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From Knowledge to Agility: The Transformative Power of Absorptive Capacity in Supply Chains

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Abstract

Purpose: This study examines the effect of absorptive capacity on supply chain agility in Jordanian pharmaceutical companies. The research highlights how absorptive capacity enhances agility dimensions—flexibility, speed, responsiveness, and efficiency—essential for navigating the industry's competitive and regulatory challenges. **Methodology**: A descriptive-analytical design was employed. Data were collected through an electronic questionnaire distributed to 226 senior and middle managers across 24 pharmaceutical firms, resulting in 185 valid responses (81.9%). Multiple linear regression analysis was used to test the relationships between absorptive capacity dimensions and supply chain agility. **Findings**: Results demonstrate that absorptive capacity has a significant impact on supply chain agility, explaining 70.9% of its variance. Knowledge assimilation emerged as the most influential dimension, followed by knowledge exploitation, acquisition, and transformation. Among agility dimensions, speed was most affected, followed by efficiency, responsiveness, and flexibility. Both absorptive capacity and agility were found at moderate levels, indicating potential for improvement in how knowledge is assimilated and applied. **Practical Implications**: The study recommends enhancing knowledge management systems, leveraging digital technologies such as AI and IoT, strengthening organizational learning, and fostering strategic partnerships to improve agility and competitiveness. **Originality/Value**: The research contributes to the resource-based view and dynamic capabilities literature by positioning absorptive capacity as a critical driver of supply chain performance in the pharmaceutical sector. **Limitations**: The focus on a single industry, reliance on quantitative methods, and cross-sectional design limit generalizability. Future research should explore diverse sectors, adopt qualitative approaches, and conduct longitudinal studies to assess long-term effects.

Keywords: Absorptive Capacity, Knowledge Management, Supply Chain Agility, Digital Technology, Pharmaceutical Companies, Jordan.

Introduction

The pharmaceutical industry globally faces increasing challenges, including heightened competition, rising demand for high-quality products, and stringent regulatory requirements. In this context, enhancing supply chain agility has become a key strategic priority for companies seeking to ensure timely availability of products at the right cost and quality. Pharmaceutical supply chains are inherently complex, involving activities such as supplier selection, raw material procurement, and customer relationship management. These activities require companies to implement flexible and adaptive strategies to cope with continuous fluctuations in supply and demand (Guo et al., 2024; Moosivand et al., 2019).

A critical factor that supports supply chain agility is capacity—the ability of a company to acquire, absorb, transform, and exploit external knowledge to improve operational processes and efficiency (Isfianadewi & Anindityo, 2022). This capacity enhances a company's flexibility and responsiveness, which are crucial for quickly adapting to changes in the market environment.

Supply chain agility, therefore, refers to a company's capability to rapidly adjust its operations to evolving circumstances, contributing to flexibility, speed, responsiveness, and efficiency (Shekarian et al., 2020).

In the context of Jordan's pharmaceutical sector, improving supply chain performance requires leveraging capacity to enhance operational agility. Moreover, Jordanian pharmaceutical companies face unique challenges that demand agility to remain competitive in both regional and global markets (Alshaar & Alkshali, 2025). Furthermore, the need for flexible and responsive supply chains is heightened by globalization, rising competition, and regulatory pressures, which means companies must adapt swiftly to new market dynamics, product development cycles, and regulatory changes.

In this regard, capacity, in its various forms (knowledge acquisition, knowledge absorption, knowledge transformation, and knowledge exploitation), has emerged as a key enabler of supply chain agility. However, despite its significance, there remains a gap in research regarding the relationship between capacity and supply chain agility; particularly because Jordan's pharmaceutical industry operates within a supply chain environment influenced by complex regulatory frameworks and intense competition.

This study aims to bridge this gap by examining the impact of capacity on supply chain agility in Jordanian pharmaceutical companies. Specifically, it seeks to explore how the different dimensions of capacity—knowledge acquisition, absorption, transformation, and exploitation— affect the agility of supply chains in terms of flexibility, speed, responsiveness, and efficiency.

Moreover, understanding this relationship will help companies improve their operational efficiency and enhance their competitive advantage in an increasingly complex and dynamic market environment. In this context, the following research questions will guide the investigation:

- What is the impact of capacity, in its various dimensions (knowledge acquisition, knowledge absorption, knowledge transformation, and knowledge exploitation), on the

agility of supply chains (flexibility, speed, responsiveness, and efficiency) in Jordanian pharmaceutical factories?

- What is the impact of capacity, in its various dimensions, on the flexibility of supply chains?
- What is the impact of capacity, in its various dimensions, on the speed of supply chains?
- What is the impact of capacity, in its various dimensions, on the responsiveness of supply chains?
- What is the impact of capacity, in its various dimensions, on the efficiency of supply chains?
- What is the relative importance of capacity and its dimensions in enhancing supply chain agility?
- What is the relative importance of supply chain agility and its dimensions?

