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## The dynamic role of business intelligence in developing effective planning strategies through analyzing data as an influential variable: Case of engineering the pharmaceutical sector in Jordan

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### ABSTRACT

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In the current pharmaceutical context of Jordan, the significance of Business Intelligence (BI) has emerged as a crucial factor in designing efficient planning methods. This research investigates the transformative impact of business intelligence (BI) in four key domains: drug development enhancement, operational optimization, compliance assurance, and market dynamics comprehension. The research highlights the need to utilize a data-driven methodology to emphasize the value of business intelligence (BI) tools in extracting valuable insights, facilitating strategic decision-making, and promoting operational efficiency. The results indicate that pharmaceutical organizations that utilize business intelligence (BI) can uncover concealed patterns, recognize chances for growth, and make well-informed decisions. Additionally, the capacity of business intelligence (BI) to integrate novel data has accelerated the development of resilient technical frameworks, thereby reinforcing its essential position within the pharmaceutical sector in Jordan. This research serves as evidence of the potential of business intelligence (BI) in facilitating innovation, surmounting obstacles, and eventually improving patient outcomes.

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## 1. Introduction

Almost every area of daily life has been impacted by technology, which has had a significant and diverse impact on our lives. The way we work, live, and engage with the world has all been profoundly altered by technology (Mbaidin et al. 2024). A business intelligence system is a way to collect, store, and analyze data for the purpose of assisting organizations to make better decisions and to effectively run their operations (Ranjan & Foropon, 2021). A major function of business intelligence is to assist organizations in understanding the current trends so that they can use them in determining their corporate strategy so that they can meet the dynamic changes in the market (Renaldo et al., 2023). To make decisions and plan strategically, data must be transformed into information. Using business intelligence, users can make informed decisions and, as a result, their experience is transformed, bringing it to a higher level (Niu et al., 2021). BI has become a transformative force in the pharmaceutical sector in Jordan, enabling strategic decision-making and encouraging data-driven decision-making (Altahrawi et al., 2021). The use of BI can enable pharmaceutical companies to develop effective planning strategies based on analyzing data as an influential variable in four dynamic roles, which include enhancing drug development, optimizing operations, ensuring compliance, and understanding market dynamics. Pharmaceutical companies have found that analyzing data through business intelligence (BI) is an essential component of developing effective planning strategies, enabling them to overcome challenges, enhance operational efficiency, and ultimately improve healthcare outcomes.

### 1.1 Research Problem

Technology has become a popular and exciting topic in recent years, so it is important to focus on this area in future research as almost every aspect of daily life has been affected by it. Business Intelligence is one of the booming trends that big businesses have adopted to support managerial operations (Khder et al., 2021). Many small, medium, and large enterprises

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around the world have struggled to stay in business because of bad strategy decisions, which has led to the closure of most of them (Shafi et al., 2020). From this angle, we focused our research on the dynamic role of business intelligence in developing effective planning strategies through analyzing data as an influential variable. Also, businesses need business intelligence to keep track of the current market trends so they can use them to determine corporate strategy to cope with dynamic market conditions. The quality of strategic decision-making at all management levels can be considered a key competitive advantage and that any gap in one of them will have an impact on the entire organization, this gap is related to the impact of the Business Intelligence system on that quality (Abu-ALSondos, 2023).

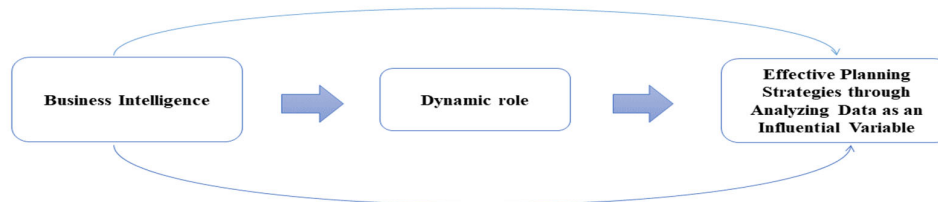
### 1.2 Research Importance

- 1) The research helps to identify the relationship between Business Intelligence and effective strategy, and what tools and techniques can be used to achieve this relationship.
- 2) The research can achieve the possibility of developing effective planning strategies that rely on data analysis by using Business Intelligence techniques to analyze big data.
- 3) The research can provide results and recommendations on how to apply Business Intelligence techniques in organizations to improve performance and achieve more success.
- 4) The research helps to raise awareness among companies and institutions about the importance of using smart analytics and tools to achieve better results and achieve planning goals and objectives.
- 5) The research can help identify weak aspects in the planning process and improve them by using smart analytics in measuring results and financial analysis to ensure success and sustainability.

### 1.3 Research Aim

- 1) Determine the extent of the impact of business intelligence as an independent factor on effective planning strategies in organizations.
- 2) Identify the relationship between business intelligence, data analysis, and the impact on decision-making and effective planning.
- 3) Measure the extent of using business intelligence in statistical analysis and effective planning and determine its importance.
- 4) Analyze the factors that affect business intelligence on future planning strategies and determine the best available options.
- 5) Develop new strategies to take advantage of business intelligence in various planning applications.
- 6) Measure the impact of using data analysis in improving business intelligence and the adopted planning strategies.
- 7) Set goals and plans for the development of business intelligence to improve the quality of services and speed up decision-making.

