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From digital vision to strategic agility: The mediating roles of organizational learning and innovation and the contingent influence of leadership climate

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Abstract

PURPOSE: *This study investigates how digital leadership influences strategic agility, emphasizing the mediating roles of organizational learning and innovation, and the moderating effect of leadership climate. By integrating dynamic capabilities theory and upper echelons theory, the research develops and empirically tests a comprehensive model of agility in volatile environments.* ***METHODOLOGY:*** *A quantitative, cross-sectional survey was conducted with 302 managerial and supervisory respondents across diverse industries, including services, manufacturing, and technology. Data were analyzed using structural equation modeling (SEM) with SmartPLS to test hypothesized direct, mediating, and moderating relationships.* ***FINDINGS:*** *Results show that digital leadership directly enhances strategic agility and exerts a significant indirect effect through organizational learning, which emerged as the primary mediating mechanism. While digital leadership positively predicts innovation and innovation is directionally associated with strategic agility, the indirect mediation path through innovation did not reach statistical significance, suggesting that organizational learning is the dominant pathway linking digital leadership to strategic agility. Leadership climate positively moderated the relationship between organizational learning and strategic agility. The cross-sectional design limits causal inference, and reliance on self-reported data may introduce bias. Future longitudinal and mixed-methods research could capture temporal dynamics and deepen insights into leadership climates across contexts.* ***IMPLICATIONS****: Theoretically, this study advances strategic agility research by integrating Dynamic Capabilities and Upper Echelons perspectives to explain how digital orientation is converted into agility through organizational learning and innovation, while identifying organizational climate as a critical boundary condition. Practically, the findings demonstrate that digital initiatives alone are insufficient, highlighting the need for learning-oriented practices, innovation routines, and supportive climates to translate digital efforts into adaptive performance.* ***ORIGINALITY & VALUE:*** *This study advances the theorization of strategic agility by unifying leadership, learning, and innovation into an empirically tested framework. It extends Dynamic Capabilities and Upper Echelons perspectives by demonstrating how leadership climate conditions the transformation of organizational processes into agility, offering a more nuanced and integrated explanation of adaptive performance.*

Keywords: *digital leadership, strategic agility, organizational learning, innovation, leadership climate, dynamic capabilities, upper echelons theory, digital transformation, structural equation modeling, adaptive performance*

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INTRODUCTION

The modern business world is becoming more volatile, uncertain, complex, and ambiguous (VUCA), and the need to constantly adjust their approaches, organizational structures, and processes arises to ensure the competitiveness of organizations (Albannai et al., 2024). In that regard, strategic agility, which is the ability of an organization to feel the changes and emerging opportunities in the environment as well as reorganize its resources fast, has become a key driver of organizational survival and competitiveness (Doz & Kosonen, 2010; Sampath et al., 2021). Although strategic agility is recognized as an essential factor in organizations, not all can effectively put it into practice. Several efforts to invest in digital technologies, innovation processes, and knowledge systems often do not lead to adaptive results, which implies that agility relies not only on resources, but also on the processes and conditions of the organization in which they should be deployed with the help of leaders (Jaafar et al., 2025).

Digital leadership is an antecedent of strategic agility that is becoming increasingly important in recent studies. Digital leadership is the ability to articulate a digital vision, align technology with strategic goals, and foster adaptive cultures to facilitate ongoing change (Zeike et al., 2019; Benitez et al., 2022). Empirical data indicate that digitally oriented leaders have the potential to improve agility by shaping organizational norms, enhancing decision-making processes, and fostering adaptive behaviors (Jasim et al., 2024). Nevertheless, the available evidence is contradictory. Although digital leadership has direct impacts on agility, as reported in some studies (Jasim et al., 2024), there are also indirect routes that operate through organizational learning and innovation (Ly, 2024; Eberl et al., 2025). Organizational learning is the ability of the firm to acquire, distribute, and use knowledge (Jerez-Gomez et al., 2005), and innovation is the process of developing and putting into the organization new products, services or processes, which restores the organizational capabilities (Sultana et al., 2022; Wang et al., 2025).

Despite their well-established status as independent constructs, the literature remains scattered on how these constructs interact to achieve strategic agility. Most previous researchers tend to focus on leadership, learning, innovation, or agility separately, without developing them into a coherent explanatory framework (Jaafar et al., 2025). In addition, although innovation is often described as a precondition for agility (Kohtamaki et al., 2020; Sultana et al., 2022), it is indicated that the exclusive presence of innovation might not be sufficient to facilitate rapid strategic reconfiguration, especially in turbulent environments (Rybalka, 2024). Likewise, organizational learning has been reported to be effective in achieving agility by aiding sensing and adaptation processes (Atanassova et al., 2025), but its efficacy appears to be context-dependent on leadership and organizational climate factors (Iqbal et al., 2025).

One of the most underexplored aspects is the role of leadership climate, a set of mutual beliefs among employees about leadership behavior regarding trust, empowerment, and support (Sarros et al., 2008; Naqshbandi & Tabche, 2018). The new evidence indicates that the conditions of leadership climate determine the successful development of learning and innovation into adaptive outputs (Atanassova et al., 2025; Bux et al., 2025). Nonetheless, the majority of previous research either treats leadership climate as a background factor or simply ignores it, leaving very little information on its moderating effect on the leadership-agility association. Therefore, the major gap in the literature is not that there are no empirical links between leadership, learning, innovation, and agility, but that there is no such process-oriented explanation establishing how and under what conditions digital leadership enables strategic agility.

Based on the dynamic capabilities theory (Teece et al., 1997; Sampath et al., 2021) and upper echelons theory (Hambrick and Mason, 1984), this paper fills this gap with a mediated-moderated model of strategic agility proposed and empirically tested. Dynamic capabilities theory offers a process perspective, according to which organizational learning and innovation may be regarded as mediating capabilities that enable sensing, seizing, and reconfiguration activities (Benitez et al., 2022; Sultana et al., 2022). This opinion is supplemented by the upper echelons theory, which explores how leadership orientations and the climates largely facilitated by leaders influence organizational outcomes (Sarros et al., 2008; Iqbal et al., 2025). By incorporating these views, the study can transcend mere confirmation of existing relationships and explain how processes driven by leadership are reconfigured into agile behavior in response to specific contextual requirements. In this respect, the present study will have the following research question:

RQ: What is the nature of the relationship between digital leadership and strategic agility using organizational learning and innovation, and how is the climate of leadership conditioned?

The proposed model is empirically tested using survey data collected from managerial and supervisory participants working in a Middle Eastern setting and with access to structural equation modeling. The results show that digital leadership improves strategic agility, both directly and indirectly through organizational learning and innovation. Furthermore, the leadership climate has a positive moderating effect on the relationship between organizational learning and strategic agility, and learning yields adaptive results only in empowering, trust-based leadership climates.

This research makes several contributions to the literature. In theory, it contributes to the strategic agility research by integrating leadership, learning, innovation, and climate into a single explanatory model that addresses the fragmentation observed in earlier studies (Jaafar et al., 2025; Syamsir et al., 2025). It builds on dynamic capabilities theory by empirically treating learning and innovation as mediating capabilities, and on upper echelons theory by treating leadership climate as a key boundary condition. In practice, the results show that digital investments alone are insufficient to create agility without support from learning-oriented behavior, innovation routines, and encouraging leadership climates that provide managers working in turbulent settings with helpful information.

