

Impact of competitive intelligence on firm sustainable competitiveness and performance: strategic design collaboration's mediating role

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231

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Abstract

Purpose – This paper aims to examine the direct and indirect impact of competitive intelligence (CI) practices on sustainable competitiveness (SC) and firm performance (FP) mediated by strategic design collaboration (SDC).

Design/methodology/approach – This empirical study is based on a survey of 179 respondents comprising senior managers from pharmaceutical companies operating in Egypt across three sectors: public, private and multinational corporations (MNCs).

Findings – The results show that CI has a positive and significant impact on SDC, which, in turn, positively impacts SC and FP. The study also shows that SDC mediates the relationship between CI and both SC and FP.

Originality/value – This study sheds light on the significant and mediating role of SDC in explaining the relationship between CI and both SC and FP.

Keywords Competitive intelligence, Strategic design collaboration, Sustainable competitiveness, Firm performance

Paper type Research paper

1. Introduction

In today's rapidly evolving business landscape marked by continual technological advancements and disruptions, companies must develop innovative business models to address unprecedented challenges (Talaoui *et al.*, 2023; Schaer *et al.*, 2022; Markovich *et al.*, 2023). The imperative to anticipate and respond effectively to unforeseen “black swan” events is crucial for maintaining competitiveness in a world full of ambiguity and uncertainty (Sheng *et al.*, 2021). Firms are increasingly reliant on diverse data sources for market insights to improve responsiveness and strategic decision-making (Giampaoli *et al.*, 2024).



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Consequently, the agility and speed of proactive response to environmental dynamics (Hajli *et al.*, 2020) is vital for an organization's sustainable competitiveness (SC) (Hashem *et al.*, 2024). However, amidst the vast array of available information, the ability to discern and use "quality" intelligence becomes paramount. According to Forrester (2021), the business intelligence (BI) technologies market is projected to reach nearly \$40 billion by 2027, driven by strong demand for actionable business insights. Quality information is vital for achieving sustainable competitive advantage and superior performance (Chen and Lin, 2021), as firms transform available data into actionable intelligence, enhancing their market position (da Silva Mattos and Shasha, 2024).

The advent of digital technologies such as big data analytics and BI software presents lucrative opportunities for organizations from all sectors to harness and leverage the vast amount of reliable, timely and free-flowing data about competitors and the marketplace (Talaoui *et al.*, 2023; Trieu, 2023). As a result, many firms have embraced computational intelligence for competitive intelligence (CI) analysis, crucial for formulating effective managerial strategies in volatile markets (Qian *et al.*, 2023). CI has become a critical discipline for organizations to adapt to changes and disruptions in the industry (Gupta *et al.*, 2021; Markovich *et al.*, 2023). It encompasses information on stakeholders' behaviors and broader business environments, aiding organizations in thinking, planning, predicting and innovatively solving problems (Hassani and Mosconi, 2022; Cadden *et al.*, 2023). For decision-makers, it has been widely acknowledged that CI is a business instrument that assists all kinds of organizations during the process of strategy-making (Volberda *et al.*, 2021) and improve business performance by enhancing the organization and its managers' strategic insights (Qian *et al.*, 2023). In other words, firms need to ensure they have ample amounts of data, information, expertise and most crucially, intelligence to be successful in today's highly competitive market (Niu *et al.*, 2021).

As a result, CI has appealed to numerous researchers and practitioners due to its role in shaping an organization's strategic decision-making (Hakmaoui *et al.*, 2022) and performance (Côte-Real *et al.*, 2020; Vugec *et al.*, 2020). On the same note, CI is one of the fastest-growing fields in the business world. According to López-Robles *et al.* (2020), CI was the third most frequent research area found in a recent bibliometric review. However, despite the growing attention that scholars have given to CI, critical gaps remain (Köseoglu *et al.*, 2019). First, the concept of CI itself has been heterogeneously defined (Madureira *et al.*, 2021) and described with varying terminology. Madureira *et al.* (2021) argued that CI has been defined in hundreds of ways where the term is associated with two or more related meanings (Vicente and Falkum, 2017) while at the same time has the same meaning as other terms as well (López-Robles *et al.*, 2020). Numerous scholars have argued that the current research still lacks a clear understanding of how to position CI practices in the context of overall organizational strategizing (Talaoui *et al.*, 2023) or how they fit into the process of enacting a business-level strategy (Baptista *et al.*, 2021). In today's networked and digital economy, there is a critical imperative to elucidate the role of CI in facilitating the flow of knowledge, both inbound and outbound, to yield actionable insights and inform strategic design process. This imperative is underscored by scholarly contributions (Hassani and Mosconi, 2022; Mudau *et al.*, 2024), highlighting the heightened relevance and urgency of addressing this issue.

With regard to the current CI research, most of the literature focuses on the technical aspects of the CI process (Cavallo *et al.*, 2021; Qian *et al.*, 2023) and on the technologies available to improve it (Hakmaoui *et al.*, 2022; Trieu, 2023). In contrast to the extensive research conducted on the application of CI within organizations, studies specifically addressing CI models remain insufficiently explored. Currently, there is no universally

accepted framework for the construct (Isichei *et al.*, 2023). Additionally, the integration of CI methodologies into business operations continues to be an under-researched area (Bartuš, 2023). Vieira *et al.* (2023) argued that the creation and use of intelligence as a social process underlies social aspects, such as organizational and individual aspects; therefore, it cannot be overlooked. Once the intelligence is created, it must be formatted, stored and disseminated among managers, so that they can always access and use it for decision-making. It is important to deliver intelligence quickly to the right manager to enable them to take the right actions or make the right decisions, since the value of intelligence decreases over time (Hassani and Mosconi, 2022).

Similarly, the linkage between CI and firm competitiveness has been researched in only a limited way (Kumar *et al.*, 2022). Pancić *et al.* (2023) argued that research on this practice that is based on the information system success model rarely analyzes the connection between its implementation and firm performance (FP). There are also no examples of how CI models used in building the competitive advantage of an organization in the market (Bartuš, 2023). Most of the studies are descriptive in nature and consist of anecdotal case studies of corporate CI (Kumar *et al.*, 2020) where the external validity of these studies is limited (Tahmasebifard, 2018). In addition, Madureira *et al.* (2021) noted that previous studies on CI are predominantly qualitative. A number of scholars have also echoed that there is little empirical work linking the impact of a firm's CI activities and its performance (Gopal *et al.*, 2024; Markovich *et al.*, 2019; Vugec *et al.*, 2020). Consequently, an understanding of the outcomes of CI practices, particularly regarding their relationship with FP, remains limited (Tej Adidam *et al.*, 2012). Notably, a recent survey revealed that many business leaders consider measuring the impact of CI programs within their organizations to be one of their top challenges (State of Competitive Intelligence, 2024). Despite the recognized relevance and value of CI to business, it is surprising that the concept has attracted relatively limited scholarly attention (Isichei *et al.*, 2023). Wu *et al.* (2023) argue that further studies are necessary to explore this link, as a firm's competitive edge derived from CI and its overall performance are conceptually distinct. Current research tends to focus primarily on the connection between capabilities and outcomes (Cao *et al.*, 2022).

