

THE IMPACT OF ENVIRONMENTAL TURBULENCE ON CONSTRUCTION ENTERPRISE PERFORMANCE: UNVEILING THE SYSTEMIC RESPONSE MECHANISMS

Jiangwei LUO, Mohd Wira Mohd SHAFIEI[✉], Radzi ISMAIL

School of Housing, Building and Planning, Universiti Sains Malaysia, Gelugor 11800, Malaysia

Article History:

- received 25 June 2025
- accepted 11 December 2025

Abstract. This study addresses the overlooked dynamic interaction between strategic agility and absorptive capacity in turbulent environments, particularly within project-based enterprises where knowledge flows are fragmented. By constructing an integrative framework, it examines how strategic agility influences enterprise performance via absorptive capacity under varying environmental turbulence levels. Using data from 198 Chinese construction industry practitioners and PLS-SEM analysis, results reveal that strategic agility dominates enterprise responses, with absorptive capacity mediating this effect. Notably, in high turbulence, the mediation path buffers the negative impact. The study advances organizational adaptability theory and offers guidance for capability development in turbulent contexts.

Keywords: mechanism, new theoretical framework, environmental turbulence, potential absorptive capacity, strategic agility, firm performance.

[✉]Corresponding author. E-mail: wira@usm.my

1. Introduction

China's construction sector is currently undergoing significant challenges driven by technological disruption, regulatory shifts, and intensified market competition, creating an urgent need for capability renewal and organizational transformation. Similar patterns have been observed across industries globally, where firms increasingly rely on external knowledge and adaptive capabilities to survive in dynamic environments (Tallon et al., 2018; Haider & Kayani, 2020). Prior research highlights that absorptive capacity (AC) – the ability to acquire, assimilate, transform, and exploit external knowledge – is vital for sustaining competitiveness and improving performance (Adams & Lamont, 2003; Darroch, 2005). Building on absorptive capacity theory, recent studies further distinguish between potential AC (acquisition and assimilation) and realized AC (transformation and exploitation) (Albort-Morant et al., 2018; Lyu et al., 2022; Mata et al., 2023).

At the same time, organizations increasingly operate in turbulent environments characterized by rapid technological change, shifting institutional conditions, and volatile market demand (Galvin et al., 2020; Mata et al., 2023). Under such conditions, strategic agility – the ability to sense, interpret, and rapidly respond to change – emerges as a critical dynamic capability (Kumkale, 2016). Exist-

ing studies primarily examine how strategic agility enhances performance (Sambamurthy et al., 2003). Meanwhile, absorptive capacity research has long followed the dominant assumption that AC enables strategic agility. Classical frameworks (Cohen & Levinthal, 1990; Zahra & George, 2002) and recent empirical studies (Kale et al., 2019; Mata et al., 2023) consistently argue that learning capabilities precede organizational responsiveness.

However, based on the current literature, few studies have examined the reverse causal pathway, namely, whether strategic agility functions as an antecedent capability that influences both potential and realized absorptive capacity. This represents a significant theoretical gap, as agility may directly affect how organizations search for, internalize, transform, and apply external knowledge, particularly in turbulent environments, yet this mechanism remains largely unexplored. Moreover, although the dual-dimensional structure of AC has gained increasing recognition, recent research calls for a deeper investigation into how external strategic capabilities, such as agility, differentially affect potential and realized AC (Mejeed et al., 2025). To date, no empirical study has distinguished these differential effects. Environmental turbulence, including technological, market, and regulatory volatility, has also

been recognized as a critical factor shaping capability–performance relationships (Arici & Gok, 2023). However, its moderating role in the strategic agility → AC → performance pathway remains conceptually fragmented and empirically underexplored, particularly in highly volatile industries such as China’s construction sector (Li et al., 2025).

Accordingly, this study addresses three unresolved theoretical gaps:

- (1) Reversing the traditional direction of absorptive capacity theory by investigating how strategic agility drives both potential and realized AC.
- (2) Extending the dual-dimensional view of AC by examining how strategic agility differentially shapes potential (acquisition/assimilation) and realized (transformation/exploitation) AC and how these processes influence firm performance.
- (3) Integrating environmental turbulence as a multi-level contingency, explaining how turbulence conditions shape the agility–AC–performance pathway in complex and dynamic industry settings.

On this basis, the study investigates the following research questions:

- RQ1:** How does strategic agility influence potential absorptive capacity and realized absorptive capacity in organizations operating under environmental turbulence?
- RQ2:** How do potential and realized absorptive capacities mediate the relationship between strategic agility and firm performance in China’s construction industry?
- RQ3:** To what extent does environmental turbulence moderate the effects of strategic agility on absorptive capacity and, subsequently, on organizational performance?
- RQ4:** How does the proposed reverse-direction dynamic capability framework (strategic agility → absorptive capacity → performance) extend existing absorptive capacity theory?

To empirically examine these questions, China provides an ideal context. As a rapidly developing economy, China hosts numerous firms undergoing technological upgrading and capability renewal, offering sufficient variation to rigorously test the proposed framework. In particular, the construction industry – one of China’s most mature yet highly complex sectors – faces intense turbulence, making it a suitable setting for exploring how strategic agility enables knowledge acquisition, internalization, transformation, and exploitation. Overall, this study advances dynamic capability theory by proposing and validating a reverse-direction framework in which strategic agility functions as an antecedent capability enabling firms’ knowledge absorption and capability renewal under environmental turbulence. The findings contribute to a richer understanding of how organizations sustain competitiveness in rapidly changing environments and offer actionable guidance for industries navigating technological and institutional transformation.

2. Literature review

2.1. Theoretical basis

This study is grounded in business ecosystem theory, viewing firms as ecosystem units embedded in highly interdependent and dynamically competitive environments. In this context, a firm’s core competitiveness derives not only from internal resources but also from dynamic capabilities (Teece et al., 1997; Teece, 2007) and absorptive capacity (Cohen & Levinthal, 1990; Zahra & George, 2002) for acquiring, transforming, and utilizing external knowledge. Strategic agility, as an organizational meta-capability (Doz & Kosonen, 2010), works synergistically with absorptive capacity, enabling firms to rapidly sense environmental changes, optimize resource allocation, and reconfigure capabilities to achieve innovation and performance enhancement. Specifically, this study introduces environmental turbulence as a critical external stimulus, highlighting that in highly uncertain and rapidly changing environments, firms must leverage the synergy between absorptive capacity and strategic agility to enhance their adaptive capability within the ecosystem, thereby sustaining competitive advantage and long-term development. Furthermore, this study incorporates organizational ambidexterity theory (March, 1991; Andriopoulos & Lewis, 2009, 2010) to explore how firms balance the exploration of new opportunities with the exploitation of existing capabilities, integrating short-term responsiveness with long-term capability accumulation. Unlike prior research that primarily focuses on either absorptive capacity or strategic agility, this study emphasizes their synergistic mechanisms under conditions of environmental turbulence and their performance pathways within the ecosystem, providing a novel theoretical explanation for capability linkage mechanisms in firms.

2.2. The business ecosystem context

Uncertainty, complex environments, and rapid technological change drive companies to integrate into “business ecosystems” (Adner et al., 2013; Moore, 1993). The term was first proposed by Moore (1993), who borrowed the concept of biological ecosystems and believed that business ecosystems are also composed of “a large number of loosely interconnected participants who rely on each other, work together, and coexist” (Iansiti & Levien, 2004, p. 8). If business ecosystems can operate effectively, they will have the ability to create comprehensive solutions that no single company can achieve alone (Adner, 2006; Fuller et al., 2019). Although academics and practitioners have shown great interest in business ecosystems in recent years, understanding their operating mechanisms is still relatively limited, especially when ecosystem members must simultaneously deal with the dual relationship of cooperation and competition. This knowledge gap is more significant (Hannah & Eisenhardt, 2018). In a business ecosystem, corporate members “promote new product development, meet customer needs, and participate in the next round of innovation cycles through cooperation and com-

petition" (Moore, 1993, p. 76). In other words, ecosystems essentially integrate the two dimensions of collaboration and competition. While members are interdependent and form a community of shared destiny, they also compete for the optimal allocation of resources and capabilities (Barile et al., 2016).

The structure of business ecosystems is completely different from the organizational structure of traditional enterprises (Rong et al., 2018), which also brings unprecedented management challenges (Riquelme-Medina et al., 2022). Ecosystem activities transcend the boundaries of a single enterprise but rely on the complementary products, services, and capabilities of members to develop together and create value together (Fuller et al., 2019), which inevitably contains a certain degree of competition mechanism (Riquelme-Medina et al., 2022). Based on this theoretical background, this paper regards the enterprise as a dynamic ecosystem unit in which there are both adverse induction factors brought about by environmental turbulence (i.e., the "competition" dimension) and cooperation mechanisms that promote optimal resource allocation and capability-sharing. The cooperation mechanism focused on in this paper is mainly reflected in the linkage between the two key dynamic capabilities of strategic agility and absorptive capacity. By exploring the interaction between the two in a turbulent environment, this paper aims to fill the current research gap on how internal resource capabilities of enterprises can synergistically adapt to ecosystem changes and further enrich the theoretical interpretation and empirical basis of business ecosystem theory at the level of capability linkage mechanism.

2.3. Absorptive capacity

Cohen and Levinthal (1990) first proposed and defined "absorptive capacity" to characterize the ability of enterprises to identify, absorb, and utilize external environmental information and evaluate it from three dimensions. Subsequently, Zahra and George (2002) defined absorptive capacity as "a series of organizational routines and processes by which enterprises acquire, absorb, transform, and utilize knowledge, thereby generating dynamic managerial capabilities". Lane et al. (2006) believed that absorptive capacity includes three learning processes: exploration, transformation, and utilization, emphasizing how enterprises can more effectively utilize external knowledge through these learning mechanisms. Flatten et al. (2011b) defined absorptive capacity as the ability of enterprises to identify the value of new knowledge, absorb new knowledge, and use it for business purposes, further refining the operational connotation of the concept. In their theoretical framework, Zahra and George (2002) divided absorptive capacity into two subsets, namely potential absorptive capacity (PAC) and realized absorptive capacity (RAC), corresponding to the four dimensions of acquisition, assimilation, transformation, and utilization, respectively. Among them, potential absorptive capacity focuses on acquiring and absorbing information, while realized ab-

sorptive capacity emphasizes that enterprises integrate the absorbed knowledge into the operating system to achieve knowledge transformation and practical application. This classification has been widely adopted and developed in subsequent studies (Jansen et al., 2005; Thérin, 2007; Fosfuri & Tribo, 2008; Camisón & Forés, 2010; Delmas et al., 2011; Flatten et al., 2011b; Ali et al., 2016; Ali & Park, 2016). Among them, Fosfuri and Tribo (2008) pointed out that "acquisition capability" refers to the ability of enterprises to identify, discover, and acquire external knowledge from the environment; Flatten et al. (2011b) further emphasized that absorptive capacity includes the ability to establish organizational procedures and routines for analyzing, evaluating and understanding external knowledge. Transformation capability involves creating or optimizing these procedures to facilitate the integration of existing knowledge and newly acquired information and its future application (Zahra & George, 2002), which includes the ability to adjust, adapt to new information and combine it with existing knowledge (Fosfuri & Tribo, 2008). In addition, Haro-Domínguez et al. (2007) defined "utilization capability" as the ability of enterprises to develop new products or services based on existing processes, skills, and technologies using transformed knowledge. This study focuses on the impact of absorptive capacity on the performance of Chinese construction companies, especially in a highly complex and dynamic environment. This paper adopts the binary structure of "potential absorptive capacity-actual absorptive capacity" to explore the path differences and synergy mechanisms between the two in terms of performance, trying to fill the theoretical and empirical gaps in existing research that "potential absorptive capacity has no significant impact on corporate performance".

2.4. Dynamic capabilities perspective and the absorptive nature of strategic agility and ambidexterity

The dynamic capability perspective believes that the competitive advantage of an enterprise comes from its ability to purposefully create, expand, or adjust its resource base "to respond to a rapidly changing external environment effectively" (Teece et al., 1997, p. 156). In a constantly changing market environment, dynamic capabilities are crucial for the adaptive development and competitive advantage of small and medium-sized enterprises in the B2B field (Teece, 2007). Organizations can rely on dynamic capabilities to continuously update existing capabilities, build new asset portfolios, and enhance their resilience through learning. Teece et al. (1997) pointed out that dynamic capabilities mainly include three core functions: perception, grasping, and reconstruction. Among them, perception refers to the ability of an enterprise to analyze data, understand the external environment, and identify opportunities; grasping capability refers to the ability of an organization to understand information and make strategic decisions, covering aspects such as the choice of business model and product design threats (Hodgkinson &

Healey, 2011). Reconstruction capability is reflected in the organization's coordination and integration of resources through process adjustment, capability reorganization, and system reconstruction to adapt to the changing market environment (Teece, 2007). This study regards absorptive capacity and strategic agility as long-term dynamic capabilities in the corporate ecosystem. The main reason is that these two capabilities not only have a regulatory role in responding to short-term changes but also show the core function of promoting the enterprise's long-term sustainable adaptability and performance improvement.