The rest of the paper is structured in the following way. The following section examines the corresponding literature and formulates the hypotheses. The methodology section describes the research design, sample, measurement scales, and analysis procedures. The empirical findings are presented in the results section, and the theoretical and practical implications are discussed. The limitations and future research directions constitute the conclusion of the paper.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The concept of strategic agility has been framed more and more in the context of the dynamic capabilities theory, which describes organizational ability to detect changes in the environment and to evolve and develop in response to them, utilizing the available resources in the most efficient ways (Teece et al., 1997; Sampath et al., 2021). In this view, agility is not an organizational characteristic but a process-based capability fueled by the ongoing renewal of resources and routines. The latter is focused on organizational learning and innovation, in that learning enables the acquisition and interpretation of new knowledge needed to sense and seize opportunities, and innovation enables the reconfiguration of resources needed to act adaptively (Benitez et al., 2022; Sultana et al., 2022; Atanassova et al., 2025). Digital leadership is essential to activating these mechanisms by aligning digital activities with strategic goals and creating conditions that enable learning and innovation as dynamic capabilities.

Although the dynamic capabilities theory is a strong model for explaining how agility is created through organizational mechanisms, it provides little insight into how human and behavioral factors contribute to the successful implementation of these mechanisms. To overcome this contradiction, we use upper echelons theory (Hambrick & Mason, 1984) to argue that leadership orientations and corporate perceptions determine organizational outcomes. This theory states that strategic outcomes reflect leaders' cognitive frames, values, and interpretations, which are passed on to organizational members through leadership behaviors and practices. Digital leadership in the context of this research indicates the strategic orientation of the leaders on the matter of technology-enabled transformation, and leadership climate indicates the mutual perception of the employees on the matters of leadership behaviors in relation to trust, empowerment, and support (Sarros et al., 2008; Naqshbandi & Tabche, 2018). Such perceptions affect the interpretation, application, and eventual translation of organizational learning in strategic agility.

Contextualizing dynamic capabilities theory with the upper echelons theory helps explain strategic agility more thoroughly, as organizational processes are connected to leadership-based contextual requirements. Dynamic capabilities are used to understand how learning and innovation can foster agility, but the upper echelons theory elucidates why the mechanisms of agility are more effective in certain organizations than in others. In particular, leadership climate is a facilitative or inhibitory context factor that determines whether learning processes produce adaptive strategic behavior. When leadership practices are perceived as supportive and empowering, organizational learning is more likely to lead to experimentation, knowledge application, and rapid strategic reconfiguration (Atanassova et al., 2025; Iqbal et al., 2025). Learning can be procedural in less favorable climates and may not bear any significant agility results.

When combined, these theoretical views provide a logical foundation for the proposed research model. Strategic agility is theorized as the product of dynamic capabilities stipulated by leadership, and in this case, digital leadership creates learning and innovation processes, and the climate of leadership moderates their success. This combined system goes beyond separate studies of isolated constructs and provides a process-based account of how strategic agility is instilled in practice. Based on this the following hypotheses are formulated.

Relationship between digital leadership and strategic agility

Despite the past literature contradicting whether the effect of digital leadership on strategic agility is direct or indirect, there are solid theoretical and empirical reasons to suggest a direct correlation as a baseline effect. Regarding dynamic capabilities, leaders are important because they can facilitate swift strategy execution by setting strategic priorities, directing resources, and reducing decision-making time frames, all of which may increase agility without considering intermediate organizational processes (Doz & Kosonen, 2010; Sampath et al., 2021). Digital leaders, specifically, are in a position to directly affect agility by enabling quick experimentation, reducing structural inertia, and making swift strategic shifts through technology-based coordination (Jasim et al., 2024). This opinion is supported by empirical evidence. A number of studies show that digitally oriented leaders can directly contribute to strategic agility by redefining organizational norms, promoting rapid responses to environmental signals, and validating adaptive action at the strategic level (Jasim et al., 2024; Schuster et al., 2023). These direct effects imply that leadership may impact agility through learning and innovation processes, as well as by directly affecting strategic behavior and decision speed in situations, especially in unstable environments. Simultaneously, the presence of indirect routes through organizational learning and innovation does not rule out a direct impact. Instead, it suggests that digital leadership can be effective in a variety of complementary ways. Ly (2024) also argues that leadership can be both the source of agility and the source of processes in the organization that maintains agility. In turn, by suggesting a direct effect, the model will enable consideration of the immediate strategic effects of leadership, and the mediating hypotheses will explain the process-based mechanisms by which these effects are magnified and institutionalized (Fatima & Masood 2024). Based on this finding, the research hypothesizes that digital leadership has a direct positive impact on strategic agility, as well as an indirect effect via organizational learning and innovation. This led to the development of the following hypothesis:

H1: Digital leadership has a positive direct effect on strategic agility.

Relationship between digital leadership and organizational learning

Assuming that agility is one of the key strategic outcomes of digital leadership, organizational learning is the primary path through which leadership impacts are realized. Various studies indicate that digital leaders develop cultures and structures that encourage continuous sharing and the adaptation of knowledge. Jasim et al. (2024) demonstrated that the organizational learning culture is positively predicted by the digital leadership factor, which in turn leads to enhanced creative performance. Their results indicate the presence of a mediating process in which learning serves as a link between leadership and innovation outcomes. This aligns with Wang et al. (2025), who theorized that digital leaders are curious (by nature) and could instill an organizational culture of exploration and curiosity. According to their argument, not only is learning a byproduct, but it is also a defining characteristic of digital leadership. Ye (2025) also described how digital leaders facilitate learning by empowering employees to design their jobs, thereby developing organizational resources that foster collective adaptability. A combination of these insights proves that learning is a cultural and structural product of digital leadership (Borah et al., 2022).

On a more granular level, Eberl et al. (2025) demonstrated how leaders institutionalize learning by proposing digital routines and artifacts, such as cross-team rituals and knowledge-sharing platforms, that make learning a daily practice. Their qualitative data supplement the larger quantitative results of Jasim et al. (2024), who found that digital leadership capability indicates the maturity of formal knowledge management systems. The integration of both qualitative and quantitative data supports the idea that digital leadership has effects on both the cultural and systemic aspects of organizational learning. This led to the development of the following hypothesis:

H2: Digital leadership positively influences organizational learning.

Relationship between digital leadership and innovation

It is a well-known fact that innovation is one of the most important organizational skills that help companies to be adaptable, rejuvenate, and competitive in the ever-changing circumstances. This paper defines innovation as a multidimensional organizational capacity encompassing technological and non-technological forms. Instead of adopting new technologies, the term innovation is defined as the creation and adoption of new or considerably better products, services, processes,

managerial practices, and organizational routines that increase the responsiveness of firms to change in the environment (Kohtamaki et al., 2020; Sultana et al., 2022; Rybalka, 2024). This broader conceptualization is compatible with the dynamic capabilities viewpoint, which holds that innovation can be understood as a reconfiguration process through which organizations renew their resource base and strategic activities.