By exploring these questions, this research provides valuable insights into how pharmaceutical companies in Jordan can utilize capacity to optimize their supply chains and better navigate the challenges of the evolving pharmaceutical landscape.
The article is structured as follows: Section 2 provide background information, section 3 presents the literature review and theoretical framework, followed by Section 4, which outlines the methodology. Section 5 presents the results to address and validate the hypotheses, followed by Section 6, which discusses the findings. Finally, Section 7 provides the conclusion.

Background Information

Approximately 24 pharmaceutical companies operate in Jordan, with the industry dating back to the mid-1970s and experiencing significant expansion in the 1990s and 2000s. These companies range from medium to large scale, with the leading firm holding a capital of 400 million dollars (GIZ, 2019). The pharmaceutical sector is one of Jordan's key strategic industries, playing a crucial role in the national economy by contributing significantly to GDP and relying heavily on exports. Around 70% of its total production is exported to more than 60 countries. The industry is recognized for its high-quality products that meet global standards, establishing Jordan as a leading pharmaceutical hub in the region.

In 2018, the sector's market value reached approximately $1.2 billion, growing at a compound annual growth rate (CAGR) of 4.5% from 2013 to 2018, with further growth anticipated in the coming years (GIZ, 2019). Jordanian pharmaceutical exports increased by 19% in 2023, with exported products totaling 2,480 and reaching a value of 616.3 million dinars—up from 514.7 million dinars in 2022—highlighting the industry's ongoing expansion (JFDA, 2024). Moreover, the pharmaceutical market in Jordan is projected to generate approximately $333.90 million in revenue in 2024, underscoring its continued significance in the local economy (Statista, 2024).

Despite the significant progress in Jordan's pharmaceutical industry, it still faces several challenges, the most notable being the inability to manufacture original drugs. The sector primarily focuses on producing generic medicines due to limited investments in research and development. Additionally, the industry heavily depends on importing active pharmaceutical ingredients (APIs), mainly from China and India, making it vulnerable to price and supply fluctuations (GIZ, 2019). Furthermore, the Jordan Food and Drug Administration (JFDA)

imposes strict regulatory requirements to ensure the quality and safety of products, requiring companies to quickly adapt to global regulatory changes enforced by international bodies such as the FDA and EMEA (Alshaar & Alkshali, 2025). Intellectual property protection laws, reinforced by international agreements such as the GATT Agreement, also limit Jordanian companies' ability to innovate and expand in producing new medicines, affecting their global competitiveness (Lanjouw & Cockburn, 2001). To strengthen their position in the global market, Jordanian pharmaceutical companies need to invest in modern technologies such as artificial intelligence and blockchain and localize supply chains to reduce costs and mitigate risks associated with reliance on foreign markets (Moosivand et al., 2019).

Literature Review and Theoretical Framework

The concept of absorptive capacity, initially introduced in macroeconomics to describe an economy's ability to absorb external resources (Sancho-Zamora et al., 2021), has evolved into a critical organizational capability. Cohen and Levinthal (1990) first defined it as a firm's ability to recognize, assimilate, and apply external knowledge for business purposes, positioning it as a key driver of innovation through R&D. Over time, this understanding has deepened, particularly with Zahra and George's (2002) distinction between potential absorptive capacity (acquisition and assimilation) and realized absorptive capacity (transformation and exploitation). This shift highlighted the dynamic nature of absorptive capacity, emphasizing the need for firms to continuously adapt external knowledge to maintain a competitive edge. Further refinement by Todorova and Durisin (2007) reintroduced the idea that knowledge recognition occurs distinctly from transformation and assimilation, challenging the assumption of a rigid, sequential process. Instead, knowledge integration is dynamic and requires strategic flexibility, as assimilation and transformation often occur concurrently in practice. Additionally, Helfat et al. (2007) stressed that external networks and strategic alliances, particularly in industries with complex technological and regulatory environments, shape absorptive capacity. In sectors like pharmaceuticals, the quality of partnerships significantly affects a firm's ability to absorb and apply external knowledge effectively.

The rise of digital technologies, especially AI and data analytics, has further transformed absorptive capacity. These technologies enable firms to process vast amounts of external knowledge quickly, enhancing learning cycles and decision-making (Patrucco et al., 2023). This shift reflects a crucial evolution in absorptive capacity, positioning it as a dynamic, technology driven capability. Firms that fail to integrate these technologies into their knowledge absorption strategies risk losing their competitive advantage in an innovation-driven market. The dimensions of absorptive capacity—knowledge acquisition, assimilation, transformation, and exploitation—remain central to current research (Zou et al., 2018; Riquelme-Medina et al., 2022; Jabarzadeh et al., 2022; Şahin et al., 2023; Alshaar and Alkshali, 2025). These dimensions are vital for organizational learning and innovation, with successful knowledge integration ensuring a sustainable competitive advantage. This has direct implications for industries like pharmaceuticals, where the ability to absorb and apply external knowledge is crucial for enhancing supply chain efficiency, market responsiveness, and competitiveness, especially in dynamic sectors like Jordan's pharmaceutical industry.

In summary, absorptive capacity is not merely a theoretical concept but a strategic imperative for firms in competitive, knowledge-driven environments. As the global market becomes more interconnected, firms must continually refine their absorptive capacities to remain

agile, resilient, and innovative. This study aims to provide deeper insights into how absorptive capacity functions in practice, stressing the need for organizations to effectively integrate external knowledge to sustain competitiveness in a rapidly evolving business landscape.

