

LINKING LEADERSHIP AND DIGITALIZATION TO CORPORATE GREEN PERFORMANCE: EVIDENCE FROM EMPLOYEE PARTICIPATION IN OPEN INNOVATION IN CHINA

CONECTANDO LIDERANÇA E DIGITALIZAÇÃO AO DESEMPENHO ECOLÓGICO CORPORATIVO: EVIDÊNCIAS DA PARTICIPAÇÃO DE FUNCIONÁRIOS EM INOVAÇÃO ABERTA NA CHINA

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Abstract

This study investigates how dynamic capabilities enable green innovation and enhance corporate environmental performance in Chinese organizations. Drawing on Dynamic Capability Theory, the research examines the role of perceived green leadership support, digital infrastructure for sustainability, and green organizational culture in shaping employee participation in open innovation and, in turn, influencing corporate green performance. A quantitative design was employed, with survey data collected from 482 employees across environmentally regulated sectors in China. Structural equation modeling using SmartPLS was applied to test six hypotheses. The results demonstrate that both green leadership support and digital support significantly promote employee participation in open innovation, which emerged as the strongest predictor of perceived corporate green performance. Leadership and digital support also exhibited direct positive effects on green performance, confirming their independent importance as organizational enablers. Effect size analysis indicated that employee participation in open innovation had a medium effect on corporate green performance, while all other relationships were small. Contrary to expectations, green organizational culture did not significantly

Resumo

Este estudo investiga como as capacidades dinâmicas possibilitam a inovação verde e aprimoram o desempenho ambiental corporativo em organizações chinesas. Com base na Teoria das Capacidades Dinâmicas, a pesquisa examina o papel do apoio percebido da liderança verde, da infraestrutura digital para sustentabilidade e da cultura organizacional verde na formação da participação dos funcionários em inovação aberta e, por sua vez, na influência sobre o desempenho verde corporativo. Foi empregado um delineamento quantitativo, com dados de pesquisa coletados de 482 funcionários em setores regulamentados ambientalmente na China. A modelagem de equações estruturais utilizando o SmartPLS foi aplicada para testar seis hipóteses. Os resultados demonstram que tanto o apoio da liderança verde quanto o suporte digital promovem significativamente a participação dos funcionários em inovação aberta, que emergiu como o preditor mais forte do desempenho verde corporativo percebido. A liderança e o suporte digital também apresentaram efeitos positivos diretos sobre o desempenho verde, confirmando sua importância independente como facilitadores organizacionais. A análise do tamanho do efeito indicou que a participação dos funcionários em inovação aberta teve um



moderate the innovation–performance relationship, suggesting that cultural orientation may act more as a contextual baseline than as an active enhancer of dynamic capability deployment. These findings contribute to theory by clarifying the micro foundations of sustainability-oriented dynamic capabilities and by integrating open innovation into the dynamic capabilities framework. Practically, the study provides guidance for managers and policymakers in China seeking to align leadership development, digital transformation, and employee innovation engagement with national dual-carbon goals and broader sustainability agendas.

Keywords: Dynamic Capabilities. Open Innovation. Corporate Green Performance. Sustainability in China.

efeito médio sobre o desempenho verde corporativo, enquanto todas as outras relações foram pequenas. Contrariamente às expectativas, a cultura organizacional verde não moderou significativamente a relação inovação-desempenho, sugerindo que a orientação cultural pode atuar mais como uma linha de base contextual do que como um aprimorador ativo da implementação de capacidades dinâmicas. Essas descobertas contribuem para a teoria ao esclarecer os fundamentos microeconômicos das capacidades dinâmicas orientadas para a sustentabilidade e ao integrar a inovação aberta à estrutura dessas capacidades. Na prática, o estudo oferece orientações para gestores e formuladores de políticas na China que buscam alinhar o desenvolvimento de liderança, a transformação digital e o engajamento dos funcionários em inovação com as metas nacionais de dupla emissão de carbono e com as agendas de sustentabilidade mais amplas.

Palavras-chave: Capacidades Dinâmicas. Inovação Aberta. Desempenho Verde Corporativo. Sustentabilidade na China.

1 INTRODUCTION

Climate change and environmental degradation have become pressing challenges for businesses worldwide, spurring a growing emphasis on sustainability and green innovation. Nowhere is this shift more urgent than in China – the world’s largest carbon emitter – which has pledged ambitious “dual-carbon” goals of peaking carbon emissions by 2030 and achieving carbon neutrality by 2060 (Xuqian, 2024). In response, Chinese authorities have tightened environmental regulations and enforcement, compelling firms to move beyond basic compliance toward proactive sustainability strategies (Fatoki, 2021). However, many Chinese organizations have historically taken a compliance-driven approach to environmental management, treating it as a cost or regulatory obligation rather than a source of innovation. This compliance mindset is increasingly untenable under escalating regulatory and market pressures. Firms are now expected to transcend compliance and innovate – developing cleaner technologies, greener products, and more sustainable business models that not only meet regulations but confer competitive advantage. The critical question is: what internal capabilities and conditions

enable this transition from compliance-driven environmental management to innovation-led sustainability in Chinese firms?

To explore this question, we draw on Dynamic Capability Theory (DCT) as a guiding lens. Dynamic capabilities refer to a firm's ability to integrate, build, and reconfigure internal and external resources to address rapidly changing environments. In the context of sustainability, dynamic capabilities allow organizations to sense emerging environmental opportunities or threats, seize these opportunities through innovation, and transform their operations accordingly (Li *et al.*, 2023). Prior studies suggest that developing “*green dynamic capabilities*” can directly enhance sustainable innovation and performance outcomes (Li *et al.*, 2023). However, there is a need to unpack the micro-level foundations of these capabilities in an emerging economy context (Li *et al.*, 2023). As Strauss *et al.* (2017) argue, the microfoundations of sustainability-oriented dynamic capabilities – such as leadership behaviors or organizational culture – may vary across organizational contexts and significantly shape how firms implement sustainability strategies (Farrukh *et al.*, 2025). Yet, relatively few empirical studies have examined how specific internal factors combine to drive green innovation and performance, particularly in Chinese organizations undergoing rapid transformation.

