INSTITUTO
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The Impact of Dynamic Capabilities of Entrepreneurial Executives on Entrepreneurial Performance: A Case-based Research

ZHAO Yanqing

Doctor of Management

Supervisors:
PhD. Nelson Antonio, Professor Emeritus,
ISCTE University Institute of Lisbon
PhD.WANG Guofeng, Associate Professor,
University of Electronic Science and Technology of China

December, 2025

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ZHAO Yanqing

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Abstract

In a VUCA environment, dynamic capabilities of top management teams (TMTs) have become a critical mechanism for driving firms' innovation performance. However, existing research still lacks a systematic understanding of how TMT's dynamic capabilities within emerging companies evolve and how they influence innovation outcomes over time. Drawing on the resource-based view and dynamic capability theory, and integrating insights from upper echelons theory, this study explores the micro-level composition and evolutionary pathways of TMT's dynamic capabilities, as well as their dynamic impact on innovation performance. Using X Company—a high-tech firm listed on China's STAR Market—as the focal case, and supplemented by interviews with two comparable listed firms in similar high-technology sectors, this study examines the evolution of team dynamic capabilities across the start-up, growth, and expansion stages. First, through interview-based coding and categorization, the study identifies the microfoundations of team dynamic capabilities at different stages of firm development. Further analysis reveals that sensing, seizing, and transforming capabilities exhibit more fine-grained micro-structural evolutionary patterns in practice. Specifically, in the start-up stage, dynamic capabilities are primarily concentrated on sensing and seizing, whereas as firms move into later stages of development, transforming capabilities become increasingly important, serving as a key driver of organizational transformation and continuous capability renewal. Meanwhile, the cognitive characteristics of the top management team profoundly shape the pathways of capability evolution and their effects on innovation performance.

Keywords: Dynamic capabilities, top management teams (TMT), innovation, emerging technology-based companies

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Resumo

Num ambiente VUCA, as capacidades dinâmicas das equipas transformam-se num mecanismo crucial para impulsionar o desempenho inovador das empresas. No entanto, na investigação existente continua a faltar uma compreensão sistemática sobre como as capacidades dinâmicas das equipas de gestão de topo (TMT) nas empresas emergentes evoluem ao longo do tempo e influenciam os resultados da inovação. Com base na visão baseada em recursos (RBV), na teoria das capacidades dinâmicas, e integrando contributos da teoria dos escalões superiores (Upper Echelons Theory), este estudo explora a composição a nível micro e os percursos evolutivos das capacidades dinâmicas das equipas de gestãode topo, bem como o seu impacto dinâmico no desempenho inovador. Utilizando a Empresa X, uma empresa de alta tecnologia cotada no STAR Market da China, como caso principal, e complementando com entrevistas a outras duas empresas comparáveis e cotadas, em sectores tecnológicos semelhantes, este estudo analisa a evolução das capacidades dinâmicas das equipas de gestão ao longo das fases de arranque, crescimento e expansão. Através da codificação e categorização das entrevistas, identificamos os microfundamentos das capacidades dinâmicas da equipa em diferentes fases de desenvolvimento organizacional. A análise subsequente revela que as capacidades de detecção (sensing), aproveitamento (seizing) e transformação (transforming) apresentam padrões evolutivos microestruturais. Em particular, na fase de arranque, as capacidades dinâmicas concentram-se sobretudo na detecção e aproveitamento de oportunidades, enquanto nas fases posteriores a capacidade de transformação adquire uma importância crescente, assumindo-se como motor central da transformação organizacional e da renovação contínua de competências. Paralelamente, as características cognitivas da equipa de gestão de topo influenciam de forma profunda os percursos de evolução das capacidades e os seus efeitos no desempenho inovador.

Palavras-chave: Capacidades dinâmicas, equipas de gestão de topo, inovação empresarial, empresas emergentes de base tecnológica

JEL: L26, O32

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摘要

在 VUCA 环境中，高管团队的动态能力成为驱动企业创新绩效的重要机制。然而，现有研究尚缺乏对创业团队动态能力演化过程及其作用机制的细致刻画。本文以资源基础观与动态能力理论为理论基础，融合高阶理论视角，探讨创业企业高管团队动态能力的微观构成与动态演化过程，并揭示其对创新绩效的影响机制。研究基于 X 公司这一中国科创板高新技术企业的案例研究，结合对另外两家同类上市企业的访谈，对创业团队在初创期、成长期与扩张期的动态能力演进路径进行了深入剖析。研究识别出团队动态能力的七类组成要素，包括机会识别、资源拼凑、客户共创、制度场景构建、产品与市场拓展、组织协同机制、以及认知与制度建构。进一步，访谈数据揭示了“感知—捕捉—重构”三类核心动态能力在实践中呈现出更细粒度的微结构演化路径，高管团队的认知特征深刻塑造了能力演进轨迹与绩效表现。研究丰富了动态能力理论的过程建构视角，拓展了高阶理论在创业团队微观层面的应用边界，并为科技型创业企业提升创新绩效与组织适应力提供了理论支持与实践参考。

关键词：动态能力，高层管理团队 (TMT)，创新，新兴技术型公司

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三人 2006 年一起创业，在刘国永董事长的带领下，团结一致，共同努力，于 2021 年公司在科创板成功上市，上市后公司成功布局水利和铁路交通领域，为公司发展奠定良好基础。在近 20 年的企业经营中，我学习了很多管理知识，进行了很多管理思考，创新和实践，让我的人生充满意义并有机会进行案例论文的研究。

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List of Acronyms

TMT	Top Management Team
VUCA	Volatility, Uncertainty, Complexity, and Ambiguity
RBV	Resource-Based View
GDMC	Global Dynamic Management Capability

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Chapter 1: Introduction

1.1 Research background

In the context of economic restructuring and upgrading in China, the competitive environment for entrepreneurial enterprises has become increasingly complex and turbulent. The new competitive environment requires companies to integrate and develop both internal and external resources to build unique competitive advantages, thereby avoiding lost and achieving sustainable growth dynamically and efficiently.

However, whether internal and external resources can be transformed into growth drivers for enterprises often depends on the response strategies of managers. Influenced by the complex and turbulent environment, managers need to make decisions based on complex and vague information, and their experience and personality traits greatly affect their interpretation and evaluation of information, resulting in significant differences in response behaviors and organizational outcomes (Hambrick & Mason, 1984). Compared to other types of companies, entrepreneurial enterprises, with relatively limited resource endowments and facing dynamic industry environments, depend more on executive members for survival and growth. As decision-makers and resource controllers, executives bear the responsibility of guiding the exchange of information and the integration of behaviors within the entrepreneurial team, and their dynamic capabilities are crucial to the strategic choices and implementation of enterprises (W. W. Li & Liu, 2024). Formed by enterprises in the process of continuously integrating and restructuring resources, dynamic capabilities are a persistent ability, enabling rapid adaptation to environmental changes (Teece et al., 1997). Therefore, studying the dynamic capabilities of senior managers, their evolution, and their impact on the overall strategy of enterprises is particularly important. This research not only helps to understand how senior managers drive enterprises to cope with rapidly changing market conditions through dynamic capabilities, but also explores how these capabilities affect the long-term growth and competitiveness of enterprises.

In the modern economic environment, enterprises need to be able to flexibly adjust their operations and strategies to adapt to rapid changes in the external environment. The dynamic capabilities of senior managers, such as opportunity recognition, coordination, and integration, and restructuring and transformation, become key to driving continuous innovation and

optimizing resource allocation in enterprises. For example, opportunity recognition allows senior managers to perceive potential market demands and technological trends in complex market environments, providing a basis for enterprises to seize market opportunities. Coordination and integration concern how to effectively utilize internal and external resources, including talent, technology, and capital, to enhance the core competitiveness of enterprises.

Furthermore, the restructuring and transformation capabilities of senior managers are particularly important for enterprises, especially during transformation and maturity phases (Helfat & Martin, 2015). At different stages of development, managers need to adjust business models and strategic focuses according to market and technological changes to ensure that enterprises can maintain their competitive positions in highly competitive markets. For instance, in industries where technology develops rapidly, enterprises may need to shift from traditional business models to more digital and networked operational models, a transformation that depends on the foresight and execution of managers. Additionally, the dynamic capabilities of senior managers also affect corporate culture and employee behavior patterns (Gupta & Gupta, 2019). By establishing an innovation-oriented corporate culture, managers can not only motivate employees to pursue new solutions but also enhance team collaboration and information sharing, thereby creating an adaptive and responsive work environment throughout the organization. Therefore, by deeply understanding the dynamic capabilities of senior managers and their impact on enterprise performance, strategic decisions can be scientifically supported, helping business leaders more effectively cope with complex and variable business environments, promote continuous development and innovation, and ultimately achieve long-term business success and profit growth.

1.1.1 Contextual background

China is undergoing a critical phase of economic structural transformation, transitioning from a traditional manufacturing-based economy toward one driven by modern services and high-technology industries. This shift is aimed at enhancing industrial value-added and achieving high-quality development. As an emerging technology, artificial intelligence (AI) has rapidly advanced and found widespread application across various sectors, becoming a pivotal engine for economic growth and societal advancement. In response, the Chinese government has actively promoted technological innovation and industrial upgrading through policy support and capital investment, seeking to align domestic enterprises with the demands of global competition and sustainable development. Against this backdrop, enterprises are compelled to continuously adjust their strategies and enhance internal resources and capabilities to navigate

an increasingly complex and dynamic market environment.

1.1.1.1 Economic structural transformation in China

Over the four decades since the initiation of reform and opening-up, China has transitioned from a low-income economy to an upper-middle-income country. However, this rapid economic growth has also exposed structural inefficiencies, including high input dependency, resource-intensive production, elevated emissions, and relatively low productivity. As China enters a stage of "new normal" characterized by slower growth, the nation has shifted its focus to structural reforms under a new growth paradigm. This involves expanding beyond material capital to incorporate various forms of intangible capital, particularly emphasizing innovation and technological advancement.

Looking forward to the next 30 to 40 years, China is expected to transition further toward high-income status. However, the scope of transformation will extend beyond output and income levels to encompass broader indicators such as social well-being, environmental quality, and sustainable development. The overarching goal is to shift from rapid economic expansion to high-quality, balanced, coordinated, and sustainable growth.

The transformation of China's economy is characterized by the following key dimensions:

(1) Industrial upgrading and structural optimization

China is actively promoting the optimization of its industrial structure, with a strategic shift from traditional manufacturing toward modern service sectors and high-tech industries. Emerging sectors such as artificial intelligence, big data, and renewable energy have received robust policy and financial support, aiming to increase value creation and enhance economic growth quality.

(2) Technological innovation and scientific self-reliance

The government has significantly increased investment in research and development, encouraging indigenous innovation. Key initiatives include accelerating the commercialization of scientific achievements, strengthening global competitiveness, and fostering digital transformation through the digitization, networking, and intelligent upgrading of traditional industries.

(3) Consumption-driven growth

Stimulating domestic demand and enhancing household consumption have become central to economic policy. Innovations in consumption such as e-commerce, the sharing economy, and new retail formats are being actively promoted to boost market dynamism and shift consumption patterns toward higher-quality goods and services.

(4) Green and low-carbon development

Environmental protection and ecological sustainability have gained heightened importance. China is committed to resource conservation, circular economy practices, and the establishment of green production and consumption systems to reduce environmental impacts and support long-term sustainability.

