




“Role of information technology in enhancing competitive priorities: Evidence from Yemeni pharmaceutical sector”

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ROLE OF INFORMATION TECHNOLOGY IN ENHANCING COMPETITIVE PRIORITIES: EVIDENCE FROM YEMENI PHARMACEUTICAL SECTOR

Abstract

The pharmaceutical sector in Yemen faces intensified competition and resource constraints, necessitating operational excellence and innovation to sustain competitiveness. The study aims to examine how information technology (IT), specifically hardware, software, networks, and databases, affects competitive priorities such as efficiency, quality, flexibility, and delivery performance.

The study focused on pharmaceutical companies located in Sana'a, the capital of Yemen. A total of eight companies were included. A structured questionnaire was distributed to a 220-randomly stratified sample; managerial, supervisory, and quality control personnel were selected from a population of 2,160 employees, yielding 198 valid responses. This sampling method was chosen to ensure representativeness across functional levels involved in strategic and operational decision-making.

Data analysis using SPSS v28 revealed that IT significantly influences competitive priorities ($R^2 = 0.586$, $\beta = 0.765$, $t = 16.642$, $p < 0.001$). Multiple linear regression further indicated that hardware ($\beta = 0.216$, $p = 0.004$), software ($\beta = 0.282$, $p = 0.014$), and networks ($\beta = 0.275$, $p < 0.001$) positively and significantly impact competitive priorities, while database ($\beta = 0.074$, $p = 0.453$) does not. The overall model explained 59.0% of the variance ($R^2 = 0.590$, $F(4, 193) = 69.416$, $p < 0.001$), demonstrating the measurable role of IT dimensions in shaping competitiveness in this sector.

Keywords

information technology, competitive priorities,
pharmaceutical sector, Yemen

JEL Classification

L65, O33

INTRODUCTION

In today's technology-driven and hypercompetitive global marketplace, marked by volatility, uncertainty, complexity, and ambiguity (VUCA), organizations are compelled to optimize limited resources to sustain both operational excellence and strategic responsiveness (Griffiths & Hackney, 2001; Van Hoang et al., 2025). Core competitive priorities, such as efficiency, product quality, delivery reliability, and adaptability, remain fundamental to maintaining strategic advantage; however, achieving a stable balance among these priorities becomes increasingly difficult in rapidly evolving markets and regions with underdeveloped infrastructure (Farida & Setiawan, 2022; Perdikaris et al., 2024).

Within this context, information technology (IT) has emerged as a transformative force (Melville et al., 2004). No longer confined to a support role, IT now serves as a central catalyst for business innovation and performance, enabling process automation, real-time coordination, and data-informed decision-making (Allioui & Mourdi, 2023; Singh, 2024). Nevertheless, existing research continues to offer limited



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empirical evidence on how specific IT capabilities, such as hardware infrastructure, software systems, network connectivity, and data management, translate into measurable competitive advantages, particularly in highly regulated industries like pharmaceuticals (Veríssimo et al., 2024).

The challenge is further amplified in developing economies, where systemic limitations ranging from financial and infrastructural constraints to regulatory and institutional inefficiencies often impede the effective deployment and integration of IT into core operations (Alshakka et al., 2020; Ibrahim et al., 2020; Madaki et al., 2024). Despite these obstacles, industries in such environments are under increasing pressure to leverage digital tools as strategic assets to maintain relevance, ensure compliance, and enhance performance (Adama et al., 2024).

The pharmaceutical manufacturing sector in emerging markets offers a particularly salient context for examining this intersection between IT capability and competitive performance. The sector operates under strict regulatory scrutiny, is capital-intensive, and demands continuous innovation – all of which heighten the need for integrated technological solutions (Hole et al., 2021). Yet, there remains a paucity of empirical studies examining the extent to which IT investments contribute to key competitive priorities in these settings, especially in fragile or conflict-affected regions.