In this context, the issue of digital leadership does not have an impact on innovation in the sense of marketing technological tools or digital systems. Rather, digital leaders influence innovation through a vision statement of the future, innovation experimentation, cross-functional teamwork, and legitimizing of risk-taking behaviors throughout the organization (Benitez et al., 2022; Tigre et al., 2025). Those leadership behaviors make possible both technological innovations, including digital platforms and data-driven solutions, and non-technological innovations, namely new coordination mechanisms, process improvement, and new managerial practices (Memon & Ooi, 2023; Erhan et al., 2022).

This is a broader view of innovation supported by empirical evidence. According to Benitez et al. (2022), digital leadership can improve innovation performance by enabling the organization to incorporate knowledge and experimentation rather than simply extending the use of technology. In the same vein, Tigre et al. (2025) also note that digital leadership drives innovation by balancing exploration and exploitation, enabling organizations to recombine existing resources in new ways. Memon and Ooi (2023) further reveal that the responsible and sustainable outcomes of innovation are contributed by digital leadership, emphasizing that not only the technical artifact but also the social and organizational aspects of innovation are included in digital leadership. All these findings suggest that innovation is best viewed as an organizational leadership ability rather than a purely technological one (Shatila et al., 2024).

In dynamic capabilities, innovation can be viewed as the process by which learning and accumulated knowledge are converted into adaptive strategic action. Digital leaders are at the center of engaging with this mechanism by establishing environments that enable experimentation, learning-by-doing, and continuous improvement (Sultana et al., 2022; Rybalka, 2024). Digital leadership will therefore positively impact organizational innovation, enhancing the organization's ability to adapt and compete in a turbulent environment. This led to the development of the following hypotheses:

H3: Digital leadership positively influences innovation.

Relationship between organizational learning and strategic agility

An alternative body of research suggests that organizational learning benefits the development of strategic agility, defined as the capability to revise strategies and quickly redistribute resources in dynamic settings. Atanassova et al. (2025) cite examples of UK companies that demonstrate that, when accompanied by empowering management, ongoing organizational learning processes can foster agility by transforming employees into lifelong learners. Their results highlight that engaging learning activities, including environmental scanning, knowledge sharing, and reflection, can help firms detect market changes and respond strategically (Shatila et al., 2026). Strategic agility can be enhanced through organizational learning, as it enables firms to renew capabilities by enabling them to reorganize resources and implement strategy changes based on the knowledge gained. The argument aligns with the dynamic capabilities view, which posits that learning serves as the foundation for sensing and capturing opportunities in turbulent environments. Notably, Atanassova et al. (2025) emphasize that organizational memory and vigilant learning enable firms to be both flexible and strategic by linking routine behaviors to strategic decision-making.

Besides, organizational learning establishes the cultural infrastructure that promotes agility. The ability of firms to identify opportunities and threats in real-time is enhanced in companies where experimentation is encouraged, feedback is welcomed, and knowledge repositories are established (Maravilhas, 2019). The processes enable employees at various levels of the company to work efficiently, thereby minimizing time wastage during decision-making. The focus on cultural fit in the studies by Atanassova et al. (2025) and Shatila (2025) demonstrates that learning can be about not only the acquisition of information but also the instillation of norms and values, thereby emphasizing adaptability. Connectedly, the literature illustrates that strategic agility is grounded in a microfoundation, i.e., organizational learning. Although the concept of strategic agility can be discussed at the macro-level of firm strategy, learning processes enable it to work in practice (Sampath et al., 2021; Shatila et al., 2025). This led to the development of the following hypotheses:

H4: Organizational learning has a positive effect on strategic agility.

Relationship between innovation and strategic agility

A substantial amount of empirical evidence suggests that innovation is a vital facilitator of strategic agility. Based on the practice-based case study of large industrial companies, Kohtamaki et al. (2020) prove that strategic agility can be achieved when entrepreneurial orientation and absorptive capacity are combined to facilitate innovation. According to them, companies that can strike a balance between exploration and exploitation through innovative practices can more easily adjust to changes in their environment. Although their paper focuses on the interaction of internal capabilities, a massive survey of 543 Chinese SMEs by Bux et al. (2025) empirically proves that open innovation plays a major role in organizational agility. They found that interacting with external partners and stakeholders makes the firm more responsive to emerging opportunities, suggesting that the role of relational innovation is even more important than internal processes. Following this standpoint, Rybalka (2024) examines how companies with varying innovation patterns responded during the COVID-19 crisis. The researchers find that firms with an existing R&D system and systematic innovation processes exhibit greater strategic agility than those without a similar system. In comparison to Kohtamaki et al. (2020), who studied innovation under relatively stable conditions, Rybalka (2024) highlights the significance of innovation in extreme turbulence, demonstrating that innovation capability is not only offensive but also protective in maintaining competitiveness.

Similarly, Wang et al. (2025) provide evidence from their supply chain study that digitalization and agility are related, with firm-level innovation capability serving as a mediator. Their findings reiterate that digital investments alone do not lead to agility unless a strong innovation capability supports them. This point is expanded by Rybalka (2024), whose argument is based on the ability to adapt to crises rather than being transformed by technology. Building on these reflections, Sultana et al. (2022) found, in their empirical study, that data-driven innovation capability effectively enhances market agility, which, in turn, leads to improved competitive performance. Their work highlights the growing value of digital data as a source of innovation, an aspect Kohtamaki et al. (2020) describe in their perspective on absorptive capacity, and extends it to the digital realm. Collectively, these works (Kohtamaki et al., 2020; Sultana et al., 2022; Rybalka, 2024; Wang et al., 2025; Bux et al., 2025) lead to the conclusion that innovation, regardless of its source, the in-house, the external, or the digital, is an efficient strategic agility driver. Nonetheless, their focus varies: some of them focus on internal absorptive mechanisms (Kohtamaki et al., 2020), others are relational openness (Bux et al., 2025), crisis resilience (Rybalka, 2024; Zia et al., 2025), or digital capability integration (Wang et al., 2025; Sultana et al., 2022). These differences demonstrate that innovation is a multidimensional construct and that, in general, its existence enhances firms' agility. This led to the development of the following hypothesis:

H5: Innovation has a positive effect on strategic agility.

Moderating effect of leadership climate

Although organizational learning is generally assumed to be a major source of strategic agility, not all organizations are effective in achieving adaptive results. In this paper, leadership climate is defined as the collective perception of employees regarding the linked leadership-related behaviors that indicate support, trust, empowerment, and willingness to participate (Sarros et al., 2008; Naqshbandi & Tabche, 2018). In comparison to leadership style, which describes the actions or characteristics of specific leaders, leadership climate describes an organizational, situational conception of how leadership is practiced and experienced within the organization. It also differs from the general organizational climate, as it emphasizes cues relevant to leadership in shaping employees' perceptions of authority, risk-taking, and opportunities to learn.