This research responds to that gap by focusing on three interrelated internal drivers rooted in dynamic capability theory: (1) Perceived green leadership support, (2) Digital infrastructure for sustainability, and (3) Green organizational culture. *Green leadership support* refers to the degree to which top management and supervisors champion environmental goals, provide resources, and motivate employees to pursue sustainability initiatives. Leadership is a crucial managerial capability in dynamic capability frameworks (Li *et al.*, 2023). Recent work on green transformational leadership indicates that when leaders articulate a clear green vision and encourage eco-initiatives, employees are more likely to engage in pro-environmental behaviors and creative ideas for sustainability (Farrukh *et al.*, 2022). However, leadership's impact on ultimate environmental performance is often indirect – operating through influencing employee attitudes and innovation behaviors (Begum *et al.*, 2022). *Digital infrastructure for sustainability* denotes an organization's deployment of advanced digital technologies (e.g. data analytics, IoT, AI) to support environmental management and innovation. Digital transformation is emerging as a key enabler of corporate sustainability: by integrating technologies like big data and IoT, companies can monitor resource use in real

time, optimize processes, and uncover new eco-innovations, thereby significantly boosting environmental performance (Khan *et al.*, 2025). For example, digital systems facilitate real-time tracking of emissions and energy, enabling firms to improve efficiency and reduce pollution (Khan *et al.*, 2025). Early evidence from Chinese industries shows that digital transformation initiatives have a positive and sustained impact on green innovation and subsequent performance improvements (Xuqian, 2024). Finally, a *green organizational culture* provides an important contextual platform for dynamic capabilities. Green culture is defined as “a collective belief toward an ecological, environment-friendly style of (co)production shared by most organizational members” (Liu and Lin, 2020). A strong green culture instills shared environmental values and norms throughout the organization (e.g. waste not, pollute less), which can deeply influence how effectively sustainability initiatives are implemented (Fatoki, 2021). Prior research finds that green organizational culture is positively associated with environmental performance (Fatoki, 2021), in part by encouraging employees to prioritize sustainability in their decision-making. In other words, culture can serve as an internal “infrastructure” of values that amplifies the impact of any green initiatives or innovations the firm undertakes.

Importantly, these three factors – leadership, digital infrastructure, and culture – do not operate in isolation. We theorize a capability system in which perceived leadership support and digital infrastructure act as key enablers of employee participation in green innovation, and this employee-driven innovation in turn drives corporate environmental performance, especially under a supportive green culture. Drawing on the concept of open innovation, we focus on *employee participation in open innovation* as the pivotal mediating mechanism. Open innovation refers to “the use of purposive inflows and outflows of knowledge to accelerate internal innovation” (Huizingh, 2011), meaning firms leverage both internal ideas and external knowledge to advance their innovation outcomes. In our context, employee participation in open innovation involves employees engaging in idea generation, collaboration (both internally across departments and externally with partners), and knowledge-sharing activities aimed at developing new eco-friendly solutions. Such participation represents a micro-level manifestation of a firm’s dynamic capability – it is through the innovative actions of individuals and teams that abstract capabilities are turned into tangible green innovations. We posit that when leaders strongly support sustainability and robust digital tools are in place, employees will be

more inclined and empowered to participate in open innovation for green solutions. Furthermore, a green culture may the effectiveness of those innovation efforts: in a culture deeply committed to environmental values, any employee-driven green innovations are more likely to be embraced, implemented, and translated into improved environmental performance outcomes.

To investigate this model, we conducted a quantitative study in China's environmentally regulated sectors (e.g. manufacturing, energy, chemicals), which are under intense pressure to improve their environmental footprint. We surveyed employees in these industries, capturing their perceptions of leadership support for green initiatives, the availability of digital systems for sustainability, the strength of their organization's green culture, and their own involvement in open innovation activities, as well as their perception of corporate green performance (environmental performance). We then tested a series of hypotheses using structural equation modeling. The results demonstrate that both green leadership and digital infrastructure significantly foster employee engagement in green innovation initiatives. In turn, higher employee participation in open innovation is associated with stronger corporate environmental performance – for example, employees' innovative efforts correlate with greater reductions in waste, emissions and resource use, and improvements in recycling and eco-efficiency (Yao *et al.*, 2025) . Moreover, we find that employee participation serves as a critical mediator, channeling the positive effects of leadership support and digital infrastructure into improved green performance. Notably, the impact of employees' innovation efforts on performance is amplified by a supportive green culture; when green values are deeply embedded in the organization, the translation of innovation into performance gains is significantly stronger. These findings offer new insight into the microfoundations of sustainability-oriented dynamic capabilities in an emerging economy context. We contribute to literature by integrating leadership, technological, and cultural aspects into a unified framework explaining how Chinese firms can build internal capacities for green innovation and performance.

The remainder of this paper is organized as follows. First, we review relevant literature and develop our hypotheses regarding the relationships between green leadership support, digital infrastructure, open innovation participation, green organizational culture, and corporate environmental performance. Next, we describe our methodology, including the sample, data collection procedures, and measures of key

constructs. We then present the results of the hypothesis tests using partial least squares structural equation modeling. In the discussion section, we delve into the interpretation and implications of the findings, highlighting contributions to theory and practice. We conclude by outlining managerial implications for firms aiming to enhance their dynamic sustainability capabilities, and suggest directions for future research.

2 LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

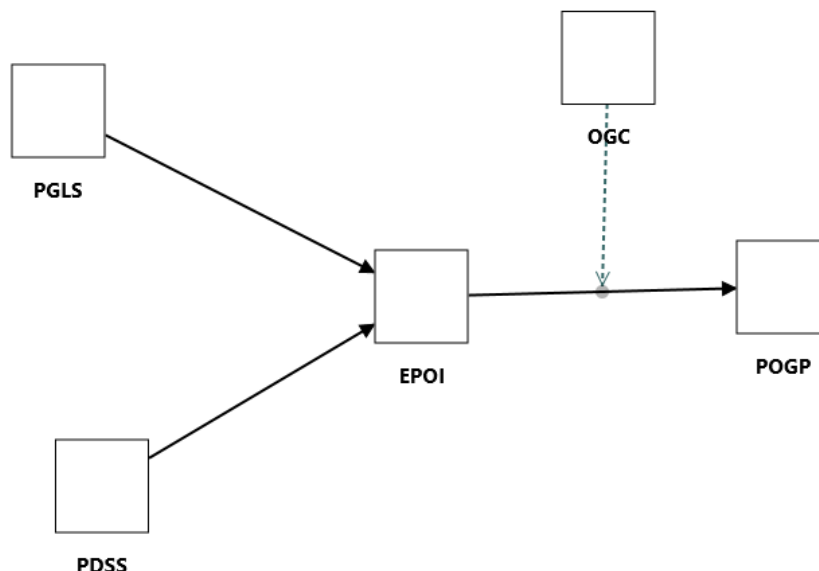
2.1 Dynamic capabilities for sustainability and open innovation

