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The Impact of Digital Transformation on Logistics Management at Jordanian Pharmaceutical Companies

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Abstract

This study aimed to examine the impact of digital transformation with its dimensions (digital strategy, digital capabilities, and digital infrastructure), on logistics management with its dimensions (supply, storage, and transportation) at Jordanian pharmaceutical companies. The study was conducted among top and middle managers in these companies through an electronically distributed questionnaire using a comprehensive survey method, (197) questionnaires were received and deemed valid for statistical analysis, (SPSS) program was used to process data. The study concluded that digital transformation and logistics management are of high relative importance at Jordanian pharmaceutical companies. The results indicated a significant impact of digital transformation on logistics management and its dimensions (supply, storage, and transportation) at Jordanian pharmaceutical companies. The study presented a set of recommendations, the most important of which are: enhancing digital infrastructure by continuously upgrading technical systems to ensure reliability, security, and integration of logistics systems, thereby driving business growth.

Keywords: Digital transformation, Logistics Management, Jordanian Pharmaceutical Companies

Introduction

Changes in various economic, cultural, and social fields in the ever-evolving information age have intensified competition in the business environment, this has required companies to keep up with all competitive conditions and invest in information and communication technologies. Today, companies prefer to manage their operations and activities using technological infrastructure rather than traditional methods, thus changing their behaviors and organizational processes, this transformation is called "digital transformation" (Çögenli, 2021, 167). Rapid technological development is at the heart of the necessity for digital transformation, technology affects all aspects of business today, not only in terms of how to meet customer expectations but also in terms of the nature of competitors, it changes how competencies are built within companies, how information is gathered and customers are

understood, and how products and services are brought to market quickly. Therefore, technology, along with human effort, is undoubtedly the factor that enables companies to identify and capitalize on customer value (Vaz, 2021, 19-20).

Logistics management links diverse activities such as transportation, storage, and customer order fulfillment to control all transportation and storage processes that contribute to the product's flow from the end of the raw material stage to its final form, ensuring customers and consumers use it at the right time, place, and in the right way, at the lowest possible cost, it also focuses on using the most suitable equipment and redistributing it in a way that guarantees a rapid flow of supplies at the lowest cost and with the highest performance and efficiency (Ahmed & Al- Sharida, 2024).

The problem addressed in the current study lies in logistics management in Jordanian pharmaceutical companies. Due to rapid technological advancements, these companies face challenges related to their ability to manage supply, storage, and transportation, this necessitates a clear digital strategy, effective digital capabilities, and a supportive digital infrastructure, which can lead to improved supply efficiency, more accurate inventory management, and enhanced transportation and storage efficiency. Based on the above, the study problem can be formulated in the following questions:

1. What is the impact of digital transformation with its dimensions (digital strategy, digital capabilities, and digital infrastructure) on logistics management with its dimensions (supply, storage, and transportation) at Jordanian Pharmaceutical Companies?
2. What is the level of relative importance of digital transformation and its dimensions (digital strategy, digital capabilities, and digital infrastructure) at Jordanian Pharmaceutical Companies?
3. What is the level of relative importance of logistics management and its dimensions (supply, storage, and transportation) at Jordanian Pharmaceutical Companies?

On the other hand, the importance of the study is evident in two aspects, from a scientific perspective, its importance lies in the implications of its variables. Independent variable is digital transformation, also known as the digital age, this transformation is no longer merely an option, but an imperative and a strategic choice for organizations to leverage the advantages of technological advancements in their activities and operations, thereby achieving a competitive edge. Dependent variable is logistics management which is a key element in building strong competitiveness and achieving sustainable business growth. Through a review of relevant previous studies, the researcher observed a scarcity of research addressing digital transformation and logistics management. Therefore, the researcher hopes to bridge this research gap between digital transformation and logistics management by presenting theoretical and conceptual frameworks that clarify the nature of their relationship. This study aims to be a valuable scientific contribution, enriching both Arab and international libraries and encouraging further research on digital transformation and its impact on logistics management in the business world.

From a practical importance, the importance of the study is evident in its findings and recommendations, and its ability to assist decision-makers in pharmaceutical companies in optimizing their investment in digital technology. Furthermore, its significance is underscored

by the importance of Jordanian pharmaceutical companies, which are vital sectors supporting the national economy.

