverage business intelligence can develop strategies based on accurate insights into customer needs, increasing market opportunities and guiding the development of new products and services. The significant impact of customer experiential knowledge-based innovation on product and service innovation highlights the importance of customer experiences in driving innovation. Companies utilizing business intelligence to understand customer experiences can create offerings that align with customer needs, leading to increased market opportunities and competitive differentiation.

This innovative, customer-focused approach ensures that new products and services are developed based on accurate customer insights, maintaining competitive advantage. Moreover, integrating business intelligence with marketing intelligence enhances product and service innovation. By combining insights from business intelligence and marketing strategies, companies can address customers' specific pain points and preferences, ensuring that new offerings are relevant and provide unique value propositions. This approach strengthens the company's market position and promotes innovation.

6.2 Conclusions of the research

The telecommunications industry in Jordan is undergoing significant transformations due to rapid technological advancements and rising competition. To remain competitive in this challenging environment, companies are increasingly turning to big data and business intelligence as essential tools. These technologies provide robust capabilities for analyzing vast amounts of data, yielding valuable insights that enhance operations and improve customer experiences. This paper explores the advantages of utilizing big data and business intelligence in the telecommunications sector, specifically focusing on their effects on competitive advantage, customer loyalty, and innovation.

The study's results highlight the substantial impact of data analysis and business intelligence on the operations and strategic decision-making processes of telecommunications companies. By leveraging advanced data analytics, these companies can gain deeper insights into customer behaviors, preferences, and trends, enabling them to tailor their services and products to better meet customer needs.

The research found that effective use of business intelligence tools not only improves customer satisfaction and loyalty but also drives innovation by utilizing experiential knowledge to develop new offerings and enhance service quality. Additionally, the integration of business intelligence systems optimizes network performance, reduces operational costs, and identifies new revenue opportunities, thus providing a competitive edge in a rapidly evolving market. The

findings underscore the necessity for telecommunications companies to invest in robust business intelligence infrastructure and continually update their analytical capabilities to maintain relevance and drive growth.

The impact of big data analytics on competitive advantage demonstrates that companies leveraging big data gain strategic insights into market dynamics and customer preferences, enabling rapid decision-making and improved operational efficiency. Companies employing big data analysis can differentiate their offerings and foster innovation, leading to a sustainable competitive advantage. This study highlights that the strategic use of big data analytics significantly enhances competitive advantage. Effective management of big data allows telecom companies to refine internal processes, identify inefficiencies, optimize resource allocation, and reduce operating costs. By analyzing customer preferences and behaviors, companies can tailor their offerings and services, thereby increasing customer satisfaction and retention. Implementing big data strategies enables companies to distinguish themselves by providing innovative services tailored to customer needs, ensuring a sustainable competitive edge.

In this thesis, we address how big data and business intelligence impact telecommunications companies, focusing on the interaction between big data analytics, business intelligence, and various aspects of customer engagement, including electronic customer relationship management (e-CRM), e-service quality, electronic word of mouth, and social media. The study also emphasizes innovation through experiential customer knowledge. Key findings reveal that big data analytics significantly enhances competitive advantage by providing deep insights into market dynamics and customer preferences, facilitating rapid decision-making and operational efficiency. Advanced business intelligence tools enable companies to process and analyze large and diverse datasets, differentiate their services, and maintain a competitive advantage.

The role of business intelligence in decision-making is crucial, as it improves internal processes, enhances resource allocation, and reduces costs, leading to better performance and cost-effectiveness. The study also highlights a strong positive relationship between business intelligence and innovation driven by experiential customer knowledge. This demonstrates that business intelligence

can uncover new market opportunities and foster the development of products and services aligned with customer needs. Integrating business intelligence with marketing intelligence enhances innovation by addressing customers' specific pain points, thereby strengthening companies' market positions.

Moreover, the impact of business intelligence on e-CRM and e-service quality is clear, providing detailed insights into customer interactions, service performance, and sentiment analysis. Social media analysis through business intelligence supports marketing strategies and targeted engagement, which are vital outcomes identified in our study. Overall, the thesis asserts that leveraging big data analytics through business intelligence tools is essential for optimizing operations, improving customer satisfaction, and maintaining competitive advantage in the telecommunications industry, ensuring long-term success and growth.