Knowledge Acquisition

Knowledge acquisition refers to an organization's ability to identify, collect, and analyze new relevant knowledge to enhance its performance and innovation. Zahra and George (2002) define this capability as the process that enables an organization to absorb and integrate externally generated knowledge into its operational processes. This process relies on factors such as skill development, relationship building, and the use of prior knowledge to improve the organization's ability to absorb new information (Cohen & Levinthal, 1990). Knowledge acquisition is considered the first step in organizational learning, involving the extraction, interpretation, and internal dissemination of knowledge in ways that facilitate its absorption and application (Liao et al., 2009). This includes acquiring knowledge about customers, suppliers, new products, and industry trends, as well as knowledge exchange among employees (Nguyen & Neck, 2008).

The routines of knowledge acquisition influence the quality of absorption through their intensity, speed, and direction. The more effectively an organization can identify and gather new information, the more efficiently it can use it to boost innovation and improve performance (Zahra & George, 2002). Other studies highlight the importance of collaboration and organizational learning in supporting firms' ability to acquire knowledge—for instance, Hyundai's experience in leveraging technology transfer and benchmarking strategies to enhance competitiveness (Kim, 1998).

Overall, knowledge acquisition plays a crucial role in building a strong knowledge base within an organization, enabling firms to keep pace with rapid market changes, develop innovative products, and achieve a sustainable competitive advantage.

Knowledge Assimilation

Knowledge assimilation refers to the integration and interpretation of externally acquired knowledge with existing internal knowledge to foster innovation and enhance performance (Zahra & George, 2002). This phase is fundamental to the knowledge management process, as it determines the firm's ability to convert acquired knowledge into usable insights (Elidjen et al., 2025). Cohen and Levinthal (1990) argue that effective assimilation relies on the presence of relevant prior knowledge, which acts as a facilitator in the process. This highlights the interconnected nature of knowledge dimensions, where each stage of absorptive capacity feeds into the next. Assimilation requires the development of internal routines and structures that enable organizations to process and integrate new information effectively (Yildiz et al., 2024).

The effectiveness of knowledge assimilation is influenced by both formal and informal mechanisms, including the conversion of tacit knowledge into explicit knowledge (Fletcher & Prashantham, 2011). However, organizational factors such as structure, culture, and management practices play a critical role in determining the success of this process. A rigid organizational structure may impede knowledge flow and hinder assimilation, while a flexible and open organizational culture fosters better integration. In contrast, poor assimilation

processes can lead to inefficiencies and missed opportunities for innovation, as firms fail to capitalize on external knowledge. Thus, organizations need to foster an environment that supports the continuous updating and reconfiguration of knowledge, which can enhance long-term sustainability and competitive advantage (Abubakar et al., 2019).

Knowledge Transformation

Knowledge transformation involves the reconfiguration and integration of existing and newly acquired knowledge to drive innovation and enhance organizational performance (Xiong, 2024). Unlike the more passive processes of acquisition and assimilation, transformation requires active reinterpretation or restructuring of knowledge to meet changing organizational needs (Todorova & Durisin, 2007). This phase is crucial for organizations operating in dynamic environments, as it enables them to adapt to external changes and create new knowledge frameworks that support innovation and strategic alignment (Garrido-Moreno et al., 2024).

The transformation process is inherently complex, as it demands both flexibility and creativity. Organizations that successfully transform knowledge are able to adapt their strategies and structures to new market conditions, technologies, or customer needs. However, the failure to effectively transform knowledge can lead to stagnation, where firms continue to operate under outdated paradigms (Butt et al., 2024). This suggests that knowledge transformation is not a onetime event but an ongoing process that requires continuous adaptation. The ability to transform knowledge effectively is a key determinant of organizational agility and resilience, as it enables firms to quickly respond to external disruptions and capitalize on new opportunities (Zahra & George, 2002).

Knowledge Exploitation

Knowledge exploitation refers to a firm's ability to deploy the knowledge it has acquired and transformed into its operational processes with the aim of improving organizational performance, enhancing innovation, and achieving sustainable competitive advantage (Zahra & George, 2002). This includes developing routines, capabilities, and technologies, or leveraging existing knowledge to create new products, processes, or systems (Flatten et al., 2011). It is considered the final stage in absorptive capacity, where the acquired knowledge undergoes analytical steps before being fully integrated into the firm's organizational structures (Todorova & Durisin, 2007).

Some firms face challenges at this stage, as they may excel at acquiring knowledge but fail to exploit it effectively due to weak implementation mechanisms or internal resistance to change (Minbaeva et al., 2003). Exploitation emphasizes the systematic and sustainable use of knowledge by developing procedural and organizational mechanisms that maximize the value of available information (Volberda et al., 2010). In this context, exploitation is seen as a crucial factor in turning knowledge into practical outputs such as innovations, patents, and improved operational processes.

Overall, exploitation represents the stage where knowledge is transformed into tangible value, driving growth, strengthening competitiveness, and enhancing a firm's ability to adapt to dynamic business environments.