In terms of objectives, this study aims to:

1. Identify the impact of digital transformation with its dimensions (digital strategy, digital capabilities, and digital infrastructure) on logistics management with its dimensions (supply, storage, and transportation) at Jordanian Pharmaceutical Companies.
2. Identify the level of relative importance of digital transformation and its dimensions (digital strategy, digital capabilities, and digital infrastructure) at Jordanian Pharmaceutical Companies.
3. Identify the level of relative importance of logistics management and its dimensions (supply, storage, and transportation) at Jordanian Pharmaceutical Companies.

Theoretical Framework

Digital Transformation

Digital transformation is a process through which organizations integrate technology and digital techniques into all their operations and activities according to a digital strategy aligned with their desired objectives, this ensures the efficiency of their operational processes and meets the requirements of their customers (Mahmoud et al., 2024). Digital transformation is defined as an advanced approach that utilizes modern technologies, such as the internet and smartphones, to improve the level of service provided to the public, enhance the organization's performance in service delivery, and enable a larger number of users to meet their needs as quickly as possible (Ahmed, 2022). According to El-Garhy (2024), digital transformation involves changing the perception of individuals within the organization regarding the work environment and striving to improve it by focusing on the use of information and communication technologies and digital techniques. It also involves modifying the organization's culture and individual behaviors to align with the nature of modern technology.

Demir et al. (2023) define digital transformation as the use of technology to improve the performance of companies or facilitate their accessibility, digital transformation essentially involves leveraging digital advancements, such as analytics, mobile applications, social media, and smart devices, while simultaneously enhancing traditional technologies like Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and internal processes. This transformation encompasses changes implemented and built upon digital technologies.

Digital transformation can be defined as the use of technology to fundamentally improve organizational performance; this requires integrating digital technologies into existing business models and leveraging digital capabilities to innovate new products and services compared to traditional service delivery methods, it also includes improving operational efficiency, reducing costs, and acquiring a broader customer base and audience to outperform competitors (Nasyiroh et al., 2023). The importance of digital transformation lies in keeping pace with modern technological developments and digital technologies that play a pivotal role in transforming work methods, patterns, and approaches for the better, this enhances an organization's competitiveness, improves the quality of its services, strengthens its ability to achieve its strategic objectives, and increases its capacity for

innovation and renewal. An organization's digital transformation enables it to keep pace with diverse environmental changes, making it more agile in its operations, capable of innovation and renewal, and able to meet evolving needs, thanks to these characteristics, the organization can improve the quality of its services in accordance with internationally recognized quality standards (Al-Fifi & Al-Shammari, 2024).

Digital Transformation Dimensions

Digital Strategy

Digital technology is reshaping an organization's entire strategy to create value and maintain its competitive edge. However, unleashing this power depends on a sound digital strategy (Flink et al., 2024, 20). A digital strategy refers to the organizational processes, issues, and objectives related to digital maturity, also known as a digital media strategy, it is a plan that maximizes the benefits of data assets and technological initiatives; therefore, the success of a digital strategy requires a cross-functional team, executive leadership, and effective IT (Al-Hadidi et al., 2022). According to Zhang et al. (2023) designing and implementing a digital transformation strategy involves senior managers, such as the digital committee and chief information/digital officers, who lead and initiate transformation efforts.

On other hand, Teng et al. (2022) argues that a digital strategy is a prerequisite for successful digital transformation; by developing an effective, clear, and sound digital transformation strategy, organizations can ensure their digital transformation is as agile as possible. A digital transformation strategy is like a customized roadmap that can deliver significant value in business transformation and providing a better customer experience. Furthermore, Brunetti et al. (2020) explained that digital strategy are characterized by the use of digital technology and the readiness of the business model for digital operation, they proposed four different digital transformation strategies that vary according to the primary driver of transformation: leadership style, the importance of skills such as creativity and initiative among employees, the risks and challenges they face in the transformation process, the potential consequences of failure, and the available tactics for improvement.

Digital Capabilities

Organizations assess their business efficiency by examining their digital capabilities, which indicate what is considered when implementing digital transformation, including the technical infrastructure, resources, and information technology (Rowles & Brown, 2017, 7). Mahmoud (2023) viewed digital capabilities as representing the skills and competencies necessary to use digital technologies and online applications to access information, create digital services, and effectively share them with service recipients. According to Ma (2023, 77), digital capabilities are fundamental to activating and rapidly implementing digital transformation in organizations. These capabilities include the digitization of users, products, conceptual systems, and more.