In traditional literature, strategic agility is closely related to dynamic capabilities and flexibility (Shams et al., 2021). Flexibility includes exploration and exploitation (March & Simon, 1958). The original concept focuses on identifying new knowledge (e.g., R&D) and exploiting new opportunities, aiming to achieve radical innovation. On the other hand, the second concept is mainly based on existing knowledge (Nonaka, 1994) and aims to promote incremental innovation (Tushman & O'Reilly, 1996). It can be seen that strategic agility is significantly related to absorptive capacity dimensions such as knowledge acquisition. For example, Doz and Kosonen (2010) proposed that strategic agility results from integrating various dynamic capabilities, such as resource mobility, strategic sensitivity, and leadership solidarity. Similarly, Ivory and Brooks (2018) proposed that strategic agility contains three main organizational meta-capability building blocks: strategic sensitivity, collective commitment, and resource mobility. To achieve this agility, organizations must "have a keen sense of emerging trends, be able to make bold decisions quickly, and know how to reconfigure business systems and redeploy resources" (Gurkov et al., 2017, p. 12). Teece (2007) argues that dynamic capabilities can be divided into three main components that enable organizations to remain competitive and achieve long-term survival based on technological advances and consumer demands: (a) "sensing" the unknown future by identifying major environmental changes; (b) "grasping" by making appropriate resource allocation decisions; and (c) "transforming" by continuously upgrading capabilities are the defining factors that make up these elements. To innovate business models, Hock et al. (2016) propose that the meta-capabilities of strategic agility (strategic sensitivity, collective commitment, and resource mobility) can be enhanced by "innovation-oriented cultural values". Furthermore, Gurkov et al. (2017) argue that agility is defined as a "dynamic capability". Teece et al. (1997) argue that dynamic capabilities provide firms with a unique framework to acquire, generate, and reorganize internal and external knowledge to adapt to adaptive changes in the external business environment. Dynamic capabilities are a set of key organizational and managerial capabilities, including knowledge management, that enable organizations to predict and influence their surroundings (Shams et al., 2021). This may indicate that knowledge management ca-

pabilities that embody dynamic capabilities (such as strategic agility) may possess absorptive properties.

On the other hand, "strategic agile processes require conflicting efforts and trade-offs between conventional processes and resource use for new business models" (Weber & Tarba, 2014, p. 8). Therefore, agile organizational structures establish the strategic necessity of "ambidexterity". However, performing both tasks simultaneously seems contradictory (Andriopoulos & Lewis, 2010; Vrontis et al., 2017). Therefore, organizations may need to adopt ambidexterity as a key capability to effectively balance and coordinate systems and resources with mutually exclusive (or distinct) goals and processes (Shams et al., 2021). Furthermore, ambidexterity is also a determinant of organizational success, and researchers have explicitly acknowledged the limitations of pursuing either exploration alone (risk of stagnant knowledge development) or exploitation alone (risk of knowledge obsolescence) (e.g., Chebbi et al., 2015). Therefore, a company's overall performance depends on its ability to pursue its goals and co-develop relevant dynamic capabilities simultaneously (Junni et al., 2015; Li & Huang, 2012). Raisch and Birkinshaw (2008) emphasize that creating a culture that values communication, coordination, collaboration, and creativity may be key for organizations to achieve ambidexterity.

2.5. Assumption establishment

2.5.1. Strategic agility and market turbulence

In the event of environmental turbulence, Chen (2012) suggested that organizations should engage the value chain in collective action to mitigate its impact, as research indicates. Consequently, enterprises with greater strategic agility are more likely to possess enhanced reconfigurability and market acumen (Anggraini & Sudhartio, 2019). This is because they will be able to more effectively adapt and respond to the swiftly changing environment compared to their competitors (Anggraini & Sudhartio, 2019). Because of the literature on strategic agility dimensions (strategic sensitivity, collective commitment, and resource liquidity), strategically agile companies can reconfigure their resources to more effectively adapt to the demands of emerging changes (Anggraini & Sudhartio, 2019). The strategic agility's dynamic capabilities will assist companies in recognizing and capitalizing on opportunities and threats as they arise (Kogut & Zander, 1992). Sambamurthy et al. (2003) have demonstrated that strategic agility has more advantageous consequences when environmental turbulence is elevated. When minimal environmental turbulence occurs, the converse will transpire: strategic agility will not generate additional value, as using existing capabilities will yield superior outcomes (Leonard-Barton, 1992). From the preceding discourse, the subsequent hypotheses are formulated:

H1: Market turbulence has a significant positive impact on strategic agility.

2.5.2. Strategic agility and absorptive capacity

Ambidexterity and dynamic capabilities are either central to strategic agility or are closely related to it, as evidenced by a greater body of literature (Shams et al., 2021). Ambidexterity is a valuable element in developing specific strategies to achieve strategic agility, as it enables the acquisition of flexibility and organizational agility (Shams et al., 2021). Ambidexterity mechanisms become a strategic imperative for agile organizational structures because “strategic agility processes necessitate conflicting efforts and trade-offs between the use of resources for routine processes and new business models” (Weber & Tarba, 2014, p. 8). Nevertheless, conducting both activities concurrently appears incongruous (Andriopoulos & Lewis, 2010; Vrontis et al., 2017). Raisch and Birkinshaw (2008) emphasized that establishing a culture that prioritizes communication, coordination, collaboration, and creativity may serve as a critical ambidextrous capability for organization agility. Consequently, the overall performance of a company is contingent upon its capacity to jointly pursue both directions and cultivate the requisite dynamic capabilities (Juni et al., 2015; Li & Huang, 2012). Ambidexterity may be critical for organizations to coordinate and balance systems and resources with mutually exclusive (or distinct) objectives and processes (Shams et al., 2021). In addition, it is a contributing factor to the success of companies, and researchers are cognizant of the constraints of pursuing exploration alone (at the risk of stagnant knowledge growth) or exploitation alone (at the risk of obsolescence) (e.g., Chebbi et al., 2015). Simultaneously, strategic agility is closely associated with dynamic capabilities and flexibility in the mainstream literature (Shams et al., 2021). Exploration and exploitation are the two actions that comprise flexibility (March & Simon, 1958). The first primarily focuses on exploiting new opportunities and discovering new knowledge (e.g., R&D), with the primary objective of accomplishing radical innovation. Conversely, the second is primarily founded on existing knowledge (Nonaka, 1994) and is designed to foster incremental innovation (Tushman & O’Reilly, 1996). Dynamic capabilities are a collection of critical organizational and managerial capabilities, such as knowledge management, that allow organizations to anticipate and influence the environment (Shams et al., 2021). According to Teece et al. (1997), dynamic capabilities offer explicit guidance on how enterprises acquire, generate, and reorganize internal and external knowledge to adapt to agile changes in the external business environment. In addition, Gurkov et al. (2017) maintain that agility is a dynamic capability. These literature reviews indicate that strategic agility and absorptive capacity are correlated. In conclusion, strategic agility benefits the theoretical relationship of absorptive capacity, as evidenced by the analysis of pertinent literature and the empirical research conducted by Dobrzykowski et al. (2015) and Kustiningsih et al. (2022). This also reflects the nature of strategic agility mediating environmental turbulence and absorptive capacity; as previously mentioned, ecological turbulence will

also affect strategic agility. The following hypotheses are formulated as a result of these discussions:

- H2a:** Strategic agility has a significant positive impact on potential absorptive capacity.
- H2b:** Strategic agility has a significant positive impact on achieving absorptive capacity.
- H3a:** Strategic agility plays a significant mediating role between potential absorptive capacity and environmental turbulence.
- H3b:** Strategic agility plays a significant mediating role between realized absorptive capacity and environmental turbulence.

2.5.3. Absorptive capacity and firm performance

Absorptive capacity has been shown to enhance operating performance and innovation in numerous studies in literature (Kale et al., 2019). Stock et al. (2001) examined the relationship between absorptive capacity and the efficacy of novel product development. The research has established a positive correlation between absorptive capacity and the performance of novel products; however, this correlation is only valid within a specific range of levels (Stock et al., 2001). When the absorptive capacity surpasses this critical threshold, it is linked to inferior new product development performance (Stock et al., 2001). Lichtenthaler (2016) discovered that the relationship between absorptive capacity and corporate financial performance is inverted U-shaped. As absorptive capacity increases, the company’s financial performance gradually improves; however, it is adversely affected when it reaches a specific level (Lichtenthaler, 2016). Kotabe et al. (2011) found that the interaction between information acquisition and authentic absorptive capacity improves the market performance of novel products. The protection of data and improving the market success of novel products correlate with the genuine absorptive capacity, as per Liu et al. (2013). This concept is also known as the organization’s ability to collect and organize information and establish operational capabilities (García-Sánchez et al., 2018). The potential absorptive capacity is a source of innovative competitive advantage, as per Fosfuri and Tribo (2008), primarily when an adequate internal information flow reduces the disparity between potential and realized capabilities. Harvey et al. (2010) developed a model that considers the joint influence of internal and external conditions on absorptive capacity. As a result, the absorptive capacity will improve the company’s performance. In certain studies (Thérin, 2007; Flatten et al., 2011b; Tzokas et al., 2015), absorptive capacity has also been found to improve the performance of small and medium-sized enterprises. Realized absorptive capacity is linked to organizational performance, while potential absorptive capacity is linked to realized absorptive capacity, as per Bolívar-Ramos et al. (2013). García-Morales et al. (2007) have observed that the technological absorptive capacity of science and technology enterprises positively impacts organizational learning and innovation. Employees can be motivated to investigate and acquire

novel concepts by cultivating technological absorptive capacity within the organization. Furthermore, their research demonstrated that organizational learning and innovation would improve organizational performance. Ali et al. (2016) discovered that organizations demonstrate superior performance when exposed to various organizational innovations and absorptive capacity conditions. Kale et al. (2019) assert that enterprises must allocate appropriate investments in prospective and actual absorptive capacity. Companies that prioritize knowledge acquisition and assimilation may fail to realize the benefits of utilization and accrue acquisition costs even though they can consistently improve their knowledge reserves (Kale et al., 2019). In contrast, organizations emphasizing transformation and development may achieve immediate benefits but become entangled in a capability trap (Volberda et al., 2010). Kale et al. (2019) indicated that a comprehensive understanding of the influence of absorptive capacity on performance is of the utmost relevance. As a result, absorptive capacity may be significantly correlated with performance. The subsequent hypothesis is derived from the theoretical assumption that strategic agility has a positive impact on absorptive capacity, as previously mentioned:

- H4a:** Potential absorptive capacity significantly affects firm performance.
- H4b:** Realized absorptive capacity significantly affects firm performance.
- H5a:** Potential absorptive capacity significantly mediates the relationship between strategic agility and performance.
- H5b:** Realized absorptive capacity significantly mediates the relationship between strategic agility and performance.

2.5.4. Environmental turbulence as a moderating variable

Corporate performance is significantly influenced by innovation performance. Consequently, it is imperative to investigate how environmental turbulence influences the relationship between absorptive capacity and innovation performance to comprehend its influence on the enterprise's overall performance. According to Song et al. (2021), in pertinent literature, environmental turbulence will regulate the focal enterprise's absorptive capacity and green innovation performance. Contingency theory posits that the organization is an open subsystem within the social system and is influenced by the environment (Luthans, 1973). Consequently, it is imperative to implement appropriate organizational and managerial strategies to ensure the organization adapts effectively to its environment (Song et al., 2021). The system is an open system, which requires that organizational activities interact with the external environment in which it is situated (Song et al., 2021). The external environment is a critical contingency factor for corporate strategy and behavior, as it influences the implementation and outcomes of corporate strategy (Boyd et al., 2012). According to research on contingency

theory (Aragón-Correa & Sharma, 2003; Martínez-del-Río et al., 2015), organizational performance advantages are derived from the congruence between internal organizational design variables and external situational variables. Simsek (2009) discovered that external environmental factors influence the impact of organizational learning on corporate performance. Consequently, the external environment is a critical moderating factor in modifying the relationship between corporate performance and organizational learning. Environmental turbulence in absorptive capacity consequently impacts the GIP of focal enterprises (Song et al., 2021). "Knowledge transfer" denotes the degree of change in the industry's market competition intensity, consumer requirements, and corporate technology (Duncan, 1972). Hitt et al. (1998) have discovered that knowledge transfer enhances the intensity of knowledge in the enterprise's business process. This is why the significance and attention paid to knowledge continue to increase. According to Zhu et al. (2011), the product development team of an enterprise requires external knowledge to conduct activities in a highly turbulent environment. Enterprises broaden their internal knowledge base by incorporating external knowledge in a swiftly changing and turbulent environment, fostering the comprehension, integration, and application of knowledge within a new cognitive framework. This, in turn, encourages the creation of novel products (Song et al., 2021; Jansen et al., 2005). Cassiman and Veugelers (2006) proposed that enterprises improve their innovation performance by promptly acquiring and assimilating various external resources, information, and knowledge due to the increased likelihood of knowledge transfer. The antecedent discourse serves as the foundation for the subsequent hypothesis:

- H6:** Environmental turbulence significantly and positively moderates the relationship between potential absorptive capacity and firm performance.