Over the past decade, research has increasingly focused on the association between CI and various factors linked to FP, such as competitive advantage, innovation and sales performance, among others (Calof *et al.*, 2018). However, most studies have primarily examined the relationship between CI and either FP or SC. There is a notable absence of research that integrates CI with organizational strategic processes while simultaneously linking it to performance and firm sustainability within a single study. Table 1 presents a summary and comparison of some recent studies on CI, revealing that these studies have largely overlooked potential mediating or moderating factors in the CI-performance relationship. Scholars have emphasized the need to explore potential mediators to broaden the understanding of CI as a construct and to investigate new insights into the multifaceted interconnections between a firm's internal intangible resources, strategic activities and overall performance (Isichei *et al.*, 2023; Safari and Saleh, 2020). Additionally, other scholars (Wu *et al.*, 2023) have suggested that certain mediating factors may help explain the contradictory results found in the literature regarding the CI-performance relationship. Therefore, it is imperative to consider additional factors in the CI-performance nexus to enhance our comprehension of this complex relationship.

On a similar note, most of the existing CI research has been carried out in developed markets in the USA, Germany and Europe (Tsuchimoto and Kajikawa, 2022; Trieu, 2023). There has been limited coverage of the emerging markets (Du Toit, 2013; Hakmaoui *et al.*, 2022). Muthukrishna *et al.* (2020) motivated other scholars of not relying excessively on

Table 1. Summary of studies in competitive intelligence

Authors (year)	Article title	Context and nature	Method	Research focus
Markovich <i>et al.</i> (2019)	Competitive intelligence embeddedness: drivers and performance consequences	Dun and Bradstreet's database of Israeli companies	Cross-sectional, survey-based quantitative. (124 respondents)	Web-based information sources and social media as CI. Customer satisfaction as a mediator toward firm performance
Popović <i>et al.</i> (2019)	Justifying business intelligencesystems (BIS) adoption in SMEs impact of systems use on firm performance	SMEs adoption and usage of BIS	Cross-sectional, survey-based quantitative. (181 SMEs)	Looking at the impact of BIS routine and innovative usage on SME performance
Bao (2020)	Competitive intelligence and its impact on innovations in tourism industry of China: an empirical research	Focus on the hotels and tourism companies in east China	Cross-sectional, survey-based quantitative (333 respondents)	Effect of CI on service innovation
Hanif <i>et al.</i> (2022)	Competitive intelligence process and strategic performance of banking sector in Pakistan	Commercial and Islamic banks' employees in Lahore, Pakistan	Cross-sectional, survey-based quantitative. (200 respondents)	CI components toward strategic performance
Isichei <i>et al.</i> (2023)	Linking competitive intelligence, learning orientation and export, performance of SMEs	Nigerian textile firms engage in export activities	Cross-sectional, survey-based quantitative. Sample data set from 400 employees	Investigates firm export performance that is influenced by CI and mediated by organizational orientation
Kunle <i>et al.</i> (2017)	The influence of marketing intelligence on business competitive advantage (a Study of Diamond Bank Plc)	Case study of the diamond bank employees in Lagos, Nigeria	Descriptive research was used to survey 285 members	The relationship between marketing intelligence and business competitive advantage
Samadhiya <i>et al.</i> (2023)	Artificial intelligence – partner relationships management for climate management in B2B firms to achieve sustainable competitiveness	Indian B2B firms that use information and communication technology capabilities for decision-making	Mixed-methods approach involves in-depth interviews and a hypothesis model (142 respondents)	Factors influencing AI usage and its influence toward firm performance. Firm performance act as mediator toward firm sustainable competitiveness

(continued)

Table 1. Continued

Authors (year)	Article title	Context and nature	Method	Research focus
Pancíc <i>et al.</i> (2023)	Business intelligence (BI) in firm performance: Role of big data analytics and blockchain technology	Focusing on BI usage among IT companies in Croatia	Cross-sectional, survey-based quantitative. Data collected from a representative sample of 387 employees from 12 Information technology (IT) firms Collected data on a sample of 346 US managers through Prolific, a crowd-working platform that recruits subjects online and explicitly caters to researchers	Business intelligence influences the adoption of big data analytics and blockchain which further influences firm performance
Giachino <i>et al.</i> (2024)	Artificial intelligence-driven decision making and firm performance: a quantitative approach	Looking at USA managers using AI-driven decision-making		The relationship between AI and decision-making in the development of AI-related capabilities. AI-driven decision-making, while it exerts a positive moderating effect on the development of AI capability

Source: Developed by authors

“WEIRD” samples in which most participants are Western, educated and from industrialized countries. [Franke and Richey \(2010\)](#) also warned of the possible error of taking the findings from a particular country that often fail to reflect a trend that applies to other countries in general, even when the overall trend is strong. Thus, scholars like [Amankwah-Amoah et al. \(2021\)](#) emphasized the importance of considering the interactions between technologies, knowledge creation and strategies in different environments and under different conditions. Therefore, this study answers the call, suggesting the need to examine the link in other contexts (e.g. emerging and developing economies) due to the high level of uncertainty involved and differing cultural contexts.

While the introduction of this paper highlights several significant gaps in existing literature, this study concentrates on addressing the most pressing issues. Specifically, these include:

- the limitations of previous research, which has largely relied on descriptive, anecdotal case studies and qualitative methods;
- the need to establish a clear relationship between a firm’s CI practices and its overall performance;
- the identification of additional factors that may influence the CI-performance relationship; and
- the scarcity of CI studies conducted in emerging markets.

In response to these identified gaps, this study aims to achieve the following research objectives:

RO1: To evaluate the contribution of the CI process to the effectiveness and efficiency of collaborative efforts in designing competitive strategies.

RO2: To assess the influence of CI practices on firms’ sustainable competitiveness and performance.

RO3: To investigate the influence of strategic design collaboration on the relationship between CI practices and firms’ sustainable competitiveness and performance.

This paper proceeds with the literature review section, which discusses and formulates hypotheses of the research model. The research methodology and results from the data analysis are then presented. The paper concludes with theoretical and managerial implications derived from the research results.

2. Literature review

2.1 Competitive intelligence

[Madureira et al. \(2021\)](#) noted that there is no commonly accepted term for referring to the internal and external intelligence required for business decision-making. The literature depicted that there are numerous terms such as market intelligence (MI), CI and BI, which are all used at various times to describe the process of making better intelligence-driven decisions. CI is an analytical process that transforms disaggregated competitor, industry and market collected data into actionable strategic intelligence to inform strategic planning and decision-making ([Maluleka and Chummun, 2023](#)). While, BI is often seen as a “technical concept” and refers to a collection of technologies and applications aimed at collecting, extracting and analyzing a variety of metrics to address market challenges and opportunities, monitor organizational performance and make better decisions ([Vugec et al., 2020](#)),

especially with the development of artificial intelligence (AI) technology expands the boundary of business practice and application of BI (Chen and Lin, 2021). Therefore, CI and BI/AI are complementary but distinct (Markovich *et al.*, 2019).

