How Technological Leadership Drives Breakthrough Innovation:A Dynamic Capabilities Perspective

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Abstract: Against the backdrop of increasingly fierce global technological competition, breakthrough innovation has become a critical path for firms to achieve sustainable development. Based on the dynamic capabilities theory, this paper constructs a theoretical framework of "technological leadership--dynamic capabilities --breakthrough innovation" to reveal how technological leadership drives breakthrough innovation through the three stages of dynamic capabilities: sensing, seizing, and reconfiguring. The study finds that technological leadership, with "technological expertise, forward-looking vision, and organizational transformation" at its core, facilitates breakthrough innovation and effectively mitigates its inherent uncertainty through the strengthening of dynamic capabilities. This mechanism is validated in the practices of Tesla and Huawei. By leveraging technological leadership as their strategic anchor, both companies have transformed technological foresight and change execution into systemic innovation advantages via the three-stage process of dynamic capabilities. Consequently, they have successfully effected paradigm shifts, including key technological breakthroughs and the restructuring of industrial ecosystems. Theoretically, this study provides a new perspective for exploring the interplay among technological leadership, dynamic capabilities, and breakthrough innovation. Practically, it offers a decision-making reference for firms in selecting their technological innovation paths.

Keywords: Technological Leadership; Breakthrough Innovation; Dynamic Capabilities; Tesla; Huawei

1. Introduction

In the context of an accelerated reconfiguration of the global technological competition landscape, breakthrough innovation has become the core driving force for firms to overcome technological barriers and reshape industrial ecosystems. Breakthrough innovation requires firms to possess a high degree of adaptability at the technological, market, and organizational levels. It also necessitates strategic resource allocation and the dynamic adjustment of organizational capabilities to cope with the uncertainties brought about by technological change. Unlike incremental innovation, breakthrough innovation promotes a qualitative upgrade of the industrial value chain through intergenerational technological leaps, market disruption, and the reconfiguration of organizational capabilities.[1] For instance, the replacement of internal combustion engine vehicles by electric vehicles and the disruption of 4G by 5G communications both exemplify the strategic significance of breakthrough innovation in reshaping the rules of global industrial competition. However, such innovations face multiple challenges, including uncertainty in technological pathways, lags in market acceptance, and high risks associated with resource investment.[2] How firms can leverage dynamic capabilities to address these challenges and achieve breakthrough innovation has become a critical question for both academia and industry.

The core characteristics of breakthrough innovation are "technological discontinuity" and "market disruption." At the technological level, it breaks from existing technological trajectories, such as the revolution in traditional biotechnology brought about by CRISPR-Cas9 gene editing. At the market level, it creates new demand or displaces old markets, as exemplified by smartphones supplanting feature phones. Through an empirical study on Chinese firms,

Xia and Zhu (2023)[3] found that breakthrough innovation is the fundamental path to solving "chokehold" problems in key technologies and securing a sustainable competitive advantage. Nevertheless, its high-risk nature cannot be overlooked: (1) Technological uncertainty: approximately 70% of breakthrough technologies fail due to excessively long development cycles or insurmountable Technological bottlenecks[1]; (2) Resource constraints: it demands sustained, high-intensity R&D investment with a significantly longer return period than incremental innovation; and (3) Organizational inertia: existing organizational structures and processes often struggle to adapt to disruptive technological changes[4].

To overcome these challenges, the three-phase model of dynamic capabilities proposed by Teece (sensing, seizing, and reconfiguring) has become a key framework. This model deconstructs a firm's ability to respond to environmental changes into three stages[5]: (1) Sensing capability: the ability to identify technological trends and market opportunities, such as Apple's use of user behavior data analysis to anticipate smartphone demand[6]; (2) Seizing capability: the ability to integrate internal and external resources for a rapid response, as demonstrated by Tesla's vertical integration of its battery supply chain to control core technology; and (3) Reconfiguring capability: the ability to adjust organizational structures and processes to accommodate innovation, such as Huawei's cross-departmental collaboration mechanisms supporting 5G R&D. However, the development of dynamic capabilities is constrained by a firm's strategic orientation, resource endowment, and organizational culture.[7] The empirical research by Sun et al. (2024)[8] indicates that without the drive of strategic leadership, dynamic capabilities can easily fall into a "capability rigidity" trap, failing to support breakthrough innovation.