In this sense, the leadership climate does not lead to leadership behaviors; on the contrary, it conditions the process by which organizational processes, including learning, are interpreted, enacted, and translated into strategic results. According to previous research, learning processes alone are insufficient to generate agility unless employees feel that leadership behaviors are supportive and enabling. To illustrate the point, we can refer to the study by Atanassova et al. (2025): the researchers found that organizational learning improves strategic agility only when leadership establishes an environment that supports experimentation and the implementation of knowledge. Equally, Naqshbandi and Tabche (2018) show that empowering leadership climates make learning cultures more effective because employees can apply the knowledge they gain to actions that lead to innovation.

Sarros et al. (2008) also present a moderating logic, stating that the leadership climate influences the activation or suppression of organizational capabilities, such as learning and innovation. In unsupportive or control-oriented climates learning can be symbolic or procedural and not affecting strategic reconfiguration. In an environment of trust, empowerment, and psychological safety, knowledge acquisition processes will promote the propensity of employees to experiment, share knowledge, and take action on the new knowledge more, which is why the potential enhancement of strategic agility is more likely (Iqbal et al., 2025; Bux et al., 2025).

Based on this, the leadership climate is hypothesized to mediate, rather than directly forecast, the connection between organizational learning and strategic agility by modifying the degree and efficiency of transforming learning into adaptive strategic action. The positive relationship between organizational learning and strategic agility is stronger when the leadership climate is favorable and weaker when it is unfavorable or weak. This led to the development of the following hypothesis:

H6: Leadership climate positively moderates the relationship between organizational learning and strategic agility.

The research model can then be illustrated as follows (Figure 1):

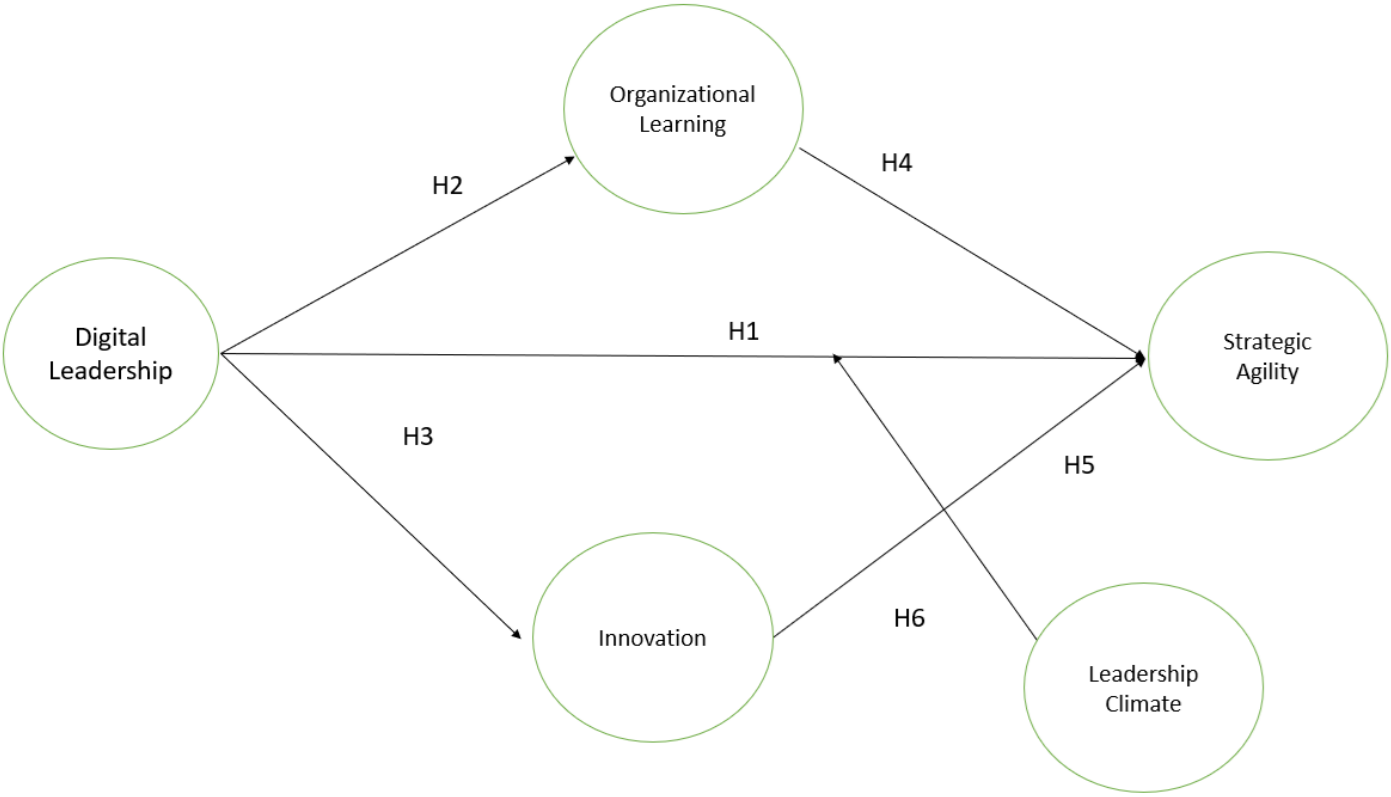

Figure 1. Research model

METHODOLOGY

Research design

The research used a quantitative, cross-sectional survey design to test hypothesized relationships among digital leadership, organizational learning, innovation, leadership climate, and strategic agility. The survey method was selected because it provides standardized data from a wide range of respondents, enabling comparisons across constructs and industries. Such a design has been widely used in leadership and strategy studies, especially in research on perceptual variables, including leadership behavior, organizational processes, and cultural dynamics (Jasim et al., 2024). Even though cross-

sectional designs do not allow causal inferences, they are suitable for testing theoretical models in which the main aim is to establish a correlation between constructs. To analyze the data, SEM was used, as it enables simultaneous testing of the measurement and structural models and is especially suitable for testing complex relationships among variables, including mediators and moderators. (Hair et al., 2021).

Sample and data collection

The current study is based on survey data collected from managerial and supervisory respondents working in organizations operating within the Middle Eastern context. The survey was distributed to 480 potential participants through professional networks and managerial associations. A total of 350 responses were received, yielding a response rate of approximately 72.9%. After screening the data for completeness, consistency, and response patterns, 48 questionnaires were excluded due to missing values or irregular answering patterns, resulting in a final sample of 302 valid responses (effective response rate of 62.9%). This final dataset was used for subsequent statistical analyses. The study employed purposive and snowball sampling procedures; therefore, the findings should not be interpreted as statistically generalizable to a defined population. The inferential statistics reported (bootstrapped standard errors and p-values) are used to assess the stability and internal consistency of parameter estimates within the observed sample rather than to produce population-level probability estimates. Accordingly, the results are interpreted as theory-consistent associations in the sampled managerial context, and not as claims of universal generalizability.

The online questionnaire was used to collect data, which was voluntary. To reduce social desirability bias, respondents were assured of anonymity and confidentiality, encouraging them to answer questions honestly. Before the actual data collection, a pilot study was conducted with 25 managers to assess the clarity, wording, and contextual relevance of the measurement items. The pilot provided feedback that included slight wording changes to ensure nothing was misunderstood and to maintain a fitting perspective within the organizational context. After the entire data collection, the responses were screened for completeness and response pattern, leaving a final sample of 302 valid questionnaires for analysis.