1. LITERATURE REVIEW

In the context of global competitiveness and digital transformation, organizations are increasingly investing in information technology (IT) capabilities as a strategic asset to sustain competitive advantage. Over the past two decades, the evolution of IT has significantly shifted from a supportive infrastructure to a driver of value creation, innovation, and operational agility (Breznik, 2012). This change in basic assumptions is particularly relevant in dynamic and highly regulated sectors such as the pharmaceutical industry, where responsiveness, efficiency, and compliance are critical for survival and growth.

Information technology can be defined as “the integration of human expertise, hardware, communication networks, software, databases, and security measures to process, store, retrieve, and deliver data efficiently and effectively to various organizational levels (Briones-Peñalver & Poças Rascão, 2014). Similarly, Turban et al. (2003) described information technology as “the technological dimension of an information system, encompassing physical components, software, databases, networks, and communication media.

This study defines information technology as an integrated system comprising computer hardware, software, databases, and communication networks, all working together to collect, pro-

cess, organize, store, and disseminate data and information within Yemeni pharmacological companies.

Hardware refers to all the physical components and tools involved in data processing. This includes input devices, the central processing unit (CPU), output devices, and the various components used to connect these parts (Krajewski & Ritzman, 2006). Procedurally, hardware is defined as the tangible elements of a computer system, encompassing all units and devices utilized within an organization to process and store data.

Software consists of detailed systems and instructions that help the computer carry out the required tasks, processes, documents, records, and displays data as final outputs to perform the work. It is defined as the non-physical components of the computer. Software includes all the programs and systems necessary to operate the computer and organize the work of its various units (Ferguson & Hebels, 2003).

Networks serve as the foundational infrastructure that facilitates interaction between computers and the software that manages communication among hardware components. They enable multiple computers to be interconnected through various communication media, forming a network that allows for the exchange of data and information among connected systems (Huawei Technologies, 2022).

A database is a collection of logically related data elements connected through mathematical relationships and stored in a computer system in an organized way to enable easy access, searching, addition, or modification (Bouchachi, 2020). Procedurally, it is defined as a structured and integrated set of interrelated data maintained within the company's computer systems to support efficient data management and retrieval.

Competitive priorities refer to the essential dimensions that a firm's production system must embody to meet the requirements of its target markets (Awwad et al., 2013). Competitive priorities is represented by four dimensions: efficiency, quality, flexibility, and delivery (Arcidiacono et al., 2023). In this study, competitive priority is defined as the pharmaceutical companies' ability to maintain efficiency, quality, flexibility, and delivery focusing on managing expenses to stay competitive; ensuring products meet customer expectations; adapting quickly to market changes; and emphasizing timely, reliable order fulfillment. These priorities help firms align their strategies to meet customer needs and stay ahead of competitors.

Efficiency, as a dimension of competitive priorities, refers to a firm's capability to use its resources, such as time, labor, materials, and capital, in the most optimal way to minimize waste and reduce operational costs while maximizing productivity and output quality (Handoyo et al., 2023). It involves streamlining processes, improving workflow, and eliminating inefficiencies to deliver products or services promptly and cost-effectively without compromising quality. High efficiency enables firms to offer competitive prices, meet customer demand reliably, and adapt quickly to market changes, thereby strengthening their overall competitiveness in the market (Jitpaiboon, 2014).

Quality is a key competitive advantage, driven by delivering products that meet or exceed customer expectations (Lee & Zhou, 2000). It is a subjective concept shaped by the customer's perspective (Kazan et al., 2006; Defeo, 2016), encompassing aspects like excellence, value, conformance, and reliability. Farner (1996) outlines eight dimensions of quality: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality – all centered on customer satisfaction.

Flexibility, defined by Zelenović (1982) as the ability to respond effectively to change, is a concept supported by many scholars (Zelenović, 1982; Upton, 1994). It involves mastering changes and uncertainty from internal and external environments. Flexibility is described as the capacity for rapid adaptation in production volume, product mix, customization, and technology adoption. Upton (1994) emphasizes quick, low-cost, and efficient responses.