Dynamic Capability Theory (DCT) provides a useful theoretical foundation for understanding how firms achieve sustainable competitive advantage in the face of environmental turbulence (Teece *et al.*, 1997). Dynamic capabilities are the firm's "ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece, Pisano, & Shuen, 1997, p. 516). Rather than view resources and routines as static, DCT emphasizes how managerial processes and organizational skills enable continuous innovation and adaptation (Teece, 2007). In a sustainability context, dynamic capabilities allow firms to proactively respond to environmental challenges by developing new products, processes, and business models that reduce ecological impact while driving performance (Li *et al.*, 2023). For example, sensing capabilities help a firm identify green market opportunities or emerging regulations, while seizing capabilities allow it to mobilize resources to innovate eco-friendly solutions, and transforming capabilities enable reconfiguring of operations towards sustainability (Li *et al.*, 2023). Recent research on *green dynamic capabilities* underscores their importance: firms with stronger dynamic capabilities oriented toward environmental management tend to achieve higher sustainable performance and can more effectively reduce issues like pollution and waste (Li *et al.*, 2023; Sawangchai *et al.*, 2025). In short, dynamic capabilities are crucial for firms seeking to transition from reactive environmental compliance to proactive sustainability innovation.

However, an important insight from the literature is that dynamic capabilities are rooted in *microfoundations* – the individual-level and organizational processes that underlie a firm's capability to change (Teece, 2007; Strauss, Lepoutre, & Wood, 2017). Strauss *et al.* (2017) argue that the microfoundations of sustainability-oriented dynamic

capabilities (e.g. leadership behaviors, employee skills, cultural values) can “take different forms in different contexts,” influencing how effectively firms implement green innovations (Arshad *et al.*, 2025). In emerging economies like China, where institutional pressures and corporate governance structures differ from those in Western contexts, examining these micro-level factors is particularly critical. Drawing on the literature, we focus on three key internal factors as microfoundations that can enable dynamic sustainable capabilities: leadership support, digital infrastructure, and organizational culture. These factors correspond broadly to managerial, technological, and cultural resources that a firm can leverage to build and deploy green innovations. Notably, they are interdependent: strong leadership and digital systems may directly foster innovation, but their full impact might be realized only when employees are empowered to act (a cultural and behavioral component). We incorporate the concept of open innovation to capture the interactive, boundary-spanning nature of innovation processes in sustainability. Open innovation, as defined by Chesbrough (2003), involves utilizing both external and internal knowledge flows to accelerate innovation. Sustainability challenges often require knowledge sharing across organizational boundaries (e.g. collaborating with suppliers on cleaner materials or with startups on green tech) (Chesbrough, 2003). Yet, equally important is *internal open innovation* – engaging employees at all levels to contribute ideas and insights for sustainability improvements. Encouraging employee participation in innovation can be seen as developing an internal dynamic capability for continuous learning and problem-solving. Below, we discuss each factor in detail and develop hypotheses linking them to employee open innovation participation and corporate green performance (see **Figure 1** for the conceptual model).

Figure 1
Conceptual model of hypothesized relationships



2.2 Green leadership support and employee participation in green innovation

Leadership plays a pivotal role in steering organizations toward sustainability. We define perceived green leadership support as the extent to which employees perceive their top management and direct supervisors as genuinely committed to environmental sustainability and supportive of employee initiatives in that realm. This concept is closely related to *green transformational leadership*, which refers to leaders who inspire and motivate followers to achieve environmental goals through vision, role modeling, support, and encouragement (Yao *et al.*, 2025). When leaders place strategic importance on environmental performance – for example, by setting clear green objectives, allocating resources for green projects, and recognizing employees’ eco-initiatives – they send strong signals that sustainability innovation is valued in the organization.

Prior research provides evidence that supportive environmental leadership fosters employees’ innovative behaviors and participation in green initiatives. Chen and Chang (2013) found that leadership and organizational attitudes around environmental concerns significantly influence employees’ green creative thinking (Chen and Chang, 2013; Lathabhavan and Kaur, 2023a; Mansoor *et al.*, 2022). A leader who frequently

communicates the importance of environmental protection and leads by example (e.g. implementing eco-friendly practices in operations) can stimulate employees to generate new ideas for reducing waste or saving energy (Li et al., 2020). Green transformational leaders encourage employees to engage in eco-friendly behaviors and experimentation, which ultimately cultivates a mindset of environmental concern and creativity among employees. Empirical studies have supported the link between green leadership and employee innovative outcomes; for instance, leaders' pro-environmental stance has been associated with higher employee green creativity and suggestion-making (Mittal & Dhar, 2016; Tuan, 2019). A recent study by Al-Ghazali et al. (2022) showed that green transformational leadership in SMEs had a significant positive impact on employees' green organizational identity and in turn on their green creativity (Al-Ghazali and Afsar, 2020). This underscores that leadership can shape how employees identify with and invest effort in sustainability goals.

From a dynamic capabilities perspective, committed leadership is a managerial capability that helps a firm *sense* the need for change and *mobilize* the organization's human capital towards innovation (Teece, 2007). Leaders who actively support green innovation provide not only verbal encouragement but also tangible support – such as dedicating time for employees to work on green ideas, providing training or resources, and removing obstacles. Such support reduces employees' perceived risks in pursuing novel ideas and increases their psychological safety to experiment. It also aligns employees' individual goals with the organization's sustainability vision, fostering intrinsic motivation for innovative work on environmental issues (Robertson and Barling, 2017). In the context of open innovation, leadership support is crucial for creating an open and collaborative climate. Employees need to feel that management will value their ideas and tolerate the uncertainty that comes with innovation. When they do, they are more likely to proactively seek out new knowledge (even beyond the firm's boundaries), share suggestions, and participate in cross-functional green innovation teams.

We therefore expect that in organizations where leadership is perceived as strongly supportive of environmental initiatives, employees will exhibit greater participation in innovation activities oriented toward sustainability. This participation may include contributing ideas to green product development, engaging in problem-solving for pollution reduction, or collaborating with external partners (e.g. NGOs, universities) to gain new insights. Formally, we hypothesize:

H1: *Perceived green leadership support positively influences employees' participation in open innovation for sustainability.*

2.3 Digital infrastructure for sustainability and employee participation in innovation

Digital technologies have emerged as a game-changer in the pursuit of sustainability. We use the term digital infrastructure for sustainability to denote a firm's deployment of digital tools, systems, and platforms (such as big data analytics, Internet of Things sensors, cloud computing, and AI) specifically to support environmental management and innovation. This includes technologies for monitoring environmental performance (e.g. energy management systems, emissions tracking software), platforms for knowledge sharing and collaboration (e.g. internal social networks or idea management systems for sustainability), and advanced analytics that help identify opportunities for eco-efficiency or new green products. Essentially, digital infrastructure represents the *technological capability* of the firm to gather and utilize information that can drive sustainable innovation.