Supply Chain Agility

Supply chain agility refers to the ability of firms to rapidly adapt to changes in demand, supply disruptions, and market challenges while maintaining operational efficiency (Basu & Wright, 2008). The concept first emerged in the early 1990s as an extension of flexible manufacturing systems (FMS) (Chen & Adam, 1991) and just-in-time (JIT) production (Basu & Wright, 2008), later formalized by the Iacocca Institute in 1991 (Bottani, 2009). Since then, it has evolved to encompass rapid response, process integration, and proactive adaptation to dynamic business environments (Christopher, 2000). Agile supply chains are characterized by their ability to respond faster and more flexibly than rigid ones, offering innovative products while balancing cost-effectiveness (Christopher & Towill, 2001).

The key dimensions of agility—flexibility, speed, responsiveness, and efficiency—capture the essential attributes needed to thrive in volatile markets (Zhang & Sharifi, 2000, 2001). Flexibility enables firms to adjust quickly to supply or demand fluctuations, speed ensures timely delivery of products, responsiveness allows rapid decision-making in changing environments, and efficiency sustains competitive performance by optimizing resources (Sherehiy et al., 2007; Lin et al., 2006; Agarwal et al., 2006). Fisher (1997) further emphasized the importance of aligning supply chain strategies with product types, arguing that innovative products demand more agile supply chains than functional ones.

With the rise of digital technologies such as Artificial Intelligence and the Internet of Things, supply chain agility has become more proactive, leveraging real-time data analytics for smarter decisions and faster adaptation (Wang et al., 2024). The COVID-19 pandemic further highlighted the critical role of agility, as firms faced unprecedented disruptions and were forced to rethink resilience and sustainability strategies in tandem with agility.

For industries such as pharmaceuticals, where regulatory pressures, innovation cycles, and global uncertainties intersect, supply chain agility is not just a competitive advantage but also a necessity. By integrating these dimensions, pharmaceutical firms can ensure operational excellence while remaining adaptive to sudden market shifts and regulatory demands.

The Relationship between Absorptive Capacity and Supply Chain Agility

The relationship between absorptive capacity and supply chain agility has been a focal point in recent studies. Alshaar & Alkshali (2025) and Jabarzadeh et al. (2022) highlight that absorptive capacity enhances supply chain agility by ensuring that organizations can quickly acquire and apply the right knowledge at the right time. This ability to leverage external knowledge, in terms of both technological advancements and market insights, significantly contributes to a firm's agility and competitive advantage. Moreover, Riquelme-Medina et al. (2022) emphasize that absorptive capacity is particularly crucial in collaborative business ecosystems, where the ability to absorb external knowledge from partners directly affects organizational performance and agility.

Absorptive capacity is crucial for enhancing supply chain agility by enabling firms to effectively acquire, assimilate, transform, and exploit external knowledge. This helps organizations adapt to dynamic markets, drive innovation, and maintain competitiveness. The literature emphasizes the multidimensional nature of absorptive capacity, which informs the following hypotheses regarding its impact on supply chain agility in Jordanian pharmaceutical firms.

Hypotheses

H1: There is a statistically significant effect at a significance level of ($\alpha \leq 0.05$) of absorptive capacity with its dimensions (knowledge acquisition, knowledge assimilation, knowledge transformation, and knowledge exploitation) on supply chain agility with its collective dimensions (supply chain flexibility, supply chain speed, supply chain responsiveness, and supply chain efficiency) in Jordanian pharmaceutical manufacturing companies.

H2: There is a statistically significant effect at a significance level of ($\alpha \leq 0.05$) of absorptive capacity with its collective dimensions on supply chain flexibility.

H3: There is a statistically significant effect at a significance level of ($\alpha \leq 0.05$) of absorptive capacity with its collective dimensions on supply chain speed.

H4: There is a statistically significant effect at a significance level of ($\alpha \leq 0.05$) of absorptive capacity with its collective dimensions on supply chain responsiveness.

H5: There is a statistically significant effect at a significance level of ($\alpha \leq 0.05$) of absorptive capacity with its collective dimensions on supply chain efficiency.

Methodology

The research developed the study model shown in Figure 1 to facilitate the research design, with detailed information provided below.