(5) High-level opening-up

China continues to engage deeply with global economic systems through initiatives such as the Belt and Road Initiative and expanded trade and investment cooperation. This strategy promotes a more open economy and enhances the integration of Chinese enterprises into global value chains, supply chains, and innovation ecosystems.

(6) Coordinated regional development

A balanced regional development strategy is being implemented to harmonize growth across eastern, central, western, and northeastern regions. The development of urban clusters and metropolitan areas is accelerating urbanization and spatial economic integration.

In summary, China's economic restructuring emphasizes industrial upgrading, technological innovation, consumption expansion, green development, global integration, and regional coordination. These efforts aim to boost industrial value creation and international competitiveness, while facilitating a transition to sustainable and high-quality economic development.

Under these structural shifts, entrepreneurial firms are increasingly confronted with a volatile and uncertain external environment. The economic transformation necessitates that firms accelerate technological change and effectively integrate internal and external resources to enhance competitiveness and comply with shifting market and policy demands. Technological transformation enables firms to improve production efficiency, reduce costs, and develop higher value-added products and services—critical for maintaining a competitive edge in an intensely contested market. Furthermore, innovation is a core driver of industrial upgrading and sustainable growth, offering viable responses to the demands of green development, digitalization, and globalization. Thus, technological advancement constitutes a prerequisite for achieving long-term viability during economic restructuring.

In addition, adapting to policy orientation is essential. Government policy often delineates priority sectors for development—such as high-tech industries and the green economy—and firms must strategically align with these priorities. Compliance with policy directions enables access to public resources, including funding, tax incentives, and subsidies. Moreover, policy initiatives frequently serve as catalysts for the emergence of new markets, and firms that can

quickly adjust their strategies are better positioned to seize these opportunities.

1.1.1.2 The rapid rise of AI

Against the backdrop of a new technological revolution and industrial transformation, the deep integration of AI with industry has become an inevitable choice for unleashing the compound effects of digitalization, accelerating the development of strategic emerging industries, and constructing comprehensive competitive advantages. At present, AI is increasingly permeating various industrial sectors, fostering cross-sectoral integration between emerging industries, between emerging and traditional industries, and between technology and society. As an emerging and strategic technology, AI plays a leading role in shaping the future and serves as a driving force in the new wave of scientific and industrial advancement.

Globally, nations are continuously advancing their AI strategies in an effort to capture key developmental opportunities. AI has emerged as a cornerstone of technological innovation and a pillar of the digital economy era. Since 2016, over 40 countries and regions have elevated the development of AI to the level of national strategy (Maslej et al., 2023). In recent years—particularly under the impact of the COVID-19 pandemic—an increasing number of countries have recognized AI as critical to enhancing global competitiveness and have correspondingly deepened their AI initiatives. For instance, the European Union released the 2030 Digital Compass, aiming to reshape its global influence in the digital age, with AI development designated as a key priority. The United States established multiple institutions, including the National AI Initiative Office and the National AI Research Resource Task Force, and introduced a series of policy measures that position AI as a core element of future industries and technologies, consolidating its leadership role in the global AI landscape. Japan issued its AI Strategy 2021, promoting innovation and creativity in the AI sector. Similarly, the UK launched a new ten-year National AI Strategy to reshape its influence in this field.

China has followed suit. The Recommendations of the Central Committee of the Communist Party of China on Formulating the Fourteenth Five-Year Plan for National Economic and Social Development and the Long-Range Objectives for 2035 (National Development and Reform Commission [NDRC], 2021) emphasized the need to focus on frontier areas such as AI and to implement a series of forward-looking and strategic major scientific and technological projects to foster the healthy development of the digital economy. The 2023 Report on the Work of the Government (China's State Council, 2023) noted that "the past five years have been extraordinary and challenging, as we faced accelerating global changes, the impact of the pandemic, and domestic economic downward pressure. Despite these,

we have made remarkable achievements in socioeconomic development." In the realm of science and technology, the national R&D expenditure intensity rose from 2.1% to over 2.5%, and the contribution rate of scientific and technological progress increased to over 60%. Under this favorable context, AI—as a representative of cutting-edge technology—has seen a surge of innovative breakthroughs.

AI technologies have been deeply integrated into various sectors, including consumer markets, manufacturing, the internet, finance, the metaverse, and digital twin technologies. These applications have enhanced operational workflows and service quality across industries, contributing to broader societal development. AI industrial strategies emphasize the creation of commercial value, enhancement of general-purpose applicability, and efficiency-oriented implementation. These strategic priorities have not only improved AI's effectiveness in practical scenarios but have also fueled the sustained growth of the AI industry itself. The forms of AI products have become increasingly diverse, encompassing software services, cloud platforms, and hardware infrastructure. These product forms, when aligned with specific application scenarios, have further extended the technological boundaries of AI deployment.

1.1.1.3 Characteristics of AI development in China

The development of artificial intelligence (AI) in China exhibits several distinctive characteristics. First, the central government, through various ministries and commissions, has attached great importance to the top-level design of the AI industry by issuing a series of policies and strategic plans. Second, local governments at various levels have actively promoted the construction of regional intelligent computing centers, thereby strengthening the computational infrastructure necessary for AI development. Third, Chinese enterprises have embraced AI technologies with enthusiasm, facilitating their application and integration across a wide range of industries.

The emphasis on top-level design is particularly evident in national strategic planning. The 19th National Congress of the Communist Party of China proposed the deep integration of the internet, big data, artificial intelligence, and the real economy. In the context of a new round of scientific and technological revolution and industrial transformation, the accumulation of big data, innovation in algorithmic theory, advancement in computing capabilities, and the evolution of network infrastructure have jointly propelled AI into a new stage of development. AI is now accelerating its integration into all sectors of the economy and society, promoting technological advancement, industrial upgrading, economic transformation, and social progress. After years of sustained investment, China has achieved significant progress in AI. It has

attained world-leading levels in speech and image recognition, and has made preliminary breakthroughs in adaptive learning, intuitive perception, integrated reasoning, hybrid intelligence, and swarm intelligence. Applications such as Chinese-language information processing, intelligent surveillance, biometric recognition, industrial and service robots, and autonomous driving are gradually entering real-world use. Innovation and entrepreneurship in AI are becoming increasingly dynamic, with a number of leading enterprises rapidly emerging and gaining international recognition. The rapid accumulation of technological capabilities, combined with vast data resources, strong market demand, and an open commercial environment, has created a unique advantage for China's AI development.

In response to these challenges, the State Council issued the New Generation Artificial Intelligence Development Plan in 2017, which provides a comprehensive blueprint for China's AI development through 2030. The plan lays out the overall strategic vision, objectives, key tasks, and supporting measures. It emphasizes the need to strengthen basic theoretical research in AI, foster interdisciplinary integration, and develop new computing architectures and intelligent systems. The plan also calls for breakthroughs in perception, cognition, reasoning, decision-making, and control, with the goal of enhancing AI's autonomous learning and adaptive capabilities. It encourages the deep integration of AI in key sectors such as manufacturing, healthcare, transportation, education, and agriculture, and promotes the development of innovative intelligent products and services. The plan also envisions the construction of new AI infrastructure, including intelligent computing centers, data centers, and open innovation platforms, to provide robust technical and resource support. Talent development is another key focus, with efforts to establish relevant academic disciplines in universities and research institutions, and to promote collaboration between academia and industry in cultivating high-level professionals.

Based on this national strategic framework, the Ministry of Industry and Information Technology (2017) subsequently released the Three-Year Action Plan for Promoting the Development of a New Generation Artificial Intelligence Industry (2018–2020). This plan, aligned with the objectives of Made in China 2025, further operationalized the tasks outlined in the national strategy from an industrial development perspective. It sought to deepen the integration of information and manufacturing technologies, promote the industrialization and integrated application of new-generation AI technologies, develop high-end intelligent products, strengthen core technological foundations, enhance the level of intelligent manufacturing, and improve public support systems for the industry.

The action plan adopted the principles of systematic planning, focused breakthroughs,

collaborative innovation, and orderly openness. It identified four major areas of emphasis. These included promoting the application of intelligent products such as smart connected vehicles, service robots, unmanned aerial vehicles, AI-assisted medical imaging systems, and facial recognition systems across economic and social domains. It also prioritized the development of key technological components, including intelligent sensors, neural network chips, and open-source platforms, to reinforce the software and hardware foundation of the AI industry. Furthermore, it emphasized the need to deepen intelligent manufacturing by encouraging the application of AI technologies in various stages of industrial production. Manufacturing is recognized as one of the earliest sectors to adopt AI, and Made in China 2025 explicitly designates intelligent manufacturing as a strategic priority. Finally, the plan proposed the establishment of industry-wide support systems, including training data repositories, standards and testing platforms, intellectual property services, intelligent network infrastructure, and cybersecurity mechanisms, to foster a favorable environment for AI development.

(2) Proactive development of intelligent computing centers by local governments

From the perspective of local governments at various administrative levels, the surging demand for intelligent computing power—driven by the rapid expansion of AI applications and R&D—has prompted an acceleration in the deployment of regional intelligent computing centers (also referred to as AI computing/supercomputing centers, or “AI computing centers”) by both governments and enterprises. Guided by the national strategy of integrated computing power hubs and the "Eastern Data, Western Computing" initiative, attention to and investment in AI computing infrastructure has notably increased across regions.

According to the Guidelines for the Innovative Development of Intelligent Computing Centers jointly released by the State Information Center and Inspur Information, intelligent computing centers represent a new form of public infrastructure designed to support AI applications. They are built upon cutting-edge AI theories and advanced computing architectures, delivering services in computing power, data, and algorithms.

As of now, over 30 cities in China have either launched or announced plans to establish intelligent computing centers, with nearly 10 of them already operational (Wu et al., 2020). These centers provide essential computing support across various local industries.

The development of intelligent computing centers significantly stimulates regional economic growth. By offering high-performance computing support, these centers enable local enterprises to conduct large-scale data analytics and AI model training, thereby enhancing technological capabilities and market competitiveness. As a strategic infrastructure, AI computing centers also attract a substantial influx of high-tech enterprises, catalyzing the

upgrading and clustering of related industries.

Furthermore, intelligent computing centers support the digital and intelligent transformation of traditional industries by enabling AI-driven optimization of production processes, increasing operational efficiency, and reducing costs. They also underpin the growth of emerging sectors such as intelligent manufacturing, smart healthcare, and intelligent transportation. Additionally, such centers facilitate the construction of smart cities, contributing to more efficient, precise, and intelligent urban governance.

In 2023, the size of China's intelligent computing market reached RMB 509.7 billion (Guo, 2024). Under the growing demand for model training and inference, the market experienced a substantial leap compared to 2022. Projections indicate that by 2028, the market could reach RMB 3.4 trillion, reflecting a five-year compound annual growth rate (CAGR) of 46.3% (Guo, 2024).

(3) Active AI deployment by enterprises

From the corporate standpoint, AI is increasingly regarded as a critical strategic lever for business growth. As AI technologies continue to mature and application scenarios diversify, a growing number of firms are implementing AI strategies to enhance operational efficiency and competitiveness.

Recent years have seen a consistent rise in both the adoption rate and breadth of AI applications among enterprises. According to a McKinsey survey, by 2022, 50% of companies had adopted AI in at least one business function—more than double the 20% adoption rate reported in 2017. Simultaneously, the average number of AI tools deployed per enterprise rose from 1.9 in 2018 to 3.8 in 2022, indicating a broader diffusion of AI technologies across business domains.