Köseoglu *et al.* (2019) commented on the problem of defining the still evolving field and practice of CI, as there is no single definition that is likely to be precise and/or universally accepted. Similarly, Madureira *et al.* (2021) explored and analyzed the phrases that various authors, over time, have proposed as their “unified” version of a CI definition (López-Robles *et al.*, 2020). In accordance with Calof *et al.* (2017), this study adopts a comprehensive definition by Bulger (2016) to emphasize the importance of integrated intelligence and collaborative efforts:

[T]he robust integration of insights from “intelligence pools” that are identified across the business environment and in collaboration with other functional areas and disciplines that are synthesized to gain a comprehensive picture of a market in its current state and in its probable future state. The resulting outcome of integrated intelligence efforts is to provide necessary knowledge for critical decisions and recommendations to drive and gain a competitive advantage for an organization (Bulger, 2016, p. 63).

Based on this definition, it becomes clear why CI is important to organizations, especially when it is related to market-oriented organizations (Vieira *et al.*, 2023). Market orientation reflects a firm’s ability to anticipate, react to and capitalize on environmental changes, leading to superior performance (Kohli and Joworski, 1990). Market orientation happens when a company “acquires, distributes, and actively responds to market intelligence over time” (Baker and Sinkula, 1999, p. 413). It can be understood as a company’s behavior directed toward marketing actions, involving interaction with the external environment (customers, competitors and suppliers) and the organization’s overall response capability based on information (Kohli and Jaworski, 1990; Bansal *et al.*, 2001). According to Lee and Lee (2017), companies can derive long-term benefits by considering all facets of market orientation, including customer orientation, competitor orientation and interfunctional coordination. Hence, this study adopts CI primary functions: planning, collection of data, analysis and dissemination of actionable intelligence (Hassani and Mosconi, 2022). This framework mirrors Kohli and Jaworski’s (1990) definition of market orientation, which entails “the organization-wide generation of MI, dissemination of the intelligence across departments and organization-wide responsiveness to it.”

2.1.1 Competitive intelligence process. Over the past three decades, the CI process and its organizational models have significantly evolved, with the most profound change being the shift from seeing CI merely as a technical task for collecting information to recognizing it as a strategic, analysis-driven management tool (Qian *et al.*, 2023). Early research indicated that many companies approached CI informally and on a short-term basis (Köseoglu *et al.*, 2019). Recent perspectives, like those of Mudau *et al.* (2024), argue for a continuous, systematic approach to identify and analyze business opportunities and threats effectively. Companies now use various CI models to structure their CI functions. These range from traditional process-driven approaches, known as intelligence cycles (Hakmaoui *et al.*, 2022), to more integrated, network-type processes across the entire firm as suggested by Van den Berg *et al.* (2020). The CI cycle, as summarized by Hassani and Mosconi (2022), includes:

- **Planning:** This initial stage focuses on defining key intelligence needs, pinpointing high-quality, actionable data necessary for strategic decision-making and filtering out irrelevant information (Côte-Real *et al.*, 2020; Cheng *et al.*, 2020).
- **Collection:** The second stage involves collecting data from diverse sources. This includes electronic sources like competitor websites, government and research

institutions, forums and news agencies, as well as databases (Liu *et al.*, 2021; Schaer *et al.*, 2022). Nonelectronic sources include insights from employees, customers and partners (Cheng *et al.*, 2021). Employees, in particular, are valued for their unique insights into the market and competitive landscape (Markovich *et al.*, 2023; Vieira *et al.*, 2023).

- *Analysis:* Here, the gathered information is analyzed using models like Strengths, Weaknesses, Opportunities, Threats, Porter's Five Forces, Boston consulting group matrix, strategic position and action evaluation, internal-external, general strategy, quantitative strategic planning and sociological, technological, economical, environmental and political to understand environmental factors (Liu *et al.*, 2021; Cheng *et al.*, 2021; Calof *et al.*, 2020; Kho *et al.*, 2021). The analysis results in intelligence products such as company profiles and market analyses, which are crucial for crafting competitive strategies.
- *Dissemination:* The final stage involves distributing the intelligence to strategic business units where it informs strategic decisions (Mudau *et al.*, 2024; Hakmaoui *et al.*, 2022).

These stages represent a more structured and strategic approach to CI, reflecting its critical role in modern business strategy and decision-making.

2.2 Strategic design process

The discourse surrounding strategy design and formulation often sparks debates among the design, planning and positioning schools of thought. This paper views strategic planning as deliberate, rational and formal – a collective endeavor linking internal and external environments (Aaker and Moorman, 2023). From the learning school, firms develop competencies in adapting and integrating organizational skills and resources to meet global business demands (Wheelen *et al.*, 2023), leading to the dynamic capabilities' framework. This framework emphasizes renewing and reconfiguring competencies to adapt to changes, vital for companies in unpredictable environments. It supports creating new strategies through collaboration, knowledge and initiative for adaptive strategy (Andersen *et al.*, 2019).

The rapidly changing business landscape makes long-range forecasting based on past data ineffective for strategic planning. Instead, quality information in well-designed data repositories enables timely, effective and intuitive analysis (Al-Okaily, 2024; Markovich *et al.*, 2019). Current business organizations must adopt strategic thinking and foresight. Cheng *et al.* (2020) suggest that companies should become more flexible, self-reorganizing and network-based, enhancing their CI to make intelligence-driven decisions. Strategic planning directs organizations, while CI, informed by quality information, illuminates the right choices (Kumar *et al.*, 2020; Chen and Lin, 2021).

2.3 Collaboration as a new strategic approach: open strategy

Responding to critiques of centralized strategy development, transformative research has initiated a shift toward decentralized strategic planning, emphasizing the pivotal role of middle managers and collaboration with both internal and external stakeholders (Splitter *et al.*, 2023; Whittington, 2019). This evolution has given rise to the concept of "open strategy," which advocates for greater inclusiveness and transparency in strategizing. Open strategy involves engaging various stakeholders in strategy creation and openly sharing information, reflecting a broader movement toward inclusivity and transparency in modern organizational settings (Stjerne *et al.*, 2022; Morton *et al.*, 2020).

Despite its promise, the implementation of strategic inclusiveness involves considerable risks, with ongoing research exploring the optimal extent and forms of stakeholder involvement (Splitter *et al.*, 2023). Strategic literature presents two primary approaches to enhancing inclusiveness. The first approach focuses on internal collaboration – “synthetic” strategy design – seeking to foster understanding and alignment across an organization’s different levels to enhance strategic coherence (Grewatsch *et al.*, 2023). This approach values cross-functional contributions that enhance creativity and effectiveness in strategy formulation. The second approach prioritizes engaging external stakeholders, termed “open strategic planning” by Stjerne *et al.* (2022). This method leverages social creativity and scenario planning involving various community members, aiming for strategies that are adaptable and competently managed across diverse social contexts.