Emerging evidence suggests that digital transformation and environmental innovation are strongly intertwined. By integrating advanced digital technologies, companies can achieve greater transparency and control over their environmental impacts, which often leads to innovation. For instance, IoT and big data analytics enable real-time monitoring and optimization of energy and resource use, helping to uncover inefficiencies and prompt innovative solutions (Khan *et al.*, 2025; Zhang, 2025). Zhang (2024) finds that the digital transformation of Chinese enterprises “significantly boosts their environmental performance” by accelerating the pace of green innovation (Zhang, 2025). Digitalization injects new vitality into green innovation processes by streamlining internal workflows and strengthening data-driven decision-making for sustainability. Concretely, technologies such as AI and data analytics can help employees more accurately identify consumer demand for green products, accelerate R&D by simulating product designs for environmental impact, and improve processes to reduce waste (Zhang, 2025). A recent study in China's transportation sector similarly concluded that digital transformation in companies *promotes green innovation*, with even lagged effects suggesting sustained innovation benefits over time.

Digital infrastructure not only provides information and efficiency; it also shapes how employees collaborate and innovate. Robust digital systems can facilitate open innovation by connecting employees across departments and even linking them with external expertise. For example, an internal online platform might enable employees to jointly develop ideas for waste reduction, or an open data portal could allow sharing of environmental performance data with external partners to co-create solutions. With modern communication and cloud tools, employees can easily seek external knowledge (benchmark data, best practices) and integrate it into internal innovation. Importantly, digital tools lower the barriers and costs for employees to experiment and implement innovative ideas. Routine tasks may be automated or simplified, freeing up employee time for creative problem-solving. Collaboration tools (video conferencing, enterprise social media) foster cross-functional brainstorming and knowledge inflows that are vital for complex sustainability innovations (Zhang, 2025).

We theorize that when a firm has a well-developed digital infrastructure oriented towards sustainability, employees will be more engaged in green innovation activities. They have better access to information (e.g. data on the firm's environmental performance or customer feedback on green products) that can spark new ideas. They also have the means to test and implement those ideas through digital simulations or pilot programs with lower risk and cost. Additionally, the presence of digital support signals management's commitment to innovation; it creates an environment where data-driven innovation is part of the culture. This should encourage employees to participate actively – for instance, by using analytics tools to identify improvement opportunities, or by leveraging collaboration platforms to contribute suggestions. Recent empirical work supports this logic: digital transformation has been shown to enhance firms' capacity for green innovation, which in turn improves environmental outcomes[36]. In summary, digital infrastructure can be viewed as a *technological dynamic capability* that empowers employees to innovate for sustainability.

Accordingly, we propose:

H2: *Digital infrastructure for sustainability positively influences employees' participation in open innovation for sustainability.*

2.4 Employee participation in open innovation and corporate green performance

Employee participation in open innovation for sustainability refers to the active involvement of a firm's employees in generating, sharing, and implementing new ideas that help improve the organization's environmental performance. This participation can take many forms – from internal activities like cross-departmental brainstorming sessions on energy savings, to external-oriented activities like collaborating with suppliers to create eco-friendly materials or with startups to pilot clean technologies. What distinguishes open innovation is the flow of knowledge across traditional boundaries[24]. Employees engaged in open innovation will often seek external knowledge (scouting industry best practices, learning from environmental experts, etc.) and combine it with internal expertise to drive innovation. They are not confined to their narrow job roles, but rather contribute to a broader collective innovation process aimed at sustainable outcomes.

Corporate green performance (or environmental performance) generally denotes the firm's effectiveness in managing its impact on the natural environment. It includes outcomes such as reduction in pollutants and greenhouse gas emissions, improved energy and resource efficiency, waste reduction and recycling, compliance with environmental standards, and overall minimization of the ecological footprint. In this study, we focus on *perceived corporate green performance* as reported by employees, which correlates with objective indicators. Employees can observe improvements like lower waste output, cleaner processes, or attainment of environmental targets. Environmental performance is a key component of a firm's sustainable performance and is increasingly tied to competitive advantage (Hart, 1995; Chen, 2008). Firms that excel in green performance often enjoy cost savings (through efficiency), enhanced reputation, and better alignment with regulations and stakeholder expectations (Fatoki, 2021).

Innovation is a well-known driver of performance, and this holds true for environmental performance. Green innovations – such as cleaner production methods, eco-designs for products, or novel recycling processes – directly contribute to reducing negative environmental impacts while maintaining or improving productivity (Fatoki, 2021). Numerous studies have documented a positive relationship between green innovation and environmental performance (e.g., Chen et al., 2008; Singh et al., 2020). For instance, a survey of manufacturing SMEs found that green innovation efforts led to

significant improvements in environmental performance, such as waste reduction and emissions control (Farrukh *et al.*, 2021). A recent study in the hospitality sector showed that green innovation mediated the effect of green culture on environmental performance, highlighting that innovation activities are the conduit through which cultural commitment translates to outcomes (Fatoki, 2021). When employees are actively participating in innovation, they generate ideas and solutions that can improve specific performance metrics – say, a new method to reuse water in a process, which cuts water consumption, or a software tool that optimizes delivery routes to lower fuel use.

Open innovation, in particular, can enhance sustainability performance by enabling broader problem-solving. Co-creation with stakeholders (customers, communities, other firms) can lead to more effective environmental solutions (e.g., designing a product take-back program). By tapping into diverse knowledge sources, companies can solve environmental problems in ways they might not achieve alone (Padthar and Ketkaew, 2024). Additionally, engaged employees are likely to be more committed to ensuring innovations are implemented successfully, thus realizing performance gains. They become champions for sustainability within the organization, helping to overcome resistance and embed new practices.

We expect a positive link between the degree of employee participation in open innovation and the level of corporate green performance. When many employees are involved in sustainability-oriented innovation – continuously finding and applying new ways to reduce environmental impact – the cumulative effect should be a measurable enhancement of the firm’s environmental outcomes. Conversely, if employees are disengaged from innovation (simply following routine and sticking to status quo practices), the firm may struggle to improve its environmental performance beyond compliance minima. Active participation implies a continuous improvement ethos at the employee level, which is crucial for moving the needle on sustainability metrics (Khan and Soomro, 2025).

Formally:

H3: *Employee participation in open innovation for sustainability positively influences corporate green performance.*

2.5 The mediating role of open innovation participation in linking capabilities to performance

Dynamic Capability Theory suggests that internal resources and capabilities (such as leadership support or digital infrastructure) do not automatically translate into performance outcomes; rather, they often work through intermediate processes or routines (Teece et al., 1997; Grant, 1996). In our model, we posit that employee participation in open innovation is a key mediating mechanism that connects two internal capabilities – green leadership support and digital infrastructure – to corporate environmental performance. In essence, supportive leadership and advanced digital tools create the conditions for employees to innovate, and it is through those innovation activities that the firm realizes improvements in environmental performance.