Therefore, technological leadership, as a strategic extension of dynamic capabilities, emphasizes a firm's ability to lead innovation ecosystems through "technological foresight" and "transformational execution". (1) Technological foresight is manifested in the forward-looking judgment of technological trends. For example, Apple utilizes LSTM models to predict technological evolution paths, achieving an R^2 of 0.94 in its stock price predictions[6]. (2) Transformational execution is reflected in the organizational-level impetus to implement technology. Through its "software-defined vehicle" model, Tesla has achieved synergy between hardware iteration and OTA updates, shortening the technology commercialization cycle by 60%. However, existing research has largely focused on the static characteristics of technological leadership, such as patent counts and R&D investment, while overlooking the micro-mechanisms through which it influences breakthrough innovation via the three stages of dynamic capabilities.[9] For instance, Huawei's three-tiered R&D system—"pre-research, incubation, and commercialization"—is a classic example of technological leadership driving a closed loop of dynamic capabilities.

Consequently, this paper aims to construct a theoretical framework of "Technological Leadership--Dynamic Capabilities--Breakthrough Innovation" to reveal how technological leadership drives firms to achieve breakthrough innovation through the three stages of dynamic capabilities (sensing, seizing, and reconfiguring). This framework will not only deepen the understanding of dynamic capability theory but also provide a strategic pathway for firms to enhance their competitiveness amidst technological change. Furthermore, by integrating practical case studies of firms, this paper will explore the applicability of technological leadership across different industries and market environments, offering evidence-based insights for policymakers and corporate managers.

2. Literature Review

2.1 The Concept and Evolution of Corporate Technological Leadership

Corporate technological leadership refers to the systemic capability of a firm to lead technological change and achieve breakthrough innovation through its technological expertise, forward-looking strategic vision, and organizational change capabilities. Early research emphasized the ability to identify and apply technological trends[10]. However, with the rise of digital and modular technologies, the concept has expanded to include interdisciplinary resource integration, control over technological architecture, and the

construction of innovation ecosystems.

Research on the evolution of corporate technological leadership can be categorized into four aspects, moving from static characteristics to dynamic capabilities and from a macro perspective to micro-level mechanisms. (1) Foundational Dimensions: Ye (2012)[11] proposed that technological leadership comprises eight key elements, including integration capabilities (Lawrence & Lorsch, 1967) and dynamic capabilities (Teece et al., 1992), focusing on the optimization of internal resources. However, this framework struggles to explain the sustainability of innovation amidst rapid technological iteration. (2) Dynamic Extension: Teece (1997)[5] argued that technological leadership must integrate technology foresight, market responsiveness, and resource reconfiguration capabilities to adapt to rapidly changing environments. Eisenhardt & Martin (1998)[12] further emphasized that it must encompass technological adaptability and organizational agility, forming a dynamic adjustment mechanism. (3) Reconstruction in the Digital and Intelligent Era: Li et al. (2025)[13] introduced a three-dimensional model of digital and intelligence leadership: subjective willingness (the proactive embrace of technology by leaders), objective capability (data-driven decision-making and AI application), and the preservation of human traits (ethical judgment and creativity), highlighting a new paradigm of human-machine collaboration. Based on research on modular innovation networks, Sun (2018)[14] identified architectural control (dominance over technological standards) and ecosystem coordination (guiding collaborative innovation among members) as the core of technological leadership. (4) Deepening of Micro-level Mechanisms: Recent studies have revealed a dynamic evolutionary path for technological leadership, which is characterized by reliance on R&D capabilities during the formative stage, a focus on architectural capabilities in the development stage, and dependence on standard-setting capabilities in the mature stage, thereby creating phased momentum for advancement[14].

This evolutionary process directly serves the goal of overcoming technological bottlenecks but requires translation into concrete innovation practices through dynamic capabilities.

2.2 Characteristics and Measurement of Breakthrough Innovation

The higher-order capabilities of technological leadership must ultimately be converted into value through breakthrough innovation. Breakthrough innovation is a type of innovation that reconfigures industrial paradigms through discontinuous leaps in technology, markets, or business models.

Its core distinguishing features from incremental innovation and its connection to dynamic capabilities are as follows. (1) Non-linear Paths and Dynamic Sensing: Characterized by non-linearity and uncertainty, the innovation path is often stochastic and dependent on serendipitous discoveries[15], with intertwined technological, market, and organizational risks. It necessitates cross-disciplinary integration, combining knowledge from multiple fields, such as AI + biology or materials + energy, to create technological intersections[16]. (2) High Uncertainty and Dynamic Seizing: The triple risks of "technology-market-organization" require the capability to rapidly seize and integrate resources. An example is Huawei's "spare tire" strategy to counter chip supply disruptions. (3) Long Cycles and Dynamic Reconfiguration: The "chasm effect"—the disconnect between a technological breakthrough and its commercialization—necessitates reconfiguration capabilities to adjust the organizational ecosystem. For instance, CATL's R&D on solid-state batteries involved significant reorganization of its research and production structures.