## 2. Theoretical framework and Literature Review



**Fig. 1.** Theoretical research framework

### 2.1 Business Intelligence

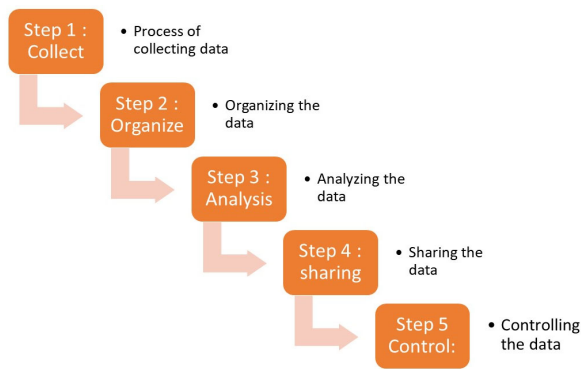
#### 2.1.1 Brief History and Development of Business Intelligence

The modern corporate environment constantly changes, bringing new economic benefits, possibilities, risks, and challenges (Kombo-Pinda-Loubondo, 2022). Business intelligence (BI) has made an incredible journey from its beginnings in the 1950s to its current status as a disruptive force in the business landscape (Mahroof, 2019). BI began as a simple computer-based method for data processing and organization. The 1970s and 1980s saw the introduction of Decision Support Systems (DSS), which provided analytical tools for managerial decision-making (Carlsson & Walden, 2021). In the late 1980s and early 1990s, the term "Business Intelligence" started gaining popularity, representing a move towards making decisions based on data (Carlsson & Walden, 2021). The increasing use of data warehousing and Online Analytical Processing (OLAP) in the 1990s made multidimensional analysis and centralized data storage possible (Reddy & Suneetha, 2021). Enterprise Resource

Planning (ERP) systems and business intelligence (BI) started combining in the late 1990s and early 2000s as technology advanced, resulting in improved operational insights (Katu, 2021). Through the use of self-service BI tools, Big Data, and sophisticated analytics -such as machine learning and predictive modeling - data analysis became more accessible in the 2000s and 2010s (Hani, 2020). In the present era, Business intelligence is advancing rapidly with the injection of artificial intelligence and augmented analytics (Mehrotra, 2019). AI-driven algorithms provide proactive insights, enabling businesses to make real-time, informed decisions. It is clear from this trajectory that BI plays a crucial role in helping organizations manage their data effectively, gain actionable insights, and navigate a data-rich environment (Candra, & Nainggolan, 2022; Srivastava et al., 2022).

### 2.1.2 The Concept of Business Intelligence

A business intelligence strategy is the process of gathering, accessing, and analyzing data to provide organizations with corporate knowledge that can aid decision-making and improve performance (Bharadiya, 2023; Chaudhry, & Chaudhry, 2023). Businesses can use business intelligence to know current trends to determine their corporate strategy to prepare for dynamic market forces (Renaldo et al., 2023). Combita Niño et al.; Tripathi et al. (2020; 2020) explains business intelligence as “an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance”. Balachandran and Prasad; Kale (2017; 2017) also defined business intelligence as the technologies, applications, and practices used to collect, integrate, analyze, and present business information for better decision-making. In accordance with these definitions, business intelligence involves analyzing and organizing information to support decision-making processes within an organization by using analytics tools and methods (Bharadiya, 2023; Jameel et al., 2017).



**Fig. 2.** Concept of Business Intelligence (Srivastava et al., 2022)



**Fig. 3.** A traditional pyramid of business intelligence data to make better decisions (Kalathas et al., 2021)

### 2.1.3 Components of Business Intelligence

BI systems consist of multiple tools, including a data warehouse, OLAP, and dashboards. In a data warehouse, accurate, clean, and detailed data is gathered from multiple sources and analyzed in detail, whereas an online analytical processing (OLAP) system facilitates real-time multidimensional analysis and allows users to perform operations such as aggregating, filtering, rolling up, drilling down for details (e.g., products, customers, times, country, region) (Batra, 2018). Additionally, dashboards serve as the front-end application for data visualization and performance management. They allow users to display graphs, charts, widgets, and ad hoc reports, while decision-makers can monitor the key performance indicators of the organization (Batra, 2018). The capacity of an organization to offer processes and high-quality information will assist decision-makers in making better choices, better organizing their plans of action, and eventually achieving more competitive positions. In other words, the foundation of business intelligence (BI) is the conversion of data into information, which leads to decisions, and ultimately to actions (Kulkarni et al., 2017). Every business intelligence system is built with tiers that are always evolving, forming a pyramid. The first step is locating the raw historical data, and the last step is making the final decisions, as illustrated in Figure 1. Processes including data preparation, data investigation, data visualization, and data mining are necessary to reach the final stage, and they should be carried out with the best possible machine learning algorithm application technique.

### 2.1.4 Business Intelligence Functions

The development of business intelligence (BI) systems has been attributed to recent breakthroughs in management information systems (MIS) and technology (Gurcan et al., 2023). To provide consumers with immediate actionable insights, BI collects data and interprets it into trends and visuals (Orji et al., 2023). Therefore, business intelligence (BI) is viewed as an innovative class of information technology (IT) capabilities that are closely linked to a business's ability to provide high-quality information to decision-makers (Kulkarni et al., 2017). BI's primary objective is to make data meaningful and pertinent to decision-makers and businesses (Delen et al., 2018). Gathering, analyzing, presenting, and disseminating business information

are the functions of business intelligence (BI) (Ali et al., 2022). A corporation and its competitive environment can be successfully analyzed with the use of this information (Abu-ALSondos, 2023). As part of building the right technological infrastructure and using BI to maximize organizational benefits, it is crucial that BI obtains, absorbs, and leverages new information effectively (Niu et al., 2021). In business, four main BI systems are usually used: reporting BI systems, analysis BI systems, monitoring BI systems, and prediction BI tools (Doshi et al.). Business Intelligence (BI) systems can serve different purposes. Analysis BI systems are designed to provide insights into the reasons behind a specific event, whereas Reporting BI systems focus on creating business documents that contain valuable information on what has already happened at a particular moment in time. On the other hand, BI monitoring solutions offer real-time tracking of information, allowing firms to stay up-to-date with the latest developments. Finally, the BI Prediction tool helps businesses predict potential outcomes based on industry trends and available data (Gauzelin & Bentz, 2017).