Additionally, traditional CI models have been criticized for their inefficiency, bureaucratic nature and overly rigid structure, often failing to align internal CI practices with external market conditions and missing critical market trend indicators (Köseoglu *et al.*, 2019; Markovich *et al.*, 2019; Wei *et al.*, 2024). In response, recent proposals suggest a revamped CI model that integrates intelligence activities throughout the organization, enhancing responsiveness and strategic utility (Calof *et al.*, 2020; Mudau *et al.*, 2024). This approach encourages broader employee involvement in CI processes, fostering a culture where intelligence is not only gathered but also actively used across various business functions.

3. Hypotheses development

3.1 *Competitive intelligence and strategic design collaboration*

From a strategic management perspective, the formal strategy design process has been tightly linked with CI literature, emphasizing its role in planning, collecting analyzing and disseminating information (Baptista *et al.*, 2021; Talaoui *et al.*, 2023). CI involves tracking competitors’ activities, strategies and tactics to achieve three main goals: understanding the industry landscape, pinpointing competitors’ vulnerabilities and evaluating the impacts of competitive actions (Köseoglu *et al.*, 2019; Talaoui *et al.*, 2023). Such intelligence is crucial for identifying opportunities and preempting threats, thereby shaping effective corporate strategies (Qian *et al.*, 2023; Ibrahim *et al.*, 2023; Mudau *et al.*, 2024).

Research has consistently shown a positive correlation between the effective planning, collection, analysis and dissemination of actionable intelligence and the enhancement of collaborative strategic efforts within organizations. Chen and Lin (2021) assert that insights derived from CI empower management teams to make informed decisions that foster sustainable competitive advantages and improve overall FP. Moreover, Kumar *et al.* (2020) argue that companies well-versed in CI are better positioned than those that neglect it in their strategic planning, as CI provides critical insights into current and future market dynamics and competitive behaviors (Qian *et al.*, 2023), thereby enabling smarter, more strategic decision-making (Köseoglu *et al.*, 2019).

The rise of new informational technologies and a more collaborative economy have increased openness in strategic processes, allowing more participants in strategic dialogues and expanding access to strategic information (Whittington, 2019; Talaoui *et al.*, 2023). Hakmaoui *et al.* (2022) further highlight that a systematic CI process significantly enhances the flow of actionable intelligence, aiding in the assessment of current decisions and the formulation of proactive strategies. These findings support the hypothesis that a robust CI process encompassing planning, collection, analysis and dissemination, significantly contributes to strategic design collaboration and competitive positioning. Thus, the study proposes the following hypothesis:

H1. CI is positively influencing strategic design collaboration.

Furthermore, the ability and willingness of individuals to process the provided amount of information and to actively participate along the entire strategy process are important factors for its success and should not be taken for granted (Whittington, 2019). It has been documented in many studies various benefits of using stakeholders' inclusiveness approach to strategizing, such as introducing new business models, leveraging customers' knowledge for strategy formation, increasing innovation and creativity, better approval of strategy and better FP (Morton *et al.*, 2020; Splitter *et al.*, 2023). Doeleman *et al.* (2022) assert that dynamic practices that enable more strategic openness and inclusion for internal and external actors facilitate the required strategic flexibility and are positively associated with organizational performance. Similarly, Stjerne *et al.* (2022) argued that transparency (sharing of information about organization's strategy) and inclusiveness (broader involvement of stakeholders) in the strategy process improve commitment and understanding in strategy implementation, and in turn, directly impact the overall firm's performance and competitiveness. Further, Grewatsch *et al.* (2023) highlight the significance of developing knowledge and coordinating actions across organizational disciplines to unlock potential strategic opportunities and provide new understandings of FP based on future long-term scenarios and collective outcomes. Based on these arguments, the following hypotheses, the effect of strategic design collaboration (SDC) (transparency and inclusiveness regarding strategic issues, among internal and external stakeholders) on SC and FP are examined through *H2* and *H3*:

H2. Strategic design collaboration is positively influencing sustainable competitiveness.

H3. Strategic design collaboration is positively influencing firm performance.

3.2 Competitive intelligence, sustainable competitiveness and firm performance

Strategic literature emphasizes the importance for organizations to continuously scan the environment to adapt to changing customer needs for competitiveness and survival (Aaker and Moorman, 2023). This explains why collecting CI is increasingly relevant for businesses to generate actionable insights about the firm and its external environment, and help in making market-related decisions (Cavallo *et al.*, 2021). Numerous scholars highlighted that CI associates positively with enhancing the firm's SC (Kamble and Gunasekaran, 2020; Kumar *et al.*, 2022), through optimizing business processes, boosting innovation (Cadden *et al.*, 2023), increasing product quality competitiveness (Liu *et al.*, 2021), reducing costs and enhancing operational efficiency (Dubey *et al.*, 2021). Moreover, CI increases organizational flexibility to meet evolving customer demands (Dubey *et al.*, 2021; Kazemi *et al.*, 2024).

On a similar note, further studies support the benefits of a formal, systematic CI process on organizational performance and decision-making (Köseoglu *et al.*, 2019; Markovich *et al.*, 2019; Côte-Real *et al.*, 2020). Chen and Lin (2021) asserted that organizations' capabilities for sensing and transforming collected data into actionable insights are strongly associated with FP. Similarly, Marjanovic (2022) demonstrated that knowledge-intensive firms experience faster growth in sales and market performance. This aligns with market orientation studies that link extensive MI collection and dissemination to improved sales, profitability, market share, new product success, customer satisfaction and return on assets, in contrast to firms less attuned to MI (Chinyavada and Sewdass, 2023; Vugec *et al.*, 2020). These findings inform the following hypotheses:

- H4.* CI is positively influencing sustainable competitiveness.
H5. CI is positively influencing firm performance.