Moreover, the commercial value generated by AI applications is steadily increasing. Research by Accenture's Institute for Business Value revealed that between 2018 and 2021, the average proportion of company revenue attributable to AI more than doubled. This figure is expected to further rise to 36% by 2024, underscoring AI's growing role in driving revenue and profitability.

Against the backdrop of continual breakthroughs in large-scale models and comprehensive policy support from the state, China's AI industry is entering a new phase characterized by a shift from general-purpose to vertical applications, and from model development to productization.

A notable example is DeepSeek, an emerging tech enterprise established by QuantumPhantom in 2023 and headquartered in Hangzhou. The company focuses on the

development of open-source large language models (LLMs). Its product portfolio—including DeepSeek-LLM, DeepSeek-Coder, and DeepSeek-R1—has demonstrated outstanding performance in language understanding, reasoning, and code generation tasks, with some benchmarks approaching globally leading levels.

Significantly, DeepSeek has not only achieved technological breakthroughs in core LLM capabilities but also promoted broad adaptation and deployment across sectors such as education, healthcare, and industry through its use of the permissive MIT open-source license. This model accelerates technological diffusion and industrial transformation within China's AI ecosystem, providing essential platforms and technical infrastructure for AI integration into industry-specific applications.

As a result, an increasing number of technology-oriented startups are focusing on the deep integration of AI in vertical domains—such as energy, transportation, and water conservancy—by leveraging fine-tuned models and tailored solutions to promote the construction of innovative "AI + industry" systems.

1.1.2 Theoretical background

The ability of a firm to transform its internal and external resources into growth drivers largely depends on the strategic responses of its managerial team. Managers must make decisions based on a range of external information; however, due to environmental uncertainties, along with individual managerial experience and personality traits, the interpretation and judgment of such information can vary significantly—leading to diverse organizational behaviors and outcomes (Hambrick & Mason, 1984). Compared with established firms, entrepreneurial ventures generally face constraints in terms of resource endowments while simultaneously navigating highly dynamic industry environments. As such, their survival and growth rely more heavily on the top management team (TMT). The TMT, as both decision-makers and resource controllers, plays a pivotal role in facilitating internal communication and behavior integration within the entrepreneurial team. Their dynamic capabilities are thus critical to strategic decision-making and execution (W. W. Li & Liu, 2024).

Dynamic capabilities refer to an organization's enduring capacity to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (Teece et al., 1997). These capabilities enable firms to remain agile and responsive amid external turbulence. Consequently, examining the evolution and functioning of TMT dynamic capabilities, and their influence on overall firm strategy, is of particular importance. This study

aims to shed light on how top management teams leverage dynamic capabilities to adapt to volatile market conditions and explores how these capabilities contribute to a firm's long-term growth and competitiveness.

The dynamic capabilities of TMTs also influence organizational culture and employee behavior. By cultivating an innovation-oriented corporate culture, management can not only encourage employees to pursue novel solutions but also enhance team collaboration and information sharing, thereby creating a highly adaptive and responsive organizational environment. Therefore, a comprehensive understanding of TMT dynamic capabilities and their effects on firm performance can provide a robust theoretical foundation for strategic decision-making. It also enables enterprise leaders to better navigate complex and uncertain business environments, foster ongoing innovation, and ultimately achieve sustainable growth and profitability.

1.2 Research problem and questions

Although extensive research has been conducted on how large and established enterprises leverage dynamic capabilities to navigate uncertain environments (Teece, 2007; Wang & Ahmed, 2007), there is a lack of systematic studies regarding the dynamic capabilities of technology-based emerging firms in their rapid growth stages. These firms typically have more flexible team structures, limited resources, and narrower response windows to environmental changes. Consequently, the process of building dynamic capabilities and their mechanisms of influencing innovation performance remain underexplored (Eisenhardt & Martin, 2000). Most existing studies on dynamic capabilities have predominantly explored how traditional organizational-level dynamic capabilities influence firm performance and competitive advantage from the perspective of mature firms. However, such research often fails to capture the unique characteristics of startups. Therefore, scholars have called for more research into the nature and mechanisms of dynamic capabilities at the individual and team levels within new entrepreneurial ventures (Felin et al., 2015).

Hence, the key research questions (RQs) addressed in this study are:

RQ1: How do we define the TMT‘s dynamic capabilities of emerging companies, including their components?

RQ2: How can we understand the evolution of TMT’s dynamic capabilities within emerging companies at different stages and their dynamic impact mechanisms on innovation performance?

RQ3: How do the cognitive characteristics of TMT influence the formation pathways of dynamic capabilities?

This study focuses on entrepreneurial teams in the Company X and it primarily explores the evolution of dynamic capabilities within these teams and their interactive impact on innovation performance in various entrepreneurial contexts. It begins by conducting a systematic literature review to analyze the theoretical aspects of entrepreneurial team dynamic capabilities and entrepreneurial performance (including innovation performance). The study constructs a theoretical integrated model that explains the influencing factors of entrepreneurial team dynamic capabilities on entrepreneurial performance and the mechanisms through which entrepreneurial team dynamic capabilities affect entrepreneurial performance.

Through the case study conducted at different stages of Company X, the research expands upon the existing integrated model, constructing a more explanatory model that is tailored to the dynamic development process of entrepreneurial teams. This process leads to the formulation of research propositions that enrich and advance the theories of dynamic capabilities and entrepreneurial team research.

1.3 Research significance

1.3.1 Theoretical significance

This study delves deeply into how the dynamic capabilities of executive team members in entrepreneurial firms influence business performance at different stages of development, further expanding the application of the Resource-Based View (RBV), Dynamic Capabilities View (DCV), and Upper Echelons Theory (UET) in the entrepreneurship field. By systematically analyzing the core elements of the executive team's dynamic capabilities, the research reveals how these capabilities impact strategic execution and performance outcomes in a continuously changing market environment.

Moreover, the study integrates detailed case study and interview, two qualitative research methods, to achieve cross-validation of dynamic capabilities theory. This research not only enhances the applicability and predictive power of dynamic capabilities theory in entrepreneurial firms but also provides theoretical support for how executive teams can implement strategic organizational goals through specific actions. It offers valuable references for strategic planning and management in entrepreneurial firms, enriching both academic perspectives and practical applications in understanding and leveraging dynamic capabilities

within the context of entrepreneurship.

1.3.2 Practical significance

In the modern economic environment, it is crucial for entrepreneurial firms to flexibly adjust their operations and strategies to adapt to rapidly changing external conditions. The dynamic capabilities of executive teams, such as opportunity identification, coordination and integration, as well as restructuring and transformation abilities, are key to driving continual innovation and optimizing company resource allocation (W. W. Li & Liu, 2024). Firstly, by analyzing the case of Company X, this study provides a practical framework that illustrates how to identify the dynamic capabilities required by entrepreneurial executives and clarifies the pivotal role of these capabilities at different stages of business development. This offers a foundation for companies to formulate appropriate management strategies and human resource development plans at various stages of growth.

At different developmental stages, leaders of innovative enterprises must adjust their business models and strategic focuses according to market and technological changes to maintain competitiveness in a fiercely competitive market. The research, through interviews with the executive team of Company X, provides in-depth insights into the challenges faced by the executive team at different stages of the company's development. It explores how the dynamic capabilities of the executive team help the company cope with market changes and intense competition, and ultimately affect business performance and promote innovative development. By deeply understanding the impact of these dynamic capabilities, this study offers significant insights for strategic planning and human resource management in entrepreneurial firms, especially startups, providing crucial guidance for navigating the complexities of growth and competition.

1.4 Research methods

(1) Literature review

Through a comprehensive review of relevant literature, including studies on entrepreneurial teams, top management teams (TMT), dynamic capabilities, and related concepts, this study aims to explore the theoretical underpinnings of entrepreneurial team dynamic capabilities by examining theories such as dynamic capabilities theory and upper echelons theory, and event system theory. This also involves defining the connotation and dimensions of entrepreneurial team dynamic capabilities from resource, process, and capability perspectives.

The research systematically explores the factors influencing Top Management Teams (TMT's) dynamic capabilities and entrepreneurial performance (including innovation performance) at individual, team, and other levels. It studies the sources of TMT's dynamic capabilities and the mechanisms through which these capabilities impact entrepreneurial performance (including innovation performance). This process involves building a theoretical integration framework to analyze the impact of entrepreneurial team dynamic capabilities on entrepreneurial performance.

(2) Case study

This study employs a single-case longitudinal study approach, focusing on Company X, and segments the company's entrepreneurial development into several key stages. Each stage represents unique internal and external environments, challenges, and strategic needs, with transition events between these stages serving as key temporal nodes, constructing the basic framework of the case study. From these events, the research extracts and analyses the evolution of Company X's executive team's dynamic capabilities and their mechanisms impacting innovation performance. This case study approach is particularly suitable for theory building and projects focusing on dynamic mechanisms, facilitating an in-depth exploration of the impact of dynamic capabilities on business development at various stages.

(3) Interviews

The study conducts face-to-face interviews with the executive team of the company. This qualitative research method is chosen because it captures profound insights directly from the decision-makers driving the company's development. The main purpose of these interviews is to explore the dynamic capabilities of the entrepreneurial team and how these capabilities influence the company's innovation performance at different stages.

By analyzing the interview data from the executive team, the research can extract thematic information related to dynamic capabilities. This analysis can be used to explain the mechanisms by which these dynamic capabilities are operationalized to drive business innovation and development. Additionally, the insights gained from the interviews will be compared and contrasted with the results of the case study to validate and enrich the understanding of dynamic capabilities and their impact.

1.5 Thesis structure

Chapter 1: Introduction. This chapter sets the stage for the entire study, discussing the research background and significance. It identifies research dilemmas and questions, outlines the content

and arrangement of each chapter, describes the research methods employed, and discusses the expected contributions. It summarizes the dynamic capabilities required by Company X's executive team at different stages of development and identifies additional capabilities needed to cope with fierce market competition.

Chapter 2: Literature Review. This chapter reviews existing literature and theoretical frameworks related to the Resource-Based View (RBV), dynamic capabilities, and upper echelons theory. additionally, it discusses upper echelons theory, as decision-making processes related to dynamic capabilities, such as seizing new market opportunities, are deeply influenced by the cognitive bases and psychological characteristics of top management.

Chapter 3: Research Methods. This chapter details the methods used in the research, with a special focus on case study and interview techniques, which are crucial for exploring the dynamic capabilities of Company X’s executive team.

Chapter 4: Interview Results. On the one hand, by using the case study, this chapter tracks the development trajectory of Company X, Y, and Z, through integrated operational data and historical archives. It identifies different growth stages and key historical milestones for each stage. The chapter also describes the internal and external environments, challenges faced by the business, and developments at each stage, along with the decisions made by the executive team. It uses this basis to analyze the dynamic capabilities required by the executive team at these stages and their impact on business development. On the other hand, this chapter employs semi-structured interviews with Company X’s executive team. The results are transcribed and analyzed using MAXQDA software to identify how the dynamic capabilities of the executive team influence the company's innovation performance at different stages. It focuses on how decisions and adjustments in dynamic capabilities by the executive team help the company maintain innovation and competitiveness in a rapidly changing market environment.

Chapter 5: Case Study. This chapter conducts a case study of Company X by integrating its operational data and information obtained from historical archival documents. It aims to trace the developmental trajectory of the company, identify its distinct growth stages, and pinpoint key historical milestones in each stage. The chapter further outlines the internal and external environments at each phase, the challenges faced by the firm, and the strategic decisions made by the top management team. Based on this, the chapter analyzes the dynamic capabilities required by the executive team at different stages and evaluates how these capabilities have contributed to the company's development.