### *2.1.5 The Benefits of Business Intelligence*

Business intelligence (BI) has become an innovative technology that enables organizations to make better, more informed decisions (Chen, & Lin, 2021; Niu et al., 2021). BI provides a wide range of advantages that have revolutionized how firms function and compete in the contemporary environment, from increasing operational efficiency to fostering strategic growth (Božič & Dimovski, 2019). According to (A. Al-Okaily et al., 2023; Khalin & Chernova, 2018), implementing BI can yield several advantages, including enhanced productivity, improved operational effectiveness, and performance, which ultimately contribute towards corporate growth, resource planning, customer satisfaction, cost savings, and maintaining competitiveness in a constantly changing and dynamic market (Ajah & Nweke, 2019). The advantages of BI are expected to increase further with the increasing amount of data and the development of BI tools, making it a vital resource for businesses (Niu et al., 2021). According to (Bhatiasevi & Naglis, 2020; Côte-Real, Ruivo, & Oliveira, 2020) It was found in a 2017 study conducted by Microsoft on 117 Thai business leaders and 1,494 Asian business leaders that 89 percent of Thai business leaders realize the importance of embracing digital transformation. To guarantee future growth, they believe it is necessary to transform their organization, which is now made possible by the Internet of Things (IoT): advanced data analytics, business intelligence, and mixed reality. Throughout history, technology has been recognized as the primary catalyst for enhancing and revamping methods. The Internet has become one of the most effective tools for enabling the evolution of different sectors. As a result, organizational excellence is a state of creativity and exceptional performance (Mbaidin 2024).

### *2.1.6 Who can benefit from Business Intelligence?*

With the advancement of technology, organizations and governments are looking for easy-to-manage and secure technology to maintain accountability (Mbaidin, Alsmairat, & Al-Adaileh, 2023). By using data to enhance operations, decision-making, and eventually corporate outcomes, business intelligence (BI) is a versatile technology that can help a broad range of businesses (Velu, 2021). BI can be beneficial to any business that wants to improve decision-making (Niu et al., 2021). In addition to providing the organization with high-quality information that is essential to decision-making, BI provides knowledge workers with real-time access to the information and the ability to analyze it effectively and intuitively (A. Al-Okaily et al., 2023). Business intelligence (BI) is scalable and flexible, which makes it an important tool for promoting efficiency and growth in a variety of industries.

### *2.1.7 Potential Applications of Business Intelligence*

Over the past 10 years, firms have made large financial investments in BI systems to obtain competitive advantages (Kulkarni et al., 2017). Business intelligence (BI) is a useful and adaptable technology with a wide range of applications in many sectors of the economy. The following are a few examples of BI applications:

#### *2.1.7.1 Financial Institutions*

Financial institutions' operations and decision-making procedures have been completely changed by BI. Leveraging BI's potential is critical to success and creating a competitive edge in the financial sector in today's data-rich market (Fast et al., 2023). On a daily basis, the financial sector deals with enormous amounts of data, including customer transactions, market trends, risk assessments, and more (Fast et al., 2023; Hasan et al., 2020). Business Intelligence (BI) includes the collection, analysis, and interpretation of this data in order to derive useful and valuable insights that can guide crucial and important business decisions (Niu et al., 2021). As data continues to increase in volume and complexity, financial institutions will need to incorporate business intelligence (BI) into their operations to remain successful and sustainable (Tunowski, 2020). Using BI will help financial institutions stand out in today's quickly changing market.

#### *2.1.7.2 Manufacturing*

Success in the competitive and fast-paced manufacturing environment of today depends on utilizing data-driven insights (Almazzomi et al., 2022). Using advanced analytics tools and technology to gather, examine, and comprehend vast amounts of data produced throughout the production process is known as business intelligence in the manufacturing industry (Niu et al., 2021). This comprises information gathered from a variety of sources, including sensors, machinery, supply chains, and consumer interactions (Abu-ALSondos, 2023). By facilitating data-driven decision-making, increasing operational

effectiveness, boosting product quality, and streamlining supply chain procedures, business intelligence is revolutionizing the manufacturing sector (Yiu et al., 2021). The most important goal is to get insightful information that can drive strategic decisions and improve operational effectiveness.

### *2.1.7.3 Healthcare*

Due to the incorporation of Business Intelligence (BI) technology, the healthcare industry has seen a profound transition in recent years. Organizations are now better equipped to make choices, allocate resources optimally, improve patient care, and increase operational efficiency and research processes because of the capacity to collect and analyze enormous volumes of healthcare data (Dash et al., 2019). A vast amount of data is produced by the healthcare sector from several sources, including electronic health records (EHRs), patient demographics, clinical trials, medical imaging, billing systems, etc (Basile et al. 2023). To transform this raw data into insights that can be put to use, business intelligence in the healthcare industry uses sophisticated data analytics methods and tools (Galetsi et al., 2020). Healthcare providers and administrators can use these insights to help them make data-driven decisions, as they are frequently shown through accessible dashboards and reports (Basile et al. 2023).

## *2.2 Effective Planning Strategies within Business Intelligence*

Due to poor strategic decisions, many small, medium, and big businesses worldwide have struggled to stay in business, leading to the closure of most of them (Shafi et al., 2020). Therefore, it is crucial that businesses use business intelligence and pay attention to how it affects them (Caseiro & Coelho, 2019). Business intelligence has become critical for strategic planning and decision-making in organizations (Hamad et al., 2021). According to (Richards et al., 2019), planning would consist of techniques like strategy mapping, SWOT analysis (strengths, weaknesses, opportunities, and threats), and environmental scanning. A decision-making and strategic planning process requires the transformation of data into information. In business intelligence, powerful analytical tools, such as visualization and data mining tools, are available to assist with informed decisions, which result in an improved user experience (Hamad et al., 2021). Analytic tools provide insight into corporate value, particularly business intelligence tools for making more effective choices and strategic planning (Seddon et al., 2017). Strategic and operational decision-making need the application of BI technologies to compete in the global market (Aziz, 2020). Gauzelin and Bentz (2017) state that business intelligence (BI) facilitates the acquisition of competitive data and organizational strategy planning, both of which are utilized in the strategic decision-making process inside a particular firm or organization. With the help of analytic tools, particularly business intelligence tools, companies gain access to valuable insights that enable them to make effective business decisions and plan strategically (Bharadiya, 2023). By leveraging these tools, businesses can maximize their corporate value, ensuring that they stay ahead of competitors and achieve long-term success (Hamad et al., 2021).