Teng et al. (2022) described digital capabilities as the key to digital transformation, which in turn utilizes digital properties for replication, linking, feedback, and simulation across all aspects of organizational operations. On the other hand, Ferreira et al. (2024) argue that digital capabilities primarily consist of an organization's ability to link innovation processes with the development of new products and services, these capabilities encompass the knowledge and ability to acquire, apply, assimilate, adapt, improve, and generate new

technologies. Digital capabilities thus emerge as specific internal processes that benefit the relationship between the organization and the user, creating value for organizations that acquire such capabilities, these digital capabilities support the means for companies to generate opportunities that enable them to solidify their competitive advantages.

Digital Infrastructure

Digital infrastructure forms a crucial foundation for ensuring the digital transformation of organizations seeking to enhance the potential of new digital technologies, digital infrastructure comprises technologies, components, processes, and organizational networks, it includes the social environment for users of digital tools, designers, and system developers connected to the infrastructure, therefore, digital infrastructure is conceived as an interconnection of different system sets, including software, hardware, standards, the internet, platforms, and people (Hustad & Olsen, 2021). Al-Farouq (2023) clarified that digital infrastructure represents a set of technological resources, including databases and hardware. Software, networks and communication, and systems that enable organizations to connect to the internet, such as mobile phones and location-based technologies. Teng et al. (2022) argue that digital infrastructure is the foundation of digital transformation because it yields multiple benefits and contributes to restructuring business models to better cope with rapid changes.

Logistics Management

The word "logistics" is derived from the ancient Greek word "logos" which means "proportion" or "reason", its use has shifted from the military's need to resupply its bases and positions to the economic sphere. Oxford English Dictionary defines logistics management as a branch of military science concerned with the management and maintenance of materials and the timing of resource transfers. Much of Britain's in American Revolutionary War and Erwin Rommel's defeat to World War II can be attributed to logistical failures, historical leaders such as Hannibal Barca and Alexander the Great are considered logistics geniuses (Ahmed & Al- Sharida, 2024).

According to Al- Sa'aydeh & Al- Sa'ed (2020) logistics management is a series of processes, both within and outside an organization, aimed at planning, implementing, and controlling the movement of business requirements from their sources to the beneficiaries, these processes include purchasing, storage, and transportation. Logistics management encompasses the planning, directing, implementing, and controlling of the movement of raw materials, semi-finished products, finished products, and related information with economic efficiency from the source of supply to the end consumer to meet their needs (Mohammed et al., 2025).

Al-Aklouk (2025) defines logistics management as the management responsible for planning, implementing, and monitoring the efficient flow of products, services, and related information to the beneficiary or end user to ensure their requirements are met. Similarly, Al-Yousef and Zwaid (2024) indicate that logistics management is part of the supply chain system, which efficiently and effectively plans, organizes, and monitors the flow of goods, services, and information to the end consumer to ensure their requirements are met. Successful implementation of strategic logistics management requires close collaboration among all departments within the organization, including marketing, sales, manufacturing, and finance. Companies must invest in capacity building and adopt advanced logistics

management systems to achieve better coordination and integration across their various activities.

Logistics management encompasses a set of plans and strategies implemented by a company to ensure the efficient delivery of services or products to the largest possible number of beneficiaries, this includes innovative and effective planning for transportation, storage, and distribution; supply chain optimization to ensure smooth and continuous operations; and achieving low costs and high quality for services or products (Muema & Achuora, 2020).

Agyabeng et al. (2020) emphasize that logistics management is a fundamental element for any company's success in the market. It aims to plan, organize, implement, and control transportation, warehousing, and distribution operations efficiently, effectively, and at a low cost. Strategic logistics management aims to balance meeting needs and maximizing service delivery by improving logistics processes and fostering collaboration across all company departments. Strategic logistics management relies on the use of technology, innovation, and data analysis to make sound and effective decisions in supply chain management.

Logistics Management Dimensions

Supply

The term supply refers to the process of acquiring services, or the activity responsible for providing materials that meet the specifications required by product users or service beneficiaries, at the right time and place, and in the right quantity and at the right price. According to Shararil (2021) supply represents a series of activities and tasks undertaken by a company, such as purchasing, inventory management, information management, quality control, production, distribution, delivery, and customer service, paving the way for customer acceptance of the product and achieving satisfaction with the service or product.