3.3 Mediating role of strategic design collaboration

Based on *H1*, *H2*, *H3*, *H4* and *H5*, this study suggests that SDC mediates the relationship between CI process and a firm's SC and performance. This hypothesis is based on the argument that CI process strongly facilitates the inflows and outflows of actionable insights from and about the firm's external environments for identifying opportunities and preempting threats, thereby contribute to support the collaborative efforts of sharing and using actionable intelligence in strategizing, among internal and external stakeholders, which, in turn, leads to improvements in organizational flexibility, innovative competency, customer satisfaction, sales and profitability, market share and overall FP. Therefore, the following hypotheses are proposed:

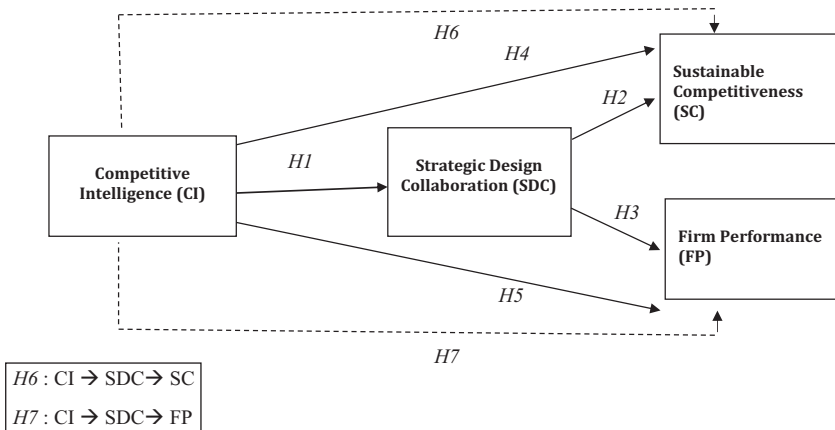
- H6.* CI positively influence sustainable competitiveness through the mediating effect of strategic design collaboration.
H7. CI positively influence firm performance through the mediating effect of strategic design collaboration.

Figure 1 illustrates the research model for this study.

4. Research method

4.1 Survey and sampling

The study focused on Egypt's licensed pharmaceutical manufacturers of human medications, categorized into public, local private and multinational corporations (MNCs) sectors. This segmentation arises from the industry's heavy reliance on information as a strategic asset and its competitive landscape, where CI is vital for agility in a demanding market. The pharmaceutical industry is rich in data, drawing from a variety of sources within the



Source: Developed by authors

Figure 1. Research model

corporation's ecosystem, such as physicians, pharmacists, hospitals, health organizations, government bodies, suppliers, competitors and patients (Chen *et al.*, 2012). Consequently, CI has proven beneficial to pharmaceutical companies in several ways, including facilitating accurate decision-making based on current information and uncovering future consumption patterns (Bragazzi *et al.*, 2020). Furthermore, the pharmaceutical industry is subject to stringent regulations. CI enables companies to stay informed about regulatory changes and anticipate the effects of new regulations. This capability allows for proactive adjustments in business strategies and compliance measures, ensuring smooth operations and avoiding costly regulatory setbacks.

Egypt stands as the largest producer and consumer of pharmaceuticals in the Middle East and Africa. It is currently the second-largest pharmaceutical market, following Saudi Arabia, with a market value of Egyptian Pound 64 billion, equivalent to approximately US\$4bn (BMI Egypt, 2019). However, the industry faces significant challenges, such as the floating Egyptian currency, foreign currency shortages, the drug pricing system, import barriers and high tariffs (Hassanin and Hamada, 2022). Therefore, it is crucial for local companies to navigate these challenges with improved information, enabling them to withstand the constant innovations of their competitors (Dragone *et al.*, 2020). The licensed pharmaceutical manufacturers under the Egyptian Ministry of Health encompass a diverse range of manufacturing areas, including human drugs, veterinary drugs, cosmetics and medical solutions for hospitals. Each sector has different strategies according to the different product nature and customers. Initial data on company names, contacts and addresses were sourced from various databases and references, including the Ministry of Health, the Chamber of Pharmaceutical, Cosmetics and Appliances, Kompass Egypt and IMS HEALTH® Market Research and Reports Repository-Egypt reports. After excluding firms related to veterinary, cosmetics and medical solutions, a final list of 90 companies manufacturing human medication was established as the sample frame. Consequently, 540 questionnaires were sent to 90 pharmaceutical companies, an average of six questionnaires per company. A total of 179 questionnaires were returned across 34 companies: 11 public, 18 private and five MNCs. Of these, 37 questionnaires are insufficiently complete, yielding 142 questionnaires completed by senior managers and used for further analysis, with a response rate of 33%.

4.2 Measurements

The study used scales from prior research, CI as a first construct was defined as per Calof *et al.* (2020) as a systematic process that includes planning, collecting, analyzing and disseminating information relevant to a company's competitive environment. CI was measured based on Hassani and Mosconi (2022) scale, consisted of 14 items covering planning, collection, analysis and dissemination. SDC, conceptualized by Whittington (2019), measured the degree of costrategizing with stakeholders on strategic issues, using ten items to assess two dimensions: strategic transparency and inclusiveness among firms' internal and external key stakeholders (Whittington, 2019; Hautz *et al.*, 2017). SC, defined by Falciola *et al.* (2020) as an organization's ability to maintain a superior market position relative to competitors. SC was measured based on Chikán *et al.* (2022) scale, included 14 items covering quality, convenience, cost, flexibility and innovation. Finally, FP was assessed through Markovich *et al.* (2019) scale, focusing on market-oriented outcomes and financial metrics like market share, growth rate, total sales and net profit, to determine how well firms meet their strategic and financial goals. The instrument of this study is divided into three sections: company details, respondent details and the research variables, including the independent variable (CI), the dependent variables (SC and FP) and the mediating variable (SDC). The Likert scale (1–10) is used to operationalize the constructs where (1) signifies

“strongly disagree” and (10) signifies “strongly agree.” A pilot panel of ten senior managers and academicians is adopted to validate the constructs’ structure and relevancy to the pharmaceutical industry. The panel suggested some minor changes to ensure that the constructs are well-structured, clearly stated and translated into two languages, Arabic and English.

5. Results

5.1 Characteristics of sampled firms and respondents

Among the participating pharmaceutical companies, 32% were from the public sector, 53% were from the private sector and 15% were from the MNCs. Moreover, 21% of firms were founded between 1930 and 1960, 32% were founded between 1961 and 1990 and 47% were founded between 1991 and 2020. In addition, 24% of firms had less than 500 employees, 30% had 500–1,000 employees, 38% had 1,001–5,000 employees and 8% had 5,001–10,000 employees. Out of 142 respondents, 24% were female and, 76% were male. Concerning respondents’ managerial positions, 17% were executive managers, 63% were senior managers and 20% were middle managers. The summary statistics of the firms and participants are shown in Table 2.