To summarize, the telecommunications industry in Jordan is witnessing significant changes driven by rapid technological advancements and increasing competition. To maintain competitiveness, companies must increasingly rely on big data and business intelligence as essential tools. The reliance on data analysis and business intelligence is crucial, as these technologies provide powerful capabilities to analyze massive datasets, delivering insights that enhance operations and improve customer experiences.

Our study emphasizes the importance of big data analytics in demonstrating how companies gain strategic insights into market dynamics and customer preferences, enabling quick decision-making and improved operational efficiency. Companies using analytics can differentiate their offerings and foster innovation, leading to a sustainable competitive advantage. Effective management of big data allows telecom companies to improve internal processes, identify inefficiencies, enhance resource allocation, and reduce operating costs. By analyzing customer preferences and behaviors, companies can tailor their services, thus increasing customer satisfaction and retention. Implementing big data strategies allows companies to distinguish themselves by offering innovative services tailored to customer needs, ensuring a sustainable competitive advantage.

One of the most significant findings points to the positive impact of business intelligence on electronic services, e-CRM, and social media platforms in the telecommunications industry. Business intelligence systems ensure reliable and accurate data processing, enabling executives to effectively pursue long-term strategic goals. Moreover, the development of electronic service quality, a critical foundation for business intelligence systems, provides competitive advantages to telecommunications companies. The results indicate that investing in advanced business intelligence tools and technologies enhances customer satisfaction and loyalty. Recommendations include employing predictive analytics, machine-learning algorithms, data visualization tools, and custom business intelligence solutions aligned with industry-specific key performance indicators.

The study also explores the influence of marketing and business intelligence on product and service innovation through experiential customer knowledge. The findings reveal interconnected relationships among business intelligence, customer experiential knowledge-based innovation, marketing intelligence, and product and service innovation. The strong positive correlation between business intelligence and experiential customer knowledge highlights the role of advanced intelligence capabilities in promoting innovative practices rooted in customer experiences.

Companies that effectively utilize business intelligence can develop strategies based on accurate insights into customer needs, increasing market opportunities and guiding the development of new products and services. This high impact underscores the importance of customer experiences in driving innovation.

The thesis concludes that critical elements for improving customer insights, service quality, and gaining a competitive advantage hinge on effective business intelligence and data analysis. Companies that utilize these tools demonstrate a deeper understanding of customer preferences and needs, leading to enhanced customer loyalty. Business intelligence initiatives are linked to improvements in service quality, allowing companies to address deficiencies promptly, thus increasing customer satisfaction and loyalty.

Companies investing in robust business intelligence infrastructure gain a competitive advantage by anticipating market trends, adapting to changing customer demands, and retaining a loyal customer base. The integration of marketing and business intelligence enhances product and service innovation by leveraging customer insights to drive development. The customer-focused and rapid innovation processes facilitated by business intelligence and marketing integration empower companies to create relevant and competitive offerings. Companies using these insights to innovate gain a competitive edge by delivering products and services that resonate with customers, thereby strengthening their market position.

6.3 Implications and recommendations for management

The analysis of raw data, the use of business intelligence to enhance customer loyalty, and the role of experiential knowledge in innovation have significant implications for achieving a sustainable competitive advantage. Integrating business intelligence into business processes facilitates a comprehensive understanding of internal operations, identifying areas for improvement and streamlining processes. This enhanced operational efficiency results in lower costs and improved performance, essential for maintaining a competitive edge in a rapidly evolving industry. Transforming raw data into actionable insights is crucial for informing strategic decisions, improving operations, and aligning products or services with market demands.

This capability enhances organizational agility. To harness the full potential of data analysis and business intelligence, management must prioritize the acquisition and implementation of advanced analytics tools. Establishing data-driven decision-making practices will enhance organizational responsiveness. Effective analysis of raw data and the application of business intelligence tools provide critical insights that aid strategic decision-making. By turning data into actionable insights, companies can make informed decisions that improve operations, reduce costs, and align offerings with market demands. This

capability supports flexibility and responsiveness, allowing companies to quickly adapt to changing market conditions and maintain a competitive advantage.

Additionally, understanding customer behavior, preferences, and feedback through data-driven insights enables companies to develop targeted marketing strategies and personalized experiences.