2.5.5. Environmental turbulence and firm performance

It is generally accepted that public service performance can be detrimentally affected by a turbulent external environment (Boyne & Meier, 2009). Boyne and Meier (2009) contend that turbulence adversely affects performance, and internal organizational changes can exacerbate this effect. The hypothesis that environmental turbulence has a detrimental effect on performance is supported by most studies (Boyne & Meier, 2009). It is generally accepted that the direct negative impact on organizational results is more significant the more unpredictable changes are (Turulja & Bajgoric, 2019). Company performance can be influenced by environmental factors that induce instability (Anning-Dorson, 2017). The following hypothesis is formulated as a result of these discussions:

- H7:** Environmental turbulence has a significant negative impact on company performance.

Strategic agility mediates the relationship between environmental turbulence and absorptive capacity, and ab-

sorptive capacity (potential and realized absorptive capacity) mediates the relationship between strategic agility and performance, per the above theoretical relationships. The following hypotheses are proposed in this study based on the discussion and development of these theoretical relationships:

H8a: Environmental turbulence significantly and indirectly affects firm performance through strategic agility and potential absorptive capacity.

H8b: Environmental turbulence significantly and indirectly affects firm performance through strategic agility and actual absorptive capacity.

Based on the hypotheses, the conceptual model is presented in Figure 1.

3. Study design

This study is based on the theoretical framework of absorptive capacity, strategic agility, and corporate performance proposed by Kale et al. (2019), with adjustments and extensions to explore the mediating role of absorptive capacity (potential and realized) and the driving role of strategic agility in enhancing corporate performance. In particular, the study focuses on the impact of environmental turbulence on the relationships among strategic agility, absorptive capacity, and performance, providing a novel theoretical exploration of the interplay between strategic agility and absorptive capacity.

To achieve the research objectives, data were collected via Credamo (www.credamo.com), a widely recognized online survey platform with extensive coverage across industries and a large registered user base. The platform's settings were used to reduce sampling bias, including restricting repeated responses from the same IP, prohibiting questionnaire sharing, and limiting distribution to a defined range (~1 km). In addition, only respondents with high credibility scores on the platform were allowed to complete the survey, ensuring high-quality responses. The survey targeted employees and managers in construc-

tion companies of different sizes across China. Respondents were informed about the purpose of the study, assured of confidentiality, and provided informed consent before participation. The survey items were adapted from established literature and validated scales using a 5-point Likert scale (see Appendix for details).

The formal survey was conducted in October 2024, and 600 questionnaires were randomly distributed. After two weeks, 465 responses were collected, yielding a recovery rate of 77.5%. Following careful screening to remove responses with issues such as repetitive answers or illogical patterns, 198 valid questionnaires were retained, resulting in an effective response rate of 53.8%. Sample size adequacy was confirmed using a priori power analysis in G*Power 3.1.9.7, achieving a 99.64% confidence level (Faul et al., 2007) (Figure 2).

Ethical considerations: although no formal ethics approval was obtained, the study adhered to standard research ethics principles. Respondents voluntarily participated, were informed about the study objectives, and their responses were kept strictly confidential. All data were anonymized to protect participants' identities, and the survey complied with relevant ethical norms for online research in organizational settings in China.

Pre-test and pilot study

The questionnaire consists of two parts. The first is the personal background and company information; the second is the primary dimension measurement questions. The researchers designed these questions, and they need to be tested. This questionnaire was first pre-tested to ensure that the various variable dimensions of the formal survey met the standards of reliability and validity as much as possible. Pre-testing can also help avoid misspelled words and unstructured sentences, which may cause confusion or measurement-related problems. Pre-testing helps to correct any variable defects before sending the questionnaire to potential respondents. Before finalizing the questionnaire for this study, pre-testing and pilot testing were conducted. The pre-test of the questionnaire mainly adopted

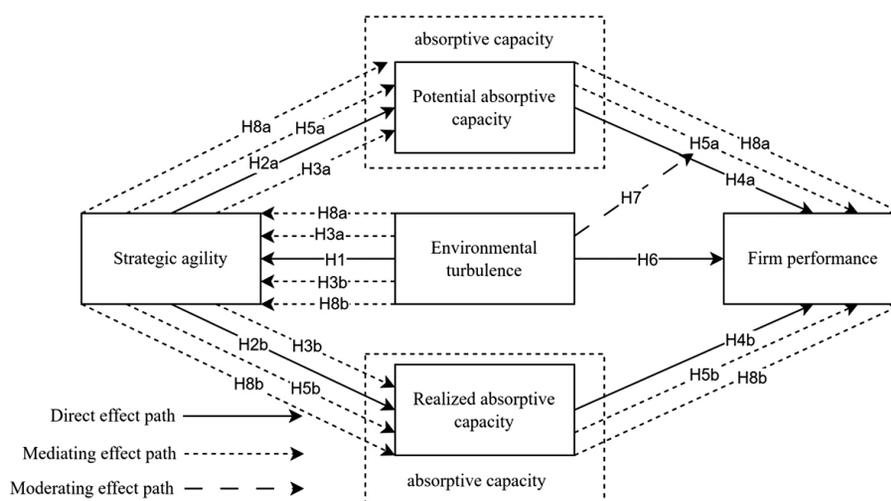


Figure 1. Conceptual model

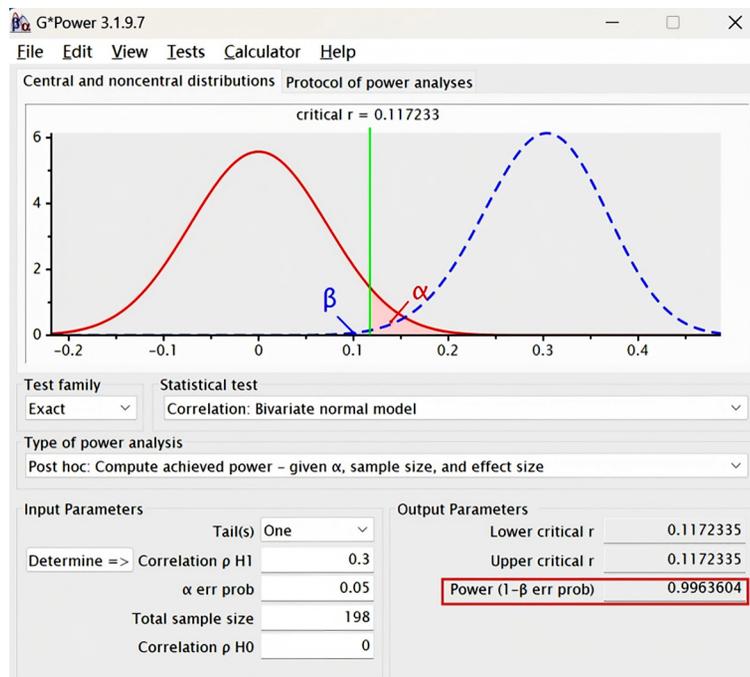


Figure 2. Statistical validity

existing research (Chelliah, 2004; Atalay et al., 2013; Neely et al., 2001). Since the questionnaire questions used in this study are directly adopted from the scale items of classic literature or the latest literature, there has been no large-scale adjustment and adaptation of the item content, only certain adjustments to the questions. Before conducting a pre-survey, this study communicated with four project managers from construction companies on the framework and question types of the questionnaire, and they provided valuable feedback to strengthen the questionnaire. The main objectives of the pilot study were to collect feedback, industry standards for grammar use, comprehensibility of questions by respondents, the number of questions answered by respondents, the number of questions accepted by respondents, and feedback for further improvement of questions. Feedback was collected and analyzed to improve the quality of the questionnaire. For example, regarding the choice of some variables, market turbulence or environmental turbulence, they agreed that it covered a wider range and was more suitable for this study, so a study on environmental turbulence was conducted. At the same time, regarding whether absorptive capacity involves a refined study of 4 dimensions, a single total dimension of absorptive capacity, or a study of two dimensions (potential and realized absorptive capacity), they believed that the two-dimensional potential and realized absorptive capacity were more research-oriented. At the same time, new content was added in response to some concerns about privacy in the survey. Your goodwill responses will be strictly confidential and will not be accessible to anyone except the researchers and the research team. The survey results report will not contain personal and/or company names. The questionnaire was revised twice before the respondents reached a consensus.

The questions were understandable and acceptable to the respondents. The data from this survey and the pilot survey were tested for reliability, consistency, and stability through the pilot study. Consistency refers to how these items measure a concept as a whole (Sekaran & Bougie, 2016). Cronbach's alpha is usually used to average the correlations between these items. The closer Cronbach's alpha is to 1, the more reliable the internal consistency is (Holmes et al., 2020; Sekaran & Bougie, 2016). The acceptable value of Cronbach's alpha is generally 0.70 (Hair et al., 2019; Sekaran & Bougie, 2016). First, 35 basic questionnaires were randomly distributed to construction companies of different sizes in my country through the survey platform Credamo. After obtaining 35 questionnaires, data quality analysis was performed. The modified total correlation coefficient (CITC) indicator in the data analysis SPSS software was used to judge the quality of the relevant items. Generally, a CITC greater than 0.5 indicates that the project has sufficient correlation with other items in the scale, and it is generally believed that the project can be retained. Those with CITC less than 0.5 will be eliminated and will not participate in the formal survey. After relevant data processing, it is ensured that the Cronbach's Alpha values of the relevant different variable dimensions in the pre-study are all greater than 0.7. The alpha of strategic agility is 0.80, and the alpha of environmental turbulence is 0.40 in the pre-study stage. This may be due to the variables' complexity, small sample size, or insufficient sample representativeness. However, in the formal survey, the reliability index was significantly improved by expanding the sample size and optimizing the questionnaire design, indicating that the measurement ability and reliability of the questionnaire in the formal application have been verified. This result fully demonstrates that the questionnaire suits

the research objectives and can accurately reflect the relationship between the core variables. The alpha of potential absorptive capacity is 0.86, the alpha of realized absorptive capacity is 0.89, and the alpha of enterprise performance is 0.84. Since the Cronbach's Alpha values of most variables in the pre-test stage and the final survey are significantly greater than 0.70, it shows that the scale has good internal consistency and is acceptable. Therefore, a questionnaire with appropriate items was obtained after the pre-study. After the screening before the study, the original questionnaire has higher validity and reliability.

4. Data analysis

This study employed IBM SPSS Statistics 24.0 (IBM, 2018) and SmartPLS 4.0 (Ringle et al., 2015) for statistical analysis and partial least squares-based structural equation modeling. The least squares method for structural equations is appropriate for model estimation in diverse contexts (Hair et al., 2017; Ringle et al., 2015). The main demographic characteristics of this sample are shown in Table 1. Among the sample population, the proportion of female employees is higher than that of male employees, and the proportion of female employees is 13.2% higher than that of male employees, which may indicate that female employees also have a high population distribution in China's construction industry. Among the educational background survey of this sample, 90.9% of the sample population has a bachelor's degree or above, which indicates that employees in China's construction industry generally receive a good higher education and have sufficient knowledge reserves. 37.4% of the samples have 1–5 years of industry experience in construction companies, 41.4% of the samples have 6–10 years of industry experience, 18.6% have 11–20 years of industry experience, and 2.5% have more than 20 years of industry experience. Among the sample population, middle and senior managers account for 75.5%, and other technical and support personnel account for 24.5%, indicating that the main population of this survey is mostly concentrated in the company's management. This survey mainly collects data from practitioners at different levels in China's construction industry, such as senior managers (general managers, directors, senior managers, regional managers), middle managers (project managers, construction engineers), and some technical and support personnel (construction workers, supervisors, construction equipment engineers, surveyors, construction workers) and some other unmarked positions. The main survey population is concentrated on middle and senior managers because this is related to the focus of this study. This study focuses on changes in corporate strategy and performance. The company's middle and senior managers have a more significant say because they hold essential management positions and are familiar with the company's strategy, departments, and even the company's performance changes. Even senior managers can deploy strategies, so using this group as the primary survey population is reasonable.