Delivery is a key competitive priority as customers seek products in the right quantity and at the right time (Awwad et al., 2013). It involves providing the right product – meeting quality, reliability, and maintainability standards – at the right place, time, quantity, and price, from a dependable vendor, with proper service. Delivery capability also reflects how quickly and reliably a firm delivers products, introduces improvements, and brings offerings to market.

While IT is widely seen as beneficial, research offers mixed results on how specific IT capabilities influence competitive priorities. Some studies highlight infrastructure's role in cutting costs, while others stress the importance of analytics talent and governance for quality and flexibility (Mikalef et al., 2023). Most evidence comes from large firms in developed markets, limiting insight into IT's impact in resource-constrained settings. This highlights the need to explore individual and combined effects of IT dimensions in more challenging contexts.

Recent research highlights advanced IT hardware like IoT, cloud systems, and automation as key to improving manufacturing performance in efficiency, quality, delivery, and flexibility by enabling predictive maintenance and reducing downtime (Soori et al., 2023; Alshahrani, 2023). However, most studies focus on large firms with strong infrastructure, while fragile sectors like Yemen's pharmaceutical industry face challenges that may limit IT hardware's effectiveness, underscoring the need to study its impact in such contexts.

Research shows enterprise software – like ERP, CRM, SCM, and business intelligence tools – enhances efficiency, delivery, quality, flexibility, and data-driven decision-making (Tarigan et al., 2021; Nilashi et al., 2023; Koot et al., 2021; Kolagar et al., 2022). However, most studies focus on large firms in developed markets, with limited insight into how modu-

lar, resource-light software performs in resource-constrained settings like Yemen's pharmaceutical industry. This study examines IT software's impact on competitive priorities in this context.

While databases are praised for their strategic potential, much literature is fragmented and overly optimistic, often lacking sector-specific evidence and overlooking organizational capabilities needed for effective use (Sakib, 2023; Shahid & Sheikh, 2021). Though linked to dynamic capabilities and innovation (Jenkinson et al., 2024), their impact varies by context. There is limited research on IT databases in fragile, resource-poor settings like Yemen's pharmaceutical sector, where challenges remain. This study examines how database management affects efficiency, quality, delivery, and flexibility in this context.

This study aims to investigate how information technology enables competitive priorities within pharmaceutical companies in Yemen, with a specific focus on operational efficiency, quality improvement, and responsiveness to market demands. The analysis offers empirically grounded insights to inform both theory and practice, especially within resource-constrained and volatile environments.

H1: Information technology has a significant impact on competitive priorities in Yemeni pharmaceutical manufacturing companies.

H1a: Hardware and equipment significantly influence competitive priorities.

H1b: Databases significantly influence competitive priorities.

H1c: Software applications significantly influence competitive priorities.

H1d: Communication networks significantly influence competitive priorities.

2. METHOD

This study adopted a correlational survey design, which was appropriate for exploring the relationships between information technology and competitive priorities within pharmaceutical manufacturing companies in Yemen. The

design allowed for an empirical examination of how variations in information technology capabilities relate to differences in competitive performance outcomes.

The study population consisted of 2,160 employees from eight pharmaceutical manufacturing companies located in Sana'a, Yemen, encompassing individuals in leadership, quality control, information technology (IT), and operations roles. These companies, listed in Appendix A, collectively account for approximately 85% of Yemen's domestic pharmaceutical production and operate under comparable regulatory and infrastructural conditions. To ensure proportional representation across both firms and functional areas, a stratified random sampling technique was employed. The stratification was based on role distribution: leadership (20%), quality control (35%), IT (25%), and operations (20%). The required sample size was determined using Krejcie and Morgan's (1970) sample size table, which recommended a minimum of 220 participants for a population of this size. Accordingly, 220 employees were selected and invited to participate. Of these, 210 completed the questionnaire, and after excluding 12 responses due to missing data or inconsistencies, 198 valid responses were retained for analysis.

The primary data collection instrument was a structured questionnaire developed based on an extensive review of relevant literature and validated through expert consultation. The questionnaire consisted of two main sections. The first section gathered demographic data, including gender, age, education level, professional experience, and job position. The second section assessed the independent variable, information technology, through twenty-eight items distributed across four dimensions: hardware, software, database, and network. The dependent variable, competitive priorities, was measured using twenty items across four dimensions: quality, efficiency, flexibility, and delivery.