## *2.3 Business Intelligence through Data Analytics*

As technology, data, and analytics become increasingly important to business (Abu-ALSondos, 2023), many organizations are implementing business intelligence systems and analytics to support reporting and strategic decisions (Rikhardsson & Yigitbasioglu, 2018). In all forms of data – structured, semi-structured, and unstructured the amount of data in the world is increasing exponentially (R. Rawat & Yadav, 2021). The huge amount of data, however, exceeds the processing capacity of traditional databases or a single machine. It has the potential to be mined and transformed into useful information. By analyzing large amounts of data, data analytics reveals patterns, correlations, and other insights that are hidden (Balachandran & Prasad, 2017). Businesses may make better decisions by using business intelligence and data analytics to gain valuable information and a deeper understanding of both structured and unstructured data (Duggal & Paul, 2013; Fan & Bifet, 2013). According to (Hamad et al., 2021) In today's fast-paced business world, having access to powerful analytic tools can make all the difference in creating a competitive edge. By leveraging business intelligence tools, companies can gain valuable insight into their corporate value, empowering them to make more effective choices and plan strategically for the future which will take the business to the next level of success (Bharadiya, 2023).

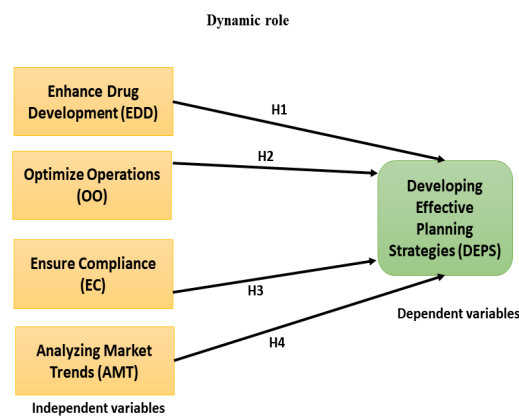
## *2.4 Business Intelligence in the Pharmaceutical Sector*

Business intelligence is driving innovation, improving operational efficiency, and guaranteeing adherence to strict industry standards, all of which are radically changing the pharmaceutical sector (Kunc, & O'brien, 2019). Pharmaceutical businesses produce large volumes of data from a variety of sources, such as research and development, clinical trials, production, marketing, and sales (Kulkov, 2021). Utilizing sophisticated analytics tools and technology, business intelligence (BI) in the pharmaceutical industry gathers, examines, and interprets data in order to convert it into actionable insights that can be put to use (Mahroof, 2019). Drug development is one of the major areas where BI has an impact on the pharmaceutical industry. Pharmaceutical businesses can optimize their research processes by employing data analysis techniques to examine large volumes of information relating to drug efficacy, safety, and patient outcomes (Del Rio-Bermudez et al., 2020). Drug development can be improved by using predictive modeling and data analytics to find promising drug ideas, enhance clinical trial success rates, and optimize trial designs. BI also has a significant impact on operational efficiency (Del Rio-Bermudez et al., 2020). Pharmaceutical firms may optimize their operations, reduce costs, and better allocate resources by analyzing data from the manufacturing process, supply chain, and distribution (Wang, Kung, & Byrd, 2018). This efficiency is essential

for satisfying a market that is changing quickly. In addition, business intelligence (BI) helps pharmaceutical companies adhere to strict regulations (Ketolainen, 2023). Assuring that procedures and products follow industry rules and standards is accomplished by helping to monitor and report on compliance-related indicators (Kumar, 2023; Ronolo, 2023). By doing this, the company's trust and reputation are improved while risks are reduced. Business intelligence (BI) gives important insights into industry trends, client preferences, and competitor operations in marketing and sales (Alasiri & Salameh, 2020). Pharmaceutical businesses can modify marketing strategies and effectively target their audiences by analyzing sales data and consumer behavior (Sarkar, 2023). This developed approach enhances sales and market development in the long run. The incorporation of business intelligence (BI) will continue to be a vital component of the pharmaceutical industry's evolution, enabling pharmaceutical companies to make data-driven decisions that enhance drug development, optimize operations, and improve patient outcomes (Gungoren 2023; Wang, Kung, & Byrd, 2018; Marques et al. 2020).

### 2.5 The Dynamic Role of Business Intelligence in Developing Effective Planning Strategies through Analyzing Data as an Influential Variable in the Pharmaceutical Sector of Jordan

