

Digital Leadership and Corporate Sustainability: An Integrated Framework of Mechanisms and Contingencies

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Abstract: In the context of global climate governance and the dual-carbon transition, corporate sustainability has become a central strategic priority. As a critical capability in the digital economy, digital leadership is increasingly recognized as a key driver of sustainable development; however, its underlying mechanisms and boundary conditions remain insufficiently theorized. Drawing on upper echelons theory, dynamic capabilities theory, the resource-based view, and stakeholder theory, this study develops an integrated theoretical framework to explain how digital leadership shapes corporate sustainability. The framework identifies four core dimensions of digital leadership—digital mindset, resource integration, strategic innovation, and organizational empowerment—and proposes that digital leadership influences sustainability both directly and indirectly through multiple mediating mechanisms, including green technology innovation, business model innovation, organizational resilience, and employee green self-efficacy. Furthermore, the effectiveness of these mechanisms is contingent upon contextual factors such as supply chain concentration, digital infrastructure, agency costs, board characteristics, and environmental dynamism. This study contributes to the literature by integrating fragmented perspectives into a coherent framework, clarifying the multilevel mechanisms linking digital leadership to sustainability, and highlighting the contingent conditions shaping these relationships. The findings offer theoretical insights and practical implications for firms seeking to leverage digital leadership for sustainable development.

Keywords: Digital leadership; corporate sustainability; green innovation; business model innovation; organizational resilience; employee green self-efficacy; dynamic capabilities; contingency factors

1. Introduction

With the deep penetration of global digital technologies and the accelerated restructuring of industrial systems, the external environment confronting enterprises has become increasingly volatile, uncertain, complex, and ambiguous. Under such circumstances, traditional business models and management approaches can no longer enable firms to balance economic benefits, social responsibilities, and environmental

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protection objectives. As a result, the pressure for sustainable development continues to rise, and enterprises must accelerate their transformation to maintain competitiveness. Driven by the dual-carbon strategy and the global trend of climate governance, enterprises are forced to pursue coordinated development between digital transformation and green low-carbon transition. Failure to achieve such synergy will lead to declining competitiveness, increasing compliance risks, damaged corporate reputation, and impaired long-term value [1].

However, in real business operations, many enterprises still encounter prominent dilemmas. These include the disconnection between digital transformation and sustainable development strategies, the mismatch between technological investment and actual value creation, the overemphasis on short-term performance, and the deviation of strategic decisions from long-term sustainable goals. Fundamentally, these dilemmas stem from the lack of a new type of leadership that can navigate digital changes, coordinate resource allocation, and lead organizations toward long-term sustainable development.

Digital transformation and sustainable development have become dual challenges for enterprises in the modern business environment. On the one hand, digital technologies represented by artificial intelligence, cloud computing, blockchain, and the Internet of Things are reshaping industrial structures, improving operational efficiency, promoting continuous innovation, and enhancing digital interconnection [2]. On the other hand, increasingly severe environmental problems such as climate change, resource depletion, and carbon emissions have further pushed sustainability to the top of corporate strategic agenda.

Authoritative studies have systematically conceptualized digital leadership as a comprehensive leadership paradigm that covers digital mindset, resource integration, strategic innovation, and organizational empowerment, rather than merely technological application capabilities [3]. Supported by the dual-carbon goals, digital transformation significantly stimulates green technology innovation, reduces environmental costs, and improves ecological performance. In addition, digital leadership effectively enhances organizational resilience, enabling enterprises to maintain stable development in a volatile environment [4]. Supply chain digitization further provides a solid collaborative foundation for sustainable development, and low-concentration supply chains help maximize the collaborative value of digital technologies.

Nevertheless, existing research still has obvious limitations. Most studies focus on empirical tests without sufficient theoretical interpretation of how digital leadership affects sustainable development. The influence paths are scattered and lack integration. Few studies theoretically summarize how contextual factors shape the effectiveness of digital leadership. The integrated theoretical framework linking digital leadership and corporate sustainable development remains incomplete [5]. Therefore, constructing a systematic and in-depth theoretical framework from a holistic perspective has important academic value and practical significance.

Using theoretical deduction, this study aims to answer four core questions:

- (1) What is the connotation, dimensions, and core characteristics of digital leadership?
- (2) Why and how can digital leadership drive corporate sustainable development

from a theoretical perspective?