Table 1. Main demographic characteristics of the sample

Categories	Demographic Information	N = 198	Percentage (%)
Gender	Male participants	86	43.4
	Female participants	112	56.6
Education	Master's degree or above	37	18.7
	Bachelor's degree	143	72.2
	College degree	14	7.1
	High school and below	4	2.0
Work experience	1–5 years	74	37.4
	6–10 years	82	41.4
	11–15 years	28	14.1
	16–20 years	9	4.5
	More than 20 years	5	2.5
Job	General Manager	4	2.0
	Company Director	13	6.6
	Regional Manager	31	15.7
	Senior Manager	13	6.6
	Project manager	65	32.8
	Building engineer	23	11.6
	Project supervisor	19	9.4
	Technical construction worker	8	4.0
	Surveyor	10	5.1
	Equipment Engineer	5	2.5
	General Construction Workers	3	1.5
	Others	4	2.0

4.1. Measurement model

This study adhered to the methodologies Hair et al. (2017) recommended using SmartPLS 4.0 (Ringle et al., 2015) for evaluating the measurement model.

4.1.1. Internal consistency

Internal consistency reliability was assessed utilizing composite reliability (CR). The values of both ρ_a and ρ_c , ranging from 0.70 to 0.83, demonstrated satisfactory internal consistency reliability, meeting or approaching the required threshold of 0.7 for all constructs (Table 2) (Hair et al., 2010, 2017).

4.1.2. Convergent validity

Convergent validity was evaluated through the average variance extracted (AVE) and external loadings (Hair et al., 2017). Table 3 shows that all AVE values were above 0.5, and all external loading values were at least 0.6. This confirms the construct's convergent validity (Hair et al., 2012; Hulland, 1999).

4.1.3. Discriminant validity

Using the heterogeneous-to-unisexual ratio (HTMT) (Table 4) and the Fornell Larcker criterion (Table 3), this study evaluated discriminant validity (Hair et al., 2017; Henseler et al., 2015). Table 4 shows that each bold diagonal value

Table 2. Outer loadings, VIF, Cronbach's Alpha, CR and AVE

Constructs	Items	Outer loadings	VIF	rho_a	rho_c	AVE
Strategic agility (SA)	SA1	0.74	1.31	0.71	0.82	0.53
	SA2	0.66	1.21	–	–	–
	SA3	0.77	1.42	–	–	–
	SA4	0.73	1.35	–	–	–
Potential absorptive capacity (PAC)	PAC1	0.78	1.38	0.74	0.83	0.55
	PAC2	0.70	1.29	–	–	–
	PAC3	0.75	1.44	–	–	–
	PAC4	0.73	1.42	–	–	–
Realized absorptive capacity (RAC)	RAC1	0.76	1.41	0.71	0.82	0.53
	RAC2	0.70	1.31	–	–	–
	RAC3	0.71	1.34	–	–	–
	RAC4	0.75	1.34	–	–	–
Environmental turbulence (ET)	ET1	0.71	1.37	0.70	0.81	0.52
	ET2	0.77	1.39	–	–	–
	ET3	0.63	1.23	–	–	–
	ET4	0.75	1.31	–	–	–
Firm performance (FP)	FP1	0.75	1.33	0.70	0.82	0.53
	FP2	0.68	1.39	–	–	–
	FP3	0.79	1.57	–	–	–
	FP4	0.68	1.26	–	–	–

Table 3. The Fornell-Larcker test

	RAC	SA	PAC	ET	FP
RAC	0.72	–	–	–	–
SA	0.55	0.73	–	–	–
PAC	0.44	0.59	0.74	–	–
ET	0.46	0.58	0.58	0.73	–
FP	0.56	0.62	0.60	0.57	0.73

Table 4. The HTMT test

	RAC	SA	PAC	ET	FP
RAC	–	–	–	–	–
SA	0.77	–	–	–	–
PAC	0.61	0.81	–	–	–
ET	0.63	0.82	0.78	–	–
FP	0.80	0.87	0.83	0.81	–

or AVE square root exceeds the inter-construct correlation, satisfying the Fornell-Larcker criterion (Fornell & Larcker, 1981; Hair et al., 2017). The HTMT criteria are satisfied, with all values in the HTMT matrix in Table 4 being below 0.90 (Hair et al., 2017; Henseler et al., 2015). Consequently, the study can assert that all dimensions included in the proposed model exhibit discriminant validity, as evidenced by the results of the HTMT assessment and the Fornell-Larcker criterion.

4.2. Common method bias

In questionnaire-based studies, common method bias (CMB) is a major concern (Schwarz et al., 2017). CMB occurs when a single factor accounts for more than 40% of the total variance (Podsakoff et al., 2003). In this study, Harman's single-factor test was conducted, and the first factor accounted for 33.62% of the total variance, below the recommended 40% threshold, indicating that CMB is unlikely to be a significant issue. Additionally, the full collinearity variance inflation factor (VIF) test, as Kock (2015) recommended, was performed to assess CMB further. When using variance-based partial least squares for CMB testing, a VIF threshold of 3.3 or 5 is typically recommend-

ed when measurement errors are included in the model. The VIF values for each construct, as shown in Table 3, are well below the 3.3 threshold, suggesting that the study model is not significantly affected by common method bias (Kock, 2021).

4.3. Analysis of Goodness of Fit (GoF)

In PLS path modeling analysis, the Goodness of Fit (GoF) used as the average R^2 for the endogenous constructs and the geometric mean average community. The estimation of GoF values can be served as benchmark values for the global validation of the PLS model (Wetzels et al., 2009). According to Hair et al. (2014) suggestion, the effect size estimation for GoF is 0.1 (small), 0.25 (medium), and 0.36 (large).

The Goodness of Fit is calculated as below:

$$\text{GoF} = \sqrt{\text{Average } R^2} \times \sqrt{\text{Average of AVE}} = \sqrt{0.38} \times \sqrt{0.53} \approx 0.45.$$

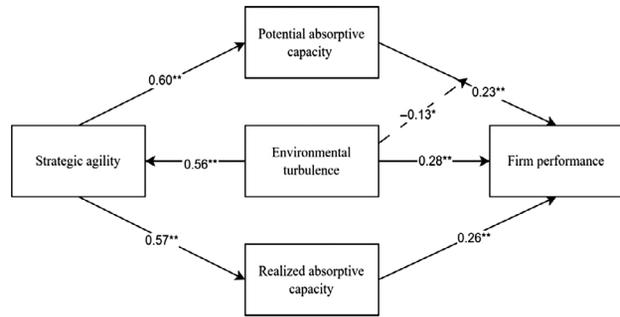
The GoF value of 0.45 indicated that the model provides sufficient support to validate the PLS model globally and has a better prediction power in consumption with the baseline values.

4.4. Evaluation of structural models

Table 5 shows the evaluation results of the structural model using SmartPLS 4.0. This study examined various mediating, moderating, and direct effects within the proposed research framework. Figure 3 shows the path estimation model. The data analysis results in the table show that most of the hypotheses are supported. In the direct impact path relationship, ET was shown to be an important predictor of SA, and ET had a significant positive effect on SA ($\beta = 0.56, p < 0.01$), supporting H1. SA also had a significant positive effect on PAC ($\beta = 0.60, p < 0.01$) and RAC ($\beta = 0.57, p < 0.01$), indicating that H2a and H2b are established. PAC and RAC are both important predictors of FP, and PAC has a significant positive effect on FP ($\beta = 0.23, p < 0.01$), and RAC also has a significant positive effect on FP ($\beta = 0.26, p < 0.01$), indicating that H4a and H4b are established. At the same time, the data shows that ET significantly and positively affects FP ($\beta = 0.28, p < 0.01$). In the hypothesized relationship, this study, supported by the literature, concluded that ET negatively affects FP. The data results are inconsistent with the hypothesized relationship, and hypothesis 7 is not established. In the mediation relationship path, SA is an excellent mediating factor. Among them, SA plays a positive mediating role in the relationship between ET and PAC ($\beta = 0.34, p < 0.01$) and the relationship between ET and RAC ($\beta = 0.32, p < 0.01$), indicating that hypotheses H3a and h3b are both established. Moreover, PAC and RAC mediate the relationship between SA and FP respectively. PAC actively mediates the relationship between SA and FP ($\beta = 0.14, p < 0.01$), and RAC also actively mediates the relationship between SA and FP ($\beta = 0.15, p < 0.01$), which supports H5a and H5b. Meanwhile, ET negatively regulated the relationship between PAC and FP ($\beta = -0.13, p < 0.05$), while the hypothesized relationship established in this study was that ET positively regulated the relationship between PAC and FP, so hypothesis H6 was not established. Meanwhile, ET affected FP through SA and PAC ($\beta = 0.08, p < 0.01$), and ET affected FP through SA and RAC ($\beta = 0.08, p < 0.01$), indicating that H8a and H8b were established.

In terms of regulatory analysis, this study proposed that ET regulates the relationship between PAC and FP in H6. Because ET negatively regulates the relationship between PAC and FP ($\beta = -0.13, p < 0.05$) (see Figure 4 and Table 5). In summary, the conditional treatment results show that when the ET is higher, the slope is flatter, and when the ET is lower, the slope is steeper, indicating that the positive correlation between PAC and FP is stronger when the ET is low. Similarly, when the ET is high, the positive correlation between PAC and FP is weaker, as shown in Figure 3, so hypothesis 6 holds.

This study evaluates the R-squared of each endogenous construct to assess the model's explanatory capacity (Table 6). As noted by Hair et al. (2017), R-squared values can be classified as weak (0.25), moderate (0.50), or high (0.75). The values for RAC (0.32), PAC (0.36), SA (0.31), and FP (0.52) are displayed in Table 6 above. Stone-Geisser's



Note: All path estimates are standardized; *p < 0.05, **p < 0.01.

Figure 3. Path estimates model

Table 5. Hypothesis testing

Hypothesis	Path	β	Results
Direct Path			
H1	ET → SA	0.56**	supported
H2a	SA → PAC	0.60**	supported
H2b	SA → RAC	0.57**	supported
H4a	PAC → FP	0.23**	supported
H4b	RAC → FP	0.26**	supported
H7	ET → FP	0.28**	rejected
Mediating effect pathway			
H3a	ET → SA → PAC	0.34**	supported
H3b	ET → SA → RAC	0.32**	supported
H5a	SA → PAC → FP	0.14**	supported
H5b	SA → RAC → FP	0.15**	supported
H8a	ET → SA → PAC → FP	0.08**	supported
H8b	ET → SA → RAC → FP	0.08**	supported
Moderating effect pathway			
H6	ET*PAC → FP	-0.13*	rejected

Notes: *p < 0.05, **p < 0.01.

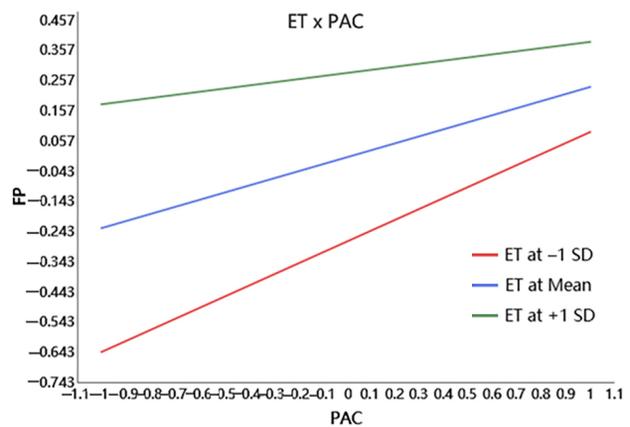


Figure 4. ET regulates the relationship between PAC and FP

Table 6. R-square and Q-square values

Construct	R-square	Q-square
FP	0.52	0.24
PAC	0.36	0.19
RAC	0.32	0.16
SA	0.31	0.16

Q-squared values (Stone, 1974) were used to assess the model's predictive utility for each endogenous structure (Table 6) (Hair et al., 2017). The table displays the following values: RAC (0.16), PAC (0.19), SA (0.16), and FP (0.24). It can be inferred that all exogenous structures and the specific endogenous structures chosen for the proposed study model exhibit appropriate predictive correlations since they are all greater than zero (Hair et al., 2017).