Chapter 5: Conclusions and Recommendations. Based on empirical results and research findings, this chapter draws conclusions and offers recommendations for similar technology-

oriented startups in China. It discusses the limitations of the thesis and suggests directions for future research. This includes further exploration of the relationship between executive team dynamic capabilities and innovation performance, and how these capabilities can be more effectively applied to business strategy to help similar businesses gain competitive advantages. It also provides strategic recommendations for businesses on how to continuously innovate technologically and expand their market presence.

Chapter 2: Literature Review

2.1 Resource-based view

The Resource-Based View (RBV) has emerged in recent years as one of the most influential analytical frameworks in the field of strategic management. According to early research, the RBV adopts an internal resource-oriented perspective, viewing the firm as a collection of heterogeneous resources. These heterogeneous resources become sources of competitive advantage because they can provide economic rents (Barney, 1986, 1995, 2001; Conner, 1991; Peteraf, 1993; Wernerfelt, 1984).

2.1.1 Definition of RBV

RBV offers an "inside-out" perspective, explaining why organizations succeed or fail in the market. According to Dickson (1996), the RBV emphasizes a firm-specific perspective, focusing on the unique resources and capabilities that enable a firm to gain a competitive advantage. Barney (1991) further elaborated on this concept by introducing the VRIN framework, which asserts that to provide a sustained competitive advantage, resources must possess the following characteristics: Valuable, Rare, Inimitable, and Non-substitutable. Resources that meet these criteria enable firms to develop and maintain a competitive advantage, ultimately achieving superior performance (Collis & Montgomery, 2009; Grant, 1996; Wernerfelt, 1989).

In line with RBV theory, organizations can be viewed as a collection of physical, human, and organizational resources (Amit & Schoemaker, 1993; Barney, 1991; Gupta & Gupta, 2019). Resources that meet the criteria of being valuable, rare, inimitable, and non-substitutable are considered the primary sources of sustainable competitive advantage, thereby achieving superior performance (Barney, 1991).

2.1.2 The proposition and development of RBV

Penrose (1959) elaborated on the internal mechanisms and processes of firm growth. She posited that a firm's growth is driven by its internal resources and capabilities, with a particular emphasis on management resources and technological knowledge playing a crucial role in this

development. Additionally, the speed of a firm's growth is constrained by its management resources and capabilities. This implies that firms need to effectively manage and utilize their resources when expanding their scale and business. Firms achieve growth through innovation and expanding their business domains, a process that is dynamic and gradual rather than instantaneous. During growth, firms gradually accumulate resources and sustain development by re-utilizing these resources. The accumulation and effective utilization of resources are key to a firm's long-term success. Growth is not merely driven by market demand but is also a process of continuous accumulation and utilization of internal resources and capabilities. Penrose's theory underscores the core role of internal resources and capabilities in firm growth, introducing key concepts such as resource accumulation, management resource constraints, innovation-driven growth, and dynamic capabilities. These viewpoints provide significant theoretical foundations and practical guidance for strategic management theory, especially the RBV.

Andrews and David (1987) also emphasized the management of internal resources, considering it central to formulating and executing effective strategies. They pointed out that firms need to comprehensively understand and assess their internal resources, including human resources, technological resources, financial resources, and management resources. The effective management and utilization of these resources are crucial to a firm's success. By evaluating internal resources, firms can identify their internal strengths and weaknesses, and on this basis, allocate resources to strategic priority areas. He also stressed the importance of enhancing employee skills through training and development and highlighted the crucial role of management in resource management. Strategy is not merely a response to changes in the external environment but also needs to be based on internal resources to formulate strategies that align with the firm's actual situation. By optimizing and integrating internal resources, firms can better respond to external challenges and achieve sustained competitive advantage.

Lippman and Rumelt (1982) explored the reasons behind different efficiencies among firms, focusing particularly on the uniqueness and inimitability of resources and capabilities. They introduced the concept of "uncertain imitability," arguing that certain firms can gain competitive advantage through unique and hard-to-imitate resources and capabilities. Due to the high costs and uncertainty associated with imitating these resources and capabilities, other firms find it difficult to replicate them, leading to significant differences in efficiency and performance. Firms with competitive advantage often possess unique resources and capabilities that cannot be easily duplicated by others. The relationship between the causes and effects of such uniqueness is complex and unclear, making it difficult for competitors to understand and imitate.

This causal ambiguity makes a firm's success hard to observe and replicate, thereby maintaining its competitive advantage. The interaction between uniqueness and causal ambiguity enhances this inimitability, enabling firms to sustain a leading position over the long term.

Wernerfelt (1984) emphasized the critical role of internal resources in obtaining and sustaining competitive advantage. He argued that firms consist of a series of resources and capabilities that determine their strategic choices and competitive positions. RBV offers a new perspective on strategic management, highlighting that firms can achieve long-term competitive advantage by identifying, developing, and protecting unique resources. He defined resources as tangible and intangible assets, such as technology, patents, brands, and employee skills. By accumulating and effectively utilizing resources, firms can achieve strategic objectives and competitive advantage.

Rumelt (1984) explored the essence and characteristics of corporate strategy. He proposed a critical concept regarding resources: resources should be viewed as a "resource bundle" rather than simple individual resources. A resource bundle refers to the collection of resources that a company possesses, where these resources interact synergistically and complementarily. Resource bundles include not only physical resources (e.g., capital, equipment), human resources (e.g., employee skills, experience), but also organizational resources (e.g., company culture, management structure). When accumulated and integrated, these resources can create greater value and competitive advantage than any single resource alone.

Dierickx and Cool (1989) examined the concept of imitation barriers and how firms can prevent competitors from mimicking their success. In highly competitive markets, a firm's success often depends on its unique resources and capabilities. However, the sustained competitive advantage of these resources and capabilities relies not only on their rarity and value but also on their inimitability by competitors. Dierickx and Cool (1989) identified several primary imitation barriers, including causal ambiguity and isolating mechanisms such as asset interconnectedness and asset stock efficiencies, which hinder or raise the costs of imitation by competitors.

By the 1990s, numerous Western scholars had made significant contributions to the development of strategic models, which positioned a firm's resources as the core concept for achieving sustainable competitive advantage. These scholars emphasized the importance of identifying, developing, and leveraging a firm's unique resources and capabilities to maintain a competitive edge in the market (Aaker, 1989; Day & Wensley, 1988; Grant, 1996; Wernerfelt, 1989).

Day and Wensley (1988) first defined competitive advantage as a firm's superior position

in the market relative to its competitors. This advantage can be achieved through higher customer value or lower costs. They then proposed a systematic framework for evaluating a firm's competitive advantage, which includes two main dimensions: market orientation and resource deployment.

Market orientation involves understanding and satisfying customer needs and responding promptly to market changes. It encompasses market sensing, customer orientation, and competitor orientation. Resource deployment requires effective utilization of resources to achieve competitive advantage, including the acquisition, development, and integration of resources. Day and Wensley (1988) emphasized that competitive advantage stems from a firm's unique resources and capabilities. Superior resources include financial resources, physical resources, technological resources, and human resources, while superior skills encompass unique capabilities in areas such as marketing, operations, R&D, and management.

They also proposed a series of indicators to assess a firm's competitive advantage, including market share, customer satisfaction, cost efficiency, brand reputation, and innovation capability. To maintain a sustainable competitive advantage, firms need to continuously adjust and optimize their strategies in response to changes in the external environment. They recommended that firms establish flexible organizational structures and dynamic capabilities to sustain long-term competitive advantage.

Aaker (1989) attributed a firm's competitive advantage to its unique assets and skills. Assets refer to the tangible and intangible resources owned by the firm, such as brands, patents, technology, and financial resources. Skills are the firm's unique abilities in key areas such as marketing, product development, production management, and customer service. Aaker emphasized that assets and skills are the foundation of a firm's competitive advantage. These assets and skills not only help the firm achieve a superior position in the market but also protect it from competitors' challenges. Aaker highlighted the complementary relationship between assets. Aaker also stressed the importance of building flexible organizational structures and an innovative culture to adapt to market changes and technological advancements. Firms should also monitor external environmental changes and adjust their strategies and resource allocations accordingly.

Wernerfelt (1989) classified company resources into two categories: threshold resources and unique resources. Threshold resources are the basic resources required for survival and competition in a specific industry, such as capital, human resources, and infrastructure. While essential for a company's existence, threshold resources do not provide sustainable competitive advantage because they are relatively easy for competitors to imitate or replace. On the other

hand, unique resources are scarce and difficult for competitors to imitate, providing a firm with sustainable competitive advantage. These resources could include proprietary technologies, unique experiential knowledge, and brand reputation. Due to their inimitability, firms can achieve long-term market leadership by fully utilizing and developing these resources. Wernerfelt argued that a firm's competitive advantage derives from its possession of these unique resources. He suggested that firms should focus on developing and leveraging their unique resources to achieve sustainable competitive advantage, such as deciding where to invest and how to strategically deploy these resources.

Hamel and Prahalad (2010) explored how companies could gain and sustain competitive advantage by identifying and leveraging their core competencies. They defined core competence as the unique skills and technologies that enable a firm to deliver sustained competitive advantage in the market. These skills and technologies are a combination of the firm's internal resources and capabilities, which can be applied across multiple products and markets. Core competencies should possess three characteristics:

1. Provide Significant Customer Benefits: Core competencies must offer clear benefits to customers.

2. Difficult to Imitate: Competencies should be hard for competitors to replicate or surpass, requiring unique technologies, processes, and accumulated knowledge.

3. Broad Applicability: Core competencies should be applicable to a wide range of markets and products, thereby creating extensive business opportunities.

Barney (1991) categorized firm resources into three types: physical capital resources (technology, equipment, location, access to raw materials), human capital resources (training, experience, judgment, relationships, and insights of employees and managers), and organizational capital resources (reporting structures, control systems, planning systems, relationships within the firm and with other firms). Barney highlighted two key characteristics of resources: heterogeneity and immobility. Resource heterogeneity means that different firms possess different combinations of resources, leading to performance differences. Resource immobility indicates that resources are not easily transferable from one firm to another, allowing firms to maintain a long-term competitive advantage because competitors cannot easily acquire or imitate these resources.

However, not all resources create sustainable competitive advantage. A firm achieves sustainable competitive advantage when it implements a value-creating strategy that is not simultaneously being implemented by any current or potential competitors, and when these other firms cannot duplicate the benefits of this strategy. By effectively utilizing scarce

resources, firms can earn returns above the average market rate, known as economic rents. Achieving these rents is the core of maintaining sustainable competitive advantage.

Barney (1991) outlined four conditions that resources must meet to provide sustainable competitive advantage, summarized as the VRIN framework:

1. Valuable: Resources must enable the firm to exploit opportunities or neutralize threats, thereby creating value.

2. Rare: Resources must be scarce and not easily available to competitors.

3. Inimitable: Resources should be difficult for competitors to imitate or duplicate.

4. Non-substitutable: Resources cannot be easily replaced by other resources.

Later, Barney (1995) refined the VRIN framework to the VRIO framework, replacing non-substitutable with organization, which added the organizational capability to effectively utilize these resources:

1. Valuable: Resources must create value and meet market demand.

2. Rare: Resources must be relatively scarce and not easily replicable.

3. Inimitable: Resources should be hard for competitors to imitate or substitute.

4. Organization: The firm must be organized to fully exploit these resources.

Within this framework, value is judged in conjunction with the value chain and firm net income, rarity forms the foundation for competitive advantage, and inimitability ensures the durability of the advantage. The newly added element—organization—plays a synergistic role. Barney emphasized that managers should not only seek valuable, rare, and costly-to-imitate resources within the firm but also ensure that the organization can develop and leverage these resources effectively. Some scholars suggest that the "O" element refers to the firm's dynamic capabilities, which transform the resource bundle into a competitive advantage (Cardeal & Antonio, 2012).