The selected organizations are heterogeneous in terms of the industries represented (35.4% services, 28.1% technology, and 24.5% manufacturing), with the rest of the respondents being heterogeneous (representing other sectors). There was also good distribution across organizational size, with firms having less than 100 employees (24.2%), 100-249 employees (26.2%), 250-499 employees (18.2%), and more than 500 employees (31.5%), thus reducing the bias introduced by size. The study captures various strategic perspectives applicable to the study of strategic agility by focusing on respondents at the managerial and supervisory levels across organizations of different sizes and industries.

The study's limited scope to organizations in one regional context will help it control for institutional, cultural, and technological conditions that could affect digitalization and organizational practices. This local emphasis enhances internal validity by minimizing confounding factors arising from differences in digital infrastructure, regulatory contexts, and cultural values across regions.

Measurement scales

All constructs in this study were measured using established, validated scales adapted from prior research. Digital leadership was assessed using six items adapted from Zeike et al. (2019) and Benítez et al. (2022), which capture leaders' ability to articulate a digital vision, promote digital skills, and align technology with strategic goals. Strategic agility was measured using six items that reflected sensing, seizing, and reconfiguring capabilities, adapted from Doz and Kosonen (2010) and Kohtamaki et al., (2020).

Organizational learning was captured through six items, drawn from Jerez-Gómez et al. (2005) and Yavas and Celik (2020), which focused on knowledge sharing, reflection, and continuous improvement. Innovation was measured using six items adapted from Wang et al. (2022) and Sultana et al. (2022), which emphasized experimentation, collaboration, and the introduction of new products or processes. Finally, the leadership climate was measured using a six-item scale capturing employees' shared perceptions of leadership behaviors related to trust, empowerment, and support. The items were adapted from prior, validated studies examining leadership-related climate perceptions (Sarros et al., 2008; Naqshbandi & Tabche, 2018; Iqbal et al., 2025; Bux et al., 2025). While these studies have individually validated the underlying items, the present research integrates them into a unified leadership climate construct that reflects the study's theoretical conceptualization of leadership climate as a contextual, perception-based phenomenon rather than a specific leadership style.

As the exact six-item configuration has not been previously validated as a single composite scale in prior research, a preliminary assessment of its psychometric properties was conducted following established scale validation procedures. First, an exploratory factor analysis (EFA) was performed to examine the underlying factor structure. The results supported a clear one-factor solution, with all items loading strongly on a single factor and no significant cross-loadings, indicating unidimensionality.

Second, the reliability and validity of the leadership climate construct were assessed within the measurement model. Internal consistency was confirmed, as both Cronbach's alpha and composite reliability values exceeded the recommended threshold of 0.70. Convergent validity was established, with AVEs exceeding 0.50, indicating that the constructs explain a substantial proportion of the variance in their indicators. Discriminant validity was also supported, as the square root of the AVE for leadership climate exceeded its correlations with other construct. All items were rated on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Data analysis

Given that all data were collected from a single source via self-report, the potential for common method bias (CMB) was assessed using Harman's single-factor test (Podsakoff et al., 2003). All study items were entered into a principal component analysis with a fixed one-factor extraction. The first unrotated factor accounted for 42.53% of the total variance, well below the 50% threshold, suggesting that common method bias is unlikely to represent a serious threat to the validity of the findings. PLS-SEM was implemented in SmartPLS to evaluate the structural model, test hypotheses, and assess explanatory and predictive power (R^2, Q^2), as well as mediation and moderation effects. Indicator loadings were examined, and the majority exceeded the recommended threshold of 0.70; items falling below this threshold were retained following Hair et al. (2021), as their removal did not improve composite reliability or Average Variance Extracted. Convergent validity was assessed using AVEs, with all constructs exceeding the 0.50 benchmark. Discriminant validity was confirmed using the Fornell–Larcker criterion, demonstrating that each construct was empirically distinct. In the second stage, the structural model was evaluated to test the hypothesized relationships. Path coefficients, t-values, and p-values were estimated through a bootstrapping procedure with 5,000 resamples, ensuring robustness in significance testing. Coefficient of determination (R^2) values indicated moderate to substantial explanatory power for the endogenous constructs, while predictive relevance (Q^2) values provided additional support for model robustness. Effect sizes (f^2) were also computed to assess the relative contribution of each predictor to its associated dependent construct.

Table 1 presents the demographic and organizational characteristics of the 302 respondents. The distribution shows a balanced representation across genders, with slightly more male respondents (55.6%) compared to females (44.4%). In terms of age, the majority were between 30 and 39 years (35.4%) and 20 and 29 years (26.8%), suggesting that the sample largely consisted of early- to mid-career professionals. Educationally, bachelor's degree holders (45.7%) and master's degree holders (36.8%) formed the bulk of participants, with a smaller proportion holding doctoral qualifications (11.3%). Organizational size was relatively diverse, with the largest segment comprising firms with more than 500 employees (31.5%). Industry-wise, services (35.4%) and technology (28.1%) were the most represented sectors, followed by manufacturing (24.5%). With respect to position, middle managers constituted the largest group (41.4%), followed by supervisors (30.8%) and senior managers (27.8%). Work experience was distributed fairly evenly: 28.5% had less than 5 years, 26.5% between 5 and 10 years, 27.8% between 11 and 15 years, and 17.2% over 15 years.

Table 1. Demographic and organizational profile of respondents

Descriptives	Category	Frequency (n=302)	Percentage
Age Group	20–29	81	26.8
	30–39	107	35.4
	40–49	77	25.5
	50+	37	12.3
Education	Bachelor's	138	45.7
	Doctorate	34	11.3
	Master's	111	36.8
	Other	19	6.3

Descriptives	Category	Frequency (n=302)	Percentage
Experience	11–15	84	27.8
	15+	52	17.2
	5–10	80	26.5
	<5	86	28.5
Gender	Female	134	44.4
	Male	168	55.6
Industry	Manufacturing	74	24.5
	Other	36	11.9
	Services	107	35.4
	Technology	85	28.1
Org Size	100–249	79	26.2
	250–499	55	18.2
	500+	95	31.5
	<100	73	24.2
Position	Middle Manager	125	41.4
	Senior Manager	84	27.8
	Supervisor	93	30.8

Source: Author's Work, Software: SPSS Version 17.

Table 2 presents the indicator loadings for the measurement items. Indicator loadings were assessed and the majority exceeded the recommended threshold of 0.70. Several items fell marginally below this threshold (e.g., DL1 = 0.661, DL4 = 0.638, OL4 = 0.646, OL5 = 0.574, OL6 = 0.673, SA5 = 0.645, SA6 = 0.610); however, following Hair et al. (2021), items with loadings between 0.40 and 0.70 may be retained when their removal does not improve composite reliability and AVE. These items were retained on this basis, and the overall measurement model demonstrates acceptable reliability and convergent validity.