To ensure the validity and reliability of the instrument, a panel of academic and industry experts reviewed the questionnaire, providing critical feedback that guided several revisions. Internal consistency was evaluated us-

ing Cronbach's alpha, which ranged from 0.881 to 0.939 across all dimensions. Composite reliability values were similarly high, ranging from 0.883 to 0.939. Convergent validity was confirmed through average variance extracted (AVE) values ranging from 0.678 to 0.804, indicating that the constructs were well-measured by the items as presented in Table 1.

Table 1. Construct reliability and validity

Construct	Dimension	Cronbach's Alpha	CR	AVE
Competitive Priorities	Quality	0.905	0.905	0.724
	Efficiency	0.881	0.883	0.678
	Flexibility	0.939	0.939	0.804
	Delivery	0.935	0.936	0.794
Information Technology	Hardware	0.921	0.922	0.761
	Software	0.921	0.924	0.759
	Database	0.937	0.938	0.760
	Networks	0.888	0.896	0.696

Note: CR = composite reliability, AVE = Average variance extracted.

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 28. The process began with data cleaning, treatment of missing values, and checks for normality and outliers. Descriptive statistics, including frequencies, percentages, means, standard deviations, and relative importance indices, were calculated to summarize participant responses. Relationships between variables were then examined using both simple and multiple linear regression analyses.

Ethical considerations were rigorously observed throughout the study. Ethical approval was obtained from the Scientific Research Committee at Sana'a University. All research procedures adhered to the principles outlined in the 1964 Helsinki Declaration and its later amendments. Participants were fully informed about the purpose of the study, the voluntary nature of participation, and their rights, including the option to withdraw at any time. Written informed consent was obtained from all respondents, ensuring the ethical integrity of the data collection process.

3. RESULTS

The analysis begins with an overview of the mean scores, standard deviations, and Relative

Importance Index (RII) for both competitive priorities and IT components. This is followed by regression analyses that examine the extent to which IT, both as an overall construct and through its individual dimensions (hardware, software, database, and networks), predicts competitive priorities. The findings provide empirical support for the hypothesized relationships and offer insights into the role of IT in enhancing operational competitiveness.

To assess the strategic focus of pharmaceutical firms in Yemen, descriptive statistics were computed for the main competitive priorities. These include quality, efficiency, flexibility, and delivery – key dimensions that shape operational performance in the sector. Table 2 presents the mean scores, standard deviations (SD), and Relative Importance Index (RII) for competitive priorities within the Yemeni pharmaceutical sector. Among the four dimensions, quality emerged as the highest-rated priority, with a mean score of 5.828 and a low standard deviation (SD = 0.967), suggesting a strong consensus among respondents regarding its critical importance (RII = 83.3%). This finding highlights the sector's strong orientation toward ensuring product excellence, driven by regulatory demands and customer expectations for safe and effective pharmaceuticals.

Efficiency was the second most emphasized priority (mean = 5.457, SD = 1.031, RII = 78.0%), reflecting the industry's need to optimize resources and reduce operational costs – particularly important in a context marked by economic constraints. Flexibility and delivery followed closely, with RII values of 79.2% and 78.1% respectively, underscoring the growing recognition of the need for adaptability and responsiveness to fluctuating market demands.

While quality clearly leads in strategic importance, the close scores among the other priorities suggest that Yemeni pharmaceutical firms are striving to balance excellence with agility and operational efficiency. This balanced approach to competitive priorities reflects an effort to build resilience and maintain market relevance in a challenging and evolving health-care environment.

Table 2. Descriptive statistics of competitive priorities

Dimension	Mean	SD	RII
Efficiency	5.457	1.031	78.0%
Quality	5.828	0.967	83.3%
Flexibility	5.543	1.102	79.2%
Delivery	5.464	1.091	78.1%
Competitive priorities	5.573	0.900	79.6%

Note: SD = standard deviation, RII = Relative importance index.