To stay ahead of the curve and promote a healthier society as the sector develops, it will be crucial to leverage the power of BI (Alabaddi et al., 2022). Business Intelligence (BI) has emerged as an important force in Jordan's pharmaceutical industry, driving strategic decision-making and promoting a data-driven approach in a rapidly expanding sector (Altahrawi et al., 2021). Pharmaceutical companies have increasingly relied on BI to develop effective planning strategies, enabling them to navigate challenges, enhance operational efficiency, and ultimately deliver better healthcare (Rehman et al., 2022). In today's dynamic environment, business intelligence and analytics are trendy issues and a requirement for creating an outstanding corporate image, and their implementation goes in line with implementing a successful technology use plan. As a result, this helps businesses make better decisions and gain a competitive advantage (Yiu, Yeung, & Jong, 2020; Zhan et al., 2021). To make decisions and plan strategically, data must be transformed into information. Using business intelligence, users can make informed decisions and, as a result, their experience is transformed, bringing it to a higher level (Ahmad et al., 2020). In the Jordanian pharmaceutical sector, research and development, clinical trials, supply chains, sales, and regulatory compliance generate a large number of data (Abedi, Kwon, & Yoon, 2023; Galetsi, & Katsaliaki, 2020). In order to make informed decisions and plan efficiently, business intelligence tools and technologies are crucial to processing and analyzing these data (Pranjić, 2018). The ability to optimize the drug development lifecycle is one of the most important dynamic roles of BI in Jordan's pharmaceutical sector (Moflih et al., 2020). Pharmaceutical companies can identify patterns and trends that guide the development and testing of new drugs by analyzing vast amounts of clinical data, drug efficacy studies, and patient outcomes (Krishnababu et al., 2023; Paul et al., 2021; Vora et al., 2023). By accelerating research and development processes, data-driven approaches deliver innovative medications faster to the market (Finelli & Narasimhan, 2020). In addition, the second dynamic function of BI is the facilitation of streamlined supply chains and inventory management. Pharmaceutical companies in Jordan can analyze data about product demand, manufacturing capacity, and distribution channels. In order to efficiently meet patient needs, it is crucial to anticipate market demand, optimize inventory levels, and ensure an efficient supply chain (Yiu, Yeung, & Jong, 2020; Handfield, Jeong, & Choi, 2019). Additionally, BI plays a dynamic role in enhancing compliance and regulatory compliance in Jordan's pharmaceutical industry. Local and international regulations can be met by integrating and analyzing data related to regulatory requirements and quality standards. As a result, products meet the necessary standards, increasing organizational credibility and patient safety (Bivona-Tellez, 2017; Wang, Kung, & Byrd, 2018). A fourth dynamic role for Business Intelligence is to assist in market intelligence and customer-centric strategies. Pharma companies in Jordan tailor their marketing strategies and product offerings by analyzing market trends, competitor activities, and customer feedback. The ability to understand customer preferences leads to the development of products that meet local needs, increasing market penetration and customer satisfaction (Zhan et al., 2021).



**Fig. 4.** The Dynamic Role of Business Intelligence in Developing Effective Planning Strategies through Analyzing Data as an Influential Variable

## 2.6 Hypotheses Development

**H<sub>1</sub>:** *The enhancement of drug development in the pharmaceutical sector of Jordan has a substantial and favorable impact on the development of effective planning strategies, achieved via the comprehensive analysis of data.*

**H<sub>2</sub>:** *The optimization of operations in the pharmaceutical industry of Jordan has a substantial positive impact on the development of effective planning strategies by means of data analysis.*

**H<sub>3</sub>:** *The act of ensuring compliance in the pharmaceutical industry of Jordan has a notable and favorable impact on the development of effective planning strategies, achieved via the analysis of data.*

**H<sub>4</sub>:** *The analysis of market trends in the pharmaceutical sector of Jordan has a notable and favorable impact on the formulation of successful planning strategies by means of data analysis.*

## 3. Methodology

This study investigates the dynamic function of Business Intelligence (BI) in the development of efficient planning strategies by evaluating data as a significant factor in the Pharmaceutical Sector of Jordan. There are four main independent variables that have been found in this study, including Enhancing Drug Development, Optimizing Operations, Ensuring Compliance, and Analyzing Market Trends. The dependent variable of this study pertains to the development of effective planning strategies through the analysis of data.

### 3.1 Research Design

The present study utilized a descriptive research approach to provide a comprehensive understanding of the role of Business Intelligence (BI) inside the pharmaceutical industry of Jordan. The researchers opted for a cross-sectional survey design, which involved collecting data at a certain moment in time. The survey consisted of a set of structured, quantitative inquiries, facilitating a methodical examination of present perceptions, patterns, and approaches concerning the adoption of business intelligence (BI) and its influence on strategic planning within the industry.

### 3.2 Population and Sample

The study's population comprises professionals working in the pharmaceutical sector in Jordan. This comprises various jobs inside an organization, including managers, analysts, research and development specialists, and regulatory compliance officials. To ensure a comprehensive representation of professionals from different job roles and hierarchical levels in this sector, a stratified random sampling technique was utilized. This approach was chosen due to the wide range of diversity and expertise within the industry.

A total of 450 experts were initially contacted to partake in the study. Out of the total, a sample size of 363 experts contributed their responses. During the preliminary evaluation stage, the responses were carefully examined to ensure they were fully completed and had internal coherence. Several surveys were excluded from the analysis because they were deemed incomplete, contained inconsistent data, or were not filled out truthfully. Following the completion of the quality control phase, a total of 313 replies were identified as legitimate, comprehensive, and appropriate for subsequent analysis. These responses constitute a substantial proportion of the targeted population, therefore carrying great relevance for further investigation.

**Table 1**  
Demographic Analysis

Demographic	Elements	Frequency	Percent
Gender	Male	180	57.5%
	Female	133	42.5%
Age Range	Below 25	16	5.1%
	25-35	139	44.4%
	36-45	104	33.2%
	46-55	40	12.8%
	Above 55	14	4.5%
Position in the company	Management	33	10.5%
	Research & Development	79	25.2%
	Operations/Supply Chain	68	21.7%
	Marketing/Sales	70	22.4%
	Compliance/Regulation	53	16.9%
	Others	10	3.2%
	Total	313	100.0



According to the data presented in Table 1, the research encompassed a collective sample size of 313 individuals. In relation to gender, most participants identified as male, comprising 57.5% (180 participants), whereas females accounted for 42.5% (133 participants). When examining the age distribution, the age group that had the highest representation was individuals between the ages of 25 and 35, constituting 44.4% (139 responses) of the overall sample. Subsequently, the 36-45 age cohort constituted 33.2% (104 participants) of the sample. The age group ranging from 46 to 55 years constituted 12.8% of the total sample size, with 40 respondents. Conversely, the age groups below 25 and beyond 55 years were the least represented, accounting for 5.1% (16 respondents) and 4.5% (14 respondents) respectively. In terms of organizational hierarchy, the Research & Development department exhibited the most significant presence, accounting for 25.2% (79 participants) of the total respondents. The Marketing/Sales and Operations/Supply Chain sectors closely followed, with 22.4% (70 respondents) and 21.7% (68 respondents) respectively. The category of Compliance/Regulation included 16.9% (53 respondents) of the total respondents, while Management represented 10.5% (33 respondents). Other jobs were reported as the fewest number of respondents, comprising 3.2% (10 respondents).