Leadership support → Open innovation → Performance: As discussed, strong leadership commitment to the environment can motivate employees to engage in innovative behaviors. However, leadership's impact on ultimate performance may be largely indirect. Prior studies indicate that transformational leadership (including the green variant) influences organizational outcomes through shaping employee behaviors and attitudes (Farrukh *et al.*, 2023; Mittal and Dhar, 2015). In the environmental domain, Chen (2011) and Mittal and Dhar (2016) found that leadership's effect on outcomes like reduced energy use or improved recycling was mediated by employees' environmentally friendly behaviors and involvement (Lathabhavan and Kaur, 2023b). Leaders enable employees to solve problems, but the actual problem-solving (innovation) must be done by employees. We therefore expect that if a firm's green performance improves following an increase in leadership support, it is largely because that support drove greater employee innovation participation, which in turn yielded performance benefits. Without employees seizing the initiative, leadership support alone (e.g. speeches about sustainability) would have limited direct effect on emissions or waste. This aligns with the notion of leadership as an orchestrator of dynamic capabilities – leaders marshal and inspire the talent (microfoundation) that then implements changes leading to improved performance (Al-Ghazali *et al.*, 2022)

Digital infrastructure → Open innovation → Performance: Similarly, having state-of-the-art digital sustainability systems can facilitate improved environmental performance, but much of this effect will occur via the innovations and process

improvements those systems enable. A study by Zhang (2024) empirically confirmed that green innovation acts as a mediator between digital transformation and environmental performance, meaning companies that digitalize extensively see better environmental outcomes primarily because digitalization spurs more green innovation (Zhang, 2025). Digital tools provide data and analytics that pinpoint where innovation is needed (e.g., data might reveal a particular manufacturing step has high emissions, prompting an innovation project to redesign that step). The tools themselves don't automatically cut emissions – they inform and empower employees to make changes that do. Thus, we anticipate that the positive impact of digital infrastructure on environmental performance will be channeled through employee-driven innovation. Indeed, case evidence shows that firms with strong IT capabilities achieve sustainability gains by strengthening their capacity for innovation and rapid implementation of eco-friendly practices (Xu *et al.*, 2023). In contrast, if digital systems are underutilized by employees (low participation), the potential performance benefits may not materialize fully.

In summary, both green leadership support and digital infrastructure for sustainability are hypothesized to improve corporate green performance indirectly by increasing employees' participation in open innovation, which then drives performance improvements. This is a mediation hypothesis: open innovation participation mediates the effect of internal dynamic capabilities on environmental outcomes. We articulate two specific mediation hypotheses:

H4: *Employee participation in open innovation mediates the relationship between green leadership support and corporate green performance.*

H5: *Employee participation in open innovation mediates the relationship between digital infrastructure for sustainability and corporate green performance.*

2.6 The moderating role of green organizational culture

While leadership and technology provide the impetus and tools for innovation, the broader organizational context can significantly influence how effectively innovations translate into performance outcomes. We posit that a green organizational culture serves as a critical moderator in our model, specifically strengthening the linkage between employee open innovation participation and corporate green performance. As defined earlier, green organizational culture (GOC) embodies the shared values, norms, and

beliefs in an organization that prioritize environmental responsibility and eco-friendly ways of working (Fatoki, 2021). In a strong green culture, sustainability is part of the organizational identity and “the way we do things here.” Employees at all levels are conscious of environmental goals and feel a collective responsibility to achieve them (Liu and Lin, 2020).

Why would culture moderate the innovation→performance relationship? We argue that when a firm’s culture strongly supports sustainability, the organization is more likely to fully capitalize on the ideas and efforts generated by employees. First, a green culture means there is top-to-bottom alignment on environmental objectives. Thus, when employees put forward innovative solutions (say a new recycling process), management and colleagues are more receptive and ready to implement these ideas rather than resist change. The innovative ideas do not languish due to a “not-invented-here” syndrome or short-term cost concerns, because the culture values long-term environmental benefits. Second, a supportive culture provides resources and rewards for sustainability initiatives – for example, teams might get recognition or bonuses for successful green projects, or there may be organizational slack allocated for experimentation. This ensures that employee-driven innovations can move from concept to reality, thereby impacting performance. In a weak culture (one indifferent to environmental concerns), even high employee participation in innovation may not yield results if those ideas are ignored or implementation is half-hearted.

Prior literature offers some tangential evidence for such moderating effects. For instance, organizational culture has been found to influence the success of continuous improvement and innovation programs, acting as a “fertile soil” where ideas take root (Cameron & Quinn, 1999). In the sustainability domain, studies note that companies with an embedded green culture achieve better outcomes from their environmental initiatives than those who treat sustainability as a peripheral issue (Norton *et al.*, 2015). One recent study observed that green organizational culture amplified the effects of certain practices on performance, suggesting it creates synergy with other environmental efforts (Akbar *et al.*, 2024). Specifically, Wang *et al.* (2022) found that a strong green culture strengthens an innovation-oriented culture in manufacturing firms, thereby boosting innovative outcomes (Ristiardi and Rino, 2025). Fatoki (2021) also highlighted that green culture can have both direct and indirect effects on performance, with green innovation as a

mediator (Akbar *et al.*, 2024) – implying that when culture is supportive, innovation contributes more significantly to performance improvements.

In our context, we expect that employees' participation in open innovation will lead to greater enhancements in environmental performance when the organization's culture is strongly green. Under a strong GOC, even small innovations can be widely adopted and scaled, and the organization learns from failures rather than discouraging future attempts. In contrast, if the culture is not green-oriented, even enthusiastic innovators might hit a wall of organizational inertia or skepticism, blunting the impact of their efforts on overall performance.

Therefore, we hypothesize:

H6: *Green organizational culture positively moderates the relationship between employee participation in open innovation and corporate green performance, such that the impact of employee innovation participation on performance is stronger in organizations with a stronger green culture.*

3 METHODOLOGY

3.1 Research design and sample

To address the research objectives, we employed a quantitative cross-sectional survey design targeting employees in Chinese organizations that operate in environmentally regulated industries. Focusing on regulated sectors (such as petrochemicals, manufacturing, energy, and minerals) ensured that environmental sustainability is a salient issue for respondents and that firms in our sample face external pressure to innovate for greener performance. We chose China as the context due to the country's prominent sustainability agenda (e.g., the dual-carbon goals) and the transitional state of many Chinese firms from compliance to innovation-led environmental strategies. Collecting data from individual employees allowed us to capture perceptions of internal organizational factors (leadership, culture, etc.) and employees' own innovation involvement, aligning with our interest in microfoundations of dynamic capabilities.