5.1.1 Differences in the means of research model variables. This study used Games-Howell tests to conduct multiple comparisons of the mean differences in research variables across three sectors: public, private and MNCs. Table 3 shows that MNCs have higher scores in all research variables. This finding illustrates that MNCs place significantly greater emphasis on CI than their private and public counterparts, attributing equal importance to all

Table 2. Characteristics of sampled firms and respondents

Demographic profiles	Frequency	%
<i>Pharmaceutical companies sector</i>		
Public sector	11	32
Private sector	18	53
MNCs	5	15
<i>Foundation year</i>		
1930–1960	7	21
1961–1990	11	32
1991–2020	16	47
<i>Number of employees</i>		
Less than 500	8	24
500–1,000	10	30
1,001–5,000	13	38
5,001–10,000	3	8
<i>Respondents’ gender</i>		
Female	34	24
Male	108	76
<i>Respondents’ positions</i>		
Executive managers	24	17
Senior managers	89	63
Middle manager	29	20

Source: Developed by authors

Table 3. Differences in the means of research variables among three sectors

Construct	Mean and SD				Mean difference and significant		
	Public sector	Private sector	MNCs sector	Total	Public–private	Public– MNCs	Private– MNCs
CI	4.18 (1.40)	5.53 (1.30)	7.20 (1.18)	5.33	–1.35*	–3.02*	–1.67*
SDC	4.48 (2.15)	6.60 (1.51)	7.72 (1.02)	6.03	–2.12*	–3.24*	–1.12*
CS	5.44 (1.92)	7.73 (1.20)	8.06 (0.96)	6.96	–2.28*	–2.62*	–0.34
FP	4.73 (2.41)	7.47 (1.51)	8.26 (1.17)	6.62	–2.75*	–3.53*	–0.79*

Note: *The mean difference is significant at the 0.05 level

Source: Developed by authors

types of external information due to its crucial role in shaping strategic growth and development in a developing economy. For instance, economic and political information is particularly important for MNCs as it influences their decisions regarding patients’ purchasing power, product portfolios, pricing strategies, health insurance systems and government health-care spending. The public sector’s nonprofit nature may reduce their managers’ focus on tracking marketplace changes and trends, leading the MNCs and private sectors to produce better results in this measure. Moreover, [Table 3](#) illustrates how MNCs, followed by the private sector, emphasize the value of strategic collaborative efforts among key stakeholders in developing competitive marketing strategies that positively contribute to SC and FP. As competitive business entities, MNCs maintain a vigilant stance toward the business environment and emerging trends, actively seeking opportunities while remaining cognizant of potential future threats.

5.2 Reliability and validity analysis

The results in [Table 4](#) show that Cronbach’s alpha values as well as the composite reliability values exceeded the recommended 0.7 threshold, for all the variables ([Hair et al., 2022](#)). Similarly, the average variance extracted of the constructs was greater than the 0.5 criteria, confirming convergent validity as per [Hair et al. \(2022\)](#). The factor loading for all the items was also above 0.50, further confirming the convergent validity (see [Appendix](#)).

5.3 Regression analysis

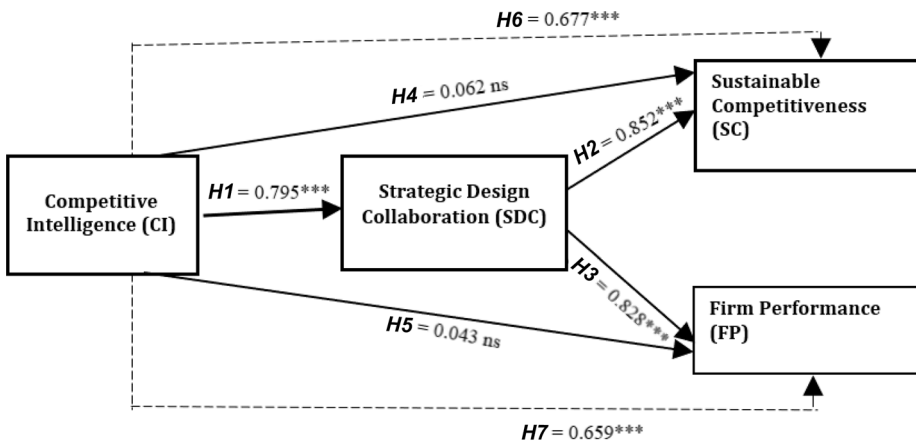
This study used analysis of moment structures path analysis to construct a measurement model and tested all the proposed hypotheses. To determine the mediation effects, this study follows similar studies ([Ibrahim et al., 2023](#)) adopting [Bollen and Stine’s \(1990\)](#) mediation analysis. The mediation effect builds on the process by which the independent variable (CI) influences the two dependent variables (SC) and (FP), which is twofold: the direct effect on the two dependent variables (SC, FP) and the indirect effect on both variables through the mediator variable (SDC).

Following Tezuka’s approach (2023), this paper initially examined the direct effects between research constructs and subsequently explored the indirect relationship, as shown in [Figure 2](#). The overall model fit measures were used to evaluate the fit of the structural model. The results illustrate that the fit indices indicate satisfactory model fit for the proposed path analysis model: probability $p < 0.001$, ratio of chi-square to degree of freedom = 2.010, goodness of fit index = 0.872, AGFI = 0.817, normed fit index = 0.920, comparative fit index = 0.958, relative fit index = 0.901 and root mean square error of approximation = 0.085 and SRMR = 0.0518 ([Hair et al., 2022](#)).

Table 4. Construct reliability and validity

Variable	No. of items	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
<i>CI: Competitive intelligence</i>				
Planning	3	0.778	0.775	0.730
Collection	3	0.734	0.760	0.712
Analysis	3	0.706	0.701	0.659
Dissemination	5	0.810	0.738	0.619
<i>SDC: Strategic design collaboration</i>				
Transparency	4	0.890	0.885	0.810
Inclusiveness	6	0.864	0.861	0.710
<i>SC: Sustainable competitiveness</i>				
Quality	5	0.847	0.842	0.716
Convenience	2	0.718	0.700	0.733
Cost	2	0.734	0.701	0.735
Flexibility	3	0.857	0.782	0.738
Innovation	2	0.861	0.742	0.768
<i>FP: Firm performance</i>	4	0.937	0.935	0.883

Source: Developed by authors



Source: Developed by authors

Figure 2. Path diagram analysis

5.4 Direct relationship analysis

In testing $H1$, the results show that CI is positively associated with SDC ($\beta = 0.795$, p -value = 0.001 $\rightarrow$ highly significant). For $H2$ and $H3$, SDC is positively associated with SC ($\beta = 0.852$, p -value = 0.001 $\rightarrow$ highly significant) and positively associated with FP ($\beta = 0.828$, p -value = 0.001 $\rightarrow$ highly significant). Hence, the results of the direct hypothesized relations support the effectiveness and efficiency of the CI processes starting from the planning,

collection, analysis and dissemination of intelligence among decision-makers and how it positively contributes to the internal and external collaborative efforts in developing strategic competitive marketing strategies (see Table 5).

In testing *H4* and *H5*, the results found that CI is not directly associated with SC and FP, while the SDC has a positive and significant impact on both. Such results lead to the importance of testing the CI-SC and CI-FP relationships through the mediating role of SDC. This also can justify that CI process facilitates the flow of knowledge, both inbound and outbound, to yield intelligence for identifying opportunities and pre-empting threats. However, the agility and speed of proactive response to environmental dynamics, requires sharing and using the created intelligence through effective collaborative strategic efforts and developing competitive strategies which, in turn, leads to improvements in operational efficiency, innovative competency, organizational flexibility and overall FP and SC.