(3) Through which specific paths does digital leadership influence sustainable development, and what logical relationships exist among these paths?

(4) What internal and external contextual factors affect the effectiveness of digital leadership, and how can enterprises use these conditions to improve implementation effects?

This study attempts to establish a systematic, rigorous, and expandable theoretical framework to lay a foundation for future empirical research and provide clear theoretical guidance for enterprise practice.

2. Theoretical Foundations

The relationship between digital leadership and corporate sustainable development involves multiple disciplines, including organization theory, strategic management, innovation theory, and corporate governance. This paper selects four complementary theoretical perspectives as the cornerstone of the entire analysis.

2.1 Upper Echelons Theory

Upper echelons theory holds that senior executives' cognitive base, values, risk preferences, and innovation willingness directly determine strategic choices and organizational behaviors, which ultimately affect firm performance and development direction. In the digital economy era, executives' understanding of digital technologies, recognition of sustainable development, and support for innovative activities constitute important sources of digital leadership.

Domestic studies show that digital transformation promotes the profound restructuring of corporate strategy and leadership models, and executives' digital cognition and innovation orientation directly determine strategic implementation effects. Extending from this logic, top management innovation is a key factor affecting the effectiveness of digital leadership. Executive innovation orientation significantly strengthens the driving effect of digital leadership on green innovation [6]. When executives are more willing to accept new technologies, invest in innovation, and bear transformation risks, digital leadership can more strongly promote green innovation and business model innovation. Meanwhile, board characteristics such as gender diversity, education level, ownership distribution, and political connections affect the efficiency of digital strategy implementation through supervision and decision-making functions [1]. Upper echelons theory provides a direct basis for interpreting the sources, governance context, and action boundaries of digital leadership.

2.2 Dynamic Capabilities Theory

Dynamic capabilities theory emphasizes that enterprises must continuously sense opportunities, seize opportunities, and reconstruct internal and external resources and organizational processes to maintain long-term competitive advantages in a turbulent environment. The accelerated iteration of digital technologies, changing market demands, and adjusting policy rules require enterprises to possess stronger dynamic adaptability. Digital leadership is essentially a high-level dynamic capability that helps enterprises sense environmental changes, integrate resources, implement rapid changes,

and further improve organizational resilience.

The synergistic effect of digital transformation, corporate culture, and leadership can significantly improve organizational sustainability performance [2], which is highly consistent with the logic of dynamic capabilities theory. Digital leadership enhances enterprises' environmental perception, resource integration, organizational learning, and change execution capabilities, enabling firms to quickly respond to external pressures and transform digital technologies into green innovation and sustainable operational capabilities. When facing shocks such as supply chain fluctuations, stricter regulations, and changing market preferences, enterprises with stronger dynamic capabilities are more likely to convert digital leadership into sustainable performance.

2.3 Resource-Based View

The resource-based view proposes that enterprises are bundles of resources and capabilities, and heterogeneous resources that are valuable, rare, inimitable, and non-substitutable are the source of sustainable competitive advantages. In the digital economy, data resources, digital technologies, digital talents, and digital leadership itself are strategic resources that are difficult to replicate.

Research indicates that digital leadership includes core dimensions such as digital resource integration and strategic cognition, and is a scarce and irreplaceable strategic resource. Digital leadership can systematically integrate scattered digital, human, technical, and social resources, improve resource allocation efficiency, reduce resource waste and environmental burdens, and promote sustainable development. From the perspective of the resource-based view, green self-efficacy, organizational innovation capability, and digital governance capability are key intangible resources for sustainable development. Digital leadership forms sustainable resource advantages by activating, cultivating, and integrating these resources.

2.4 Stakeholder Theory

Stakeholder theory states that the survival and development of enterprises depend on the support of shareholders, employees, customers, suppliers, governments, and the public. Therefore, enterprises should go beyond a single profit goal and balance the interests of multiple stakeholders. The essence of sustainable development is to meet the long-term expectations of stakeholders in economic, social, and environmental dimensions.