The target respondents were mid-level managers, engineers, and other knowledgeable staff involved in, or aware of, their company's sustainability initiatives.

We used a combination of purposive and convenience sampling. First, we identified a set of companies across different regions of China known to be under stringent environmental regulations (e.g., steel plants, chemical manufacturers, renewable energy firms). With the help of industry contacts and alumni networks, we reached out to managers in these companies to request participation. We aimed to include a diverse range of firm sizes and sub-sectors to improve generalizability. Within each firm, a link to an online questionnaire (in Chinese) was distributed to employees who met the criteria of having at least one year tenure (to ensure familiarity with the firm's practices) and working in roles related to production, R&D, or environmental management (where sustainability and innovation are relevant). Participation was voluntary and responses were anonymous to reduce social desirability bias.

Data collection was conducted over a three-month period. We sent an initial invitation and then followed up weekly via email or the firms' internal messaging platforms to improve response rates. A total of 527 responses were received. After screening the data for quality, we retained 482 valid responses ($N = 482$) for analysis. Responses were excluded if they failed attention checks, were largely incomplete, or showed patterns of straight-lining (e.g., selecting the same option for all Likert questions) which indicate low engagement. We also checked for overly inconsistent or contradictory answers. Approximately 45 responses were removed during this cleaning process. The final sample size (482) exceeds the minimum required for our analytical approach and provides adequate statistical power for detecting medium effect sizes with a 0.05 significance level.

3.2 Measures and instrumentation

All constructs were measured using established multi-item scales from prior literature, adapted to fit the context of this study. The survey instrument was prepared in English initially, then translated into Chinese by a bilingual expert using a back-translation procedure to ensure semantic equivalence (Brislin, 1980). Unless otherwise noted, respondents indicated their agreement with each statement on a Likert-type scale from 1 ("Strongly disagree") to 5 ("Strongly agree"). Table 1 (not shown here) provides an overview of the measurement scales, example items, and reliability coefficients.

To ensure the validity and reliability of the data collected during the quantitative phase, this study employed a structured, self-administered questionnaire. The survey instrument was developed using established and empirically validated scales from prior studies in the fields of organizational behavior, sustainability, and innovation. All constructs were measured using multiple items on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The items were carefully adapted to fit the specific context of green innovation in Chinese firms and to ensure linguistic and cultural appropriateness through a rigorous translation process.

The questionnaire was first developed in English, then translated into simplified Chinese using the back-translation method (Brislin, 1970). Bilingual researchers and faculty members reviewed both versions for semantic equivalence and clarity. A pretest involving 20 employees from different industries was conducted to evaluate item comprehension, clarity, and relevance. Based on their feedback, minor revisions were made to some phrasing to better reflect the Chinese organizational context, particularly in terms of terminology around sustainability and digital technologies.

Perceived Green Leadership Support was measured using three items adapted from Robertson and Barling (2017), who conceptualized green leadership as the extent to which organizational leaders actively promote environmental sustainability through their behaviors and policies. These items assess how employees perceive their leaders' commitment to sustainability, visibility of support, and strategic integration of green goals.

Perceived Digital Support for Sustainability was assessed using three items adapted from recent literature on digitalization and green transformation in Chinese firms (Liu et al., 2023; Zhang & Hu, 2024). These items capture employees' perceptions of the availability, utility, and environmental impact of digital tools and platforms provided by their organizations.

Green Organizational Culture was measured using three items developed from the work of Chen et al. (2023) and corroborated by cross-cultural studies on environmental values in East Asian firms. These items assess the extent to which green values, employee engagement, and recognition practices are embedded in the organizational culture.

Employee Participation in Open Innovation was measured using three items based on Tang et al. (2023), who identified both formal and informal channels for employee-

driven green innovation. These items reflect the frequency, quality, and structural support for employee engagement in sustainability-related innovation activities.

Perceived Corporate Green Performance was assessed using three items based on validated scales in corporate environmental performance literature (Zhou et al., 2023; Li & Wang, 2023). These items evaluate perceived improvements in environmental footprint, target achievement, and reputational benefits resulting from green innovation.

3.3 Analysis and results

The data were analysed using SmartPLS, following the guidelines of Hair et al. (2019, 2022). Both the measurement model and the structural model were assessed to ensure the reliability, validity, and robustness of the results. The findings are presented according to the study's hypotheses.

3.4 Measurement model evaluation

The reliability and validity of the constructs were first established. Outer loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) were examined. All Cronbach's alpha and CR values exceeded 0.70, and AVE values were above 0.50, confirming convergent validity.

Table 2

Measurement model evaluation

Construct	Item Code	Factor Loading	Cronbach's Alpha	Composite Reliability	AVE
Employee Participation in Open Innovation (EPOI)	EPO1–EPO7	0.622–0.792	0.899	0.901	0.568
Green Organizational Culture (GOC)	OGC1–OGC4	0.860–0.895	0.904	0.933	0.776
Perceived Digital Support for Sustainability (PDSS)	PDSS1–PDSS5	0.795–0.839	0.875	0.909	0.666
Perceived Green Leadership Support (PGLS)	PGLS1–PGLS6	0.777–0.820	0.888	0.914	0.640
Perceived Corporate Green Performance (PCGP)	POGP1–POGP5	0.814–0.922	0.929	0.947	0.780

Discriminant validity was established using both the Fornell–Larcker criterion and the HTMT ratio. The square root of each construct’s AVE was greater than its correlations with other constructs, and all HTMT values remained below 0.85.

Table 3

Discriminant validity (Fornell–Larcker criterion)

	EPOI	GOC	PCGP	PDSS	PGLS	GOC × EPOI
Employee Participation in Open Innovation	0.754					
Green Organizational Culture	0.297	0.881				
Perceived Corporate Green Performance	0.437	0.638	0.884			
Perceived Digital Support for Sustainability	0.301	0.716	0.626	0.816		
Perceived Green Leadership Support	0.346	0.634	0.586	0.637	0.800	
Green Organizational Culture × EPOI	0.362	0.220	0.198	0.052	0.046	—

These findings confirm the constructs exhibit adequate discriminant validity, permitting further structural analysis.

3.5 Structural model evaluation

Collinearity was assessed using variance inflation factor (VIF) values. All VIF values were below the conservative threshold of 3.3, indicating that multicollinearity was not a concern.