The demographic breakdown offers a complete analysis of the participants' characteristics, encompassing their gender, age, and roles within their different organizations. This breakdown provides valuable insights into the respondents' backgrounds. The inclusion of a wide range of perspectives guarantees a comprehensive and balanced examination of the subject matter.

### 3.3 Data Collection Instrument

A structured questionnaire was prepared in accordance with the information provided and the research objectives. The survey comprises a total of 20 questions, which have been organized into groups according to the previously specified criteria. Participants were requested to express their degree of agreement by utilizing a 5-point Likert scale, with 1 denoting "Strongly Disagree" and 5 denoting "Strongly Agree."

### 3.4 Validity and Reliability

The establishment of the questionnaire's content and construct validity was achieved by conducting pilot research that involved 25 individuals selected from the target group. In response to the feedback received, appropriate modifications were implemented. The instrument's reliability was assessed by the utilization of Cronbach's alpha, resulting in a coefficient over 0.9, therefore signifying a satisfactory degree of internal consistency.

**Table 2**

Pilot study (Cronbach's alpha)

Variables	Cronbach's alpha	N of Items
Enhance Drug Development (EDD)	0.955	4
Optimize Operations (OO)	0.943	4
Ensure Compliance (EC)	0.959	4
Analyzing Market Trends (AMT)	0.922	4
Developing Effective Planning Strategies (DEPS)	0.968	4

### 3.5 Ethical Considerations

Prior to participating in the study, all participants were provided with information regarding the goal of the research and were guaranteed that their identities would remain anonymous, and their responses would be treated with utmost confidentiality. The act of participating in the study was not obligatory, and individuals who chose to participate had the autonomy to withdraw their involvement at any given time.

## 4. Data Analysis

The acquired data was analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach in this study. Partial Least Squares Structural Equation Modeling (PLS-SEM) was selected as the preferred methodology due to its inherent capacity to effectively handle intricate models, its adaptability to smaller sample sizes, and its appropriateness for exploratory research, particularly when the aim is theory development.

### 4.1 Interpretation of Outer Loadings

Table 3 shows that outer loadings demonstrate the resilience of the measuring model in relation to several constructs that are essential to the investigation. Each construct, namely Analyzing Market Trends (AMT), Developing Effective Planning Strategies (DEPS), Ensure Compliance (EC), Enhance Drug Development (EDD), and Optimize Operations (OO), has loadings that are above the commonly acknowledged criterion of 0.7 (Hair et al., 2021). This statement confirms the robust association between specific items and their underlying constructs, highlighting the credibility and consistency of the assessment instruments. Based on the significant loadings observed, the study model exhibits a robust and well-organized framework that can serve as a solid basis for conducting subsequent investigations.



**Table 3**  
PLS-Sem Analysis's

Constructs	Observed	Loadings	VIF	C alpha	rho_a	rho_c	AVE	F <sup>2</sup>	R <sup>2</sup>	R <sup>2</sup> adjusted
Enhance Drug Development (EDD)	EDD1	0.917	3.599	0.934	0.934	0.953	0.834	3.786		
	EDD2	0.903	3.16							
	EDD3	0.913	3.537							
	EDD4	0.919	3.736							
Optimize Operations (OO)	OO1	0.879	2.738	0.906	0.913	0.934	0.78	2.857		
	OO2	0.863	2.502							
	OO3	0.904	3.011							
	OO4	0.886	2.577							
Ensure Compliance (EC)	EC1	0.916	3.62	0.933	0.935	0.952	0.833	3.438	0.932	0.931
	EC2	0.919	3.69							
	EC3	0.917	3.438							
	EC4	0.898	3.125							
Analyzing Market Trends (AMT)	AMT1	0.903	3.319	0.935	0.937	0.953	0.836	3.488		
	AMT2	0.917	3.792							
	AMT3	0.919	3.544							
	AMT4	0.917	3.723							
Developing Effective Planning Strategies (DEPS)	DEPS1	0.937	4.695	0.946	0.947	0.961	0.862			
	DEPS2	0.912	3.543							
	DEPS3	0.921	3.942							
	DEPS4	0.943	5.034							

## 4.2 Measurement Model Assessment

### 4.2.1 Construct reliability and validity

Table 3 shows that assessment of the constructs' reliability and validity was conducted through the utilization of diverse statistical metrics. The measure of internal consistency, known as Cronbach's alpha, is consistently above the acceptable threshold of 0.7 for all constructs, indicating a high level of internal dependability. In a similar vein, the composite reliability for each construct, as measured by both rho\_a and rho\_c, are above the established threshold of 0.7 (Hair et al., 2021). This suggests a high level of consistency and dependability among the items within each construct. The average variance extracted (AVE) for each construct exceeded the recommended threshold of 0.5, indicating that over 50% of the variance in the indicators may be attributed to the underlying structures. In conclusion, these metrics reaffirm the strength and dependability of the measurement model, validating its appropriateness for subsequent analysis and hypothesis testing.