Digital leadership reduces communication costs, improves information transparency, and strengthens stakeholder collaboration through digital platforms and tools, thereby better fulfilling social responsibilities, improving environmental performance, and enhancing long-term economic value. Digital leadership helps enterprises establish efficient stakeholder connection mechanisms and practices such as green supply chain management, transparent environmental information disclosure, and employee-participatory green governance. Stakeholder theory provides a theoretical basis for defining the goal system of corporate sustainable development and explaining the value orientation of digital leadership.

3. Connotation, Dimensions, and Core Characteristics of Digital Leadership

3.1 Connotation of Digital Leadership

Digital leadership refers to the comprehensive ability of senior managers to use digital technologies, data-driven thinking, and transformational leadership to guide organizations in digital transformation, promote innovation, allocate resources rationally, and balance short-term performance and long-term sustainable development goals in a digital environment. It is not a single technical capability or leadership trait, but a combination of technical comprehension, strategic insight, organizational mobilization, change execution, and value judgment.

The core connotation of digital leadership is reflected in four aspects: first, the ability to understand and apply digital tools such as big data, artificial intelligence, and the Internet of Things for scientific decision-making; second, possession of data-driven, open-sharing, and dynamically adaptive digital thinking; third, the ability to formulate and implement long-term strategies integrating digitalization and green development; fourth, the capacity to stimulate organizational vitality, improve employee capabilities, enhance organizational resilience, and lead the entire organization toward sustainable development.

3.2 Dimensions of Digital Leadership

Supported by authoritative domestic measurement studies [7], this paper divides digital leadership into four interrelated dimensions:

(1) Digital Mindset Guidance Capability

As the cognitive foundation of digital leadership, it means that executives have data-driven, innovative, systematic, and sustainable thinking, and can establish digital and green development concepts within the organization.

(2) Digital Resource Integration Capability

As the resource foundation, it refers to the ability to integrate internal data, technology, talent, capital, and other resources, and externally collaborate with supply chains, customers, governments, and partners to achieve resource sharing and efficient allocation.

(3) Digital Strategic Innovation Capability

As the core output, it refers to the ability to formulate strategies integrating digital transformation and sustainable development, promote green technology innovation and business model innovation, and transform digital advantages into competitive advantages.

(4) Digital Organizational Empowerment Capability

As the implementation guarantee, it refers to improving organizational resilience, employee green self-efficacy, and execution through digital management, culture construction, training, and incentive design.

3.3 Core Characteristics

Digital leadership has four distinct characteristics: technology integration, innovation-driven, sustainability-oriented, and dynamic adaptability. These

characteristics make digital leadership a key capability for enterprises to achieve sustainable development in the digital era.

4. Theoretical Framework and Action Mechanisms

4.1 Overall Framework

This study constructs an integrated theoretical framework: digital leadership, as the core independent variable, promotes corporate sustainable development through four mediators: green technology innovation, business model innovation, organizational resilience, and employee green self-efficacy. Meanwhile, supply chain concentration, digital infrastructure, agency costs, board structure, and environmental dynamism moderate the above relationships.

4.2 Direct Effect

Digital leadership directly improves environmental performance, social performance, and long-term economic performance through digital monitoring, data-based management, stakeholder coordination, and risk resistance enhancement [1].

4.3 Mediating Paths

4.3.1 Green Technology Innovation

Digital transformation significantly promotes green technology innovation. Digital leadership provides technical support, resource investment, and cultural atmosphere for green R&D. Green innovation is a key transmission mechanism [6].

4.3.2 Business Model Innovation

Digital leadership embeds green logic into value creation, delivery, and capture, forming new models such as circular economy and service-oriented manufacturing.

4.3.3 Organizational Resilience

Digital leadership significantly improves organizational resilience to maintain strategic stability amid external shocks.

4.3.4 Employee Green Self-Efficacy

Based on social cognitive theory, digital leadership improves employees' confidence and participation in green practices through training, empowerment, and incentives.

4.4 Moderating Mechanisms

Lower supply chain concentration, better digital infrastructure, lower agency costs, and higher environmental dynamism strengthen the effects of digital leadership.

5. Practical Paths

5.1 Cultivate Executive Digital Leadership

Enterprises should prioritize the cultivation of digital leadership among senior managers. Systematic training, external talent introduction, and practical exercise can strengthen executives' understanding of digital technologies, digital thinking, and sustainable development. Enterprises should optimize the structure of the executive team, improve innovation orientation, educational level, and diversity to reduce short-sighted decisions. Digital and green indicators should be incorporated into recruitment, assessment, and incentive systems to align executives' personal goals with long-term corporate sustainability goals.