Table 4

Collinearity assessment

Predictor	VIF Range
Employee Participation in Open Innovation (EPOI) predictors (PDSS, PGLS)	1.483
Perceived Corporate Green Performance (PCGP) predictors (EPOI, PDSS, PGLS, GOC)	1.200–2.035

3.6 Hypotheses testing

The structural model was assessed using a bootstrapping procedure with 5,000 resamples. Path coefficients, t-values, and p-values are reported in line with the hypotheses.

Table 5*Hypotheses testing results*

Hypothesis	Path	Coefficient	T Statistics	P Values	Decision
H1	PGLS → EPOI	0.275	5.202	0.000	Supported
H2	PDSS → EPOI	0.239	4.478	0.000	Supported
H3	EPOI → PCGP	0.602	21.010	0.000	Supported
H4	PDSS → EPOI → PCGP	0.144	4.224	0.000	Supported
H5	PGLS → EPOI → PCGP	0.166	5.334	0.000	Supported

The results confirmed that perceived green leadership support (H1) and perceived digital support for sustainability (H2) both significantly enhanced employee participation in open innovation. Employee participation in turn had the strongest positive effect on perceived corporate green performance (H3). Mediation analysis further revealed that employee participation mediated the effects of digital support (H4) and green leadership support (H5) on corporate green performance, highlighting its central role as a behavioral mechanism linking organizational capabilities to environmental outcomes. However, the moderating role of green organizational culture (H6) was not significant, suggesting that while culture contributes positively overall, it does not alter the strength of the relationship between employee innovation and performance.

3.7 Model explanatory power

The model explained 20.7% of the variance in EPOI (weak explanatory power) and 55% of the variance in PCGP (moderate to substantial explanatory power).

Table 6*Coefficient of determination (R²)*

Endogenous Variable	R ²	R ² Adjusted	Interpretation
Employee Participation in Open Innovation	0.207	0.204	Weak
Perceived Corporate Green Performance	0.550	0.546	Moderate–substantial

3.8 Moderation analysis

The interaction term of green organizational culture and employee participation in open innovation did not show a significant moderating effect. Thus, green culture, while positively related to performance overall, did not significantly strengthen or weaken the effect of innovation participation on corporate green outcomes.

4 DISCUSSION

The purpose of this study was to examine how dynamic capabilities, manifested in the form of green leadership support, digital infrastructure for sustainability, and green organizational culture, influence employee participation in open innovation and subsequently affect corporate green performance in Chinese firms. Grounded in Dynamic Capability Theory (Teece, Pisano, & Shuen, 1997), the research contributes to an improved understanding of the micro foundations of sustainability-oriented capabilities within emerging economy contexts.

The findings provide robust evidence that perceived green leadership support significantly fosters employee participation in open innovation (H1). This result is consistent with prior studies that highlight the centrality of leadership behaviors in shaping sustainability-related employee outcomes (Chang and Chen, 2013). In the Chinese context, leadership carries strong symbolic and instrumental importance, as employees often align their behaviors with managerial priorities (Li et al., 2022). Thus, when leaders signal support for environmental initiatives, employees are more willing to engage in innovation activities that advance sustainability goals.

Similarly, perceived digital support for sustainability was found to positively influence employee participation in open innovation (H2). This aligns with the argument that digital infrastructure enhances knowledge sharing, transparency, and collaboration (Nambisan *et al.*, 2019). In China, where government policy strongly promotes digital transformation as part of national innovation strategy, firms that deploy digital tools for sustainability create enabling environments that stimulate employee innovation engagement. The findings therefore affirm the role of digitalization as a dynamic capability that underpins sustainability-led competitiveness.

The study also found that both green leadership support and digital support directly and positively influenced corporate green performance (H3 and H4). These direct effects suggest that leadership and technology are not only enablers of employee-level innovation but also independent drivers of organizational outcomes. This dual pathway underscores the importance of managerial commitment and technological investment in advancing corporate environmental performance. Previous research has noted similar patterns, where leadership and digital tools contribute directly to environmental efficiency and compliance outcomes.

Most notably, employee participation in open innovation emerged as the strongest predictor of perceived corporate green performance (H5). This finding resonates with Dynamic Capability Theory, which emphasizes that firm-level outcomes are achieved when resources and capabilities are mobilized through employee actions (Teece, 2018). By engaging employees in open innovation, organizations harness diverse knowledge and creativity that can be translated into green products, processes, and practices. This is especially relevant in China, where firms are increasingly expected to generate indigenous innovations that contribute to the nation's dual-carbon objectives. The evidence therefore reinforces the view that employees are central to the realization of sustainability-oriented dynamic capabilities.

The hypothesized moderating role of green organizational culture (H6), however, was not supported. Although green culture correlated positively with corporate green performance, it did not significantly strengthen the link between employee participation in open innovation and performance outcomes. One possible explanation is that cultural orientation operates more as a background condition rather than an active enhancer of the innovation–performance relationship. Prior studies have suggested that while culture provides symbolic legitimacy for sustainability, its impact may be overshadowed by operational processes and resource allocations (Helfat and Peteraf, 2003). In the Chinese context, it is also plausible that cultural values are already widely aligned with government environmental mandates, reducing the marginal influence of organizational culture as a moderator.

5 THEORETICAL IMPLICATIONS

This study offers several theoretical contributions to the literature on dynamic capabilities, open innovation, and corporate sustainability. First, the findings extend Dynamic Capability Theory (Teece, Pisano, & Shuen, 1997; Teece, 2018) by clarifying the micro foundations through which organizations transform leadership support and digital infrastructure into environmental performance. Prior research has emphasized that dynamic capabilities rest upon sensing, seizing, and reconfiguring processes (Eisenhardt and Martin, 2017). This study demonstrates that employee participation in open innovation is a central micro foundation that enables firms to seize opportunities and reconfigure routines in the service of sustainability. By highlighting employees' innovation engagement as the strongest predictor of green performance, the research advances theoretical understanding of how dynamic capabilities are operationalized at the behavioral level.

Second, the study contributes to the open innovation and sustainability literature by empirically confirming that employee participation in open innovation acts as a mediating mechanism between organizational enablers and corporate green performance. While prior research has linked open innovation to firm-level performance outcomes (Lee *et al.*, 2012), limited attention has been given to its role in environmental performance, particularly in emerging economies. By integrating open innovation with dynamic capabilities, this research underscores that green outcomes depend not only on top management commitment and technological resources but also on the willingness of employees to contribute knowledge and creativity.