Supply management encompasses the activities and tasks through which goods and services are acquired, it is also defined as the activity responsible for ensuring the availability of materials that meet specifications, are available at the right place and time, and in the right quantity and at the right price (Al-Yousef & Zwaid, 2024). Supply process facilitates the transfer of required resources, products, or services from the supplier to the company, and then to the user (Bilha & Awuor, 2024).

Storage

Storage is defined as the process of holding things for a period of time and preserving them until they are needed (Al-Aklouk, 2025). Storage encompasses the activities related to storing, protecting, and properly preserving products for the required period, taking into account the layout of the storage space, such as a warehouse or storage facility, and the characteristics of the products themselves, it is also essential to select the appropriate number and type of handling equipment for the products, as warehouse productivity depends on it (Shararil, 2021).

Storage management refers to holding things until they are needed. In other words, it is the process of holding assets for a period of time and maintaining them in their original condition, or exposing them to natural conditions that induce a required change, and making

these assets available as needed at the specified time (Al-Yousef & Zwaid, 2024). Storage is a fundamental function in any company, regardless of its type, whether service-oriented or production-based, this necessitates attention to warehouses, whether the stored materials are raw materials, work-in-process, finished products, or other storage items, there is no doubt that proper storage reduces storage costs and therefore operating costs, and also enhances the supply process in general (Bilha & Awuor, 2024).

Transportation

Transportation is the process of moving goods and products efficiently and effectively to achieve high-quality logistics activities and services (Al-Sa'aydeh & Al-Sa'ed, 2020). Transportation management is viewed as the planning, organization, and monitoring of the movement of goods and products effectively to enhance the added value of logistics activities and ensure that these products reach the end consumer (El-Garhy, 2024).

Transportation, shipping, and delivery of goods to customers are among the most important logistics management tools, ensuring that customer orders are met at the specified time and place. Shipping operations include preparing and packaging the goods ordered by customers, transporting them using appropriate means of transport, and delivering them to customers at the specified time and place, goods are also returned to the origin in case of product defects. Transportation methods include maritime transport via ships across seas and oceans, air transport via airplanes, land transport via rail and road, and pipeline transport for liquids (Mohammed et al., 2025).

The Relationship Between Digital Transformation and Logistics Management

Ravshan and Ogunmola's (2025) study confirmed that digital transformation enhances the performance of logistics operations in Uzbekistan. Mahmoud et al.'s (2024) study demonstrated the impact of digital transformation on logistics management through its mediating role in integrating food supply chains for the Hajj pilgrimage. El-Garhy's (2024) study also found that Industry 4.0 capabilities positively influence transport logistics strategy through the efficiency of the digital supply chain as a mediating variable. Furthermore, Ahmed and Al- Sharida's (2024) study showed a positive impact of information technology on improving the logistics management of the General Company for Iraqi Ports.

Study Hypotheses

Based on the above, researcher puts forward the following hypotheses:

H1: There is an impact at a significance level ($\alpha \leq 0.05$) of digital transformation with its dimensions (digital strategy, digital capabilities, and digital infrastructure) on logistics management at Jordanian Pharmaceutical Companies.

H2: There is an impact at a significance level ($\alpha \leq 0.05$) of digital transformation on supply at Jordanian Pharmaceutical Companies.

H3: There is an impact at a significance level ($\alpha \leq 0.05$) of digital transformation on storage at Jordanian Pharmaceutical Companies.

H4: There is an impact at a significance level ($\alpha \leq 0.05$) of digital transformation on transportation at Jordanian Pharmaceutical Companies.

Methodology

Study Sample

The current study sample consisted of (253) managers in the top and middle management of (27) Jordanian pharmaceutical companies, researcher adopted an electronic questionnaire using the comprehensive survey method, and (197) questionnaires were collected that were valid for statistical analysis.

Study Measurement

To collect the primary data, the researcher designed a questionnaire based on a review of the theoretical framework and previous studies related to digital transformation and logistics management. The questionnaire consisted of (15) questions covering the three dimensions of digital transformation, and (15) questions covering the three dimensions of logistics management, with (5) questions for each dimension.

Results

Table (1) presents the results of descriptive analysis in terms of arithmetic mean and standard deviation of the dimensions of independent variable "digital transformation" and dependent variable "logistics management".