5.2 Unblock Mediating Transmission Paths

Enterprises should establish four supporting mechanisms around digital leadership: first, build a green technology innovation system and increase investment in digital R&D and low-carbon technologies; second, promote sustainability-oriented business model innovation to realize value reconstruction; third, develop data-driven risk management and early warning systems to enhance organizational resilience; fourth, strengthen employee digital and green skills training to improve green self-efficacy and form a full participation pattern.

5.3 Optimize Internal Governance and Reduce Agency Costs

Improve corporate governance structure, enhance board independence and diversity to strengthen supervision; optimize ownership structure to avoid large shareholder short-sightedness; establish performance appraisal and incentive mechanisms oriented toward sustainable development to reduce opportunistic behaviors; improve information transparency and strengthen internal and external supervision to ensure digital leadership serves long-term value creation.

5.4 Adapt to External Environment and Strengthen Supply Chain Collaboration

For enterprises with high supply chain concentration, expand cooperation networks through digital platforms and promote green supply chain collaboration; continuously strengthen digital infrastructure to support digital leadership implementation; proactively adapt to policy and market changes, use digital tools to capture sustainable development opportunities, and maintain strategic initiative in a dynamic environment.

6. Conclusion and Implications

6.1 Research Conclusions

This study constructs a comprehensive theoretical framework of digital leadership driving corporate sustainable development. The main conclusions are as follows:

First, digital leadership is a composite capability integrating digital mindset guidance, resource integration, strategic innovation, and organizational empowerment. It has four core dimensions and four prominent characteristics: technological integration, innovation-driven, sustainability-oriented, and dynamic adaptability.

Second, digital leadership has a direct positive impact on corporate sustainable development. Meanwhile, it indirectly drives sustainability through four parallel and

complementary paths: green technology innovation, business model innovation, organizational resilience, and employee green self-efficacy, forming a multi-level and multi-channel action system.

Third, the effectiveness of digital leadership presents significant context dependence. Its driving effect on sustainable development is stronger when supply chain concentration is lower, digital infrastructure is better, agency costs are lower, corporate governance is more sound, and environmental dynamism is higher.

6.2 Theoretical Implications

This study makes three important theoretical contributions.

First, it systematically defines the connotation and dimensions of digital leadership, clarifies its theoretical boundaries, and enriches the theoretical system of digital leadership research.

Second, it constructs an integrated theoretical framework that links digital leadership to corporate sustainable development. It reveals the internal mechanism and transmission path, which makes up for the lack of systematic theoretical research in the existing literature [5].

Third, it identifies key contextual factors including supply chain concentration, digital infrastructure, and agency costs, and clarifies their moderating effects. This expands the boundary conditions of digital governance and sustainable development research.

6.3 Managerial Implications

The conclusions of this study provide clear practical guidance for enterprises.

First, enterprises should elevate digital leadership to a core strategic capability and strengthen the training and introduction of digital executives.

Second, enterprises should focus on the construction of green technology innovation and sustainable business models to amplify the driving effect of digital leadership.

Third, enterprises should improve digital infrastructure, optimize internal governance, reduce agency costs, and create institutional conditions for digital leadership to play a role.

Fourth, enterprises should promote digital collaboration in the supply chain, reduce excessive concentration, and enhance the synergy between digital transformation and sustainable development.

6.4 Limitations

This study is a purely theoretical deduction and has not been tested by empirical data. The conclusions are general and lack industry-specific analysis. Future research can refer to the empirical research design in the information technology industry for targeted testing to further verify the reliability of the framework [4].

6.5 Future Outlook

Future research can be expanded in four directions. First, large-sample empirical

tests can be conducted to quantify the direct effect, mediating mechanism, and moderating variables proposed in this paper. Second, cross-industry and cross-regional comparative studies can be carried out to analyze differences under different institutional and industrial contexts. Third, emerging topics such as digital ethics, digital security, and digital equity can be included to further improve the connotation of digital leadership. Fourth, longitudinal case studies can be conducted to reveal the formation process and evolution of digital leadership in enterprise practice [8].

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