The effect size of each predictor was calculated using Cohen's *f*-squared formula, with thresholds for small (0.02), medium (0.15), and large (0.35) effects (Cohen, 2013). As shown in Table 7, the effect sizes varied across paths: ET on SA was 0.46; SA on PAC was 0.57; SA on RAC was 0.48; and the effects of ET, PAC, and RAC on FP were 0.12, 0.06, and 0.08, respectively.

Table 7. F-square

ET	SA	PAC	RAC	FP
–	0.46	0.57	0.48	0.12
–	–	–	–	0.08
–	–	–	–	0.06

These results indicate that PAC and RAC exhibit moderate explanatory power for FP. Furthermore, when the effect of ET is excluded from the model, the *f*-squared values of PAC and RAC on FP increase to 0.17 and 0.15, respectively, reflecting a medium effect size. This suggests that environmental turbulence attenuates the positive impact of both PAC and RAC on firm performance. Additionally, the model without ET shows an R-squared value of 0.43 for FP, demonstrating moderate explanatory power. Overall, these findings highlight that PAC and RAC play a crucial and effective role in explaining firm performance, both in terms of specific causal pathways and overall model performance, while ET acts as a contextual factor that can influence their impact.

5. Discussion

To investigate how Chinese construction firms respond to environmental turbulence, this study builds upon the theoretical framework proposed by Kale et al. (2019), which specifies absorptive capacity as the antecedent, strategic agility as the mediating mechanism, and firm performance as the outcome. Several theoretical extensions and refinements are introduced. First, this study distinguishes between PAC and RAC and systematically examines their dual mediating roles in the absorptive capacity – strategic agility – performance linkage. It further analyzes how strategic agility operates as a pivotal driver of firm performance and how it enables firms to more effectively leverage absorptive capacity to achieve superior outcomes. Second, the study evaluates the influence of environmental turbulence on strategic agility and investigates how such turbulence indirectly affects PAC, RAC, and FP. The potential moderating role of environmental turbulence within these rela-

tionships is also explored, offering a more comprehensive understanding of how external dynamism shapes internal capability configurations.

Additionally, the study proposes an ecosystemic regulatory mechanism to explain how firms dynamically adjust internal capabilities in response to turbulent environments. Empirical evidence from China's construction sector supports most of the proposed hypotheses, although several findings deviate from initial theoretical expectations, revealing opportunities for new theoretical insights. Overall, the proposed model demonstrates strong goodness-of-fit, confirming the robustness and validity of the extended framework.

The results of this study reveal the key mechanisms through which absorptive capacity (PAC and RAC) and SA influence FP under ET. As shown in Table 6, the R-squared values indicate that the model explains a moderate proportion of variance in FP ($R^2 = 0.52$), PAC ($R^2 = 0.36$), RAC ($R^2 = 0.32$), and SA ($R^2 = 0.31$), suggesting substantial explanatory power for the selected exogenous constructs and their interrelationships. The Stone-Geisser Q-squared values ($Q^2 > 0$ for all endogenous constructs) further confirm the model's predictive relevance, indicating that the proposed paths reliably forecast the outcomes of endogenous variables. FP exhibits the highest explanatory power, highlighting that the model robustly captures factors affecting firm performance. Effect size analysis (Table 7) shows that SA strongly influences both PAC ($f^2 = 0.57$) and RAC ($f^2 = 0.48$), emphasizing SA as a key driver of absorptive processes. In contrast, PAC and RAC have smaller direct effects on FP ($f^2 = 0.06$ and 0.08). Notably, when ET is removed from the model, the f^2 values of PAC and RAC on FP increase to 0.17 and 0.15, respectively, and the R^2 for FP slightly decreases to 0.43. This indicates that ET attenuates the positive effects of both PAC and RAC on firm performance, although PAC is more sensitive to turbulence than RAC. The finding aligns with theory: PAC represents potential absorptive capacity that relies on timely knowledge recognition and acquisition, which is vulnerable to environmental fluctuations, while RAC reflects realized absorptive capacity that transforms accumulated knowledge into actionable outcomes and is relatively less sensitive but still affected. From a theoretical perspective, these results highlight the distinct mediating roles of PAC and RAC under ET. PAC primarily supports opportunity recognition and knowledge acquisition, but its contribution to performance is highly context-dependent, whereas RAC can more consistently convert accumulated knowledge into results, though its impact is partially weakened by turbulence. Furthermore, the significant indirect effects of SA on FP via both PAC and RAC underscore the synergistic mechanism between strategic agility and absorptive capacity in enhancing firm performance. Integrating R^2 , Q^2 , and f^2 metrics with path analysis provides a comprehensive understanding of the model's explanatory and predictive power, while illustrating the moderating role of ET in shaping these dynamic capability – performance linkages.

This study draws on Chen (2012), who argues that organizations should implement collective measures along the value chain to mitigate the effects of environmental turbulence. This perspective aligns with the findings of Anggraini and Sudhartio (2019), suggesting that firms with higher strategic agility demonstrate stronger reconfigurability and market responsiveness. Agile firms can adapt more flexibly and rapidly to environmental changes than their competitors. According to the literature on strategic agility, which emphasizes strategic sensitivity, collective commitment, and resource fluidity, strategically agile firms can effectively reorganize resources to meet evolving market demands (Anggraini & Sudhartio, 2019). As a dynamic capability, strategic agility enables firms to seize opportunities and respond effectively to emerging threats (Kogut & Zander, 1992). It becomes especially valuable under heightened environmental turbulence (Sambamurthy et al., 2003). This literature supports the theoretical proposition of this study that environmental turbulence positively influences strategic agility. Specifically, turbulence stimulates firms' reconfigurability and market responsiveness, prompting strategic resource reallocation, improved resource mobility, and enhanced market adaptability, thereby fostering competitive advantages. Core characteristics of strategic agility include rational resource allocation, strategic sensitivity, market monitoring, adaptive adjustment, and opportunity recognition. Firms are thus motivated to enhance strategic agility in response to manageable levels of environmental turbulence, including market shifts, technological disruptions, and competitive pressures. Strategic agility integrates multiple dynamic capabilities (Doz & Kosonen, 2010; Gurkov et al., 2017) further assert that agility itself is a dynamic capability. In the face of environmental turbulence, firms can more effectively coordinate internal structures, adjust external strategies, and execute strategic upgrades and decision-making, including preparing sufficient strategic resources to strengthen organizational capabilities and mitigate adverse impacts. Notably, prior studies (Turulja & Bajgoric, 2019; Anning-Dorson, 2017) indicate that the negative impact of environmental turbulence on organizational performance is positively related to its unpredictability. However, the empirical findings of this study reveal that environmental turbulence can positively enhance firm performance. This outcome may relate to the nature and scale of the enterprises: medium- and large-sized firms, particularly project-based firms such as those in the construction industry, generally exhibit higher sensitivity and risk tolerance, allowing them to better withstand environmental turbulence. Despite the uncertainty, risk, and potential organizational barriers associated with turbulence, these firms' stronger feedback, coordination, organizational systems, institutional mechanisms, culture, and structural adjustment capabilities enable them to capture beneficial factors and resource opportunities in the turbulent environment, thereby improving performance. Although Boyne and Meier (2009) suggest that organizational change may exacerbate the negative effects of turbulence on performance, this study posits that strate-

gic agility serves as the primary mitigating factor. Strategic agility is considered a critical organizational resource and capability, significantly influencing organizational integration and performance. It helps firms build more responsive, orderly, flexible, and resilient absorptive capacity, thereby alleviating the negative impacts of environmental turbulence and enhancing overall organizational performance.

This study proposes that strategic agility and absorptive capacity together constitute a corporate defense and linkage mechanism against external threats such as environmental turbulence. While the framework examines the direct effects of environmental turbulence on strategic agility and performance, the study identifies a novel theoretical pathway: environmental turbulence has a direct and positive effect on firm performance. This suggests that environmental turbulence influences performance through intervening mechanisms that either mitigate its adverse effects or amplify its beneficial aspects, ultimately enhancing outcomes. Environmental turbulence may thus exhibit binary characteristics, containing both risks and opportunities. Within this framework, strategic agility, absorptive capacity, and performance form the core constructs, with strategic agility positioned as a dominant force within the enterprise ecosystem. Gren and Lenberg (2020) highlight the ambiguity of defining agility in research and practice, noting that agile organizations exhibit heightened sensitivity to change. This study proposes that strategic agility inherently possesses absorptive capacity characteristics. Environmental turbulence contains abundant resources, such as knowledge, information, and technology, which can have both positive and negative effects. Firms with robust absorptive systems are better able to manage and leverage these external inputs. Strategic agility acts as the first line of defense in managing environmental turbulence, enabling firms to process and transmit the beneficial aspects embedded within turbulent environments effectively. Strategic agility may thus embody absorptive capacity attributes. Guided by strategic agility, internal absorptive capacity becomes more robust and organized, facilitating the integration of external resources into the firm's internal knowledge system. This includes dimensions of acquisition, assimilation, transformation, and utilization. These capabilities transfer knowledge to the firm's absorptive capacity system for secondary absorption and optimization, enhancing organizational capabilities. In this sense, strategic agility and absorptive capacity have dual characteristics: strategic agility drives the development of enterprise-wide absorptive capacity, creating a powerful resource absorption dynamic. Metaphorically, firms possess a strategic "brain" (agility) and "weapons" (absorptive capacity) to respond effectively to external shocks. The synergy between strategic agility and absorptive capacity stabilizes and structures the enterprise ecosystem, embedding sophisticated regulatory mechanisms. Examining the impact of environmental turbulence on firm performance thus requires a systemic perspective that integrates strategic agility, absorptive capacity, and organizational capability di-

versity, rather than isolating turbulence as a single factor. Empirically, this study confirms that strategic agility positively mediates the relationship between environmental turbulence and absorptive capacity. Although direct literature on this mediation path is limited, the findings show that environmental turbulence enhances strategic agility (Anggraini & Sudhartio, 2019; Sambamurthy et al., 2003), which in turn strengthens absorptive capacity. This mediation demonstrates that environmental turbulence can indirectly promote absorptive capacity through strategic agility. Overall, although environmental turbulence is often considered detrimental to performance, its negative impact can be mitigated by the joint action of strategic agility and absorptive capacity. This dynamic synergy enables firms to convert environmental turbulence into a positive force for performance improvement. The proposed theoretical framework thus illustrates an internally coherent mechanism, demonstrating flexibility and strong relational dynamics among strategic agility, absorptive capacity, and firm performance.

The empirical results indicate that both PAC and RAC have a direct impact on firm performance, which is consistent with prior studies (Ahmed et al., 2020; Gonzalez, 2023; Singh et al., 2023). The literature shows that entrepreneurial orientation can enhance PAC and improve innovation performance (Ato Sarsah et al., 2020). Singh et al. (2023) found, based on a survey of 376 managers in project-based organizations in India, that PAC directly influences project performance, which aligns with the findings of this study in the Chinese construction industry – a typical project-based sector. Furthermore, Singh et al. (2023) emphasized that absorptive capacity is critical for project-based organizations to cope with complex and dynamic environments. This study further empirically validates the moderating role of SA) and absorptive capacity (PAC and RAC) in the relationship between ET and performance, reflecting the internal systemic response of Chinese construction firms to external turbulence. Notably, the results reveal that ET negatively moderates the relationship between PAC and performance, which contrasts with previous research suggesting a positive moderating effect (Song et al., 2021; Cassiman & Veugelers, 2006), providing a new theoretical perspective on environmental turbulence. One possible explanation is that during the transformation of PAC into performance, the negative factors of ET emerge, weakening their positive relationship; alternatively, to maintain systemic balance, strategic agility may guide ET, producing a negative moderating effect, reducing the frequency and intensity of excessive knowledge absorption, and ensuring a more stable and dynamic absorption process. Overall, the theoretical framework proposed in this study offers a coherent synthesis that emphasizes the leading role of strategic agility, the complexity of environmental turbulence, and the critical role of absorptive capacity. The model reflects the complex micro-level interactions among variables and demonstrates the organic coherence and vitality of the theoretical system.