In the context of the dynamic adjustment of measurement methods for breakthrough innovation, it is evident that indicators like the technological generational gap[5] and the disruption index[17] focus on the intensity of the technological breakthrough but overlook the dimension of organizational adaptation. Furthermore, the text mining approach by Wei et al. (2024)[18] quantifies strategic intent using a "breakthrough innovation lexicon" (e.g., "paradigm reconfiguration," "ecosystem disruption"). In contrast, the SIR propagation model by Zhang et al. (2012)[16] infers breakthrough potential from the diffusion rate of an innovation. Both approaches suggest that measurement must accommodate both technological radicalness and organizational responsiveness. These characteristics and

measurement challenges reveal that breakthrough innovation urgently requires dynamic capabilities to act as a bridge for converting technological leadership into tangible outcomes.

2.3 Innovative Applications of Dynamic Capability Theory

The theory of dynamic capabilities, founded by Teece (1997)[5], is defined as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." The application of this theory in the field of innovation has deepened through three stages. (1) The Classic Three-Stage Model: The sensing stage involves scanning for technological opportunities and market gaps, such as Huawei's foresight in 5G technology. The seizing stage entails rapidly allocating resources to develop new products, exemplified by Xiaomi's integration of its ecosystem chain. The reconfiguring stage involves adjusting the organizational structure to adapt to a new paradigm, as seen in Didi Chuxing's reconfiguration of the transportation ecosystem. Xiong et al. (2016)[19] proposed that dynamic capabilities for technological innovation consist of technological opportunity identification, innovation resource integration, and adaptive organizational change, asserting that "dynamic capabilities are the high-order engine of technological innovation." (2) A New Four-Stage Framework: Roseno et al. (2023)[20] added extending and separating stages, arguing that after scaling a breakthrough innovation, firms must divest non-core businesses to achieve sustainable growth. (3) Deepening of Micro-foundational Cognition: Cheng (2023)[21] identified leaders' cross-boundary associative thinking and tolerance for ambiguity as the cognitive pivot that transforms technological leadership into dynamic capabilities.

Although substantial research has explored the relationships among technological leadership, breakthrough innovation, and dynamic capabilities, several research gaps persist. First, the interactive mechanism between technological leadership and dynamic capabilities has not been fully investigated. Existing studies often focus on the static characteristics of technological leadership, lacking a systematic analysis of the micro-processes through which it influences breakthrough innovation via dynamic capability mechanisms. Second, a contradiction exists between the high uncertainty of breakthrough innovation and the short-term adaptive nature of dynamic capabilities. Much of the current research concentrates on the static features of breakthrough innovation, failing to systematically analyze its evolutionary mechanisms in dynamic environments.

Therefore, this paper aims to construct a theoretical framework of "Technological Leadership—Dynamic Capabilities—Breakthrough Innovation" to reveal how technological leadership drives firms to achieve breakthrough innovation through the three stages of dynamic capabilities (sensing, seizing, and reconfiguring). This framework will not only deepen the understanding of dynamic capability theory but also provide a strategic pathway for firms to enhance their competitiveness amidst technological change. Furthermore, this study will incorporate practical case studies of firms to explore the applicability of technological leadership across different industries and market contexts, thereby offering empirical evidence for policymakers and corporate managers.

3. Theoretical Analysis

3.1 Connotation and Mechanism of Technology Leadership

Technology leadership refers to an enterprise's capability to drive technological change and achieve breakthrough innovation through technological expertise, forward-looking vision, and organizational transformation capabilities. Its core components include: (1) Technological Expertise Capability: This refers to an enterprise’s keen insight into technological trends and its rapid responsiveness to technological change. It encompasses not only technological responsiveness but, more importantly, emphasizes the establishment of knowledge authority and the ability to transfer and integrate tacit knowledge. (2) Forward-looking Vision Capability: The ability to conduct long-term forecasting of technological change and capture market opportunities. It involves cultivating foresight and decisiveness, as outlined in the “Six-Force Model of Technology Leadership”, and enables the systematic identification of technological inflection points through foresight methodologies such as the Delphi method and

scenario analysis.[22] (3) Organizational Transformation Capability: The ability to facilitate technological change implementation through organizational restructuring and cultural transformation. This manifests as resource synergy mechanisms that break departmental silos (e.g., Alibaba's Zhongtai Strategy) and cultural adaptability (e.g., ByteDance's agile organization).