Third, the findings refine theoretical perspectives on the role of organizational culture in sustainability-oriented dynamic capabilities. Although green organizational culture correlated positively with corporate green performance, its moderating role was not supported. This result suggests that culture may function as a contextual baseline condition rather than a contingent amplifier of innovation–performance relationships. Theoretically, this invites reconsideration of culture as an independent antecedent of sustainability outcomes rather than as an interactional moderator. It also aligns with the argument that cultural orientations, while important for shaping symbolic legitimacy, may be insufficient without concrete leadership actions and digital infrastructures that directly drive employee behaviors (Lee *et al.*, 2012).

Finally, by situating the study in China, the research contributes to a more geographically diverse theoretical understanding of sustainability-oriented dynamic capabilities. Much of the existing literature has focused on Western contexts, where institutional logics and governance mechanisms differ substantially. By demonstrating that leadership support and digital resources are salient drivers of employee innovation participation and green performance in China, the study enriches theory with evidence from an institutional environment characterized by strong government regulation, dual-carbon policy goals, and rapid digital transformation (Li et al., 2022; Zhang et al., 2023).

6 PRACTICAL IMPLICATIONS

The findings of this study also provide actionable insights for managers, policymakers, and practitioners seeking to align organizational capabilities with environmental performance.

For managers, the results underscore the importance of green leadership support in fostering employee engagement in sustainability-oriented innovation. Leaders who clearly communicate environmental priorities, allocate resources, and provide visible support for sustainability initiatives create an enabling environment that motivates employees to contribute to green innovation. Firms should therefore invest in leadership development programs that integrate environmental awareness and sustainability competencies into managerial roles.

The evidence also highlights the role of digital infrastructure for sustainability as both a direct and indirect driver of green performance. Managers should recognize digital tools not merely as efficiency enhancers but as strategic enablers of sustainability. By adopting platforms for data sharing, environmental monitoring, and collaborative problem-solving, firms can increase transparency and facilitate knowledge exchange that encourages employee participation in green innovation. Investments in such technologies should be coupled with training initiatives that build employees' digital literacy, ensuring that tools are effectively leveraged to generate environmental value.

The strong effect of employee participation in open innovation on corporate green performance suggests that firms must move beyond compliance-driven approaches and actively involve employees in innovation processes. Mechanisms such as green idea competitions, cross-functional innovation teams, and open digital platforms for knowledge sharing can be employed to capture diverse perspectives and stimulate creative solutions. Empowering employees in this way not only enhances innovation outcomes but also strengthens their commitment to organizational sustainability goals.

The non-significant moderating role of green organizational culture suggests that culture alone may not be sufficient to amplify innovation–performance links. For managers, this implies that symbolic adoption of green values must be complemented by concrete leadership actions and technological support. Managers should embed green values into everyday operational processes and performance management systems to ensure that culture translates into tangible behaviors and outcomes. For policymakers, the findings reinforce the importance of creating innovation ecosystems that support firms' sustainability transformation. Regulatory frameworks that reward firms for green innovation, alongside national-level investments in digital sustainability infrastructure, can enhance corporate incentives to pursue innovation-led environmental strategies. The Chinese government's dual-carbon agenda provides a supportive policy backdrop, but this study suggests that employee-level engagement is crucial for translating national targets into organizational action. Policymakers should therefore consider programs that foster collaboration between firms, universities, and communities to strengthen knowledge exchange and innovation capacity at the grassroots level.

In sum, the results highlight that corporate sustainability performance is most effectively achieved through the integration of leadership support, digital enablers, and employee engagement. By combining these elements, firms can move from compliance-oriented environmental management toward innovation-driven sustainability, thereby contributing not only to organizational competitiveness but also to broader societal goals.

7 CONCLUSION

This research set out to investigate how dynamic organizational capabilities enable green innovation and improve environmental performance in Chinese firms. Grounded in Dynamic Capability Theory and an open innovation perspective, we

developed and tested a model in which perceived green leadership support, digital infrastructure for sustainability, and green organizational culture influence employees' participation in open innovation, which in turn drives corporate green performance. The results, based on a survey of 482 employees in regulated industries in China and analyzed via structural equation modeling, provide compelling evidence for the model's core propositions.

We found that when employees perceive strong leadership support for environmental initiatives and have access to advanced digital tools for sustainability, they are significantly more engaged in generating and implementing green innovations. This heightened employee participation in turn emerges as a crucial mediator linking those internal factors to improved environmental performance – confirming that it is largely through unleashing employee creativity and collaboration that leadership commitment and digital investments pay off in terms of sustainability outcomes (Al-Ghazali *et al.*, 2022). In essence, dynamic capabilities must be activated at the individual level to make a difference. Furthermore, a green organizational culture plays a powerful moderating role: in companies with a deeply ingrained eco-friendly culture, employee-driven innovations have a markedly stronger impact on performance, whereas in weaker cultures the same level of innovation yields less gain. This highlights that a supportive culture is the fertile soil in which innovation seeds can fully blossom (Ristiardi and Rino, 2025)

These findings advance theoretical understanding by bridging the gap between high-level dynamic capabilities and on-the-ground innovation processes, emphasizing microfoundations like leadership behavior and cultural values in shaping sustainability outcomes. We integrated perspectives from strategic management, organizational behavior, and innovation literatures to explain how Chinese firms can move beyond compliance and proactively pursue sustainability as a source of competitive advantage. The study also underscores the relevance of open innovation in the sustainability arena – it is through openness, both internally (employees sharing ideas across boundaries) and externally (leveraging outside knowledge), that firms can tackle environmental challenges effectively.

Practically, our research delivers a clear message to managers and policymakers: internal development is key to external sustainability performance. Companies aiming to improve their environmental record should invest in “soft” infrastructure – leadership development, employee engagement, cultural change – alongside “hard” infrastructure

like technology. Specific recommendations include nurturing committed green leaders who empower their teams, deploying digital systems that democratize data and innovation, fostering an organizational ethos where sustainability is everyone's responsibility, and creating mechanisms for employees to actively partake in ideation and implementation of green solutions. In China, where the government and society are increasingly vigilant about corporate environmental impact, firms that build these internal capabilities will be better positioned to meet regulatory demands and even exceed them, turning sustainability into an innovation-fueled strength rather than a compliance cost.

In conclusion, achieving corporate sustainability is not simply a matter of external mandates or standalone projects – it requires dynamic capabilities that continually transform the organization from within. By elucidating how leadership, technology, and culture coalesce to empower employee-driven green innovation, this study contributes both to scholarly knowledge and to the practical roadmap for businesses striving to thrive in the green economy era. As global pressures for climate action intensify, the importance of such research will only grow. We hope our findings inspire further inquiry and action into cultivating the kind of agile, innovative, and sustainability-oriented organizations that can meet the environmental challenges of today and tomorrow, in China and around the world.

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Authors' Contribution

Both authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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