6. Conclusions

This study provides a comprehensive examination of how Chinese construction firms respond to environmental turbulence. It analyzes the dynamic interactions among strategic agility, absorptive capacity, and firm performance within the corporate system under turbulent conditions. Through systematic literature review, empirical analysis, and logical reasoning, the study uncovers the internal operating mechanisms of the corporate ecosystem and highlights several key theoretical insights: the dual attributes of environmental turbulence and strategic agility, the dominant and absorptive properties of strategic agility, the systemic balancing role of absorptive capacity, and the linkage mechanisms connecting strategic agility and absorptive capacity. These findings deepen our understanding of the relationship between environmental turbulence and firm performance. The results further indicate that PAC directly enhances firm performance, consistent with Singh et al. (2023), who found that PAC significantly improves the performance of project-based organizations. Additionally, strategic agility serves as a key mediator between environmental turbulence and absorptive capacity, while absorptive capacity mediates the relationship between strategic agility and performance. This dual mediation underscores the central role of strategic agility in responding to environmental shocks and transforming them into enhanced absorptive capacity. In this framework, absorptive capacity acts as a “baton” of strategic agility, translating external turbulence and agile initiatives into improved firm performance, thereby clarifying the interactive mechanism between strategic agility and absorptive capacity within the corporate system. Although environmental turbulence does not directly optimize internal mechanisms, it negatively moderates the relationship between PAC and performance, contrasting with prior studies and highlighting the nonlinearity and context-specificity of turbulence. Notably, despite weakening the PAC – performance link, environmental turbulence still exerts a significant positive effect on overall firm performance. In summary, this study identifies novel theoretical relationships and offers practical recommendations, providing both theoretical and actionable guidance for firms seeking to strengthen strategic agility and absorptive capacity in response to environmental turbulence.

6.1. Theoretical contributions

This study systematically investigates the significant impacts of environmental turbulence on firm performance, strategic agility, and absorptive capacity. It reveals the dual mediating role of strategic agility and absorptive capacity, thereby enriching the theoretical framework. Notably, the study identifies a unique pathway through which potential absorptive capacity can directly enhance firm performance. This finding aligns with Singh et al. (2023), who demonstrated that PAC directly influences the performance of project-based organizations. The present study further validates the applicability of this finding in the construction

industry. Additionally, the study finds that environmental turbulence negatively moderates the relationship between PAC and firm performance, challenging prior research suggesting a positive moderating effect (Song et al., 2021; Cassiman & Veugelers, 2006). Although environmental turbulence is generally considered a destabilizing factor, our results unexpectedly indicate that, within the proposed framework, turbulence can also enhance firm performance. This contradicts prior assertions that turbulence undermines corporate performance (Arici & Gok, 2023; He et al., 2024). The complexity of the research model encourages deeper theoretical reflection and understanding.

This study introduces several novel theoretical concepts, including the linkage mechanism between absorptive capacity and strategic agility, the absorptive attributes of strategic agility, the dual mechanism of environmental turbulence, and the latent regulatory function embedded in internal absorptive capacity. Collectively, these contributions advance theory along multiple dimensions. Specifically, in contrast to recent studies that treat environmental turbulence as a unidimensional construct (Ibrahimcioğlu & Kitapçı, 2025; Jiang et al., 2024), this study emphasizes its duality: on one hand, turbulence can directly enhance firm performance and optimize strategic agility and absorptive capacity; on the other hand, it negatively moderates the relationship between PAC and performance. This duality enriches the conceptual understanding of environmental turbulence, highlighting its complex and multifaceted role within the organizational system. Based on the duality of strategic agility, the study argues that the observed dual impact of turbulence on performance is not solely attributable to external factors. Rather, strategic agility, through strategic leadership, plays a critical role in balancing firm performance, absorptive capacity, and environmental turbulence. Turbulence triggers inflows of external resources and knowledge, which, under the influence of strong strategic agility, can enhance organizational absorptive capacity. This aligns with Mata et al. (2023), who noted the close relationship between absorptive capacity dimensions and the sensing–responding components of strategic agility. To maintain organizational stability, firms must carefully manage the absorption and integration of knowledge. This illustrates the dual function of strategic agility: it facilitates the acquisition of external knowledge while regulating internal strategy, moderating the speed and intensity of knowledge absorption induced by turbulence. Such balance contributes to maintaining systemic equilibrium. The duality of both environmental turbulence and strategic agility provides a valuable foundation for future research. Moreover, the study uncovers internal organizational mechanisms. Strategic agility may sometimes be overly prominent or dominant, necessitating internal balancing mechanisms. We propose that absorptive capacity serves this regulatory function, helping to sustain the firm's ecological and dynamic balance. This finding highlights the reciprocal interaction between absorptive capacity and strategic agility. Based on rigorous data analysis

and theoretically grounded propositions, the study uncovers new theoretical relationships and extends existing ones across multiple domains. Furthermore, under environmental turbulence, the mediating relationship between strategic agility and absorptive capacity demonstrates the firm system's multidimensional dynamic capabilities, reflecting the dynamic, sustainable, coherent, and organic nature of firms within an ecosystem framework.

6.2. Practical significance

This study conducted an in-depth analysis of strategic agility, absorptive capacity, environmental turbulence, and corporate performance, with a particular focus on the construction industry. It systematically examined the substantial impact of environmental turbulence on strategic agility and absorptive capacity and directly explored its effect on enterprise performance, providing actionable guidance for managers, project leaders, and decision-makers.

In the face of environmental turbulence, such as rapid market shifts, intensified competition, regulatory changes, and technological disruptions, construction enterprises should recognize that turbulence is not inherently detrimental. Firms with robust strategic and operational resources can leverage turbulence to enhance resilience, adaptive capacity, and strategic competitiveness. Specifically, construction companies can operationalize strategic agility through:

- (1) **Market Sensing and Opportunity Identification:** Establish dedicated teams to continuously monitor policy, technology, and competitor trends. Use data analytics to detect emerging opportunities or risks in project procurement, supply chains, and client demands.
- (2) **Rapid Strategic Reconfiguration:** Develop modular project management frameworks to enable fast reassignment of resources across projects, allowing quick adaptation to delays, cost fluctuations, or regulatory changes.
- (3) **Flexible Decision-Making Protocols:** Empower project managers with decentralized authority for procurement, staffing, and on-site adjustments, reducing delays caused by hierarchical approvals.
- (4) **Cross-Project Knowledge Sharing:** Implement mechanisms for capturing lessons learned from ongoing and completed projects to inform decision-making organization-wide.

Simultaneously, enterprises should strengthen absorptive capacity, focusing on both potential absorptive capacity and realized absorptive capacity:

- (1) **PAC (Acquisition & Assimilation):** Assign dedicated R&D and technical teams to acquire external knowledge, such as new construction technologies, sustainable materials, and regulatory updates, and systematically assimilate it. Facilitate inter-departmental workshops and learning sessions to convert acquired knowledge into actionable insights.

- (2) RAC (Transformation & Exploitation): Establish structured processes to transform acquired knowledge into practical project applications, such as integrating new building techniques into ongoing projects or adopting digital construction platforms. Provide technical training to ensure effective application and monitor outcomes for iterative improvement.

In turbulent environments, strategic resource allocation is crucial. Enterprises should prioritize internal optimization over non-essential external expenditures, enhance internal communication channels, and promote cross-departmental knowledge transfer. Managers should encourage employees to actively learn, experiment, and collaborate, collectively strengthening both PAC and RAC. Additionally, improving information capture and processing systems is essential. Construction firms should:

- (1) Integrate project management platforms and knowledge management systems to collect real-time data on costs, timelines, and supply chain disruptions.
- (2) Internalize external knowledge through digital repositories, ensuring technical insights are accessible across departments.
- (3) Regularly update internal systems to support iterative application of new techniques, materials, or regulatory requirements.

In conclusion, environmental turbulence does not necessarily harm construction firm performance. When guided by deliberate strategic agility and strengthened absorptive capacity, enterprises can transform turbulence into opportunities. By operationalizing agility through market sensing, rapid reconfiguration, decentralized decision-making, and cross-project knowledge sharing – and systematically developing PAC and RAC – construction companies can enhance resilience, innovation capability, and overall performance, turning potential disruptions into strategic advantage.

7. Study limitations and future research

This study has several limitations. First, its scope is restricted to the construction industry in China, which limits the generalizability of the proposed theoretical framework across different regions and industries. Second, the relatively small sample size constrains the broader applicability of the findings. Moreover, while this study finds that environmental turbulence has a positive effect on enterprise operations and performance within the proposed framework, most previous research highlights its typically negative impact. Therefore, variations in firm characteristics, size, regional context, and industry type should be further examined to enhance the framework's applicability. Additionally, this study focuses on the China, where national institutions and economic conditions may influence the findings. The applicability of this framework to developed countries, particularly those dominated by high-tech industries and experiencing more severe environmental tur-

bulence, remains uncertain. In such contexts, turbulence may exceed organizational thresholds, leading to information overload and operational challenges. This may require larger panel datasets and more detailed field studies to explore additional internal organizational responses to environmental turbulence. This study specifically targets project-based enterprises, and whether its conclusions generalize to non-project-based firms warrants further investigation. Likewise, the proposed absorptive characteristics of strategic agility require additional validation. Future research could employ qualitative analyses and case studies to more precisely identify the specific absorptive dimensions and practical applications of strategic agility. Overall, subsequent studies should consider regional development levels and industry structural differences to refine and expand the proposed theoretical framework.

Data availability statement

Data will be provided upon request.

References

- Adams, G. L., & Lamont, B. T. (2003). Knowledge management systems and developing sustainable competitive advantage. *Journal of Knowledge Management*, 7(2), 142–154. <https://doi.org/10.1108/13673270310477342>
- Adner, R. (2006). Match your innovation strategy to your innovation ecosystem. *Harvard Business Review*, 84(4), 98–107.
- Adner, R., Oxley, J. E., & Silverman, B. S. (2013). *Collaboration and competition in business ecosystems*. Emerald Group Publishing. [https://doi.org/10.1108/S0742-3322\(2013\)0000030018](https://doi.org/10.1108/S0742-3322(2013)0000030018)
- Ahmed, S. S., Guozhu, J., Mubarik, S., Khan, M., & Khan, E. (2020). Intellectual capital and business performance: The role of dimensions of absorptive capacity. *Journal of Intellectual Capital*, 27(1), 23–39. <https://doi.org/10.1108/JIC-11-2018-0199>
- Albort-Morant, G., Henseler, J., Cepeda-Carrión, G., & Leal-Rodríguez, A. L. (2018). Potential and realized absorptive capacity as complementary drivers of green product and process innovation performance. *Sustainability*, 10(2), Article 381. <https://doi.org/10.3390/su10020381>
- Ali, M., & Park, K. (2016). The mediating role of an innovative culture in the relationship between absorptive capacity and technical and non-technical innovation. *Journal of Business Research*, 69(5), 1669–1675. <https://doi.org/10.1016/j.jbusres.2015.10.036>
- Ali, M., Kan, K. A. S., & Sarstedt, M. (2016). Direct and configurational paths of absorptive capacity and organizational innovation to successful organizational performance. *Journal of Business Research*, 69(11), 5317–5323. <https://doi.org/10.1016/j.jbusres.2016.04.131>
- Andriopoulos, C., & Lewis, M. W. (2009). Exploitation–exploration tensions and organizational ambidexterity: Managing paradoxes of innovation. *Organization Science*, 20(4), 696–717. <https://doi.org/10.1287/orsc.1080.0406>
- Andriopoulos, C., & Lewis, M. W. (2010). Managing innovation paradoxes: Ambidexterity lessons from leading product design companies. *Long Range Planning*, 43(1), 104–122. <https://doi.org/10.1016/j.lrp.2009.08.002>
- Anggraini, W., & Sudhartio, L. (2019). Strategic agility in environmental turbulence: A case of the banking sector in Indonesia. In *Proceedings of the 1st Sampoerna University–AFBE Interna-*