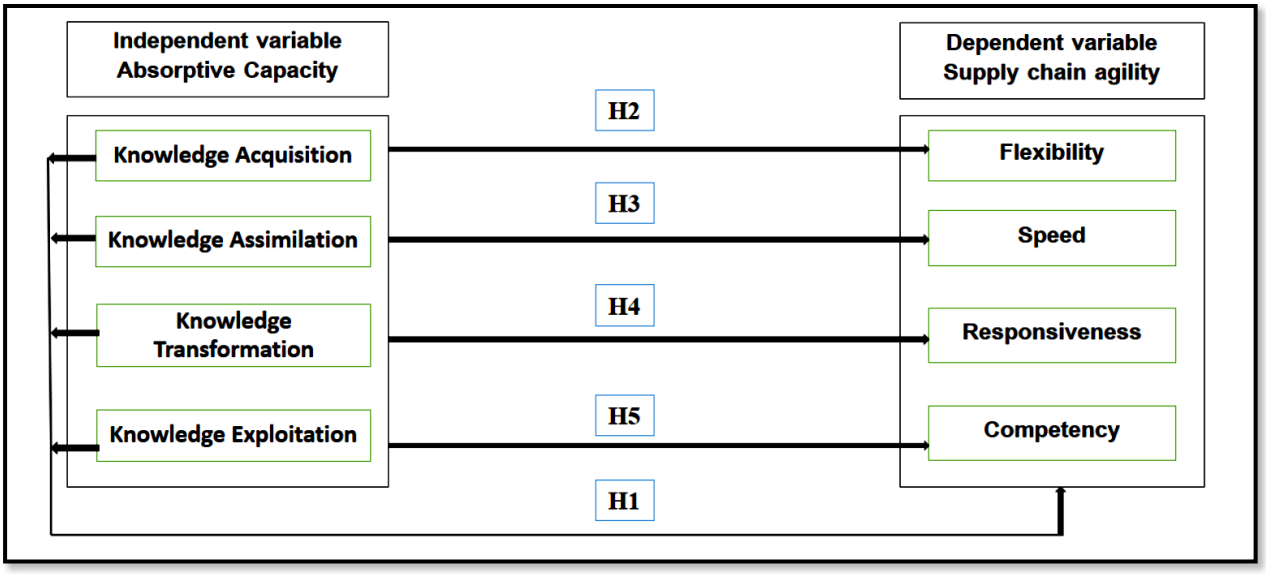

Figure (1) illustrates the study model

Research Design

The study adopted a descriptive quantitative approach using a questionnaire as the main tool to collect data from managers in senior and middle management in Jordanian pharmaceutical companies. The objective was to investigate the role of absorptive capacity in supply chain agility.

Instrument

The questionnaire consists of 45 detailed questions, along with demographic information. The detailed questions follow the Likert scale, ranging from 1 to 5 (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree). The relative importance method was used to interpret the mean scores according to an established format based on the five-point

scale, as shown in Table 1. The study tool was an electronic questionnaire divided into four sections, each designed to measure different variables.

Table 1
Measures of relative importance

The Measure	The Level of Relative Importance
1- Less than 2.34	low
2.34 - less than 3.67	average
3.67- 5	high

Sample and Respondent
The study population included all senior and middle managers, totaling 549 managers from 24 companies in Jordan. A sample of 226 managers was selected using a stratified random sampling method, with a response rate of 81.9%. The study included 185 participants, all of whom are managers in middle and higher management positions. Among them, 47% are male, while 53% are female. In terms of age distribution, 18.9% of the participants are under 30 years old, another 18.9% are over 50 years old, and the remaining 62.2% fall within the 30 to 49-year-old age range. Regarding their educational background, 70.8% of the participants hold a bachelor's degree, 24.9% have a master's degree, and 4.3% possess a doctoral degree. Additionally, 75% of the participants have ten or more years of work experience, reflecting a high level of expertise and knowledge in their respective fields.

Data Collection
After developing the questionnaire on Google Drive, the links were distributed via email and WhatsApp, allowing respondents to complete the survey without providing any personal information.

Data Analysis
The statistical analysis used in the study included reliability analysis (Cronbach's alpha), descriptive statistics, and regression analysis. Cronbach's alpha was used to assess the reliability of the measurement tool, ensuring internal consistency. Descriptive statistics provided an overview of the levels of supply chain agility and absorptive capacity. Regression analysis was employed to examine the relationship between absorptive capacity and supply chain agility, with an R^2 value of 0.709 indicating that absorptive capacity explains 70.9% of the variation in supply chain agility.

These statistical tools ensure measurement reliability, summarize key trends, and stablish relationships between variables. Reliability analysis confirms consistency, descriptive statistics provide insights into data distribution, and regression analysis quantifies the impact of absorptive capacity on supply chain agility, enhancing the study's validity and applicability as suggested by Cooksey (2020).

Data Validation
Validity was verified through expert judges, and reliability was assessed using Cronbach's alpha coefficient. Data were analyzed using SPSS software, employing descriptive statistical methods (frequencies, mean, standard deviation, relative importance) and inferential statistics (multiple regression analysis, simple regression analysis), ensuring the reliability of

the tool and the validity of the statistical hypotheses related to the relationships between the study variables.

Results

The main objective of the study was to investigate the effect of absorptive capacity on supply chain agility in Jordanian pharmaceutical manufacturing companies.

Table 2

Cronbach's Alpha Values for Study Variable Dimensions

Variable	Dimension	Number of Items	Alpha Value
Absorptive Capacity	Knowledge Acquisition	3	0.848
	Knowledge Assimilation	3	0.867
	Knowledge Transformation	3	0.878
	Knowledge Exploitation	3	0.889
Supply Chain Agility	Supply Chain Flexibility	5	0.900
	Supply Chain Speed	5	0.936
	Supply Chain Responsiveness	5	0.912
	Supply Chain Efficiency	5	0.908

Source: Prepared by the researchers based on SPSS analysis results.