Peteraf (1993) explored the foundations of competitive advantage from a resource-based perspective. She posited that a firm's competitive advantage is built on three pillars: resources, capabilities, and competitive advantage. Resources are the various assets a firm possesses, while capabilities are the firm's ability to effectively utilize these resources. Competitive advantage is the superior position a firm holds relative to its competitors. Resources can be categorized into tangible resources (e.g., equipment, capital) and intangible resources (e.g., brand, reputation, technology). These resources must have certain characteristics to serve as the basis for competitive advantage. Peteraf emphasized the importance of capabilities, defining them as the firm's ability to integrate and utilize resources effectively, which is crucial for transforming resources into competitive advantage. Firms must possess adaptability, learning

ability, and innovation capabilities to effectively leverage their resources.

Day (1994) defined market-driven organizations as those capable of quickly identifying and adapting to market changes. These organizations maintain their competitive advantage through continuous learning and innovation. He identified key capabilities for market-driven organizations:

1. Market Orientation: Sensitivity and responsiveness to market demands and competitive environment.

2. Innovative Capability: The ability to continuously introduce new products and services.

3. Resource Integration: The capability to effectively integrate internal and external resources.

4. Adaptability: The ability to quickly adapt to changing market environments.

Market-driven organizations are better positioned to meet customer needs, withstand competitive pressures, and maintain a leading position in the market. Day suggested that firms develop learning mechanisms, encourage continuous learning and innovation, emphasize market orientation, and focus on customer needs and market changes. Effective integration of internal and external resources is also crucial for supporting innovation and market adaptability. His research highlighted the importance of market-driven organizations in competition and provided key capabilities and strategies for developing such organizations, guiding managers in creating flexible and adaptive organizations to respond to changing market environments.

Collis and Montgomery (2009) emphasized that a firm's resources and capabilities are central to its competitive strategy. Unlike traditional market-oriented strategies, the RBV focuses on how a firm's unique internal resources become sources of competitive advantage. They stressed the importance of effectively integrating and applying resources. Firms need to identify and evaluate their key resources and find the best ways to integrate these resources into their operations and strategies to form unique competitive advantages.

Grant (1996) proposed the Knowledge-Based View (KBV), which posits that knowledge is the key or strategic asset of a firm. This theory builds on RBV by emphasizing the central role of knowledge in achieving competitive advantage. According to Grant, knowledge is the most important strategic resource for a firm. Knowledge encompasses both explicit knowledge (e.g., technology, patents, documented processes) and tacit knowledge (e.g., employee skills, experience, corporate culture). These knowledge assets form the foundation for acquiring and sustaining competitive advantage. He identified several critical characteristics of knowledge:

1. Complexity and Proprietary Nature: Complex and proprietary knowledge is difficult for competitors to replicate or imitate.

2. Embeddedness: Knowledge is often embedded in a firm's processes, systems, and employees, making it hard to externalize and transfer.

3. Growth Potential: Through learning and innovation, a firm's knowledge assets can continually grow and update.

Grant also emphasized the importance of knowledge management within firms. Knowledge management involves the creation, sharing, application, and protection of knowledge. Firstly, firms can create new knowledge through R&D, training, and employee interactions. Subsequently, internal communication and collaboration facilitate the flow and sharing of knowledge within the organization. This environment allows knowledge to be applied in product development, process optimization, and strategic decision-making, thereby enhancing the firm's competitiveness. Once a firm's knowledge reaches a certain level, measures such as intellectual property protection and confidentiality agreements should be implemented to prevent knowledge leakage and imitation by competitors.

2.1.3 Summary of the RBV

Since the 1980s, numerous scholars have contributed to the development and advancement of the RBV theory. These contributions can be summarized in Table 2.1, which highlights key developments and scholars' contributions to RBV.

Table 2.1 Summary of key contributions to RBV theory

Year	Scholar	Contribution
1984	Wernerfelt	Introduced the Resource-Based View (RBV) in "A Resource-Based View of the Firm," emphasizing the role of internal resources in shaping firm strategy and competitive advantage.
1986	Barney	Proposed that unique, valuable, rare, and inimitable resources are crucial for achieving sustainable competitive advantage.
1990	Prahalad & Hamel	Defined core competencies as unique skills and technologies providing competitive advantage, applicable across multiple markets and products.
1991	Barney	Further developed the VRIN framework (Valuable, Rare, Inimitable, Non-substitutable) to evaluate resources' potential for sustainable competitive advantage.
1991	Conner	Compared RBV with industrial organization economics, highlighting RBV’s focus on internal resources and capabilities versus external market structures.
1993	Peteraf	Explored the foundations of competitive advantage, emphasizing the importance of resources and capabilities, and the need for adaptability and innovation.
1994	Day	Introduced the concept of market-driven organizations, stressing the importance of market orientation, innovation, resource integration, and adaptability.
1995	Collis & Montgomery	Emphasized that resources and capabilities are core to competitive strategy, highlighting the need for dynamic capabilities to adapt to changing markets.
1996	Grant	Developed the Knowledge-Based View (KBV), positioning knowledge as a

	key strategic resource and emphasizing the importance of knowledge management and dynamic capabilities.

Source: Created by this study

Generally, most scholars categorize resources into tangible resources (such as equipment and financial resources) and intangible resources (such as brand, technology, and intellectual property). Additionally, many scholars emphasize the unique position of human resources within this categorization, including employees' skills, experience, and knowledge. These human resources are considered crucial for creating and sustaining a firm's competitive advantage.

Many studies distinguish between resources and capabilities. Resources are the assets a firm possesses, while capabilities refer to the firm's ability to effectively manage and utilize these resources. This distinction is important as it highlights the role of dynamic capabilities, which enable firms to continuously adapt to market changes and technological advancements. The majority of research acknowledges the heterogeneity and immobility of resources, focusing on the unique resources a firm owns that are difficult to transfer or imitate, thus leading to sustained competitive advantage.

Barney (2001) argued that resources are not static. Firms need to continuously develop new resources and capabilities while integrating existing ones to respond to market changes. The introduction of dynamic capabilities addresses the need for firms to adjust and renew their resources and capabilities according to the evolving environment. Recent studies have emphasized the knowledge resource perspective, highlighting knowledge as a critical strategic resource. Knowledge includes both explicit knowledge (such as technology and patents) and tacit knowledge (such as experience and corporate culture). This is particularly significant in today's knowledge-based society. It is also crucial to the development of technology-oriented enterprises in the context of China's economic structural transformation.

Some critics argue that RBV might be overly focused on internal factors, potentially neglecting important external factors such as market dynamics, competitive behaviors, and industry trends. This internal focus could lead firms to overlook changes in consumer preferences, technological advancements, and economic conditions, all of which are critical for strategic decision-making. By primarily concentrating on internal strengths, firms might fail to effectively address external threats and opportunities, thereby harming their competitive position and long-term success.

Levitas and Ndofor (2006) highlighted another limitation of RBV, noting that it can not account for rare, unpredictable, and impactful "black swan" events, such as global financial crises, sudden technological breakthroughs, natural disasters, or political changes. These events

can significantly affect firm operations, potentially leading to the downfall of an entire firm or industry. While RBV emphasizes gaining competitive advantage through internal resources and capabilities, it may not effectively predict or handle external unexpected events that are beyond a firm's control and can have profound strategic implications. The resources and capabilities emphasized by RBV might be effective under normal operating conditions, but firms may require more flexible strategic adjustments and response capabilities when facing black swan events.

The most valuable resources of a firm are often complex, unobservable, and difficult to measure. These resources contribute significantly to sustainable competitive advantage but are challenging to identify and verify through empirical research. Most RBV studies in the existing literature tend to focus on relatively easily measurable resources, such as human capital (Lockett et al., 2009; Newbert, 2007). This methodological approach makes it difficult for scholars to understand which resources truly influence sustainable competitive advantage or key competitive advantage.

What is crucial is not the type of resources a firm possesses, but how managers utilize these resources to maximize their effectiveness (Penrose, 1959; Peteraf & Bergen, 2003; Wernerfelt, 1984). A single resource can have multiple functions and can be applied in different markets. The most typical example is knowledge resources. Knowledge resources have virtually no usage limits and can be infinitely expanded in their applications. One of the key roles of managers is to find the most effective ways to utilize the firm's existing resources. This implies that the use of resources is subject to the managers' subjective influence. Therefore, focusing solely on the resources that a firm possesses is insufficient to understand the source of the firm's competitive advantage. Equally important is how managers combine and leverage these resources, particularly knowledge resources.

2.1.4 Empirical Research from the lens of RBV

Armstrong and Shimizu (2007) conducted a comprehensive review of 125 empirical RBV studies published between 1991 and 2005. They identified major methodological challenges in RBV research, such as the difficulty of measuring intangible and unobservable resources and the risk of confounding factors. In these 125 studies, researchers employed qualitative methods, survey methods, and objective proxy indicators to translate abstract theoretical concepts into measurable and observable specific indicators and variables. This process is known as conceptual operationalization, which is crucial in RBV empirical research because it allows

researchers to measure and test theoretical constructs using actual data, thereby validating research hypotheses.

Arbelo et al. (2021) evaluated the impact of corporate reputation as a strategic resource on competitive advantage, using a sample of firms from 2010 to 2016. They introduced profit efficiency as a new performance indicator, measuring how effectively firms utilize their internal resources to generate economic value. This aligns with the core RBV viewpoint that competitive advantage stems from unique and inimitable internal resources. Profit efficiency dynamically reflects changes in a firm's resource utilization efficiency over time, offering a more timely and relevant performance assessment than traditional financial or accounting indicators. He argued that on profit efficiency is a unique and more comprehensive performance measure compared to traditional financial indicators, and corporate reputation significantly contributes to competitive advantage, affirming its role as a strategic resource.

Beamish and Chakravarty (2021) focused on the application of RBV in multinational enterprises (MNEs). While RBV has been successfully applied to explore the relationship between capabilities and performance at the firm level, it has been less utilized in MNE research. They argued that RBV can evaluate the contributions of core resources and capabilities of different subsidiaries and business units to overall firm performance. RBV can also analyze how resources are transferred and shared across different countries and markets to achieve global competitive advantage. For instance, subsidiaries can leverage the parent company's technological expertise, brand value, and managerial experience to enhance their competitiveness. However, due to the complexity of MNE operations, integrating RBV with other theoretical perspectives, such as institutional environment impacts and multi-level analysis, is often necessary. Beamish and Chakravarty's study provided insights into the complexity of operating in diverse institutional environments and the need for a nuanced understanding of resource utilization and transfer in MNEs.

Zahra (2021) argues that existing research on the RBV often assumes that the resource management processes in entrepreneurial firms are similar to those in established companies, but this is not always the case. Resource accumulation and management in entrepreneurial ventures can differ significantly from those in mature companies. However, much of the existing research overlooks the heterogeneity of entrepreneurial firms and the unique challenges they face in resource management. Resources in startups are often very limited, hence the importance of the process of "managing resources" should be emphasized, as it is a key source of competitive advantage. Therefore, future studies need to extend the application of RBV to the management processes of resources, which is significant for research on startups.