The aggregate score for competitive priorities is 5.573 (RII = 79.6%), reflecting unanimous agreement on their collective importance. Prioritizing quality, efficiency, flexibility, and timely delivery can enhance competitiveness and meet evolving industry needs in Yemen’s pharmaceutical sector.

Table 3 presents the mean scores, standard deviations (SD), and Relative Importance Index (RII) for the key components of information technology (IT) in the Yemeni pharmaceutical sector. Hardware and equipment received the highest rating (mean = 5.778, SD = 1.076, RII = 82.5%), reflecting strong consensus among respondents regarding the foundational role of physical infrastructure in supporting pharmaceutical operations. Software closely followed (mean = 5.730, SD = 1.071, RII = 81.9%), emphasizing its critical role in streamlining workflows, enhancing productivity, and enabling data-driven decision-making across various functions.

Similarly, database systems (mean = 5.679, SD = 1.048, RII = 81.1%) and networks (mean = 5.672, SD = 1.075, RII = 81.0%) were also rated highly, underscoring their importance in ensuring effective data management, integration, and communication across departments and with external stakeholders. The close clustering of RII values across all IT components indicates a comprehensive appreciation of the multifaceted nature of IT infrastructure and its contribution to organizational performance.

Table 4. Simple linear regression

Model	Model Summary			ANOVA		Coefficients		T	p	Decision
	R	R ²	Adj R ²	F	p	B	Beta			
1	.765 ^a	.586	.583	276.956	.000 ^b	.714	.765	16.642	.000	Supported

Note: Predictors: Information Technology. Dependent Variable: Competitive priorities.

Table 3. Descriptive statistics of information technology

Dimension	Mean	SD	RII
Hardware	5.778	1.076	82.5%
Software	5.730	1.071	81.9%
Databases	5.679	1.048	81.1%
Networks	5.672	1.075	81.0%
Information Technology	5.715	0.965	81.6%

Note: SD = standard deviation, RII = Relative importance index.

The overall mean score for information technology was 5.715 with an RII of 81.6%, demonstrating a prominent level of agreement among respondents on the strategic significance of IT investment. These results suggest that Yemeni pharmaceutical firms recognize IT not merely as a support function, but as a critical enabler of operational efficiency, strategic agility, and long-term competitiveness in an increasingly digital healthcare landscape.

To examine the impact of information technology on competitive priorities, a simple linear regression analysis was conducted. This analysis aimed to determine the extent to which variations in IT influence the strategic focus of pharmaceutical firms in Yemen.

As shown in Table 4, the simple linear regression analysis revealed a strong positive relationship between information technology and competitive priorities ($R = 0.765$, R -squared = 0.586, Adjusted R -squared = 0.583). This indicates that 58.6% of the variance in competitive priorities can be explained by changes in information technology. ANOVA results demonstrated that the regression model significantly accounted for the variance in competitive priorities ($F(1, 196) = 276.956$, $p < .001$). The findings showed robust evidence that IT drives competitive priorities ($B = 0.714$, $\beta = 0.765$, $p < 0.001$), suggesting that for each one-unit increase in information technology, competitive priorities increased by 0.714 units. Therefore, the main hypothesis is supported.

Table 5. Multiple linear regression (sub-hypotheses testing)

Model Summary			ANOVA		Dimension	Coefficients		t	p	Decision
R	R ²	Adj R ²	f	p		B	Beta			
.768	.590	.581	69.41	.000	Hardware	.180	.216	2.942	.004	Supported
					Software	.237	.282	2.468	.014	Supported
					Databases	.064	.074	.752	.453	Rejected
					Networks	.230	.275	3.586	.000	Supported

Note: a. Dependent Variable: Competitive priorities.

To gain deeper insights into how specific IT components influence competitive priorities, a multiple linear regression analysis was conducted. This analysis tested the sub-hypotheses by examining the individual contributions of hardware, software, databases, and networks to the overall model.