Table 2. Outer loadings of measurement items from PLS-SEM

	DL	INN	LC	OL	SA
DL1	0.661				
DL2	0.719				
DL3	0.731				
DL4	0.638				
DL5	0.780				
DL6	0.718				
INN1		0.724			
INN2		0.711			
INN3		0.834			
INN4		0.769			
INN5		0.789			
INN6		0.808			
LC1			0.777		
LC2			0.852		
LC3			0.883		
OL1				0.791	
OL2				0.811	
OL3				0.791	
OL4				0.646	
OL5				0.574	
OL6				0.673	

	DL	INN	LC	OL	SA
SA1					0.755
SA2					0.795
SA3					0.798
SA4					0.801
SA5					0.645
SA6					0.610

Source: Author's Work, Software: Smart PLS 4.1.

Table 3 presents the internal consistency and convergent validity statistics for the study constructs. All Cronbach's alphas exceeded the 0.70 threshold, ranging from 0.712 (leadership climate) to 0.865 (innovation), indicating acceptable reliability. Composite reliability values (rho_a and rho_c) also surpassed the 0.70 standard, indicating strong construct consistency. AVE values were above the recommended minimum of 0.50, ranging from 0.503 to 0.598, thereby supporting convergent validity. Innovation had the highest reliability (α = 0.865; CR = 0.899; AVE = 0.598), while leadership climate, although acceptable, was slightly lower (α = 0.712; AVE = 0.700). Taken together, these results confirm that the constructs were measured with satisfactory reliability and validity, ensuring the robustness of subsequent structural analyses.

Table 3. Reliability and convergent validity statistics (Cronbach's Alpha, Composite Reliability, and AVE)

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DL	0.802	0.811	0.858	0.503
INN	0.865	0.867	0.899	0.598
LC	0.712	0.800	0.842	0.700
OL	0.810	0.827	0.864	0.518
SA	0.829	0.837	0.876	0.545

Source: Author's Work, Software: Smart PLS 4.1.

Table 4 explains that the discriminant validity was assessed using the Fornell–Larcker criterion, whereby the square root of AVE for each construct is compared with its correlations with other constructs. As shown in Table 4, the diagonal values representing the square roots of AVE for digital leadership (0.710), innovation (0.774), leadership climate (0.836), organizational learning (0.720), and strategic agility (0.738) all exceed the corresponding inter-construct correlations. This indicates that each construct shares more variance with its own indicators than with other constructs in the model, thereby demonstrating adequate discriminant validity. These results suggest that the constructs are empirically distinct and that potential conceptual overlap among closely related variables - such as digital leadership, organizational learning, and strategic agility does not compromise their measurement integrity.

Table 4. Discriminant validity assessment using the Fornell–Larcker criterion

	DL	INN	LC	OL	SA
DL	0.710				
INN	0.683	0.774			
LC	0.538	0.658	0.836		
OL	0.634	0.623	0.524	0.720	
SA	0.616	0.714	0.497	0.606	0.738

Source: Author's Work, Software: Smart PLS 4.1.

RESULTS

Table 5 reports the coefficients of determination (R^2) for the endogenous constructs. The endogenous construct strategic agility achieved $R^2 = 0.762$, indicating that digital leadership, organizational learning, innovation, leadership climate, and the interaction term between organizational learning and leadership climate collectively explain 76.2% of the variance in strategic agility.

Table 5. Coefficients of determination (R^2) for endogenous constructs

	R-square	R-square adjusted
INN	0.466	0.464
OL	0.539	0.538
SA	0.762	0.758

Source: Author work Software: Smart PLS 4.1.

Table 6 presents the results of the predictive relevance assessment using the Stone–Geisser Q^2 criterion obtained through the blindfolding procedure. The positive Q^2 values indicate predictive relevance within the blindfolding procedure, suggesting that the model possesses in-sample predictive relevance for the endogenous constructs. However, these statistics do not constitute full out-of-sample prediction validation.

Table 6. Predictive relevance assessment using Stone–Geisser Q^2 (blindfolding procedure)

	SSO	SSE	Q^2 (=1-SSE/SSO)
INN	1812	1332.634	0.265
OL	1812	1319.746	0.272
SA	1812	1074.838	0.407

Source: Author work, Software: Smart PLS 4.1.

To assess the potential for CMB, Harman's single-factor test was conducted (Podsakoff et al., 2003). As shown in Table 7, the first unrotated factor accounted for 42.53% of the total variance, well below the 50% threshold, suggesting that common method bias does not pose a serious threat to the validity of the findings.

Table 7. Harman's single-factor test: total variance explained

Component	Total eigenvalue	% of variance	Cumulative %
1	11.483	42.53	42.53
2	2.05	7.593	50.123
3	1.146	4.244	54.367
4	1.009	3.737	58.104

Note: Extraction method: Principal Component Analysis. Only components with eigenvalue ≥ 1.0 are shown.
Source: Author's work. Software: IBM SPSS Statistics Version 17.

Table 8 reports the collinearity diagnostics for the moderation analysis. The VIF values for organizational learning (1.61), leadership climate (1.70), and their interaction term (1.00) are all well below the conservative threshold of 3.3. These results indicate that multicollinearity is not a concern and confirm that the estimated moderation effect is not biased by high intercorrelations among the predictors.

Table 8. Collinearity diagnostics for moderation analysis (VIF Values)

Construct	VIF
OL	1.61
LC	1.7
OL × LC	1

Source: Author's work, Software: Smart PLS 4.1.

Table 9 reports the effect sizes (f^2) for all structural paths, interpreted using Cohen's (1988) benchmarks: small ($f^2 \geq 0.02$), medium ($f^2 \geq 0.15$), and large ($f^2 \geq 0.35$). Digital leadership exerted large effects on both organizational learning ($f^2 = 1.171$) and innovation ($f^2 = 0.874$), confirming its dominant role as the primary antecedent in the model. Its effect on strategic agility was medium ($f^2 = 0.215$). Organizational learning had a large effect on strategic agility ($f^2 = 0.247$), reinforcing its status as the principal mediating mechanism. Leadership climate showed a small effect on strategic agility ($f^2 = 0.027$). Innovation's effect on strategic agility was negligible ($f^2 = 0.010$), falling below the small-effect threshold, and was fully consistent with its non-significant direct and indirect paths, confirming that innovation does not constitute a practically meaningful route to strategic agility in this sample.

Table 9. Effect sizes (f^2) for structural paths

	INN	LC	OL	SA
DL	0.874		1.171	0.215
INN				0.010
LC				0.027
OL				0.247

Source: Author work, Software: Smart PLS 4.1.

Table 10 presents the direct path coefficients estimated through PLS-SEM bootstrapping (5,000 subsamples), including original sample estimates, sample means, standard deviations, T-statistics, and p-values for all structural paths.

Table 10. Direct path coefficients, t-statistics, and p-values (bootstrapping, 5,000 subsamples)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
DL INN	0.683	0.686	0.038	18.135	0.000
DL OL	0.734	0.736	0.037	19.762	0.000
DL SA	0.371	0.371	0.054	6.877	0.000
INN SA	0.088	0.087	0.063	1.405	0.160
LC SA	0.119	0.122	0.052	2.302	0.021
OL SA	0.401	0.400	0.049	8.206	0.000

Source: Author's work, Software: Smart PLS 4.1.