Additionally, this study also highlights the importance of integrating RBV with other theories, specifically mentioning prominent entrepreneurial theories: effectuation and bricolage. Unlike traditional causation logic (i.e., based on predetermined goals and searching for resources and means to achieve those goals), effectuation logic starts with available resources and means, gradually forming and adjusting goals. Bricolage refers to entrepreneurs creating value under resource constraints by utilizing readily available resources and opportunities. Bricolage emphasizes flexibility and creativity, incorporating resource patching, opportunity orientation, problem-solving, and multifunctional use of resources.

Nason and Wiklund (2018) utilized meta-analytic techniques to conduct a systematic review and statistical analysis of a large body of empirical research to examine the effects of different resource characteristics on firm growth. The study initially distinguished between the theoretical differences in resource characteristics and firm growth as posited by Barney (1986) and Penrose (1959). Barney (1986, 1991) focused on how four characteristics of resources—valuable, rare, inimitable, and non-substitutable—can confer competitive advantage. Penrose, on the other hand, emphasized the versatility and flexibility of resources, and how reconfiguring these resources could expand a firm's set of productive opportunities. The findings revealed that while VRIN resources significantly impact competitive advantage, they do not significantly affect firm growth; however, resource diversity has a significant positive effect on firm growth, enabling firms to be flexible. Consequently, the study suggests that future research on firm growth should be more grounded in Penrose's theory rather than Barney's VRIN framework. Although VRIN resources are apt for explaining efficiency and competitive advantage, growth, as a unique performance outcome, necessitates a specific theoretical approach.

In the context of the innovation-driven development strategy, Xiao (2023) explored the impact of founders' key resources and their resource management on corporate innovation investment. She categorized founders' resources into internal capability resources and external relational resources. The study employed structural equation modeling, fuzzy set qualitative analysis, and robustness checks to examine the effects of founders' resource management on corporate innovation investment from multiple perspectives. The findings concluded that from the perspective of internal capability resources, founders' authority resources, knowledge resources, and control resources have a significant positive impact on corporate innovation investment, especially more evident in small-scale enterprises and in low-competitive environments. Founders' external relational resources facilitate corporate innovation investment through mechanisms such as information transmission, capital acquisition, and policy support. Social relational resources positively influence innovation investment, whereas

political relational resources may have a negative effect. Combining founders' resources and adopting an "inward-looking" or "balanced internal-external" resource management approach is most effective for innovation investment. Investments in internal capability resources promote corporate innovation investment more than external relational resources.

2.1.5 A summary of empirical studies on RBV

Several studies have pointed out challenges in measuring intangible resources, such as brand reputation and employee skills, within RBV empirical research. For instance, Beamish and Chakravarty (2021) emphasized that applying RBV to multinational enterprises may require a multi-level analysis due to differences in culture, institutions, and market environments, and may need to be complemented with other theoretical perspectives. While researchers acknowledge this issue, there is still a lack of innovative solutions on how to specifically measure intangible resources. Most studies rely on subjective surveys or proxy indicators, which may introduce bias.

Many studies have suggested that RBV needs to be integrated with other theories to address more complex corporate environments (Nason & Wiklund, 2018; Zahra, 2021). Zahra (2021), for example, proposed combining RBV with theories such as effectuation and improvisation to better understand resource management in entrepreneurial firms. This integration expands RBV's applicability in different contexts. Although these studies recommend integrating various theories, they fall short of providing detailed discussions on how such integration should occur. Future research should offer more in-depth analyses of how different theories can work in synergy.

The literature by Nason and Wiklund (2018) and Zahra (2021) delves into the differences in resource management between entrepreneurial firms and established firms, pointing out that existing RBV research often assumes similar resource management processes for both, which is not always valid. This research offers more targeted guidance for resource management in entrepreneurial firms. While these findings help deepen RBV's application in entrepreneurial settings, they remain largely theoretical. Empirical studies, especially in emerging markets like China, are still relatively scarce, and resource management challenges in entrepreneurial firms in such markets are likely more diverse and complex. Future research should focus more on the practical conditions of entrepreneurial firms in China, exploring the applicability of RBV in different market environments.

Researchers generally agree that future RBV studies should focus more on the processes of

resource management rather than merely on resource characteristics. For example, Zahra (2021) suggested that RBV should expand to encompass the dynamic processes of resource management. This perspective offers new directions for future RBV research. However, there is still a lack of empirical research on resource management processes. Particularly in the context of globalization, how to enhance a firm's long-term competitiveness through effective resource management remains a topic worthy of further exploration.

2.2 Dynamic capabilities view (DCV)

Section 2.1 introduces the concept, dimensions, and related empirical studies of the RBV. As an influential and significant theory, it has effectively helped scholars and entrepreneurs understand the pathways to achieving and maintaining a competitive advantage within a firm (Barney, 1991; Hamel & Prahalad, 2010; Penrose, 1959; Teece et al., 1997). Subsequently, scholars expanded RBV from a static to a dynamic perspective (Teece et al., 1997) because the RBV alone could not fully explain why some firms maintain a competitive advantage in rapidly changing and unpredictable markets.

2.2.1 Definition and dimensions of dynamic capabilities

From the perspective of the RBV, Teece et al. (1997) first introduced the concept of "dynamic capabilities" in 1994. They interpreted this concept from two aspects: dynamics and capabilities. Firstly, it refers to the changing characteristics of the environment; secondly, it emphasizes the crucial role of strategic management in appropriately adjusting, integrating, and reconfiguring internal and external organizational skills, resources, and functional capabilities to adapt to the continuously changing environment. From this point, researchers began to focus on the specific details of developing capabilities unique to each firm and how to update these capabilities to respond to changes in the business environment, positioning dynamic capabilities as a new paradigm for modern business corporations. They also believed that a firm's competitive advantage stems from dynamic capabilities, which are embedded in the firm's inherent processes and rooted in the efficient routines of internal operations, implying that dynamic capabilities are constrained by the company's history.

Subsequently, Teece et al. (1997), after comparing four paradigms in strategic management (the competitive forces approach, the strategic conflict approach, the resource-based view, and the dynamic capabilities approach), further noted that dynamic capabilities refer to a firm's ability to integrate, build, and reconfigure internal and external resources in response to rapidly

changing environments. Dynamic capabilities focus on adapting, integrating, and reconfiguring organizational skills, resources, and capabilities in a rapidly changing environment, thereby achieving new forms of competitive advantage by maintaining consistency with the changing business landscape.

In 2007, Teece further explored the theoretical framework of dynamic capabilities, defining them as specific processes and capabilities that firms use to integrate, build, and reconfigure internal and external resources to address rapidly changing environments. These capabilities include three main aspects: sensing opportunities and threats, seizing opportunities, and reconfiguring resources and capabilities to respond to market changes. Additionally, he emphasized the micro-foundations of dynamic capabilities, which include the following aspects:

Managerial cognitive capability: The cognitive processes and mental models used by managers in strategic decision-making, including the ability to sense opportunities and threats, learn, interpret complex information, and solve problems effectively.

Organizational processes: The routines and processes established within the company that support efficient coordination and resource integration, including coordination/integration, learning, and reconfiguration.

Resource management: The ability of a firm to effectively acquire, deploy, and utilize resources, encompassing resource acquisition, deployment, and utilization.

Path dependency: The choices and investments made in a firm's history shape its current capabilities and strategic options; these past decisions, successes, and failures lay the foundation for future decisions and capabilities.

Organizational culture and leadership: The values, norms, and leadership style within a firm significantly impact dynamic capabilities. A culture that encourages innovation, risk-taking, and learning from failures helps enhance a firm's dynamic capabilities.

Zollo and Winter (2002) articulated that dynamic capabilities are the ability to extend, modify, or create ordinary capabilities. Zahra et al. (2006) incorporated the role of managers into the definition of dynamic capabilities, defining them as the ability to reconfigure company resources and routines in a manner deemed appropriate by management. They emphasized that dynamic capabilities differ from the more static and operational substantial capabilities. They also identified several antecedents of dynamic capabilities, including organizational knowledge, integration skills, and learning processes. They noted significant differences between startups and established companies in developing and utilizing dynamic capabilities. Startups often rely on trial-and-error and improvisation, while established companies benefit from planned changes and leveraging existing resources. The theoretical model proposed in their study

highlights the complex interplay between entrepreneurial activities, dynamic capabilities, and performance. The model suggests that dynamic capabilities are not only crucial for immediate performance but also for long-term strategic advantages. The ability to learn organizationally and integrate new knowledge is also vital for the development of dynamic capabilities, as these abilities in turn affect the firm's adaptability and competitiveness.

Eisenhardt and Martin (2000) summarized dynamic capabilities as the processes through which firms achieve new resource configurations in response to market changes, including integration, reconfiguration, acquisition, and release of resources. While dynamic capabilities may vary in detail and exhibit path dependency, they show commonalities across different firms, often referred to as best practices. These commonalities suggest that a similar set of dynamic capabilities can lead to business success. Through case analysis, they classified markets into moderately changing markets and rapidly changing markets. Moderately changing markets are those where changes are somewhat predictable and occur along a linear path. These markets have a relatively stable industry structure, clear market boundaries, and well-known participants (e.g., competitors, customers, complementors). In these markets, effective dynamic capabilities primarily rely on existing knowledge. Managers use their tacit knowledge and experience to analyze the market and then develop efficient and stable linear processes (Helfat, 1997), methodically planning and organizing their activities. Sometimes, dynamic capabilities are used to codify tacit knowledge into explicit, detailed routines for employees to operate and repeat continuously.

In rapidly changing markets, the effectiveness of dynamic capabilities becomes simpler. This is because managerial attention is prioritized, and simple routines or rules allow managers to focus on the most critical issues. Moreover, relying on past experiences is often unhelpful in such markets, as prior knowledge may not be applicable to the current situation. To address the present circumstances, managers need to create new knowledge based on the current context. In these markets, whether dynamic capabilities can help firms achieve effective growth depends critically on the choices made.

From the perspective of the Knowledge-Based View (KBV), Zollo and Winter (2002) focused on how deliberate learning processes foster the development of dynamic capabilities. They proposed that dynamic capabilities evolve through structured learning mechanisms within organizations. This study drew on evolutionary theory, positing that organizations adapt and evolve over time through routines and learning processes. This theoretical framework helps explain how firms develop and refine their capabilities through experience and adaptation. The findings indicate that deliberate learning is a key mechanism for developing dynamic

capabilities. Firms that engage in systematic learning activities, such as process reviews, simulations, and feedback loops, are better able to adapt to changing environments. The research emphasizes that there is significant variation in how different firms implement these learning processes. Some organizations are more effective at integrating these processes into their routines, thereby advancing their dynamic capabilities to a greater extent.

Easterby-Smith and Prieto (2008) defined dynamic capabilities as the ability of a firm to generate, integrate, and reconfigure knowledge. They explored the relationship between dynamic capabilities and knowledge management, emphasizing the integrative role of learning in linking dynamic capabilities with knowledge management. Their research found that learning processes are crucial for the development and deployment of dynamic capabilities. Learning facilitates the integration and reorganization of organizational knowledge and resources. Organizations with strong learning capabilities are more adaptive and better equipped to handle environmental changes and uncertainties. Firms with robust dynamic capabilities tend to excel in knowledge acquisition, absorption, transformation, and utilization.