Table 2 indicates that all Cronbach's alpha values exceeded 0.7, reflecting a high level of internal consistency and reliability of the study tool. Knowledge Exploitation recorded the highest reliability within absorptive capacity (0.889), while Supply Chain Speed had the highest reliability within supply chain agility (0.936). These results enhance the reliability of the data and the ability to confidently test the relationships between the variables (Sekaran & Bougie, 2016, p. 289).

Table (3)

Mean Scores, Standard Deviations, and Relative Importance Levels of Sample Responses Regarding supply chain agility and Its Dimensions

Dimension	Mean	Rank	Relative Importance
Flexibility	3.562	3	Moderate
Speed	3.530	4	Moderate
Responsiveness	3.627	2	Moderate
Efficiency	3.630	1	Moderate
Overall	3.587		Moderate

Source: Prepared by the researchers based on SPSS analysis results.

Table (3) reflects a moderate level of supply chain agility in Jordanian pharmaceutical companies, with an overall mean score of (3.587). This suggests the need for improvements in the various dimensions to enhance supply chain agility. The results show that companies invest in improving efficiency (3.630) and responsiveness (3.627), which are related to emergency responses from suppliers and customers, while facing greater challenges in speed and flexibility.

Table (4)
Mean Scores, Standard Deviations, and Relative Importance Levels of Sample Responses Regarding Absorptive Capacity and Its Dimensions

Dimension	Mean	Rank	Relative Importance
Knowledge Acquisition	3.701	1	High
Knowledge Assimilation	3.580	2	Moderate
Knowledge Transformation	3.550	4	Moderate
Knowledge Exploitation	3.556	3	Moderate
Overall	3.600		Moderate

Source: Prepared by the researchers based on SPSS analysis results.

The results in Table (4) show that the level of absorptive capacity in Jordanian pharmaceutical companies is at a moderate level, with an overall mean score of 3.600. The dimension of knowledge acquisition was the highest with a mean of 3.701, indicating that companies focus on gathering new knowledge from external sources such as partnerships, research, and development. On the other hand, the dimensions of knowledge assimilation (3.580), knowledge transformation (3.550), and knowledge exploitation (3.556) all fell within the moderate level, indicating challenges in processing the acquired knowledge and effectively utilizing it in operational processes.

These results suggest that while companies have a good capacity for acquiring knowledge, there is a need to improve mechanisms for assimilating, analyzing, and transforming it into actionable procedures that can be used to enhance the efficiency and flexibility of supply chains. Given the importance of agility in adapting to rapid market changes, improving the ability to absorb and exploit knowledge can contribute to faster response times, better operational efficiency, and increased competitiveness. Therefore, it may be beneficial for these companies to focus on developing knowledge management systems, promoting a culture of organizational learning, and increasing internal coordination, so that knowledge does not remain just in the acquisition stage but is integrated into decision-making and strategic processes, helping achieve higher levels of agility in supply chains.

Table (5)
Results of Hypothesis H1: Testing the Impact of Absorptive Capacity on Supply Chain Agility Model Summary

ANOVA	**Source**	**F**	**Degrees of Freedom**	**Sig.**		
	Model	87.072	5	0.000		
Model Summary Table	**R**	**R^2**	**F**	**Degrees of Freedom**	**Sig.**	
	0.842	0.709	87.072	5	0.000	
Regression Analysis Table	**Variable**	**B**	**Standard Error**	**B**	**T**	**Sig.**
	Knowledge Acquisition	0.189	0.063	0.209	3.016	0.003
	Knowledge Assimilation	0.237	0.062	0.288	3.804	0.000
	Knowledge Transformation	0.181	0.074	0.199	2.450	0.015
	Knowledge Exploitation	0.210	0.075	0.277	2.804	0.006

Source: Prepared by the researchers based on SPSS analysis results

The regression analysis results indicate that absorptive capacity explains a large portion of the variance in supply chain agility, with an R^2 value of 0.709. This means that 70.9% of the changes in supply chain agility can be attributed to the dimensions of absorptive capacity. The F value of 87.072 at the significance level (Sig. = 0.000) indicates that the model is statistically significant, reflecting a substantial impact of absorptive capacity on supply chain agility.

As for the impact of the sub dimensions, all are statistically significant, with knowledge assimilation having the largest effect (β = 0.288, T = 3.804, Sig. = 0.000); followed by knowledge exploitation (β = 0.277, T = 2.804, Sig. = 0.006); then knowledge acquisition (β = 0.209, T = 3.016, Sig. = 0.003); and finally, knowledge transformation, which had the lowest effect but is still significant (β = 0.199, T = 2.450, Sig. = 0.015).

These results suggest that all dimensions of absorptive capacity positively affect the enhancement of supply chain agility, with knowledge assimilation having the most impact. This highlights the importance of companies' ability to analyze, process, and interpret external knowledge and integrate it into their operational processes to ensure flexibility and quick response in supply chains.

Table 6
(Model Summary & Goodness of Fit)

Hypothesis	**R**	**R^2**	**F**	**Sig.**
H2	0.735	0.541	215.459	0.000
H3	0.804	0.646	334.206	0.000
H4	0.781	0.611	286.934	0.000
H5	0.809	0.655	347.204	0.000

Source: Prepared by the researchers based on SPSS analysis results.