To build on the study's findings and advance the application of business intelligence and data analysis in telecommunications companies, several strategic steps are recommended. Companies should prioritize investments in advanced business intelligence infrastructure, including cutting-edge analytics platforms, machine learning algorithms, and real-time data processing systems, to enhance data analysis capabilities and support more accurate decision-making.

Furthermore, incorporating advanced analytics and machine learning techniques will enhance predictive capabilities, enabling companies to anticipate customer needs and optimize performance. Also, focusing on real-time data analysis will allow companies to respond quickly to changing market conditions and customer needs.

Moreover, investigating emerging technologies such as IoT and blockchain can further enhance business intelligence capabilities. And creating customer-centric business intelligence models will improve engagement and loyalty through personalized services.

Finally, training programs focused on the latest advances in data analysis, business intelligence tools, and technological innovations will ensure a proficient workforce capable of leveraging these resources.

By implementing these strategic steps, telecommunications companies can fully harness the potential of business intelligence and data analysis to drive innovation, improve customer satisfaction, and maintain a competitive edge in a rapidly evolving market.

This customer-centric approach not only enhances customer satisfaction but also fosters loyalty. By integrating business intelligence with customer relationship

management (CRM) systems, companies can effectively collect and analyze customer data, translating insights into actions that lead to long-term engagement and repeat business.

Implementing a structured approach to data-driven decision-making will enable organizations to proactively address market changes and capitalize on emerging opportunities. Business intelligence tools are essential for handling and analyzing large volumes of diverse data, allowing actionable insights to be extracted.

To maximize the benefits of artificial intelligence and data analytics for continuous learning and development, management should invest in training programs. Continuing professional development will equip employees with the necessary skills to utilize these resources effectively, fostering a more innovative workforce capable of achieving the company’s strategic goals.

Additionally, a comprehensive training approach will ensure that employees are adept at using these tools effectively. This investment will enable organizations to make data-driven decisions, improve operations, and maintain a competitive advantage, allowing companies to quickly adapt to market changes.

The study underscores the importance of understanding customer behavior through business intelligence to drive repeat business and long-term engagement. By integrating business intelligence with CRM systems, companies can collect and analyze customer data seamlessly, leading to a deeper understanding of customer behavior, preferences, and feedback.

By combining insights from business intelligence and CRM, companies can develop targeted marketing strategies and personalized service offerings. This integration enhances customer satisfaction, loyalty, and overall relationship management. Businesses can effectively analyze customer data, leading to tailored marketing strategies and personalized experiences that improve satisfaction and loyalty.

Furthermore, leveraging experiential knowledge in the innovation process is crucial for developing relevant products and services. Encouraging a culture of innovation is vital for harnessing customers' experiential knowledge in creating

new offerings. Management should implement mechanisms to capture customer feedback, such as feedback loops, focus groups, and user testing. Actively engaging with customers and incorporating their insights into the innovation process will ensure that new offerings are relevant and successful.

Fostering an environment where innovation is valued and supported will help companies stay ahead in a competitive market. Practical recommendations include investing in cutting-edge analytics, integrating business intelligence with CRM systems, engaging customers in innovation, fostering a culture of innovation, and adopting data-driven decision-making practices.

By focusing on these areas, management can ensure their organization remains agile, customer-focused, and innovative in a dynamic market environment, leading to sustainable growth and long-term success.

6.4 Limitations and future research directions

This study, employing a cross-sectional design, faces limitations in establishing causal relationships between variables, a constraint partially mitigated through theoretical evidence (Katsikeas & Morgan, 1994). Longitudinal studies may be required to examine these relationships over time. The effectiveness of big data analytics in achieving a competitive advantage is contingent upon the quality and completeness of the data; inconsistent, outdated, or incomplete data can lead to inaccurate insights and suboptimal decision-making.