The direct effect of digital leadership on innovation was positive and highly significant ($\beta = 0.683$, $t = 18.135$, $p < 0.001$), indicating that digital leadership is a strong and robust predictor of organizational innovation. This represents the largest path coefficient in the model, suggesting that leaders who articulate a digital vision and cultivate technology-oriented organizational practices exert a substantial influence on the firm's capacity to generate and sustain innovative outcomes. This finding is consistent with Benitez et al. (2022) and Erhan et al. (2022), who similarly identified digital leadership as a principal antecedent of innovation capability.

The direct effect of digital leadership on organizational learning was equally strong and statistically significant ($\beta = 0.734$, $t = 19.762$, $p < 0.001$), representing the highest t-statistic in the model. This finding reinforces the conceptualization of digital leaders as architects of learning environments who institutionalize knowledge-sharing routines, promote reflective practices, and create the structural conditions for continuous organizational learning. The magnitude of this coefficient underscores organizational learning as the primary channel through which digital leadership exerts its influence on downstream strategic outcomes.

Digital leadership also had a significant direct effect on strategic agility ($\beta = 0.371$, $t = 6.877$, $p < 0.001$), lending empirical support to Hypothesis 1. This finding confirms that digital leadership contributes to strategic agility not only indirectly through mediating mechanisms but also directly, consistent with upper echelons theory's proposition that leadership orientation shapes organizational-level strategic responsiveness.

Organizational learning exerted a significant, positive, direct effect on strategic agility ($\beta = 0.401$, $t = 8.206$, $p < 0.001$), supporting Hypothesis 4. This result confirms that firms in which knowledge acquisition, experimentation, and collective reflection are institutionalized are better positioned to reconfigure their strategic posture in response to environmental change. The magnitude of the coefficient positions organizational learning as the most influential mediating construct in the model.

Leadership climate had a significant positive direct effect on strategic agility (β = 0.119, t = 2.302, p = 0.021). While this path was not hypothesized as a direct effect in the original model leadership climate was theorized as a moderator. Its significant direct coefficient suggests that a supportive, trust-based leadership environment also exerts an independent, albeit modest, facilitative influence on strategic agility. This finding warrants attention in future model refinements.

By contrast, the direct effect of innovation on strategic agility, while positive in direction, did not reach conventional levels of statistical significance (β = 0.088, t = 1.405, p = 0.160), failing to support Hypothesis 5 as a direct path in the presence of the other constructs. This result implies that innovation's contribution to strategic agility in this sample is better understood as part of a broader, sequential process originating in digital leadership rather than as an independent, direct driver. The non-significance of this path is consistent with the non-significant indirect effect reported for the digital leadership → innovation → strategic agility chain and, collectively, suggests that the innovation pathway to agility may be conditioned by contextual or boundary factors not fully captured in the present model.

Table 11. Indirect Effects and Bootstrapped Significance for Mediation Paths

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
DL OL SA	0.294	0.294	0.039	7.593	0.000
DL INN SA	0.060	0.060	0.044	1.381	0.167

The results in Table 11 reveal a clear distinction between direct and indirect effects within the model. While innovation is positively associated with strategic agility as a direct path, this effect did not reach statistical significance (β = 0.088, p = 0.160). The indirect effect of digital leadership on strategic agility through innovation is also not statistically significant. This indicates that although innovation contributes to organizational agility, it is not the primary mechanism through which digital leadership translates into agility. In contrast, organizational learning emerges as the dominant mediating pathway, highlighting its central role in transmitting the influence of digital leadership to strategic agility.

DISCUSSION

The results provide empirical support for the proposed conceptual framework and offer insight into how digital leadership is associated with strategic agility through interconnected organizational processes. Given the cross-sectional design of the study, the findings are interpreted as directional associations consistent with the theoretical model rather than definitive causal relationships.

First, the analysis indicates a positive association between digital leadership and strategic agility, consistent with Hypothesis 1. This pattern aligns with prior research suggesting that leaders who articulate a clear digital vision, encourage flexibility, and promote technology-enabled practices are linked to greater organizational responsiveness to environmental change (Jasim et al., 2024). From a dynamic capabilities perspective, digital leadership appears to be associated with sensing and reconfiguring processes, thereby reducing organizational inertia and facilitating strategic adaptation. While some studies position leadership effects primarily as indirect (Ly, 2024), the present findings suggest that digital leadership maintains a direct association with agility even when learning and innovation mechanisms are considered, indicating its role as both an enabling and a contextual driver of adaptive behavior.

Second, the strong positive relationship between digital leadership and organizational learning (H2) underscores the importance of learning as a central pathway through which leadership orientation is translated into adaptive capacity. This observation is consistent with evidence that digital leaders foster knowledge-sharing cultures, institutionalize experimentation, and embed learning routines within organizational processes (Jasim et al., 2024; Wang & Chen, 2022; Eberl et al., 2025). Organizational learning thus functions as a micro-foundational mechanism that supports the acquisition, interpretation, and application of knowledge in dynamic environments. In line with Atanassova et al. (2025), the findings suggest that agility emerges not solely from top-level strategic decisions but from collective and routinized learning processes embedded across organizational levels.

Third, digital leadership also had a positive association with innovation (H3). This finding is consistent with research emphasizing the role of digital leaders in setting strategic direction, legitimizing experimentation, and encouraging cross-functional collaboration (Benitez et al., 2022; Tigre et al., 2025). In the present study, innovation encompasses both technological and non-technological dimensions, including process improvements and new managerial practices.

From a dynamic capabilities viewpoint, digital leadership appears linked to organizations' capacity to recombine resources and leverage digital opportunities to generate novel outcomes (Memon & Ooi, 2023; Schuster et al., 2023).

Fourth, organizational learning exhibits a positive relationship with strategic agility (H4), reinforcing its importance as a foundational adaptive mechanism. Firms that institutionalize reflection, knowledge exchange, and continuous improvement are more likely to adjust their strategic actions in response to environmental shifts (Atanassova et al., 2025; Sampath et al., 2021). These findings support the view that agility is not spontaneous but develops through sustained learning processes that enable timely resource reconfiguration and strategic recalibration.

Fifth, while digital leadership was positively associated with innovation (H3), and innovation was directionally associated with strategic agility (H5), the direct path from innovation to strategic agility did not reach statistical significance in the present model ($\beta = 0.088$, $p = 0.160$). Similarly, the indirect mediation path from digital leadership through innovation to strategic agility was not statistically significant. These findings suggest that innovation's role in agility may be more contingent on contextual boundary conditions or may operate through more complex sequential mechanisms not fully captured in the present cross-sectional design. Prior research has linked various forms of innovation to improved responsiveness under uncertainty (Kohtamaki et al., 2020; Sultana et al., 2022; Rybalka, 2024), and future longitudinal studies may be better positioned to detect this relationship.