Furthermore, Barreto (2010), after analyzing the essence, specific roles, relevant contexts, heterogeneity assumptions, and objectives of the dynamic capabilities concept from various scholars, posits that dynamic capabilities represent a firm's potential to systematically solve problems by perceiving potential opportunities and threats and making timely adjustments to its market orientation and resource base.

Pitelis et al. (2023) employed a systematic literature review method to analyze 196 articles on dynamic capabilities and multinational enterprises' (MNEs) global strategy published since 1997. The study summarized three major dynamic capabilities in MNEs' global strategy: opportunity sensing, opportunity seizing, and resource reconfiguration. Although the SSR (sensing, seizing, and reconfiguring) components of dynamic capabilities have been widely recognized in theory, they are rarely directly measured in empirical research. Many studies use proxy indicators, such as marketing expenditures and R&D spending, to measure these dimensions of dynamic capabilities, which leads to inaccurate measurements. Entrepreneurial capabilities and managerial capabilities intersect in MNEs' global strategies. In particular, entrepreneurial capabilities (e.g., innovation, risk-taking, and proactiveness) play a crucial role in global expansion but have been under-researched. The dynamic nature of the external environment significantly impacts dynamic capabilities and should not be overlooked. Thus, MNEs need to have flexible management systems that can respond quickly to market changes. Based on this, the study proposed a new conceptual framework (see Figure 2.1) that integrates variables and relationships from the existing literature, emphasizing entrepreneurial capabilities,

co-specialization, and the co-creation of cross-border markets and ecosystems. This framework transcends traditional internalization and cross-border integration theories, providing a more comprehensive perspective.

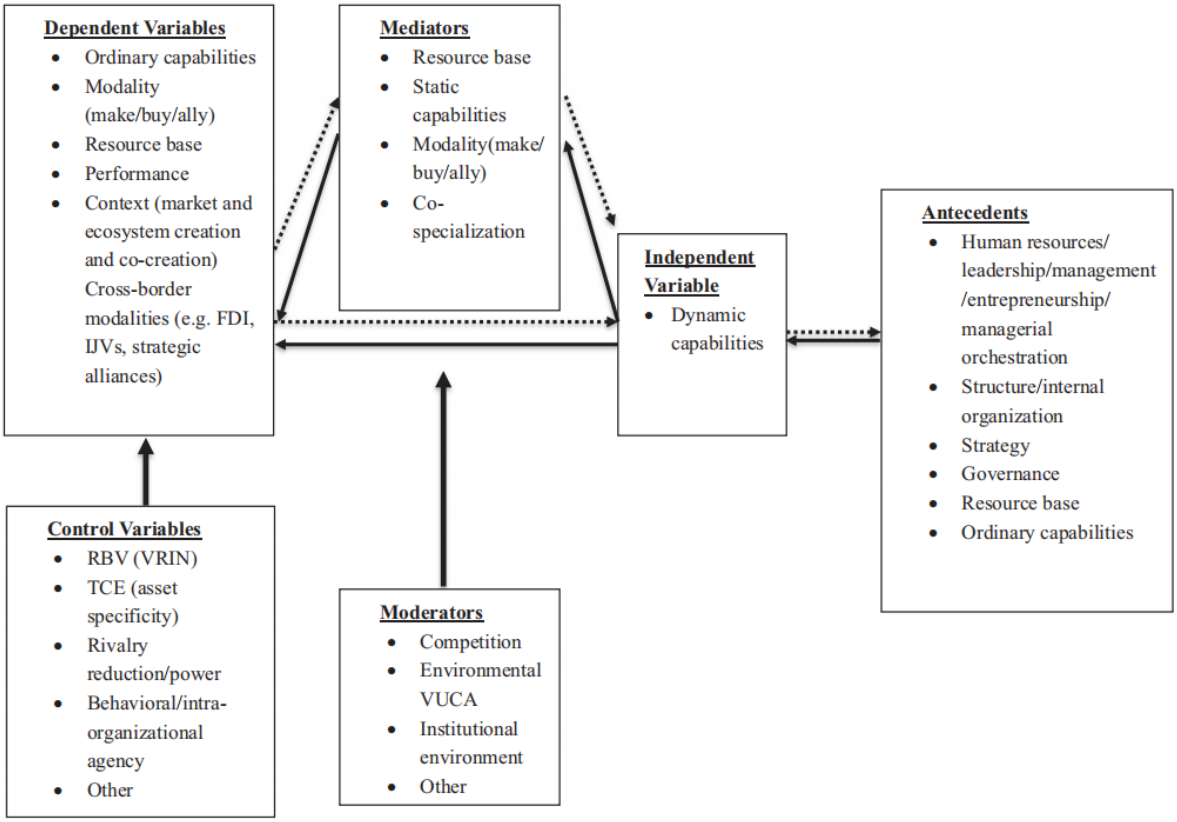


Figure 2.1 Dynamic capability concept architecture

Source: Pitelis et al. (2023)

Helfat (2022) studied how dynamic capabilities influence a firm's external environment, enhancing the firm's adaptability and shaping capabilities in the process, with a particular focus on externally oriented dynamic capabilities—those that interact directly with the external environment and generate an impact. This research aims to fill a gap in the existing literature regarding the role of dynamic capabilities in the external environment. Helfat defines dynamic capabilities as the firm's ability to achieve strategic and organizational change, including the capabilities to sense opportunities, seize them, and reconfigure resources. Different types of dynamic capabilities serve various purposes and activities, such as technological innovation, mergers and acquisitions, and alliances. Dynamic capabilities can exist at the organizational, team, or individual level and are supported by factors such as procedures, processes, human capital, social capital, and cognition.

Externally oriented dynamic capabilities can alter a firm's resource base. Firms enhance their resource base through externally oriented dynamic capabilities, such as acquisition capabilities and external integration capabilities, by acquiring and integrating external resources.

For example, firms can acquire new technologies and knowledge through mergers and acquisitions or gain access to new market opportunities through alliances. Externally oriented dynamic capabilities can also directly influence the external environment, such as by altering customer demand through marketing and sales capabilities or reshaping market structures through rule-setting in platform ecosystems.

Dynamic capabilities not only help firms adapt to changes in the external environment but can also proactively change the external environment through market shaping. For example, Apple reshaped the smartphone market through its product development and marketing capabilities. The research also highlights that some dynamic capabilities serve dual purposes: they can be used both to adapt to environmental changes and to shape market environments. For instance, sales capabilities not only increase product sales but also provide insights into customer needs that inform new product development.

Dong et al. (2004) proposed that the evolution of dynamic capabilities involves four cyclical stages: variation, internal selection, dissemination, and retention. Jiang (2006), from the perspective of knowledge transfer, studied the dynamic capabilities of latecomer firms, stating that dynamic capabilities are the firm's ability to create and innovate knowledge after absorbing, transferring, and integrating it. Yin (2009) defined dynamic capabilities as the firm's ability to construct new resource and capability structures and mechanisms for capability reconfiguration in order to seize existing or potential technological opportunities under changing technological paradigms. Xiong (2011) deeply analyzed the thoughts and theoretical foundations of dynamic capabilities from the perspective of strategic management, proposing that dynamic capabilities are the ability to change operational routines, essentially representing a firm's transformative capabilities in a changing environment.

The above research can be broadly summarized into three perspectives on the exploration of the connotations and components of dynamic capabilities (see Table 2.2 for the comparison):

Table 2.2 Comparison of three schools of thought on dynamic capabilities

Aspect	First School: Capability Theory Perspective	Second School: RBV Perspective	Third School: Strategic Perspective
Core Focus	Deconstructing dynamic capabilities into basic functional, dynamic, and strategic insight capabilities. Focuses on innovation and resource allocation.	Organizational learning, knowledge refinement, and resource adaptation from the perspective of behavior and cognition.	Dynamic capabilities for strategy formulation and execution, emphasizing meta-learning and organizational routines.
Key Elements of Dynamic Capabilities	Adaptive capability (restructuring organization, processes,	Key elements of dynamic capabilities	Adaptive capability (restructuring organization, processes, and culture)

	and culture)		
Main Contributors	Teece et al. (1997) Wang and Ahmed (2007)	Zollo and Winter (2002)	Eisenhardt and Martin (2000)
Application	Highlights how different combinations of resources and capabilities lead to various innovation outcomes.	Views dynamic capabilities as linked to resource flexibility, resource renewal, and organizational cognitive development.	Describes dynamic capabilities as essential for specific strategic objectives like alliances, and protecting competitive advantage.

Source: Created by this study

2.2.2 Dynamic capabilities of start-ups

Traditional business lifecycle theory attempts to divide a firm's development into several distinct stages, with the difference between new and established firms attributed to these stages. The growth process of technology-based startups is often divided into four phases: concept development, product development, market entry, and stable growth. Each stage presents unique challenges and issues. During the concept development phase, the main issues include resource acquisition, technology validation, and market demand assessment. Startups need to address problems related to funding shortages, technical feasibility, and market acceptability. In the product development phase, startups face challenges related to product research and development and pilot production, such as technological realization, product quality control, and initial market response. The market entry phase is characterized by issues around market promotion and the establishment of sales channels. Startups must tackle problems related to market positioning, brand promotion, and the construction of a sales network. During the stable growth phase, the main issues revolve around scaling operations and optimizing management, with challenges including improving operational efficiency, adjusting organizational structures, and sustaining innovation (Kazanjian, 1988).

Increasing attention is being paid to the significant differences between startups (emerging organizations) and established organizations that have a long entrepreneurial history and operate relatively stably. It would be overly simplistic to assume that new firms are merely "smaller versions of big firms" simply because large firms possess some of the key characteristics of startups, and applying theories of established companies to startups is not always appropriate. In reality, the issues faced by firms at different stages of growth have dynamic characteristics. As a firm grows, the nature and priorities of these issues change. Companies must flexibly adjust their strategies and resource allocations according to the specific circumstances of each stage.

Firstly, startups face a severe resource scarcity dilemma. Resources are fundamental

elements for the survival and development of new enterprises. However, due to the liabilities of newness, startups typically possess limited initial resources and lack knowledge of the market and industry, placing them at a disadvantage in market competition. They also lack experience in communicating with customers and internal staff, making it difficult to gain customer and employee commitment. Furthermore, due to the absence of track records that could demonstrate their growth potential, startups struggle to obtain resources through banks or capital markets (Ren, 2011). Therefore, startups need to continuously build and leverage social relationships, using informal network channels to acquire resources, while also engaging in constant observation and learning to address their resource scarcity (Baum & Silverman, 2004).

Secondly, startups have simple and flexible organizational structures. From the perspective of the size characteristics of new enterprises, their organizational structures are relatively simple, and resource allocation is limited (Zhu Xiumei, 2008). Large, established firms often adopt mature, hierarchical organizational structures that can hinder innovation activities. In contrast, startups and highly innovative firms have more flexible and dynamic approaches to product and market development. As these companies continually expand and redefine their markets, their products and processes are constantly evolving, making knowledge resources and internal knowledge management processes crucial (Knight & Cavusgil, 2004).

Thirdly, startups face the challenge of lacking legitimacy. Legitimacy is something that needs to be built over time, and newly established companies often lack a track record (Cafferata et al., 2009). Additionally, the limited or underperforming results of startups, combined with their inherent disadvantages, often lead to a general lack of legitimacy. Legitimacy can be acquired by adhering to standards, norms, and regulations established by government agencies, large corporations, and certification bodies (Singh et al., 1986). Since startups are new to the market, their products or services are often unfamiliar to customers and have not yet gained recognition. This makes it difficult for startups to establish a market position quickly, resulting in challenges in building market legitimacy (Ren, 2011).