Further, a multiple regression analysis was conducted to check the research model direct path coefficients across three sectors: public, private and MNCs, presented in Table 6. Results of the public sector confirm that CI has a positive and significant impact ($\beta = 0.753$, p -value = 0.001) on SDC. It also confirms that SDC has a positive and significant impact ($\beta = 0.966$, p -value = 0.001, $\beta = 0.82$, p -value = 0.001) on both SC and FP. Similarly, the results of the private sector show that CI has a positive and significant impact ($\beta = 0.651$, p -value = 0.001) on SDC. It also confirms that SDC has a positive and significant impact ($\beta = 0.895$, p -value = 0.001, $\beta = 0.990$, p -value = 0.001) on both SC and FP. Further, the results of MNCs show that CI has a positive and significant impact ($\beta = 0.472$, p -value = 0.05) on SDC. It also

Table 5. Result of research model direct path coefficient

Hypothesis	Path	Regression coefficient (direct effect)	Significance level (p -value)	Results
<i>H1</i>	CI $\rightarrow$ SDC	0.795***	<0.001	Supported
<i>H2</i>	SDC $\rightarrow$ SC	0.852***	<0.001	Supported
<i>H3</i>	SDC $\rightarrow$ FP	0.828***	<0.001	Supported
<i>H4</i>	CI $\rightarrow$ SC	0.062 ns	0.531	Unsupported
<i>H5</i>	CI $\rightarrow$ FP	0.043 ns	0.669	Unsupported

Notes: ***= $p < 0.001$; **= $p < 0.005$; *= $p < 0.05$ at a significant level of 95%; ns = not significant

Source: Developed by authors

Table 6. Result of multiple regression analysis across three sectors

Hypothesis	Path	Public sector <i>Regression (p-value)</i>	Private sector <i>Regression (p-value)</i>	MNCs <i>Regression (p-value)</i>
<i>H1</i>	CI $\rightarrow$ SDC	0.753***	0.651***	0.472*
<i>H2</i>	SDC $\rightarrow$ SC	0.966***	0.895***	0.969***
<i>H3</i>	SDC $\rightarrow$ FP	0.82***	0.990***	0.911***
<i>H4</i>	CI $\rightarrow$ SC	-0.056 ns	-0.108 ns	-0.229 ns
<i>H5</i>	CI $\rightarrow$ FP	-0.025 ns	-0.292 ns	-0.177 ns

Notes: ***= $p < 0.001$; **= $p < 0.005$; *= $p < 0.05$ at a significant level of 95%; ns = not significant

Source: Developed by authors

confirms that SDC has a positive and significant impact ($\beta = 0.969$, p -value = 0.001, $\beta = 0.911$, p -value = 0.001) on both SC and FP. Therefore, we conclude that overall CI processes empower decision-makers through disseminating important intelligence in real-time to all relevant stakeholders, and positively contribute to internal and external strategic collaborative efforts.

Comparably, in testing *H4* and *H5* across three sectors, the results aligned with the research model's main findings and confirm that CI is not directly associated with SC and FP, while SDC is positive and significant for both, as presented in Table 6. This also confirms the justification that CI process significantly enhances the flow of actionable intelligence, aiding in the assessment of current decisions and the formulation of proactive strategies. However, once intelligence is created, it is important to be disseminated in real time to all relevant stakeholders for decision-making purposes, since the value of intelligence decreases over time. Moreover, it highlights the crucial role of strategic collaborative efforts in sharing MI and developing competitive and proactive strategies. Based on the above discussion, the subsequent section focused on testing the mediating role of SDC to enhance our comprehension of this complex relationship.

5.6 Indirect relationship analysis

The second part of the analysis examined the indirect relationship of the CI process with both variables SC and FP through SDC. The indirect effect for the research *H6* and *H7* was examined using a bootstrapping estimation approach and the results indicated that indirect coefficients are significant. As shown in Table 7, CI is indirectly positively associated with SC through SDC ($\beta = 0.677$, p -value = 0.001 $\rightarrow$ highly significant). This shows that the CI about the firm and its external environment empowers the collaborative efforts of decision-makers in designing competitive strategies that place the organization at a competitive advantage in the marketplace by having a distinct point of differentiation. The study found also support for *H7*, CI is indirectly positively associated with FP through SDC ($\beta = 0.659$, p -value = 0.001 $\rightarrow$ highly significant). This shows the important role of CI in supporting the inflows and outflows of knowledge in the form of actionable intelligence about the internal and external environment, which, in turn, facilitates designing competitiveness and proactive strategies.

5.7 The mediator effect

The mediation analysis showed that SDC mediates the relationship between CI and both SC and FP. Initially, the direct relationship between CI and SC was not statistically significant. However, when examined through SDC as a mediator, the indirect effects were highly significant, indicating full mediation (Bollen and Stine, 1990). Similarly, the indirect relationship between CI and FP is fully mediated by SDC, as the direct link between these

Table 7. Result of research model indirect path coefficient

Hypothesis	Path	Regression coefficient (indirect effect)	Significance level (p -value)	Results
<i>H6</i>	CI $\rightarrow$ SDC $\rightarrow$ SC	0.677***	<0.001	Supported full mediation
<i>H7</i>	CI $\rightarrow$ SDC $\rightarrow$ FP	0.659***	<0.001	Supported full mediation

Notes: ***= $p < 0.001$; **= $p < 0.005$; *= $p < 0.05$; at a significant level of 95%
Source: Developed by authors

variables is also statistically insignificant. This sheds light on the significant and mediating role of SDC in explaining CI- SC and CI- FP relationships. Thus, the transparency and inclusiveness of sharing and using “quality” intelligence in strategizing are crucial to improve commitment and understanding in strategy implementation, which, in turn, leads to improvements in product quality, operational efficiency, innovative competency, organizational agility and overall firm’s performance.

6. Discussion and implications

The research objectives of this study were motivated by the limited empirical studies investigating the relationship of organizational CI toward firms’ SC and FP. As highlighted in the introduction of this study, most of the literature addressing this issue has been either anecdotal and/or case-based research (Edgar and Albright, 2023; Kumar *et al.*, 2020). With little “empirical work linking the impact of a firm’s CI activities on sustainable competitiveness and firm’s performance” (Markovich *et al.*, 2019; Vugec *et al.*, 2020) in existing research, this study in a very particular setting provides a substantial contribution, although not in an exhaustive manner, to this knowledge gap. To fill these gaps in the literature, this study empirically investigated whether CI activities have any impact on the SC and performance of firms in the context of a developing country. In addition, this study also examined the mediation impact of SDC. Furthermore, it answers the question of how do the components of CI contribute to SC and FP? To this end, a survey was administered to examine the proposed relationship. The findings confirmed significant and positive impact of the implementation of CI activities on the strategic collaborative efforts in developing strategic competitive strategies as well as the mediation effect of SDC between CI process and firms’ SC and performance. The findings of the study contribute to both theory and practice in multiple ways.