### 4.2.2 Collinearity statistics (VIF)

Table 3 shows that Variance Inflation Factor (VIF) values offer valuable insights into the presence of multicollinearity among the variables inside a regression model. In the provided dataset, all the independent variables exhibit Variance Inflation Factor (VIF) values that fall below the commonly accepted threshold of 5 (Hair et al., 2021). This observation suggests that the presence of multicollinearity among these predictors is moderate and falls below acceptable thresholds, hence maintaining the stability and interpretability of their coefficients. However, even though the VIF values for DEPS1, DEPS2, DEPS3, and DEPS4 surpass certain commonly used thresholds, they are considered as dependent variables. Hence, the elevated levels of VIF seen in this context are unlikely to compromise the integrity or precision of the regression model, given that the principal problems associated with VIF often pertain to independent variables. In general, the Variance Inflation Factor (VIF) values indicate that the model exhibits a satisfactory level of resilience against problems related to multicollinearity.

### 4.2.3 Discriminant Validity

Table 4 shows that Heterotrait-Monotrait ratio (HTMT) matrix is a diagnostic instrument employed to evaluate the discriminant validity of components.

Table 4  
Heterotrait-Monotrait ratio (HTMT) matrix

	(AMT)	(DEPS)	(EDD)	(EC)	(OO)
(AMT)					
(DEPS)	0.5				
(EDD)	0.033	0.507			
(EC)	0.025	0.556	0.063		
(OO)	0.096	0.48	0.055	0.136	

To establish differentiation between constructs, it is preferable for the HTMT values to fall below the threshold of 0.85 (Hair et al., 2021). The HTMT matrix provided in this study demonstrates that the values of all construct pairs are far below the

established threshold, thereby demonstrating the presence of strong discriminant validity. It is worth noting that the pairs "Analyzing Market Trends (AMT) & Enhance Drug Development (EDD)" and "Analyzing Market Trends (AMT) & Ensure Compliance (EC)" have notably low values, suggesting a significant level of differentiation between these constructs. On the other hand, the correlation between the pair "Developing Effective Planning Strategies (DEPS) & Enhance Drug Development (EDD)" as indicated by the HTMT value is near the threshold. This implies a slightly stronger correlation, however still within the permitted range for ensuring discrimination validity. In brief, the constructs demonstrate different characteristics, hence affirming their suitability as distinct entities within the study model.

4.3 Structural Model Assessment

4.3.1 R-squared Value

Table 3 shows that R-Square and Adjusted R-Square values for the construct "Developing Effective Planning Strategies (DEPS)" are 0.932 and 0.931, respectively. This finding suggests that a significant amount of the variability in the "Developing Effective Planning Strategies (DEPS)" may be accounted for by the proposed model. More precisely, the analysis reveals that around 93.2% of the variability in DEPS can be accounted for. However, this percentage is slightly altered to 93.1% when considering the influence of the predictors included in the model.

4.3.2 Effect Size ( $f^2$ )

For context F-square, it is generally acknowledged in academic literature that impact sizes of 0.02, 0.15, and 0.35 are commonly classified as small, medium, and large, respectively (Hair et al., 2021). Table 3 displays the f-square values, which indicate the effect sizes of several constructs on the "Developing Effective Planning Strategies (DEPS)." The constructs, specifically referred to as "Analyzing Market Trends (AMT)," "Enhance Drug Development (EDD)," "Ensure Compliance (EC)," and "Optimize Operations (OO)," exhibit substantial effect sizes ranging from 2.857 to 3.786, hence exerting a major impact on DEPS. Among the options considered, the initiative known as "Enhance Drug Development (EDD)" emerges as particularly noteworthy due to its significant impact, so underscoring its crucial role in the formulation of effective planning strategies.

4.4 Bootstrapping and Blindfolding

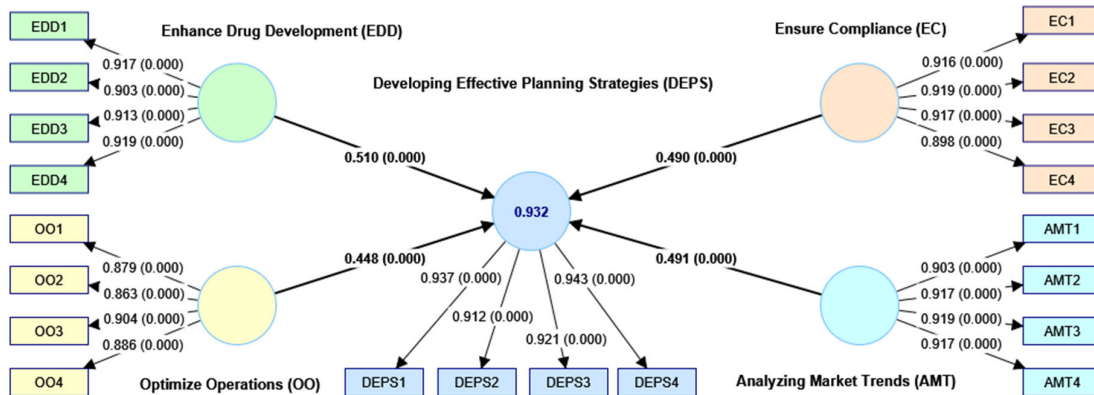


Fig. 6. Structural Model

According to the structural model and hypothesis testing, as presented in Table 4, the Figure 6 Structural Model illustrates a Structural Equation Modeling (SEM) diagram, which delineates the interconnections among various constructions. Each of the larger circles/ovals depicted in the diagram symbolizes a latent variable, while the rectangles represent the observed variables or indicators. The numerical values adjacent to the directional arrows connecting different constructs represent the path coefficients, while the values included in parentheses indicate the corresponding p-values. The numerical values displayed next to the arrows that point towards the observed variables are the factor loadings assigned to the corresponding indicators.