As presented in Table 5, the multiple linear regression analysis revealed a significant relationship between the predictors (networks, hardware, databases, software) and competitive priorities ($R = 0.768$, $R^2 = 0.590$, Adjusted $R^2 = 0.581$). 59.0% of the variance in competitive priorities was explained by the predictors. The strong R value of 0.768 indicates a prominent level of correlation between IT and competitive priorities, suggesting that IT is not just statistically significant but also impactful. ANOVA results indicated that the regression model was significant in predicting competitive priorities ($F(4, 193) = 69.416$, $p < .001$).

Interpreting the coefficients of regression, among the predictors, hardware ($B = 0.180$, $\beta = 0.216$, $p = .004$), software ($B = 0.237$, $\beta = 0.282$, $p = .014$), and networks ($B = 0.230$, $\beta = 0.275$, $p < .001$) showed significant positive relationships with competitive priorities. However, databases did not significantly predict competitive priorities ($B = 0.064$, $\beta = 0.074$, $p = .453$). Interestingly, the databases component did not significantly predict competitive priorities, which may reflect underutilization or lack of integration of database systems in operational decision-making within the Yemeni pharmaceutical sector. In summary, the findings suggest that hardware, software, and networks are significant predictors of competitive priorities. In contrast, databases do not appear to play a significant role in influencing competitive priorities within the model. Therefore, three sub-hypotheses were supported, and one was rejected.

Overall, the results underscore the significant role of IT in shaping competitive priorities within the Yemeni pharmaceutical sector, particularly through investments in software, hardware, and network infrastructure. These findings confirm the proposed model and offer evidence-based insights for strategic decision-makers.

4. DISCUSSION

This study contributes to the growing body of literature examining the strategic role of information technology (IT) in enhancing competitive priorities, with a specific focus on the pharmaceutical sector in Yemen – an environment marked by institutional challenges and resource constraints. Our findings elucidate the differentiated impact of individual IT components on competitive priorities, revealing that software, networks, and hardware significantly enhance firms' competitive positioning, while databases did not show a statistically significant relationship. This nuanced understanding advances theoretical and practical perspectives on the strategic deployment of IT in developing economies.

The results offer strong empirical support for the resource-based view (RBV) (Barney, 1991; Bharadwaj, 2000), which posits that heterogeneous, valuable, and inimitable resources are central to sustaining competitive advantage. In line with this theoretical lens, our findings highlight that specific IT components – when strategically aligned with firm aims – can serve as critical enablers of operational efficiency, agility, and service excellence. For instance, advanced software solutions facilitate the automation of production and quality control processes, thereby enhancing efficiency (Bharadwaj et al., 2013). Likewise, robust network infrastructures improve internal and external communication flows, contributing

to greater responsiveness and customer-centric differentiation (Koch & Windsperger, 2017). The observed impact of hardware may be attributed to its role in data acquisition, real-time analytics, and mobile technologies in distribution networks – factors that support both cost and differentiation advantages.

The absence of a significant relationship between database systems and competitive priorities aligns with prior studies highlighting IT adoption challenges in developing economies. In contexts like Yemen, infrastructural limitations, skill shortages, and weak IT governance often result in databases being underutilized as passive repositories rather than strategic assets (Alshakka et al., 2020; Madaki et al., 2024). Firms tend to prioritize operational technologies like ERP and IoT to meet immediate needs such as compliance and production efficiency, sidelining back-end systems (Hole et al., 2021; Sakib, 2023). Regulatory pressures and poor infrastructure further divert investments toward compliance tools, while weak data governance and siloed systems hinder the use of data for competitive advantage (Arshad et al., 2019; Mikalef et al., 2019). These patterns reflect the resource-based view, which stresses that only well-leveraged, rare, and inimitable resources contribute to sustained advantage. Additionally, the findings support the strategic alignment model, emphasizing that IT investments must align with business priorities – like quality or responsiveness – to yield performance gains (Dairo et al., 2021; Benkhayat et al., 2024).