The regression analysis results indicate a significant impact of absorptive capacity on all dimensions of supply chain agility. All R-values were high, reflecting the strong relationship between absorptive capacity and the flexibility, speed, responsiveness, and efficiency of supply chains. Additionally, the R^2 values show the proportion of the variance explained in each dimension of supply chain agility due to absorptive capacity, indicating that the model explains a large portion of the changes in the dependent variables.

 Hypothesis H2 (The Impact of Absorptive Capacity on Supply Chain Flexibility): The results showed R = 0.735 and R^2 = 0.541, meaning that 54.1% of the changes in supply chain flexibility are attributed to absorptive capacity. The F value of 215.459 and Sig. = 0.000 indicate strong statistical significance, supporting the hypothesis.

 Hypothesis H3 (The Impact of Absorptive Capacity on Supply Chain Speed): This hypothesis showed the strongest effect compared to the other dimensions, with R = 0.804 and R^2 = 0.646, meaning that 64.6% of the changes in supply chain speed are attributed to absorptive capacity. The F value of 334.206 and Sig. = 0.000 reflect a very strong statistical significance, indicating a significant relationship between absorptive capacity and supply chain speed.

 Hypothesis H4 (The Impact of Absorptive Capacity on Supply Chain Responsiveness): The results showed R = 0.781 and R^2 = 0.611, indicating that absorptive capacity explains 61.1% of the changes in supply chain responsiveness. The F value of 286.934 and Sig. = 0.000 confirm the high statistical significance.

 Hypothesis H5 (The Impact of Absorptive Capacity on Supply Chain Efficiency): This hypothesis showed the second highest effect after supply chain speed, with R = 0.809 and R^2 = 0.655, meaning that 65.5% of the changes in supply chain efficiency are attributed to absorptive capacity. The F value of 347.204 and Sig. = 0.000 indicate strong statistical significance.

Based on these results, all hypotheses (H2, H3, H4, H5) are accepted, indicating that absorptive capacity plays a key role in improving flexibility, speed, responsiveness, and efficiency in supply chains of Jordanian pharmaceutical companies.

Table 7
(Regression Coefficients & Impact of Variables)

Hypothesis	B	Beta	T	Sig.
H2	0.738	0.735	14.679	0.000
H3	0.918	0.804	18.281	0.000
H4	0.783	0.781	16.939	0.000
H5	0.844	0.809	18.633	0.000

Source: Prepared by the researchers based on SPSS analysis results.

The results of the coefficients analysis for hypotheses H2, H3, H4, H5 indicate that absorptive capacity has a positive and statistically significant impact on all dimensions of supply chain agility, as all B and Beta values were positive and statistically significant at ($\alpha \leq 0.05$).
 Hypothesis H2 (The Impact of Absorptive Capacity on Supply Chain Flexibility): Achieved B = 0.738 and Beta = 0.735, indicating a strong effect. The T value of 14.679 and Sig. = 0.000

indicate a high statistical significance, confirming that absorptive capacity enhances supply chain flexibility.

 Hypothesis H3 (The Impact of Absorptive Capacity on Supply Chain Speed): Recorded the highest impact among all hypotheses, with B = 0.918 and Beta = 0.804, indicating a strong correlation between absorptive capacity and supply chain speed. The T value of 18.281 and Sig. = 0.000 confirm strong statistical significance.

 Hypothesis H4 (The Impact of Absorptive Capacity on Supply Chain Responsiveness): Showed B = 0.783 and Beta = 0.781, indicating a significant effect. The T value of 16.939 and Sig. = 0.000 support this relationship and demonstrate the importance of absorptive capacity in improving supply chain responsiveness.

 Hypothesis H5 (The Impact of Absorptive Capacity on Supply Chain Efficiency): Achieved B = 0.844 and Beta = 0.809, reflecting a significant effect. The T value of 18.633 and Sig. = 0.000 indicate very strong statistical significance, meaning absorptive capacity significantly contributes to improving supply chain efficiency.
Based on these results, all hypotheses H2, H3, H4, and H5 are accepted, indicating that absorptive capacity plays a crucial role in enhancing supply chain agility by improving flexibility, speed, responsiveness, and efficiency in Jordanian pharmaceutical companies.

Discussion
The study results confirm that absorptive capacity plays a pivotal role in enhancing supply chain agility within Jordanian pharmaceutical companies. Statistical analyses validate all proposed hypotheses, underscoring the importance of acquiring, assimilating, transforming, and exploiting knowledge to optimize supply chain performance.

The findings indicate that absorptive capacity accounts for 70.9% of the variance in supply chain agility ($R^2 = 0.709$), demonstrating its substantial impact. This aligns with prior research (e.g., Riquelme-Medina et al., 2022) that highlights how absorptive capacity enables firms to respond swiftly to market changes and foster supply chain flexibility and innovation. Among the four dimensions of absorptive capacity, knowledge absorption had the most significant effect ($\beta = 0.288$, T = 3.804, Sig. = 0.000), emphasizing the importance of analyzing and integrating acquired knowledge. Knowledge exploitation followed ($\beta = 0.277$, T = 2.804, Sig. = 0.006), highlighting its role in converting knowledge into actionable processes and products. While knowledge acquisition and transformation had comparatively lower effects, their statistical significance reinforces that acquiring knowledge alone is insufficient without effective assimilation and application.