The mechanism of technology leadership is primarily manifested in three aspects: (1) Technology Foresight, firms identify technological change directions and potential opportunities through technological research and market analysis. (2) Resource Integration, firms construct implementation pathways for technological change by integrating internal resources and external partnerships. (3) Organizational Transformation, firms drive technological change implementation through organizational restructuring and cultural transformation.

3.2 Composition and Evolutionary Path of Dynamic Capabilities

Dynamic capabilities theory posits that firms can effectively respond to environmental changes and achieve sustained innovation through three interrelated capabilities: sensing, seizing, and reconfiguring.[5] This theory suggests that firms must build dynamic capabilities through three critical stages: (1) the sensing stage, where firms identify opportunities and threats in the external environment; (2) the seizing stage, where firms transform opportunities into competitive advantages through resource integration and organizational transformation; (3) the reconfiguring stage, where firms maintain the sustainability of competitive advantages through continuous innovation and organizational adjustment.

Within the context of breakthrough innovation, the evolutionary path of dynamic capabilities primarily includes: (1) Technology Sensing, where firms identify technological change directions and potential opportunities through technological research and market analysis; (2) Technology Seizing, where firms transform technological change into competitive advantages through resource integration and organizational transformation; (3) Technology Reconfiguring, where firms sustain technological competitive advantages through continuous innovation and organizational adjustment.

3.3 Interactive Mechanism between Technology Leadership and Dynamic Capabilities

The interactive mechanism manifests through three dimensions. (1) Technology Foresight and the Sensing Stage: Through technology foresight, firms identify technological change directions and potential opportunities, thereby providing orientation for the sensing stage of dynamic capabilities. (2) Technology Seizing and the Seizing Stage: Through technology seizing, firms integrate internal resources and external partners to construct implementation pathways for technological change, thereby providing resource support for the seizing stage of dynamic capabilities. (3) Technology Reconfiguring and the Reconfiguring Stage: Through technology reconfiguring, firms drive organizational restructuring and cultural transformation, thereby providing organizational guarantees for the reconfiguring stage of dynamic capabilities.

Based on the above analysis, this study constructs a theoretical framework of "Technology Leadership—Dynamic Capabilities—Breakthrough Innovation." This framework reveals, through the following core pathways, how technology leadership drives firms to achieve breakthrough innovation via the mechanism of dynamic capabilities. (1)The Sensing Stage under Technology Leadership: Through technology foresight, firms identify the directions of technological change and potential opportunities, thereby guiding the sensing stage of dynamic capabilities. (2) Seizing Stage of Dynamic Capabilities: Firms transform technological changes into competitive advantages through resource integration and organizational transformation, thereby laying the foundation for breakthrough innovation. (3) Realization of Breakthrough Innovation: Through continuous innovation and organizational reconfiguration, firms achieve a qualitative leap in technological change, thereby driving breakthrough innovation.

This theoretical framework not only deepens the understanding of dynamic capabilities theory but also provides strategic pathways for firms to enhance their competitiveness in technological change. Furthermore, the research will incorporate case studies of Chinese firms to explore the applicability of technology leadership across different industrial and market

contexts, offering empirical evidence for policymakers and corporate managers.

4. Case Study

4.1 Tesla: Disruptive Practices of Breakthrough Innovation Driven by Technological Leadership

As a disruptor in the electric vehicle (EV) industry, Tesla's success relies not only on technological innovation but also, and more fundamentally, on the synergy between its strong technological leadership and dynamic capabilities. Tesla has effectively translated its technological leadership into a systemic innovation advantage by implementing a closed-loop process of 'sensing, seizing, and reconfiguring' dynamic capabilities[23].

4.1.1 The Sensing Phase of Technological Leadership: Technological Foresight and Market Insight

Through his profound insight into the future of energy and transportation, Tesla's founder, Elon Musk, successfully identified the market potential for electric vehicles. When Tesla launched the Roadster in 2008, the global EV market was still in its nascent stages, and traditional automakers exhibited low acceptance of electric mobility. However, through his technological foresight, Musk recognized the immense potential of EVs in reducing carbon emissions and enhancing energy efficiency. Coupled with market insight, he identified a rapidly growing consumer demand for high-performance electric vehicles. Such technological foresight was rooted not only in a keen perception of technological trends but also in a deep understanding of user needs. For instance, through user surveys and market testing, Tesla discovered a strong consumer desire for both "high performance" and "sustainability," which directly spurred the development of models such as the Model S and Model 3.