- tional Conference (SU-AFBE 2018) (p. 109). European Alliance for Innovation. <https://doi.org/10.4108/eah.6-12-2018.2286279>
- Anning-Dorson, T. (2017). How much and when to innovate: The nexus of environmental pressures, innovation, and service firm performance. *European Journal of Innovation Management*, 20(4), 599–619. <https://doi.org/10.1108/EJIM-05-2016-0055>
- Aragón-Correa, J. A., & Sharma, S. (2003). A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review*, 28(1), 71–88. <https://doi.org/10.5465/amr.2003.8925236>
- Arici, T., & Gök, M. S. (2023). Examining environmental turbulence intensity: A strategic agility and innovativeness approach on firm performance in environmental turbulence situations. *Sustainability*, 15(6), Article 5364. <https://doi.org/10.3390/su15065364>
- Atalay, M., Anafarta, N., & Sarvan, F. (2013). The relationship between innovation and firm performance: An empirical evidence from Turkish automotive supplier industry. *Procedia – Social and Behavioral Sciences*, 75, 226–235. <https://doi.org/10.1016/j.sbspro.2013.04.026>
- Ato Sarsah, S., Tian, H., Dogbe, C. S. K., Bamfo, B. A., & Pomegbe, W. W. K. (2020). Effect of entrepreneurial orientation on radical innovation performance among manufacturing SMEs: The mediating role of absorptive capacity. *Journal of Strategy and Management*, 13(4), 551–570. <https://doi.org/10.1108/JSMA-03-2020-0053>
- Barile, S., Lusch, R., Reynoso, J., Saviano, M., & Spohrer, J. (2016). Systems, networks, and ecosystems in service research. *Journal of Service Management*, 27(4), 652–674. <https://doi.org/10.1108/JOSM-09-2015-0268>
- Bolívar-Ramos, M. T., García-Morales, V. J., & Martín-Rojas, R. (2013). The effects of information technology on absorptive capacity and organizational performance. *Technology Analysis & Strategic Management*, 25(8), 905–922. <https://doi.org/10.1080/09537325.2013.823146>
- Boyd, B. K., Haynes, K. T., Hitt, M. A., Bergh, D. D., & Ketchen, D. J. (2012). Contingency hypotheses in strategic management research: Use, disuse, or misuse?. *Journal of Management*, 38(1), 278–313. <https://doi.org/10.1177/0149206311418662>
- Boyne, G. A., & Meier, K. J. (2009). Environmental turbulence, organizational stability, and public service performance. *Administration & Society*, 40(8), 799–824. <https://doi.org/10.1177/0095399708326333>
- Cadiz, D., Sawyer, J. E., & Griffith, T. L. (2009). Developing and validating field measurement scales for absorptive capacity and experienced community of practice. *Educational and Psychological Measurement*, 69(6), 1035–1058. <https://doi.org/10.1177/0013164409344494>
- Camisón, C., & Forés, B. (2010). Knowledge absorptive capacity: New insights for its conceptualization and measurement. *Journal of Business Research*, 63(7), 707–715. <https://doi.org/10.1016/j.jbusres.2009.04.022>
- Cassiman, B., & Veugelers, R. (2006). In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisition. *Management Science*, 52(1), 68–82. <https://doi.org/10.1287/mnsc.1050.0503>
- Chebbi, H., Yahiaoui, D., Vrontis, D., & Thrassou, A. (2015). Building multiunit ambidextrous organizations: A transformative framework. *Human Resource Management*, 54(S1), S155–S177. <https://doi.org/10.1002/hrm.21732>
- Chelliah, S. (2004). *Antecedents of the internationalization and the relationship between internationalization and performance of Malaysian small and medium manufacturing enterprises (SMEs)* [Doctoral dissertation]. Universiti Sains Malaysia.
- Chen, X. (2012). *Impact of business intelligence and IT infrastructure flexibility on competitive advantage: An organizational agility perspective* [Doctoral dissertation]. University of Nebraska–Lincoln.
- Cohen, J. (2013). *Statistical power analysis for the behavioral sciences* (2nd ed.). Academic Press. <https://doi.org/10.4324/9780203771587>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128–152. <https://doi.org/10.2307/2393553>
- Darroch, J. (2005). Knowledge management, innovation, and firm performance. *Journal of Knowledge Management*, 9(3), 101–115. <https://doi.org/10.1108/13673270510602809>
- Delmas, M., Hoffman, V. H., & Kuss, M. (2011). Under the tip of the iceberg: Absorptive capacity, environmental strategy, and competitive advantage. *Business & Society*, 50(1), 116–154. <https://doi.org/10.1177/0007650310394400>
- Dobrzykowski, D. D., Leuschner, R., Hong, P. C., & Roh, J. J. (2015). Examining absorptive capacity in supply chains: Linking responsive strategy and firm performance. *Journal of Supply Chain Management*, 51(4), 3–28. <https://doi.org/10.1111/jscm.12085>
- Doz, Y. L., & Kosonen, M. (2010). Embedding strategic agility: A leadership agenda for accelerating business model renewal. *Long Range Planning*, 43(2–3), 370–382. <https://doi.org/10.1016/j.lrp.2009.07.006>
- Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly*, 17(3), 313–327. <https://doi.org/10.2307/2392145>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191. <https://doi.org/10.3758/BF03193146>
- Flatten, T. C., Engelen, A., Zahra, S. A., & Brettel, M. (2011a). A measure of absorptive capacity: Scale development and validation. *European Management Journal*, 29(2), 98–116. <https://doi.org/10.1016/j.emj.2010.11.002>
- Flatten, T. C., Greve, G. I., & Brettel, M. (2011b). Absorptive capacity and firm performance in SMEs: The mediating influence of strategic alliances. *European Management Review*, 8(2), 137–152. <https://doi.org/10.1111/j.1740-4762.2011.01015.x>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50. <https://doi.org/10.2307/3151312>
- Fosfuri, A., & Tribó, J. A. (2008). Exploring the antecedents of potential absorptive capacity and its impact on innovation performance. *Omega*, 36(2), 173–187. <https://doi.org/10.1016/j.omega.2006.06.012>
- Fuller, J., Jacobides, M., & Reeves, M. (2019). The myths and realities of business ecosystems. *MIT Sloan Management Review*, 60(3), 1–9.
- Galvin, P., Burton, N., Singh, P. J., Sarpong, D., Bach, N., & Teo, S. (2020). Network rivalry, competition and innovation. *Technological Forecasting and Social Change*, 161, Article 120253. <https://doi.org/10.1016/j.techfore.2020.120253>
- García-Morales, V. J., Ruiz-Moreno, A., & Lloréns-Montes, F. J. (2007). Effects of technology absorptive capacity and technology proactivity on organizational learning, innovation, and performance: An empirical examination. *Technology Analysis & Strategic Management*, 19(4), 527–558. <https://doi.org/10.1080/09537320701403540>
- García-Sánchez, E., García-Morales, V. J., & Martín-Rojas, R. (2018). Influence of technological assets on organizational perfor-

- mance through absorptive capacity, organizational innovation, and internal labour flexibility. *Sustainability*, 10(3), Article 770. <https://doi.org/10.3390/su10030770>
- Gonzalez, R. V. D. (2023). Potential and realized absorptive capacity: An analysis in project teams. *Revista de Administração de Empresas*, 63, Article e2022-0006. <https://doi.org/10.1590/S0034-759020230106>
- Gren, L., & Lenberg, P. (2020). Agility is responsiveness to change: An essential definition. In *Proceedings of the 24th International Conference on Evaluation and Assessment in Software Engineering* (pp. 348–353). Association for Computing Machinery. <https://doi.org/10.1145/3383219.3383268>
- Gurkov, I., Goldberg, A., & Saidov, Z. (2017). Strategic agility and persistence: HEM's entry into the Russian market of expendable materials for clinical laboratories. *Global Business and Organizational Excellence*, 36(5), 12–19. <https://doi.org/10.1002/joe.21881>
- Haider, S. A., & Kayani, U. N. (2020). The impact of customer knowledge management capability on project performance: Mediating role of strategic agility. *Journal of Knowledge Management*, 25(2), 298–312. <https://doi.org/10.1108/JKM-01-2020-0026>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Pearson.
- Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, 40(3), 414–433. <https://doi.org/10.1007/s11747-011-0261-6>
- Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM). *European Business Review*, 26(2), 106–121. <https://doi.org/10.1108/EBR-10-2013-0128>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). SAGE Publications.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>
- Hannah, D. P., & Eisenhardt, K. M. (2018). How firms navigate cooperation and competition in nascent ecosystems. *Strategic Management Journal*, 39(12), 3163–3192. <https://doi.org/10.1002/smj.2750>
- Haro-Domínguez, M. C., Arias-Aranda, D., Lloréns-Montes, F. J., & Moreno, A. R. (2007). The impact of absorptive capacity on technological acquisitions in engineering consulting companies. *Technovation*, 27(8), 417–425. <https://doi.org/10.1016/j.technovation.2007.02.003>
- Harvey, G., Skelcher, C., Spencer, E., Jas, P., & Walshe, K. (2010). Absorptive capacity in a non-market environment: A knowledge-based approach to analysing the performance of sector organizations. *Public Management Review*, 12(1), 77–97. <https://doi.org/10.1080/14719030902817923>
- He, Y., Liu, Z., & Lee, M.-J. (2024). Navigating sustainable value creation through digital leadership under institutional pressures: The moderating role of environmental turbulence. *Sustainability*, 16(21), Article 9169. <https://doi.org/10.3390/su16219169>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Hitt, M. A., Keats, B. W., & DeMarie, S. M. (1998). Navigating in the new competitive landscape: Building strategic flexibility and competitive advantage in the 21st century. *Academy of Management Executive*, 12(4), 22–42. <https://doi.org/10.5465/ame.1998.1333922>
- Hock, M., Clauss, T., & Schulz, E. (2016). The impact of organizational culture on a firm's capability to innovate the business model. *R&D Management*, 46(3), 433–450. <https://doi.org/10.1111/radm.12130>
- Hodgkinson, G. P., & Healey, M. P. (2011). Psychological foundations of dynamic capabilities: Reflection and reflexion in strategic management. *Strategic Management Journal*, 32(13), 1500–1516. <https://doi.org/10.1002/smj.964>
- Holmes, S. D., Resnick, B., Galik, E., Gruber-Baldini, A., & Kusmaul, N. (2020). Reliability and validity of the Resident Satisfaction Index in assisted living. *Journal of Applied Gerontology*, 39(11), 1186–1194. <https://doi.org/10.1177/0733464820943807>
- Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal*, 20(2), 195–204. [https://doi.org/10.1002/\(SICI\)1097-0266\(199902\)20:2<195::AID-SMJ13>3.0.CO;2-7](https://doi.org/10.1002/(SICI)1097-0266(199902)20:2<195::AID-SMJ13>3.0.CO;2-7)
- Iansiti, M., & Levien, R. (2004). *The keystone advantage: What the new dynamics of business ecosystems mean for strategy, innovation, and sustainability*. Harvard Business School Press.
- IBM. (2018). *IBM SPSS statistics*. (Version 24.0). <https://www.ibm.com/support/pages/ibm-spss-statistics-24-documentation>
- İbrahimcioğlu, A. S., & Kitapçı, H. (2025). How environmental turbulence shapes the path from resilience to sustainability: Useful insights gathered from small and medium enterprises (SMEs). *Sustainability*, 17(15), Article 6938. <https://doi.org/10.3390/su17156938>
- Ivory, S. B., & Brooks, S. B. (2018). Managing corporate sustainability with a paradoxical lens: Lessons from strategic agility. *Journal of Business Ethics*, 148(2), 347–361. <https://doi.org/10.1007/s10551-017-3583-6>
- Jansen, J. J. P., van den Bosch, F. A. J., & Volberda, H. W. (2005). Managing potential and realized absorptive capacity: How do organizational antecedents matter?. *Academy of Management Journal*, 48(6), 999–1015. <https://doi.org/10.5465/amj.2005.19573106>
- Jiang, Y., Li, C., & Zhao, Y. (2024). Environmental turbulence, network position and firm innovation: Evidence from a natural experiment in China. *Chinese Management Studies*, 18(4), 1149–1163. <https://doi.org/10.1108/CMS-04-2023-0148>
- Jiménez-Barrionuevo, M. M., García-Morales, V. J., & Molina, L. M. (2011). Validation of an instrument to measure absorptive capacity. *Technovation*, 31(5–6), 190–202. <https://doi.org/10.1016/j.technovation.2010.12.002>
- Junni, P., Sarala, R., Tarba, S., & Weber, Y. (2015). The role of strategic agility in acquisitions. *British Journal of Management*, 26(4), 596–616. <https://doi.org/10.1111/1467-8551.12072>
- Kale, E., Aknar, A., & Başar, Ö. (2019). Absorptive capacity and firm performance: The mediating role of strategic agility. *International Journal of Hospitality Management*, 78, 276–283. <https://doi.org/10.1016/j.ijhm.2018.09.010>
- Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard: Measures that drive performance. *Harvard Business Review*, 70(1), 71–79.
- Khan, S. H., Majid, A., & Yasir, M. (2020). Strategic renewal of SMEs: The impact of social capital, strategic agility and absorptive capacity. *Management Decision*, 59(8), 1877–1894. <https://doi.org/10.1108/MD-12-2019-1722>
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, 11(4), 1–10. <https://doi.org/10.4018/ijec.2015100101>