Table 1
Descriptive analysis

Dimension	Items	Alpha	Mean	Std. deviation
digital strategy	5	.910	4.256	.7026
digital capabilities	5	.926	4.237	.6671
digital infrastructure	5	.904	4.284	.6549
Supply	5	.949	4.276	.7161
Storage	5	.956	4.260	.7098
Transportation	5	.937	4.245	.6790

The results in Table (1) reveal that alpha coefficient values exceeded (0.70) the lowest acceptable value for data quality (Sekaran & Bougie, 2016, 290). This indicates a high degree of internal consistency in the study data. Also, the means for dimensions of digital transformation were high, with the mean values for digital infrastructure, digital strategy, and digital capabilities reaching (4.284, 4.256, 4.237) respectively. Similarly, the means for dimensions of logistics management were high, with the mean values for supply, storage, and transportation reaching (4.276, 4.260, 4.245) respectively, using the five-point Likert scale.
Table (2) shows results the impact of digital transformation with its dimensions (digital strategy, digital capabilities, and digital infrastructure) on logistics management at Jordanian Pharmaceutical Companies. This hypothesis was analyzed using the multiple linear regression coefficient.

Table 2
Impact of digital transformation on logistics management

Variable		B	T	Sig.
digital strategy		.18	2.27	.03
digital capabilities		.02	.21	.84
digital infrastructure		.47	6.11	.00
R^2 = .88	F= 184.16		Sig.= .00	

The results in Table (2) revealed that there is a significant impact of digital transformation in logistics management with an R^2 value (.88). This means that digital transformation explained (88%) of the variance in logistics management, F value was (184.16) at a significance level of (.00).

Also, the analysis revealed that dimensions of digital transformation (digital strategy and digital infrastructure) have a significant impact on logistics management at a significance level of (.03, .00) respectively, while digital capabilities did not have a significant impact on logistics management.

Table (3) presents results of the analysis of H2, H3, and H4 hypotheses. Simple linear regression was used to analyze these hypotheses.

Table **3**
Impact of digital transformation on logistics management dimensions

Hypothesis	R^2	B	F	Sig.
H2	.81	.93	426.05	.00
H3	.85	.83	271.44	.00
H4	.76	.87	326.07	.00

The results in Table (3) revealed a significant impact of digital transformation on supply with an R^2 value (.81), a significant impact of digital transformation on storage with an R^2 value (.85), and a significant impact of digital transformation on transportation with an R^2 value (.76), all at a significance level of (.00)

Discussion

Current study examined the impact of digital transformation on logistics management in Jordanian pharmaceutical companies. The results showed high levels of digital transformation dimensions (digital strategy, digital capabilities, and digital infrastructure), this indicates that Jordanian pharmaceutical companies recognize importance of digital planning and moving from simply possessing technology to actual digital empowerment, this is further supported by a digital environment that efficiently supports digital transformation. These companies have a clear digital strategy that improves efficiency of their logistics operations, consider transformation a long-term strategic choice, and align their digital strategies with their competitive and operational objectives. Companies also possess the resources to manage change, ability to absorb and utilize technology in their logistics operations, and a high level of technological readiness that supports their logistics processes.

The results also showed high levels of logistics management dimensions (supply, storage, and transportation), that Jordanian pharmaceutical companies have maturity in managing their supply chain from source, high operational efficiency supported by digital technology, and the ability to achieve responsiveness and flexibility in distribution, this indicates that this companies able to cope with supply chain disruptions, their effective inventory management that reduces damage and loss, and there commitment to quality and safety standards during transport.

The results revealed a significant impact of digital transformation on logistics management in Jordanian pharmaceutical companies, this confirms that digital

transformation is a key driver for improving logistics management, that reflecting digital maturity, alignment between these companies' strategic directions and their logistics operations, their ability to leverage digital technologies to achieve operational efficiency, and a proactive response to global challenges.

Finally, these results may contribute to raising awareness among managers in Jordanian pharmaceutical companies about the importance of digital transformation and its role in improving their logistics performance, thus differentiating them from their competitors.

Recommendations

1. Enhancing digital strategy by regularly updating it and aligning it with logistical objectives.
2. Enhancing companies' digital capabilities by investing in ongoing employee training on using digital technologies in logistics operations.
3. Enhancing digital infrastructure by continuously upgrading technical systems to ensure reliability, security, and integration of logistics systems, thereby driving business growth.
4. Improve supply by leveraging digital analytics to predict customer needs and mitigate disruption risks.
5. Enhance storage by linking storage systems with production and distribution systems to achieve logistical integration.
6. Improve transportation by adopting digital tracking technologies to enhance shipment monitoring during transit.

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