Table 5 provides an overview of the hypothesis testing conducted to examine the links between the various constructs:

**H1:** The association between "Enhance Drug Development (EDD)" and "Developing Effective Planning Strategies (DEPS)" is characterized by a path coefficient of 0.51, which demonstrates a very significant p-value of 0. This implies that there is a statistically significant association between the variables under investigation, hence providing support for the stated hypothesis.

**H<sub>2</sub>:** The route coefficient between "Optimize Operations (OO)" and "Developing Effective Planning Strategies (DEPS)" is 0.448, with a p-value of 0. This indicates that the association between these two variables is statistically significant, providing support for the hypothesis.

**H<sub>3</sub>:** The route coefficient between "Ensure Compliance (EC)" and "Developing Effective Planning Strategies (DEPS)" is 0.49, with a p-value of 0. The findings provide more evidence to support the notion that the association is statistically significant, hence reinforcing the hypothesis.

**H<sub>4</sub>:** The path coefficient between "Analyzing Market Trends (AMT)" and "Developing Effective Planning Strategies (DEPS)" is 0.491, indicating a statistically significant association ( $p < 0.05$ ) and providing evidence for the hypothesis.

All the assumptions put forward in this study are substantiated by robust statistical evidence, indicating that the constructs of "Enhance Drug Development", "Optimize Operations", "Ensure Compliance", and "Analyzing Market Trends" have a major impact on the process of "Developing Effective Planning Strategies".

**Table 5**

Path coefficients Analysis

H	Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O/STDEV )	P values	Decision
H <sub>1</sub>	(EDD) → (DEPS)	0.51	0.51	0.026	19.729	0.00	supported
H <sub>2</sub>	(OO) → (DEPS)	0.448	0.447	0.025	17.856	0.00	supported
H <sub>3</sub>	(EC) → (DEPS)	0.49	0.489	0.027	18.187	0.00	supported
H <sub>4</sub>	(AMT) → (DEPS)	0.491	0.491	0.026	18.757	0.00	supported

## 5. Discussion and Results

### 5.1 Relationship Between Drug Development and Planning Strategies (H1)

The findings derived from the conducted hypothesis testing indicate a statistically significant and favorable association between the advancement of drug development within Jordan's pharmaceutical industry and the implementation of thorough data analysis to formulate successful planning strategies. This association is consistent with the research objective of investigating the influence of business information as a standalone variable on the efficacy of planning strategies. The observed level of significance suggests that when advancements are made in the field of drug development, the approaches for efficient planning grow more resilient, particularly when guided by thorough data analysis.

### 5.2 Impact of Operations Optimization on Planning (H2)

The identification of operational optimization in the pharmaceutical industry has been recognized as a significant determinant impacting the formulation of efficient planning strategies. This highlights the significance of optimizing operational procedures in effectively utilizing data and converting it into implementable strategy. This result aligns with the stated goal of assessing the utilization of business information in statistical analysis to enhance the process of planning.

### 5.3 Role of Compliance in Strategy Formulation (H3)

The alignment of operations with laws in the pharmaceutical sector not only ensures compliance but also has a substantial impact on the formulation of successful planning strategies through data analysis. This finding aligns with the aim of investigating the correlation between business intelligence, data analysis, and their collective influence on decision-making and strategic planning. This statement highlights the significance of creating a conducive environment that adheres to regulations and guidelines in order to fully optimize the advantages of data-driven tactics.

### 5.4 Analysis of Market Trends (H4)

Market trends play a crucial role in guiding the strategic decisions of several firms. The examination of these patterns within the pharmaceutical industry in Jordan has revealed a significant favorable influence on the development of effective planning strategies through the utilization of data analysis. This aligns with the objective of examining the variables that influence business intelligence in the context of future planning methods and ascertaining the most optimal alternatives.

### 5.5 Overall Implications

The robust support for the hypotheses indicates that business intelligence, which is propelled by thorough data analysis, holds a crucial position within the pharmaceutical industry of Jordan. The research's aims are affirmed by the direct effects of the tested constructs, including medication development, operations optimization, compliance, and market trend analysis, on effective planning methods. This facilitates the exploration of novel approaches for using business intelligence in the context of planning applications, hence enhancing service quality, and accelerating the decision-making process.

The findings of the research emphasize the significance of business intelligence and data analysis in the establishment of objectives, strategic planning, and improvement of decision-making processes within the pharmaceutical industry of Jordan. It is recommended that organizations operating within this industry increase their investments in these specific areas to attain optimal outcomes.

## 6. Conclusion

Business Intelligence (BI) plays a crucial role in the collection, analysis, and utilization of data to impact an organization's performance (Kilanko, 2022). Business Intelligence (BI) is not merely a collection of tools, but rather a powerful resource that enables firms to effectively adapt to changing market trends and understand significant alterations in the business landscape (Renaldo et al., 2023). According to the scholarly work of Alasiri and Salameh (2020), decision-makers utilize business intelligence (BI) as a collection of tools to effectively extract valuable insights from data. These tools enable decision-makers to gather, present, and distribute essential company information.

The effectiveness of business intelligence (BI) resides in its ability to consistently incorporate fresh information, prompting firms to develop appropriate technological frameworks to maximize its influence. According to Bharadiya (2023), this phenomenon gives rise to an ecosystem in which enterprises can discover latent patterns, recognize avenues for growth, optimize their operations, and ultimately, make well-informed decisions that contribute to their success.

The current state of the pharmaceutical industry in Jordan serves as evidence of the revolutionary potential of business intelligence (Altahrawi et al., 2021). The strategic decision-making within the industry has become firmly established in a data-driven approach, mostly attributed to the utilization of Business Intelligence (BI) techniques. Pharmaceutical firms can utilize data as a significant factor in several important aspects, such as improving medication development, optimizing operations, enforcing strict compliance, and deciphering complex market dynamics. Business Intelligence has become a crucial component for the pharmaceutical business in Jordan, playing a vital role in overcoming obstacles, improving operational efficiency, and ultimately, optimizing patient outcomes.

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