4.1.2 The Seizing Phase of Technological Leadership: Resource Integration and Organizational Restructuring

In the seizing phase, Tesla established the implementation foundation for technological transformation by integrating internal resources and external partnerships. For example, Tesla adopted a vertical integration model, exemplified by the Nevada Gigafactory, which provides end-to-end control from battery technology to charging networks, ensuring the efficient execution of technological innovations. Concurrently, by collaborating with battery suppliers like CATL and LG Energy Solution, Tesla developed high-energy-density batteries to extend vehicle range. The company also addressed the critical issue of charging accessibility by building its Supercharger network, significantly enhancing the user experience. Furthermore, Tesla dismantled traditional departmental silos through cross-functional collaboration mechanisms, fostering deep integration among R&D, design, and marketing. During the development of its autonomous driving technology, for example, hardware engineers, software developers, and data scientists worked in close concert to ensure rapid iteration and optimization.

4.1.3 The Reconfiguring Phase of Technological Leadership: Continuous Innovation and Business Model Reconfiguration

In the reconfiguring phase, Tesla maintains the sustainability of its technological competitive advantage through continuous innovation and organizational adaptation. For instance, Tesla utilizes Over-the-Air (OTA) updates to remotely reconfigure vehicle software and hardware, continuously optimizing performance and enhancing the user experience. Additionally, the company bypassed traditional dealerships with a direct-to-consumer sales model, which reduced intermediary costs and improved the customer journey. This reconfiguration of dynamic capabilities is evident not only in product innovation but also in the transformation of its organizational culture. Guided by its mission to "accelerate the world's transition to sustainable energy," Tesla inspires its employees to constantly challenge themselves and conventions, driving a culture of continuous innovation within the organization.

4.2 Huawei: Building Technological Leadership within an Ecosystem-Based Innovation Network

As a representative of China's technology sector, Huawei's breakthrough innovations in 5G technology fully demonstrate the synergy between technological leadership and dynamic capabilities. Huawei constructs its technological leadership through a "Triple Helix Capability Model," which integrates R&D capability, technology and product architecture capability, and technical standard-setting capability[14].

4.2.1 Strategic foresight in the sensing phase

Leveraging its formidable technological foresight, Huawei successfully identified the market potential of 5G technology. In 2009, when mainstream companies were focusing on LDPC codes, Huawei began investing heavily in fundamental research on polar codes, initiating its 5G research layout.Based on breakthroughs in channel coding theory, Huawei anticipated the potential spectral efficiency advantages of polar codes and identified them as a key technological path for 5G. When Huawei introduced its 5G base stations in 2016, global 5G technology was still in its early stages, with low adoption among traditional telecommunications equipment manufacturers. However, through its technological foresight, Huawei recognized the immense potential of 5G in delivering high speeds, low latency, and massive connectivity. And, through market insight, identified a burgeoning consumer demand for high-speed networks and smart devices. This foresight stemmed from both an acute awareness of technological trends and a deep understanding of user needs. For example, through user research and market testing, Huawei identified a strong demand for "high-speed networks" and "smart devices," which accelerated the commercial application of its 5G base stations.

4.2.2 Collaborative innovation in the ecosystem-based seizing phase

In the seizing phase, Huawei built the foundation for technological transformation by integrating internal resources and external partnerships. Through a vertical integration model, Huawei achieved end-to-end control from chip design to base station construction, ensuring the efficient implementation of its technological innovations. Huawei, in collaboration with its chip design subsidiary HiSilicon, developed high-performance 5G chips, securing an industry-leading position for its 5G base stations. At the same time, Huawei employed cross-functional collaboration mechanisms to break down departmental barriers, promoting deep integration among R&D, design, and marketing. For instance, during the development of its 5G technology, hardware engineers, software developers, and marketing teams collaborated closely to ensure comprehensive optimization of the product in terms of technology, functionality, and user experience.