Finally, the moderation analysis indicates that leadership climate conditions the relationship between organizational learning and strategic agility (H6). Specifically, the positive association between learning and agility becomes stronger in organizational contexts characterized by higher levels of trust, empowerment, and supportive leadership practices. This suggests that leadership climate serves as a contextual boundary condition that influences the extent to which learning processes translate into adaptive strategic outcomes. Consistent with prior research (Naqshbandi and Tabche, 2018; Atanassova et al., 2025; Iqbal et al., 2025), supportive climates appear to facilitate the enactment of knowledge into action. Rather than replacing learning as a driver of agility, leadership climate shapes the conditions under which learning mechanisms become more effectively mobilized.

Implications and contributions

The research study contributes to the literature on strategy and leadership in several significant ways, offering a more integrated perspective on the emergence of strategic agility within organizations. Instead of viewing agility as an isolated or improvised outcome, the results reveal that strategic agility is a multifaceted ability that emerges from the interaction among digital leadership, organizational learning, and innovation. Although some previous studies have treated these antecedents as independent variables (e.g., Jasim et al., 2024), the current study demonstrates that they are complementary and function as interdependent microfoundations of agility. Empirically validating such an integrated configuration, the study brings the literature out of fragmented explanations and offers a more comprehensive description of the contribution of leadership-driven processes to adaptive capacity.

Theoretically, the research develops the dynamic capabilities theory by elucidating the mechanisms by which leadership orientation is translated into strategic deliverables. The findings indicate that organizational learning and innovation are mediating capabilities that refocus the role of digital leadership to strategic agility. This observation helps unpack the enactment of dynamic capabilities in practice, showing that sensing, seizing, and reconfiguring are not theoretical managerial constructs but are accomplished through actual learning routines and innovation processes embedded in organizations. By doing so, the research study would add to a more process-intensive, resolution-oriented vision of dynamic capabilities.

The study also continues the upper echelons theory by emphasizing the contextual mechanisms of leadership climate in transforming organizational processes into strategic outcomes. In addition to the cognitive orientations or traits of individual leaders, the results highlight the importance of collective understandings of leadership behavior, embodied in the leadership climate, in mediating the effectiveness of learning in producing agility. The view expands the upper echelons approach to include behavioral and contextual aspects of the framework, proposing that the environments leaders foster play a pivotal role in shaping the outcomes of learning and innovation initiatives toward adaptiveness.

In practice, the results have practical implications for managers and organizational leaders. To begin with, the findings indicate the need to develop digital leadership skills that go beyond technical skills, including vision, flexibility, and effective communication. Leaders are critical in instilling digital logic into the organization's culture and routine, enabling learning and innovation that drive agility. Second, the organizational learning process must be institutionalized vigorously within an organization by investing in knowledge management systems, cross-functional teamwork, and

digital media that enable continuous information exchange. Integrating learning into day-to-day work experiences also empowers employees to be change agents rather than change recipients. Third, innovation ought to be viewed as a strategic enabler of agility rather than a marginal R&D effort. Companies that incorporate innovation into their adaptive mechanisms are better positioned to respond to environmental uncertainty. Lastly, the moderating aspect of leadership climate underscores the importance of strong learning and innovation systems that can foster agility when supported by inappropriate environments. Managers are hence advised to create an environment rich in trust, empowerment, and psychological safety so that the organizational gains from learning and innovation are maximized.

On a larger scale, the results also have implications for policymakers and institutions charged with fostering competitiveness and resilience. Digital leadership programs that combine technological knowledge with adaptive and people-oriented skills must be the primary focus of policies on leadership development. Moreover, policymakers may also foster strategic agility by nurturing innovation ecosystems that bridge the gap between firms and universities, research institutions and technology hubs, enabling knowledge exchange and innovation. Lastly, institutionalizing organizational learning could be facilitated by policy frameworks that encourage lifelong learning and workforce reskilling, ensuring that companies have the human capital to sense and respond to dynamic challenges. During periods of systemic uncertainty, such as economic crises or rapid technological disruption, joint policy support for leadership development and innovation cooperation can enhance firm-level adaptability and overall economic resilience.

CONCLUSION

The research confirms that strategic agility is considerably improved by digital leadership, both directly and through the mediating role of organizational learning. Organizational learning emerged as the primary and statistically significant mediating mechanism, explaining the dominant pathway through which digital leadership translates into adaptive strategic outcomes. Although digital leadership positively predicts innovation and innovation is directionally associated with strategic agility, the indirect mediation path through innovation did not reach statistical significance in this sample, suggesting that its mediating role may be context-dependent or contingent on factors beyond the scope of the present study. Critically, the relationship between learning and agility was positively moderated by the leadership climate, demonstrating that trust-based, empowering environments enhance the benefits of learning.

Although this study makes several important contributions, it also has several limitations that must be taken into account in interpreting the findings. First, the study uses a cross-sectional survey, which is analyzed with the structural equation model. Although SEM is suitable for in-depth research into the intricate relationships between latent constructs, the cross-sectional nature of the data makes it impossible to draw convincing causal conclusions. The relationships observed will thus be relationships as opposed to dynamic causal relationships. The longitudinal or panel research design would help address this problem by examining it further over time as digital leadership, organizational learning, and innovation change, leading to the emergence of strategic agility together.

Second, although 302 respondents were sufficient for the SEM analysis, the results should be placed in the context of the Middle Eastern region. Despite the internal diversification of the sample, i.e., in terms of industry and organization size, cross-national or cross-regional variation is not represented. Organizational contexts, digital maturity levels, and cultures may vary significantly across locations, which can affect the intensity or orientation of the discovered correlations. There are opportunities in future research to increase external validity by using larger, multinational samples or by conducting comparative studies across areas with varying institutional and cultural features.

Third, the research relies on self-reported data from a single source, increasing the risk of common method bias. This bias can be addressed through procedures such as ensuring anonymity and a well-designed scale. Although SEM alleviates certain measurement issues, future research validity can be enhanced by including additional data sources, such as objective performance measures, archival records, or matched supervisor-subordinate reactions. These methods would provide a more subtle understanding of leadership behaviors and organizational outcomes.

Lastly, the model specifically examines digital leadership and leadership climate, thereby eliminating other leadership approaches that can also impact strategic agility. Leadership styles such as ethical, servant, or distributed leadership were not discussed, and there may be other or supplementary ways to encourage agility. The broadening of the leadership lens might provide a more detailed picture of the micro-foundations of adaptive capability.

Based on these limitations, several future research directions can be identified. Longitudinal research can capture the temporal processes of leadership, learning, and innovation, especially during disturbances such as crises or sudden

technological shifts. Inter-industry comparative studies could explore whether the relative significance of learning, innovation, and leadership climate varies across high-velocity and more stable industries.

The model can also be extended into the future by adding additional mediators and moderators, such as organizational culture, environmental uncertainty, or digital maturity, to better understand the boundary conditions of strategic agility. In addition, qualitative or mixed-methods research would be a more valuable source of information on the issue of leadership climates constructed and experienced by organizational members, supplementing the quantitative results. Finally, the cross-national studies would facilitate establishing the cultural contingency and internationalizability of the presented framework.

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Author contribution statement

Salam O. Sami is the sole contributor to this manuscript and assumes full responsibility for all aspects of the work: Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Resources, Data Curation, Writing, Review and Editing, Visualization.

Conflict of interest

The author declares no conflict of interest.

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