- Kock, N. (2021). *WarpPLS user manual* (Version 7.0). ScriptWarp Systems.
- Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3), 383–397. <https://doi.org/10.1287/orsc.3.3.383>
- Kotabe, M., Jiang, C. X., & Murray, J. Y. (2011). Managerial ties, knowledge acquisition, realized absorptive capacity, and new product market performance of emerging multinational companies: A case of China. *Journal of World Business*, 46(2), 166–176. <https://doi.org/10.1016/j.jwb.2010.05.005>
- Kumkale, İ. (2016). Organization's tool for creating competitive advantage: Strategic agility. *Balkan and Near East Journal of Social Sciences*, 2(3), 118–124.
- Kustiningsih, N., Tjahjadi, B., & Soewarno, N. (2022). Projecting experience of technology-based MSMEs in Indonesia: Role of absorptive capacity in the relationship between strategic alliances and organizational performance. *Sustainability*, 14(19), Article 12025. <https://doi.org/10.3390/su141912025>
- Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. *Academy of Management Review*, 31(4), 833–863. <https://doi.org/10.5465/amr.2006.22527456>
- Lee, Y. K., Kim, S. H., Seo, M. K., & Hight, S. K. (2015). Market orientation and business performance: Evidence from the franchising industry. *International Journal of Hospitality Management*, 44, 28–37. <https://doi.org/10.1016/j.ijhm.2014.09.008>
- Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, 13(S1), 111–125. <https://doi.org/10.1002/smj.4250131009>
- Li, L., Zhang, Y., Sun, J., & Yang, Z. (2025). Strategic flexibility in dynamic environments: The game-changer in digital transformation and organizational resilience. *Total Quality Management & Business Excellence*, 36(11–12), 1281–1300. <https://doi.org/10.1080/14783363.2025.2548598>
- Li, Y.-H., & Huang, J.-W. (2012). Ambidexterity's mediating impact on product development proficiency and new product performance. *Industrial Marketing Management*, 41(7), 1125–1132. <https://doi.org/10.1016/j.indmarman.2012.05.002>
- Lichtenthaler, U. (2016). Absorptive capacity and firm performance: An integrative framework of benefits and downsides. *Technology Analysis & Strategic Management*, 28(6), 664–676. <https://doi.org/10.1080/09537325.2015.1119148>
- Liu, H., Ke, W., Wei, K. K., & Hua, Z. (2013). The impact of IT capabilities on firm performance: The mediating roles of absorptive capacity and supply chain agility. *Decision Support Systems*, 54(3), 1452–1462. <https://doi.org/10.1016/j.dss.2012.12.016>
- Luthans, F. (1973). The contingency theory of management: A path out of the jungle. *Business Horizons*, 16(1), 67–72. [https://doi.org/10.1016/0007-6813\(73\)90026-8](https://doi.org/10.1016/0007-6813(73)90026-8)
- Lyu, C., Peng, C., Yang, H., Li, H., & Gu, X. (2022). Social capital and innovation performance of digital firms: Serial mediation effect of cross-border knowledge search and absorptive capacity. *Journal of Innovation & Knowledge*, 7(2), Article 100187. <https://doi.org/10.1016/j.jik.2022.100187>
- March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), 71–87. <https://doi.org/10.1287/orsc.2.1.71>
- March, J. G., & Simon, H. A. (1958). *Organizations*. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.
- Martínez-del-Río, J., Antolín-López, R., & Céspedes-Lorente, J. J. (2015). Being green against the wind? The moderating effect of munificence on acquiring environmental competitive advantages. *Organization & Environment*, 28(2), 181–203. <https://doi.org/10.1177/1086026615573082>
- Mata, M. N., Martins, J. M., & Inácio, P. L. (2023). Impact of absorptive capacity on project success through mediating role of strategic agility: Project complexity as a moderator. *Journal of Innovation & Knowledge*, 8(1), Article 100327. <https://doi.org/10.1016/j.jik.2023.100327>
- Matear, S., Boshoff, C., Gray, B., & Matheson, P. (1998). Developing a better measure of market orientation. *European Journal of Marketing*, 32(9–10), 884–903. <https://doi.org/10.1108/03090569810232327>
- Mejeed, S. H., Aljanabi, A. R. A., & Kasem, J. M. (2025). The mediating role of marketing agility on the relationship between entrepreneurial resilience, absorptive capacity, and new product performance. *International Journal of Innovation Management*, 29(03n04), Article 2550015. <https://doi.org/10.1142/S136391962550015X>
- Miller, D., & Friesen, P. H. (1982). Innovation in conservative and entrepreneurial firms: Two models of strategic momentum. *Strategic Management Journal*, 3(1), 1–25. <https://doi.org/10.1002/smj.4250030102>
- Moore, J. F. (1993). Predators and prey: A new ecology of competition. *Harvard Business Review*, 71(3), 75–86.
- Neely, A., Filippini, R., Forza, C., Vinelli, A., & Hii, J. (2001). A framework for analysing business performance, firm innovation and related contextual factors: Perceptions of managers and policy makers in two European regions. *Integrated Manufacturing Systems*, 12(2), 114–124. <https://doi.org/10.1108/09576060110384307>
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1), 14–37. <https://doi.org/10.1287/orsc.5.1.14>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Raisch, S., & Birkinshaw, J. (2008). Organizational ambidexterity: Antecedents, outcomes, and moderators. *Journal of Management*, 34(3), 375–409. <https://doi.org/10.1177/0149206308316058>
- Ringle, C. M., Wende, S., & Becker, J.-M. (2015). *SmartPLS* (Version 3) [Computer software]. SmartPLS GmbH. <https://www.smartpls.com>
- Riquelme-Medina, M., Stevenson, M., Barrales-Molina, V., & Lloréns-Montes, F. J. (2022). Cooperation in business ecosystems: The key role of absorptive capacity and supply chain agility. *Journal of Business Research*, 146, 464–476. <https://doi.org/10.1016/j.jbusres.2022.03.058>
- Rong, K., Lin, Y., Li, B., Burström, T., Butel, L., & Yu, J. (2018). Business ecosystem research agenda: More dynamic, more embedded, and more internationalized. *Asian Business & Management*, 17(3), 167–182. <https://doi.org/10.1057/s41291-018-0038-6>
- Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of IT in contemporary firms. *MIS Quarterly*, 27(2), 237–263. <https://doi.org/10.2307/30036530>
- Schwarz, A., Rizzuto, T., Carraher-Wolverton, C., Roldán, J. L., & Barrera-Barrera, R. (2017). Examining the impact and detection of the “urban legend” of common method bias. *SIGMIS Database: The DATABASE for Advances in Information Systems*, 48(1), 93–119. <https://doi.org/10.1145/3051473.3051479>
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach* (7th ed.). Wiley.

- Shams, R., Vrontis, D., Belyaeva, Z., Ferraris, A., & Czinkota, M. R. (2021). Strategic agility in international business: A conceptual framework for “agile” multinationals. *Journal of International Management*, 27(1), Article 100737. <https://doi.org/10.1016/j.intman.2020.100737>
- Simon, A., Bartle, C., Stockport, G., Smith, B., Klobas, J. E., & Sohal, A. (2015). Business leaders' views on the importance of strategic and dynamic capabilities for successful financial and non-financial business performance. *International Journal of Productivity and Performance Management*, 64(7), 908–931. <https://doi.org/10.1108/IJPPM-02-2014-0028>
- Simsek, Z. (2009). Organizational ambidexterity: Toward a multilevel understanding. *Journal of Management Studies*, 46(4), 597–624. <https://doi.org/10.1111/j.1467-6486.2009.00857.x>
- Singh, A. K., Jain, N. K., Sharma, M. G., & Nigam, S. (2023). Reconceptualization of absorptive capacity as potential and realized absorptive capacity for project-based organizations. *International Journal of Project Management*, 41(2), Article 102449. <https://doi.org/10.1016/j.ijproman.2022.102449>
- Song, S., Hossain, M. A., Yin, X., & Hosain, M. S. (2021). Accelerating green innovation performance from the relations of network potential, absorptive capacity, and environmental turbulence. *Sustainability*, 13(14), Article 7765. <https://doi.org/10.3390/su13147765>
- Stock, G. N., Greis, N. P., & Fischer, W. A. (2001). Absorptive capacity and new product development. *Journal of High Technology Management Research*, 12(1), 77–91. [https://doi.org/10.1016/S1047-8310\(00\)00040-7](https://doi.org/10.1016/S1047-8310(00)00040-7)
- Stone, M. (1974). Cross-validatory choice and assessment of statistical predictions. *Journal of the Royal Statistical Society: Series B (Methodological)*, 36(2), 111–147. <https://doi.org/10.1111/j.2517-6161.1974.tb00994.x>
- Tallon, P. P., Queiroz, M., Coltman, T., & Sharma, R. (2018). Information technology and the search for organizational agility: A systematic review with future research possibilities. *Journal of Strategic Information Systems*, 27(2), 218–237. <https://doi.org/10.1016/j.jsis.2017.10.002>
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Thérin, F. (2007). Absorptive capacity: An empirical test of Zahra and George's contribution in small business settings. *Gestion 2000*, 24(4), 17–30.
- Turulja, L., & Bajgorić, N. (2019). Innovation, firms' performance and environmental turbulence: Is there a moderator or mediator? *European Journal of Innovation Management*, 22(1), 213–232. <https://doi.org/10.1108/EJIM-03-2018-0064>
- Tushman, M. L., & O'Reilly, C. A. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review*, 38(4), 8–29. <https://doi.org/10.2307/41165852>
- Tzokas, N., Kim, Y., Akbar, H., & Al-Dajani, H. (2015). Absorptive capacity and performance: The role of customer relationship and technological capabilities in high-tech SMEs. *Industrial Marketing Management*, 47, 134–142. <https://doi.org/10.1016/j.indmarman.2015.02.033>
- Volberda, H. W., Foss, N. J., & Lyles, M. A. (2010). Absorbing the concept of absorptive capacity: How to realize its potential in the organization field. *Organization Science*, 21(4), 931–951. <https://doi.org/10.1287/orsc.1090.0503>
- Vrontis, D., Thrassou, A., Santoro, G., & Papa, A. (2017). Ambidexterity, external knowledge and performance in knowledge-intensive firms. *Journal of Technology Transfer*, 42(2), 374–388. <https://doi.org/10.1007/s10961-016-9502-7>
- Walton, R. E. (1985). *Toward a strategy of eliciting employee commitment based on policies of mutuality*. Harvard University Press.
- Weber, Y., & Tarba, S. Y. (2014). Strategic agility: A state-of-the-art introduction to the special section on strategic agility. *California Management Review*, 56(3), 5–12. <https://doi.org/10.1525/cm.2014.56.3.5>
- Wetzels, M., Odekerken-Schröder, G., & van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, 33(1), 177–195. <https://doi.org/10.2307/20650284>
- Wu, S., & Lu, C. (2012). The relationship between CRM, RM, and business performance: A study of the hotel industry in Taiwan. *International Journal of Hospitality Management*, 31(1), 276–285. <https://doi.org/10.1016/j.ijhm.2011.06.012>
- Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review*, 27(2), 185–203. <https://doi.org/10.5465/amr.2002.6587995>
- Zhu, X. M., Jiang, Y., Du, Z. W., & Lu, Q. W. (2011). A study on the impact of KM processes on new product development performance. *Journal of Industrial Engineering and Management*, 4(1), 113–122.

APPENDIX

Table A1. Questionnaire items and literature sources

Dimensions	Items	Sources
Strategic agility	Our company uses advanced production technologies, such as value analysis, concurrent engineering, and modular design systems	Khan et al. (2020)
	Our company invests in upgrading production, information, and inventory management systems	
	Our company promotes interdisciplinary training and team activities	
	Our company integrates functional strategy well with business strategy	
Potential absorptive capacity	The frequency and importance of collaboration with R&D organizations (universities, business schools, technical colleges, etc.) to create knowledge and innovation as a member or sponsor	Camisón and Forés (2010), Flatten et al. (2011a), Jiménez-Barrionuevo et al. (2011), Cadiz et al. (2009)
	The company's ability to absorb useful or potential new technologies and innovations	
	The company is able to develop a knowledge management program to ensure that the company can understand and carefully analyze knowledge and technologies from other organizations	
	The information flow in our company is fast, for example, if one business unit obtains important information, it quickly passes this information to the company, to all other business units or departments	
Realized absorptive capacity	Our employees are used to absorbing new knowledge, preparing it for further purposes and making it available	Camisón and Forés (2010), Flatten et al. (2011a), Jiménez-Barrionuevo et al. (2011), Cadiz et al. (2009)
	The ability of the organization to use and develop new knowledge in the workplace to quickly respond to environmental changes	
	Our company regularly reconsiders technology and adjusts based on new knowledge	
	New technological knowledge can be quickly applied to our work	
Environmental turbulence	The frequency of changes in our marketing strategy	Miller and Friesen (1982)
	The speed of our product or service updates	
	The degree to which competitors' actions are predictable	
	The degree to which technological developments in the company's products or services change	
Firm performance	The company's products or services enhance customers' willingness to consume	Lee et al. (2015), Simon et al. (2015), Kaplan and Norton (1992), Wu and Lu (2012), Matear et al. (1998), Walton (1985)
	Our organization can achieve an increase in profit margins	
	Our organization can achieve an increase in market share	
	The productivity of the company's employees is high	