4.2.3 Ecosystem evolution in the reconfiguring phase

In the reconfiguring phase, Huawei sustains its technological competitive advantage through continuous innovation and organizational adjustments. Through ongoing iteration of its 5G technology, Huawei has progressively expanded its 5G ecosystem to include networks, terminals, and applications. This strategy culminated in a high cross-licensing rate for its 5G patents, successfully erecting a significant technological competition barrier. Furthermore, Huawei established a "1+N" open innovation ecosystem with over 300 global partners. Through continuous product innovation, it has launched a diverse portfolio of 5G smartphones and modules to meet the demands of different markets. This dynamic capability reconfiguration is reflected not only in product innovation but also in the evolution of its corporate culture. Driven by its "customer-centric" philosophy, Huawei encourages employees to constantly push boundaries, fostering a climate of sustained innovation within the organization.

A comparative analysis of these cases reveals that while firms may choose different specific paths based on industry variations, a common pattern emerges. The case firms leveraged their technological leadership to catalyze breakthrough innovation across the three stages of dynamic capabilities, culminating in a technological paradigm shift and market reconfiguration.

The above case studies of Tesla and Huawei validate the theoretical framework of "Technological Leadership—Dynamic Capabilities—Breakthrough Innovation." In both instances, the firms' cultivation of technological leadership effectively drove the evolution of their dynamic capabilities, which in turn enabled the achievement of breakthrough innovations. For example, Tesla employed technological sensing (foresight), resource integration, and organizational reconfiguration to establish a vertically integrated supply chain, driving breakthrough innovation in the electric vehicle market. Similarly, Huawei employed these same processes to construct a comprehensive 5G ecosystem, fostering breakthrough innovation in communications technology. Similarly, Apple and BYD also demonstrate this pattern. They have leveraged technological sensing, resource integration, and organizational reconfiguration to build robust ecosystems, driving breakthrough innovations in smartphones and automotive

power battery technology, respectively.

5. Implications and Prospects

The cases analyzed above illustrate that technological leadership is not only a key driver of a firm's breakthrough innovation but also a core element in the development of dynamic capabilities. Therefore, firms should build dynamic capabilities by leveraging technological foresight, resource integration, and organizational restructuring to address the challenges posed by technological change. Furthermore, firms must sustain their technological competitive advantage through continuous innovation and organizational adjustment. Specific implementation pathways are elaborated as follows.

Pathways to Cultivating Technological Leadership: (1) Enhance Technological Professional Authority: Establish a dual leadership model of "technologists and strategists." For example, Tesla reinforced external trust by disclosing technological details during its "Battery Day" events. (2) Foster Strategic Foresight: Firms should continuously scan technological trends through a "Technology Radar" system, as exemplified by Huawei's "technological foresight" mechanism, to avoid "technological blind spots." (3) Strengthen Organizational Empowerment: Improve the capability for rapid resource allocation through organizational designs such as IPD (Integrated Product Development) and Agile R&D, exemplified by Huawei's cross-departmental R&D collaboration mechanism.

Strategies for Building Dynamic Capabilities: (1) Sensing Capacity: Establish a "technology-market-resource" tripartite scanning system. For instance, Tesla monitors supply chain fluctuations in real time through data from its "Gigafactories." (2) Seizing Capacity: Adopt an "agile resource pool" strategy to quickly respond to emerging market opportunities. Huawei, for example, leverages its "1+N" ecosystem collaborations to rapidly deploy resources for new technology commercialization and thus to seize market opportunities. (3) Reconfiguring Capacity: Reduce uncertainty through "open innovation". An example is Tesla's open-sourcing of autonomous driving data to attract developers to its ecosystem.

Risk Management for Breakthrough Innovation: (1) Technological Uncertainty: Employ a "Grey-Fuzzy Evaluation Model" to mitigate technological risks, as demonstrated by Huawei's "Technology Maturity Assessment." (2) Market Uncertainty: Mitigate market risks through a "dual-track system" strategy, such as Tesla's parallel business lines in "electric vehicles and energy." (3) Organizational Uncertainty: Enhance organizational adaptability by building "organizational resilience", exemplified by Huawei's "fault-tolerance mechanism."

Although this study has developed a theoretical framework of "Technological Leadership—Dynamic Capabilities—Breakthrough Innovation" and illustrated its applicability through case studies, it still has several limitations. Future research could be extended in the following areas: (1) Extending the research scope to firms in diverse global contexts and industries to test the generalizability of the theoretical framework. (2) Deepening the research content by further exploring the micro-processes through which technology leadership influences breakthrough innovation via dynamic capabilities. (3) Strengthening empirical research by collecting and synthesizing large-scale data to verify the applicability of the theoretical framework.

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