Data silos within organizations further impede comprehensive analysis. Additionally, the successful implementation of advanced data analytics demands specialized skills, and organizations lacking in-house expertise may face challenges in leveraging these tools fully, potentially limiting the advantages of data-driven strategies. Privacy and security concerns also emerge with the collection and analysis of large data volumes, necessitating compliance with data protection regulations and robust security measures, which may constrain the scope of data analysis. In the context of business intelligence and its influence on customer loyalty, the rapidly evolving nature of customer preferences due to

market trends, economic shifts, and technological advancements complicates the formulation of enduring strategies. Integrating Business Intelligence systems with existing customer relationship management and enterprise systems can be complex and resource-intensive, potentially resulting in fragmented insights and ineffective decision-making. There is also the risk of bias in interpreting business intelligence data, where misinterpretation or over-reliance on specific metrics may lead to flawed conclusions concerning the determinants of product and service innovation, capturing and quantifying experiential knowledge from customers poses challenges due to its qualitative nature, making standardization and integration into the innovation process difficult. Moreover, engaging customers in innovation processes requires significant resources, which smaller organizations may struggle to allocate. While experiential knowledge can drive innovation, there is a risk of developing products or services that are innovative but impractical or commercially unviable. Balancing creativity with practicality is essential for successful innovation, and implementing customer-driven innovation may encounter resistance from employees accustomed to traditional methods, hindering the integration of experiential knowledge.

The rapidly advancing field of technology and data analytics presents both opportunities and challenges for organizations striving to sustain a competitive advantage. This dissertation includes three key studies: an exploration of big data's effect on competitive advantage, an examination of business intelligence's impact on customer loyalty, and an analysis of product and service innovation determinants, with a particular focus on how customers' experiential knowledge mediates these processes. These studies collectively offer insights into how contemporary analytical tools and customer-focused approaches can influence strategic business outcomes.

Future research should build on these studies by addressing several critical areas to enhance their robustness and applicability. For big data research, adopting longitudinal designs and incorporating data from various industries will help capture long-term effects and improve generalizability. Ensuring data quality from diverse sources and systematically addressing privacy and security concerns are vital for accurate analysis. Continuous updates to reflect the rapid evolution of big

data technologies, combined with the application of advanced analytical methods such as machine learning and artificial intelligence, will provide more precise and comprehensive insights. Developing robust frameworks for data privacy and security is essential to maintain ethical standards while facilitating extensive data usage.

Regarding business intelligence and its influence on customer loyalty, future research should mitigate the limitations identified, such as reliance on self-reported data and industry-specific focus. Employing mixed-methods approaches and conducting comparative studies across different regions and industries will enhance the validity and generalizability of findings. Implementing continuous monitoring mechanisms to adapt to market changes and expanding the scope to include factors like product quality, technological innovation, and pricing strategies will offer a more holistic view of business intelligence's impact on customer loyalty.

In the realm of product and service innovation, future studies should utilize multi-level analysis and robust measurement tools to accurately assess the role of customer knowledge. Conducting research in diverse contexts and incorporating a variety of data sources will enhance the understanding and applicability of innovation determinants. The strategic application of big data is crucial for telecommunications companies aiming for a sustainable competitive edge. By optimizing operations, enhancing customer experiences, differentiating themselves in the market, and ensuring high data quality, these companies can thrive in a competitive environment. Ongoing investment in big data analytics capabilities is essential for maintaining and strengthening their position. Future research should focus on integrating data from varied sources, using longitudinal designs, and applying advanced analytical techniques. Additionally, robust frameworks for data privacy and security, mixed-methods approaches for business intelligence studies, and multi-level analysis for innovation research will further advance the field and its practical applications.

Despite the comprehensive approach and valuable insights offered by this study on business intelligence, data analysis, and innovation based on experiential knowledge of customers, several limitations must be acknowledged. The study

heavily relies on the availability and quality of data, which can sometimes be incomplete, outdated, or biased, affecting the accuracy and reliability of findings. Additionally, variations in data infrastructure among telecommunications companies across different regions can lead to inconsistencies in data collection and analysis. Technological constraints also pose challenges, as the rapid advancement of technology necessitates continuous updates and upgrades to business intelligence systems, which smaller companies might struggle to afford, limiting the generalizability of the study's findings. Privacy and ethical concerns present significant challenges as well, as the use of big data and business intelligence involves handling sensitive customer information, and stringent data protection regulations can limit the scope of data analyzed. The focus on telecommunications companies, particularly in Jordan, means the findings might not be directly applicable to other industries or regions, as different markets and cultural contexts can significantly influence customer behavior and business intelligence strategies. Methodological limitations include potential biases from self-reported data and the oversimplification of variables in complex big data analyses, as well as the limitations of cross-sectional studies in making causal inferences. Finally, the dynamic nature of customer preferences and behaviors, influenced by market trends, economic conditions, and technological advancements, means the study's capture future changes in customer behavior.

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