The study further demonstrates that absorptive capacity significantly influences all dimensions of supply chain agility, albeit to varying extents. The strongest impact was observed on supply chain speed ($R^2 = 0.646$, $\beta = 0.804$, Sig. = 0.000), suggesting that enhanced absorptive capacity accelerates operational responsiveness. This supports Liu et al. (2013), who emphasize the role of absorptive capacity in improving information flow and operational efficiency.

The effects on other agility dimensions were as follows:
 Supply Chain Flexibility (R^2 = 0.541, β = 0.735, Sig. = 0.000): Absorptive capacity aids firms in adapting to unforeseen changes.
 Supply Chain Responsiveness (R^2 = 0.611, β = 0.781, Sig. = 0.000): Firms become more adept at recognizing and responding to market fluctuations.
 Supply Chain Efficiency (R^2 = 0.655, β = 0.809, Sig. = 0.000): Enhanced absorptive capacity optimizes resource utilization while maintaining cost-effectiveness and quality.

For the theoretical contribution, this study reinforces the link between absorptive capacity and supply chain agility in the pharmaceutical sector, supporting the resource-based view and dynamic capabilities perspective. It highlights how knowledge absorption and exploitation enhance supply chain performance, extending prior research with industry-specific insights. Given the sector's challenges—such as competition, regulations, and demand fluctuations—absorptive capacity plays a crucial role in fostering flexibility, responsiveness, and operational efficiency.

Furthermore, to enhance supply chain agility, Jordanian pharmaceutical companies should strengthen their absorptive capacity. Implementing advanced knowledge management systems can facilitate rapid data collection and analysis, while fostering a learning culture through continuous training will improve knowledge absorption and application. Additionally, strategic partnerships with suppliers and customers can enhance responsiveness and efficiency. Moreover, leveraging Artificial Intelligence, Internet of Things, and real-time tracking will accelerate decision-making and supply chain speed. Encouraging internal innovation ensures that acquired knowledge translates into process improvements. Equally important, prioritizing knowledge absorption and analysis—identified as the most influential factor—will optimize decision-making. Finally, improving departmental integration will enhance coordination and overall supply chain performance.

Conclusion

This study confirms that absorptive capacity significantly enhances supply chain agility in Jordanian pharmaceutical companies. The ability to acquire, absorb, transform, and exploit knowledge improves supply chain speed, flexibility, responsiveness, and efficiency. Notably, knowledge absorption emerged as the most critical factor, followed by knowledge exploitation, highlighting the importance of not just acquiring information but effectively integrating it into operations.

These findings have important practical and managerial implications. Companies should invest in knowledge management infrastructure, employee training, and advanced technologies to enhance absorptive capacity. Additionally, strengthening external collaborations and internal integration will further boost agility and operational efficiency.
However, this study has some limitations. Since the research focused solely on Jordanian pharmaceutical companies, the findings may not be fully generalizable to other industries or regions. Moreover, the reliance on quantitative methods suggests that future studies could incorporate qualitative approaches to gain deeper insights.

Looking ahead, future research could explore absorptive capacity in different industries to compare its effects on supply chain agility. Longitudinal studies examining how absorptive

capacity evolves over time would provide valuable perspectives. Furthermore, integrating qualitative analyses, such as case studies or interviews, could offer a more comprehensive understanding of the mechanisms behind absorptive capacity's impact on supply chain performance.

Theoretical and Contextual Contributions

This study makes meaningful contributions to both theory and practice in supply chain management, particularly within the context of emerging markets. Theoretically, it advances the Resource-Based View and Dynamic Capabilities frameworks by empirically demonstrating that absorptive capacity serves as a vital enabler of supply chain agility. By breaking down this capacity into its four dimensions—acquisition, assimilation, transformation, and exploitation—the research provides a refined model that clarifies how each dimension uniquely influences different aspects of agility. The findings highlight the especially important roles of knowledge assimilation and exploitation, providing a sharper theoretical understanding of how internal learning processes drive rapid organizational adaptation.

On a contextual level, the research fills a notable gap by focusing on the Jordanian pharmaceutical industry—an environment marked by strict regulation, intense international competition, and dependence on imported materials. Validating the absorptive capacity model within this demanding and underexplored context confirms its broader applicability while also revealing how local market pressures shape its practical expression.

From a managerial perspective, the study offers a clear takeaway: organizations operating in volatile environments should invest strategically in knowledge management systems, cross-functional collaboration, and continuous learning initiatives. These investments cultivate absorptive capacity, which in turn strengthens agility and long-term competitiveness.

Ultimately, this work bridges a key gap between global theory and local practice. Grounding an abstract strategic construct in a real-world industrial setting, it lays the groundwork for future comparative studies. It provides a practical roadmap for enhancing supply chain resilience through knowledge-driven strategies.

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