Institutional theory offers further explanatory power by contextualizing IT adoption within Yemen's unique regulatory and socio-economic landscape (Arshad et al., 2019; Aldossari et al., 2023). Regulatory pressures, such as compliance with drug traceability and pharmacovigilance requirements, may drive investments in certain technologies (e.g., quality assurance software and tracking hardware). Concurrently, infrastructural limitations, skill shortages, and financial constraints may hinder broader IT integration or the effective exploitation of databases as strategic assets.

From a policy and managerial standpoint, the study highlights an urgent need for capacity-building initiatives aimed at enhancing IT capabilities within the pharmaceutical sector. Stakeholders, including government entities, industry regulators, and academic institutions, must collaborate to foster an enabling environment for digital transformation. Key initiatives include the development of sector-specific IT training programs, incentives for technology adoption, and the promotion of data governance best practices. Particularly, targeted efforts to expand the effective use of software, networking, and hardware solutions are recommended, given their demonstrated impact on competitive priorities. Simultaneously, the underperformance of database systems calls for a strategic reassessment of data management practices and the cultivation of data-driven cultures within firms.

CONCLUSION

This study examined the influence of distinct information technology (IT) components on competitive priorities within Yemen's pharmaceutical sector, revealing that the strategic deployment of software, network infrastructure, and hardware significantly contributes to enhancing operational performance, organizational agility, and responsiveness to market dynamics. These findings substantiate prior scholarship positioning IT as a transformative enabler of competitive advantage, particularly in sectors characterized by rapid innovation and complex supply chains, such as pharmaceuticals.

Notably, the lack of a statistically significant association between database systems and competitive priorities introduces an important conceptual nuance. It suggests that the mere presence of IT infrastructure is insufficient to drive competitive outcomes unless it is strategically aligned with organizational aims and contextual demands. This divergence challenges the homogenizing view of IT value and underscores the necessity of a selective, purpose-driven approach to IT investment, particularly in environments marked by infrastructural and institutional volatility.

A central theoretical contribution of this study is its interrogation of the assumed uniformity in IT resource value. The non-significant role of database systems points to a broader issue in data strategy: the underutilization of databases as tools for strategic intelligence. Rather than functioning as dynamic resources for decision-making and innovation, databases in the observed context may remain under-integrated or poorly governed. This underscores the need for organizations to develop robust data governance frameworks and cultivate analytical competencies that transform data from static repositories into engines of insight and value creation.

Despite its contributions, this study acknowledges several limitations. The reliance on self-reported data introduces the potential for respondent bias. The cross-sectional research design limits the ability to establish causal relationships, necessitating longitudinal or experimental studies. The focus on the Yemeni pharmaceutical sector restricts generalizability, and the exclusive use of quantitative methods may overlook qualitative dimensions of IT's influence. Finally, investigating the reasons behind the non-significant impact of databases on competitive priorities is essential for providing more targeted recommendations to the industry.

Future research could benefit from mixed-method approaches to gain a more nuanced understanding. Furthermore, exploring the specific ways in which software, networks, and hardware impact different competitive priorities would be a valuable extension of this research. In addition, future research should extend this work by employing longitudinal and mixed-method approaches to better understand the causal dynamics of IT and competitiveness. Comparative studies across industries and geographies could also offer deeper insights into how IT capabilities function under different institutional conditions. Further exploration into the role of databases and data analytics could uncover hidden opportunities for value creation in the pharmaceutical supply chain.

AUTHOR CONTRIBUTIONS

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APPENDIX A

Table A1. Pharmaceutical companies in Yemen (study population)

Company	Year of Establishment	Total Products	Production Lines
Yemeni Company for Drug Manufacturing and Trade (Yedco)	1965	141	5
Saba Pharma for Drug Manufacturing	1993	300	3
International Company for Drug Manufacturing (Pharma Care)	1998	104	4
Shifaco for Pharmaceutical Industries	1999	178	4
Modern Pharmaceutical Company for Drug Manufacturing	1999	222	4
Bio Pharma for Pharmaceutical Industries	2000	100	3
Modern Global Company for Drug Manufacturing	2004	182	3
Yemeni-Egyptian Company for Pharmaceutical Industries	2005	141	3