6.1 Theoretical implications

First, this study is a pioneer to empirically examine how the various components of CI generate direct as well as indirect effects toward firms’ SC and performance. While many previous studies often used a summated or a general CI construct and directly linked CI to SC or FP (Köseoglu *et al.*, 2019; Vugec *et al.*, 2020; Markovich *et al.*, 2023) without taking SDC into consideration, this study introduces the mediation effects of SDC into the relationship.

The empirical findings revealed that, a firm’s strategic collaborative efforts strongly mediate the relationship of CI and SC and FP. Hence, the CI process positively contributes to the collaborative internal and external efforts within the organization in developing competitive strategies that affect the firm’s SC and performance. This discovery also highlights the increasing relevance of CI practices for companies in the networked and digital world (Qian *et al.*, 2023) where precise and important intelligence needs to be disseminated in real time to all relevant stakeholders for decision-making purposes. Firms that focus solely on internal CI practices risk overlooking market trends and needs, potentially leading to negative impact on the company. Furthermore, the findings confirm and support previous studies that there are no significant deviations with regard to the CI process known as the “intelligence cycle” (Van den Berg *et al.*, 2020; Hakmaoui *et al.*, 2022). Whether companies adopted an informal or formal CI structure, the procedures that emerge follow the CI cycle process (Hassani and Mosconi, 2022) as proposed in the research framework.

6.2 Managerial implications

The pharmaceutical industry is one of the world's fastest and strategically growing industries; it also has a greater impact on the Egyptian national economy. Different managerial implications and recommendations could be derived from the research findings, guiding senior managers through the process of integrating CI into the strategy design framework. First, the study underscores the significant and mediating role of promoting strategic design collaboration and open planning discussions across departmental lines as a way to foster a unified approach to strategic challenges, increasing alignment and reducing inefficiencies. Therefore, pharmaceutical companies' senior managers should prioritize shared mental representations, collaboration and commonly agreed interpretations across an organization's different managerial levels and business functions. Moreover, strategic external collaborations with stakeholders such as customers, distributors, suppliers and governmental bodies are essential for maintaining organizational agility and responding promptly to market changes. These collaborative efforts among internal and external stakeholders enhance the organization's capability to adapt strategies quickly to evolving external conditions, thereby sustaining its competitive edge. Hence, pharmaceutical public companies' leaders should give priority to simplifying the organization's hierarchical and centralized structure to reinforce cross-functional integration and open discussion among firms' internal and external key stakeholders toward more transparency and inclusiveness.

Second, for both public and private companies' senior managers, strategic and tactics-oriented CI should be adopted to strategically monitor market dynamics and competitor actions, allowing for agile adjustments in marketing and strategic responses. MNCs are noted for their proactive approach in tracking marketplace changes and trends. Reflecting on the comparative CI activities among the sectors studied, it is recommended that firms allocate sufficient resources to CI processes and infrastructure to maintain competitiveness, mirroring MNC practices. This includes providing adequate support for personnel involved in CI tasks, and ensuring that the intelligence gathered is effectively used where it can generate significant value.

Third, in the intelligence planning and collection phases, it is vital for companies in the three sectors to identify the most beneficial external sources for their managers and executives, ensuring that these resources are shared internally to inform decision-making. For instance, the pharmaceutical companies are subject to stringent regulations, so it is important to stay informed about regulatory changes and anticipate the effects of new regulations. Further, pharmaceutical companies' senior managers should give attention to both technological tools and human aspects throughout the intelligence process. Technology facilitates information collection, storing, analyzing and sharing, but it is the interest and engagement of the employees that determine the actual usage and dissemination of intelligence. Thus, it is significant to train existing and newly hired employees on CI practices and develop a reward system to motivate and encourage them to implement CI practices.

Finally, public and private companies' senior managers should advocate for developing an organizational culture where planning, collecting and analyzing CI is routine and disseminating important intelligence in real-time to all relevant stakeholders for decision-making purposes, particularly exemplified by MNCs that have embedded CI into their strategic processes. Given CI's potential to drive superior market performance, its implementation is crucial for enhancing marketplace efficiency, especially in dynamic and competitive environments typical of developing economies.

7. Limitations and future research directions

The discussion of limitations is indispensable for the future appropriate use of research findings. Initially, as this study mainly focused on the pharmaceutical industry, there may be

an issue of generalizability. Hence, the study would be able to increase the generalization of its data if it is replicated in other sectors. In addition, further in-depth or complementary particularization are obvious area for future research. This could be done, for example, by researching in-depth in the same area all constructs in a longitudinal manner. Future studies could also explore the decision-making process of managers and executives to better understand at what stage they actually use CI when making strategic and operational decisions. This will help CI teams to ensure they provide timely CI that supports decision-making.

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Further reading

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Appendix

Table A1. Construct and items: Reliability and validity results

Scale	Items	Factor loading SRW	Reliability (α)	Convergent validity	
				CR	AVE
<i>Competitive intelligence (CI)</i>					
Planning			0.778	0.775	0.730
	CIPF1	0.655			
	CIPF2	0.747			
Collection	CIPF3	0.787			
			0.734	0.760	0.712
	CICF1	0.615			
Analysis	CICF2	0.870			
	CICF3	0.652			
			0.706	0.701	0.659
Dissemination	CIAF1	0.548			
	CIAF2	0.627			
	CIAF3	0.802			
			0.810	0.738	0.619
	CIDF1	0.577			
	CIDF2	0.591			
	CIDF3	0.543			
	CIDF4	0.715			
	CIDF5	0.667			
<i>Strategic design collaboration (SDC)</i>					
Transparency			0.890	0.885	0.810
	SDTF1	0.878			
	SDTF2	0.830			
	SDTF3	0.813			
Inclusiveness	SDTF4	0.717			
			0.864	0.861	0.710
	SDIF1	0.816			
	SDIF2	0.827			
	SDIF3	0.653			
	SDIF4	0.694			
	SDIF5	0.694			
SDIF6	0.574				
<i>Sustainable competitiveness (SC)</i>					
Quality			0.847	0.842	0.716
	SCQF1	0.616			
	SCQF2	0.757			
	SCQF3	0.622			
	SCQF4	0.789			
Convenience	SCQF5	0.794			
			0.718	0.700	0.733
	SCCF1	0.739			
	SCCF2	0.727			
<i>(continued)</i>					

Table A1. Continued

Scale	Items	Factor loading SRW	Reliability (α)	Convergent validity	
				CR	AVE
Cost	SCOF1	0.722	0.734	0.701	0.735
	SCOF2	0.747			
Flexibility	SCFF1	0.760	0.857	0.782	0.738
	SCFF2	0.722			
	SCFF3	0.731			
	SCIF1	0.794			
Innovation	SCIF2	0.741	0.861	0.742	0.768
	SCIF2	0.741			
Firm performance (FP)	FPF1	0.937	0.937	0.935	0.883
	FPF2	0.951			
	FPF3	0.817			
	FPF4	0.828			
	FPF4	0.828			

Source: Developed by authors

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