Fourthly, compared to established companies, startups are more externally oriented in their search for knowledge. Due to their relatively limited accumulation of knowledge and experience, startups tend to focus on learning from external entities, including customers, suppliers, and research institutions. This exploratory learning helps shift the startup's perspective and values, stimulating innovative behaviors and helping the startup build a competitive advantage (Calantone et al., 2002).

The previous review of the dimensions of dynamic capabilities revealed that scholars have yet to reach a consensus on the components of dynamic capabilities. J. B. Li (2019), considering

the characteristics of China's transitional environment and those of startups, argued that dynamic capabilities are the ability to integrate internal resources and absorb external resources to adapt to environmental changes (Biedenbach & Müller, 2012; C. L. Wang & Ahmed, 2007). He analyzed the composition of dynamic capabilities in startups from the perspectives of innovative capability, absorptive capability, and adaptive capability. Below, the concepts of these three types of capabilities will be introduced, followed by an explanation of why they are the main components of dynamic capabilities in the development of startups .

Innovation capability refers to a firm's ability to develop new products and enter new markets, which is an expression of its innovative behavior (C. L. Wang & Ahmed, 2007). Innovation capability allows firms to adapt to changes in the external environment to maintain productivity and achieve growth, serving as a guarantee for implementing innovation strategies (Akman & Yilmaz, 2008). It forms the foundation for strategic renewal and growth. Startups often lack market legitimacy and receive limited recognition in the market (Delmar et al., 2013). To compete with established companies, startups need to differentiate their products or services or develop new markets, and innovation capability is the foundation for achieving these goals. Therefore, startups' entry into the market and their subsequent growth are heavily dependent on their innovation capability.

Absorptive capability is the ability of a firm to identify valuable external information and absorb and utilize that external knowledge through learning processes (Biedenbach & Müller, 2012; Lane et al., 2006; Martinkenaite & Breunig, 2016). Due to the liabilities of newness, startups may find it insufficient to rely solely on their internal resource endowment when facing challenges brought about by market and technological changes, making the absorption of external knowledge essential. C. L. Wang and Ahmed (2007) pointed out that firms with high absorptive capability can learn from business partners, integrate external information, transfer it internally, and internalize it as organizational knowledge. Therefore, absorptive capability is crucial for startups, helping them address environmental changes and compensate for their newness disadvantages.

Adaptive capability is the ability to identify and exploit opportunities in emerging markets (Biedenbach & Müller, 2012; C. L. Wang & Ahmed, 2007). This capability primarily encompasses opportunities arising from technology, the market, and the firm’s own organization (Tuominen et al., 2004). Adaptive capability reflects a firm's ability to reconfigure resources and adjust its behavior to quickly align with a changing environment (Eshima & Anderson, 2017). For startups operating in a dynamic environment, strong adaptive capability facilitates their survival and growth by enabling flexible resource management and the

alignment of resources and capabilities with external changes. Given the ongoing industrial upgrading and structural transformation in China's economic development, startups face challenges stemming from changes in the market, technology, and other environmental factors, and their participation in market activities is heavily dependent on adaptive capability.

2.2.3 The evolution of the dynamic capabilities view (DCV)

He et al. (2016) proposed a comprehensive analytical framework for understanding how firms acquire dynamic capabilities. They outlined the process of acquiring dynamic capabilities as involving several critical steps:

1. Resource Utilization Knowledge: Firms must acquire and master new knowledge about resource utilization. This implies that firms need to continuously learn and update their understanding of how to effectively use existing resources. By doing so, they enhance their ability to deploy resources strategically and respond to changing market conditions.

2. Recombination of Resources: Firms need to develop new ways to recombine resources. This involves not only reconfiguring existing resources but also discovering and leveraging new resource combinations to improve competitiveness. Through creative recombination, firms can adapt to evolving environments and capitalize on emerging opportunities more effectively.

3. Coordination and Integration of Internal and External Resources: Firms must be capable of coordinating and integrating both internal and external resources. This requires the ability to organically combine resources from various sources to create a stronger competitive advantage. Effective coordination and integration are essential for aligning resources with strategic objectives and achieving sustained success in dynamic markets.

This framework highlights that the acquisition of dynamic capabilities is a multi-step process that involves continuous learning, innovative recombination of resources, and the effective integration of both internal and external resources. Through this process, firms can enhance their adaptability and resilience in rapidly changing environments.

The analytical pathway proposed by He Xiaogang et al. is illustrated in Figure 2.2. According to this pathway, firms develop specific resources and capabilities in response to particular market opportunities. However, as the market environment changes, these resources and capabilities need to be continuously updated to adapt to new circumstances. By doing so, firms can develop new dynamic capabilities, which enable them to achieve sustained growth.

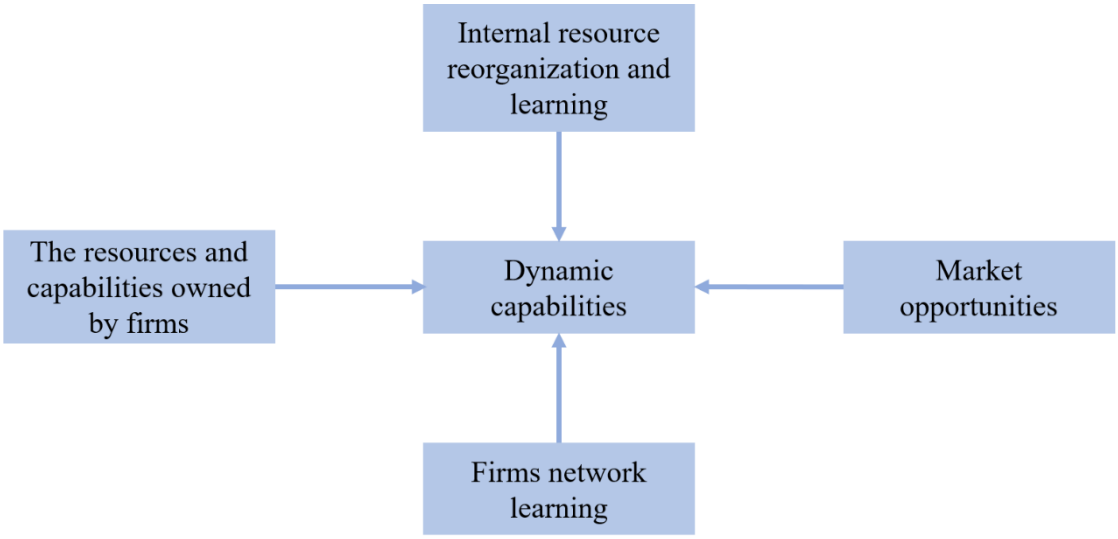


Figure 2.2 The pathes for firms to acquire dynamic capabilities

Source: He et al. (2016)

The research by Keller et al. (2022) sheds light on how path dependency influences the development and application of dynamic capabilities. They also propose strategies to address path dependency to facilitate organizational adaptation and transformation in constantly changing environments. By systematically reviewing the existing literature on dynamic capabilities, path dependency, and organizational change, they constructed a theoretical framework to analyze the contradictions and gaps in current research, particularly focusing on the path dependency of dynamic capabilities and its impact on a firm's adaptability.

The study found that due to the nature of dynamic capabilities being based on organizational routines and learning processes, they tend to accumulate path dependency over time. Path dependency allows dynamic capabilities to be effective in environments with continuous changes, but in environments with discontinuous changes, it may become inapplicable or even harmful. The strategies to address path dependency include:

Path Transformation: By intervening and readjusting the self-reinforcing mechanisms, firms can transform path-dependent dynamic capabilities to better adapt to environmental changes.

Path Dissolution: Gradually dismantling path-dependent dynamic capabilities that no longer meet the demands of the new environment, thereby reducing their negative impact on the organization's adaptability.

Path Switching: Leveraging other existing dynamic capabilities to avoid rigidity caused by path dependency and promote resource reallocation.

New Path Creation: Directly intervening in the resource base to create new dynamic

capability pathways in response to significant environmental changes.

Managers play a critical role in addressing path dependency, especially through ad hoc managerial actions to break and transform path dependency. Managers need to possess reflective and responsive systems to promptly identify the impact of path dependency on dynamic capabilities and take appropriate intervention measures.

Sunder and Ganesh (2021) introduced the concept of a dynamic capability ecosystem through a systems thinking perspective in their theoretical exploration of dynamic capabilities. They argue that studying a single dynamic capability may not provide complete practical insights. Instead, by adopting a systems theory perspective, examining multiple dynamic capabilities and their interrelationships (as a dynamic capability system, or DC system) can lead to sustained competitive advantage. They propose that dynamic capabilities interact to form a system that enables firms to achieve competitive advantage. Organizational resources, organizational processes, operational capabilities, and environmental dynamism are identified as input factors for creating the DC system. The DC system helps firms maintain competitive advantage by enabling them to respond to various internal and external environmental factors. Managed by feedback mechanisms, the DC system facilitates the regular renewal of dynamic capabilities.

Barbosa and Carvalho (2024) developed a multi-level dynamic capabilities framework through the lens of project management, project portfolio management, and project-based organizations (PBOs). The study identified and categorized 99 dynamic capabilities (DCs) across these three levels. Following Teece's (2007) micro-foundation framework, the DCs were classified into three categories: sensing, seizing, and reconfiguring. Each level's DCs need to remain continuously active, with bidirectional learning flows between the levels to respond effectively to market changes. The framework highlights the core DCs at each level and their interactions, stressing the importance of knowledge in the development of DCs. Bibliometric analysis and thematic mapping indicated that knowledge transfer, tacit knowledge, absorptive capacity, and learning mechanisms are key research themes. Additionally, the study pointed out a gap in the literature regarding the relationship between entrepreneurial orientation and the development of DCs.

Zott (2003) explored the impact of dynamic capabilities on the evolution of resource allocation within firms in the same industry. The key attributes of dynamic capabilities examined included the timing of resource deployment, associated costs, and learning processes. The findings revealed that the timing of resource deployment significantly affects firm performance. Even when firms have similar dynamic capabilities, resource reconfigurations at

different points in time can result in performance variations. Firms that effectively manage these costs can maintain a competitive advantage. Learning how to reconfigure resources influences the trajectory of performance, leading to differences in firm performance under certain conditions. Over time, even small initial differences between firms can lead to significant performance disparities. The interplay of timing, cost management, and learning effects fosters stable performance differences among firms with similar dynamic capabilities, contributing to sustained differentiated performance patterns within an industry.

Dynamic capabilities are embedded in a firm's abilities, processes, or routines, enabling the firm to effectively respond to environmental changes, adjust, and reconfigure resources and capabilities in a timely manner to maintain sustained competitive advantage. H. P. Wang (2019) analyzed the mechanisms by which dynamic capabilities influence competitive advantage:

(1) Dynamic capabilities create new advantages through continuous exploration and innovation

Dynamic capabilities not only inherit the views of the Resource-Based View (RBV) and core competence theory but also emphasize their higher-order nature—the ability to change a firm's capabilities. Firms that build highly flexible organizational systems enhance their exploratory and innovative capacities. For example, Alibaba has maintained its competitive advantage in a highly turbulent market environment through continuous innovation. Dynamic capabilities drive firms to innovate continuously, enhancing their ability to adapt to dynamic environments, thereby leading to sustained competitive advantages.

(2) Dynamic capabilities sustain competitive advantage through openness and learning

Dynamic capabilities emphasize both internal and external knowledge acquisition and learning. Firms must not only accumulate internal knowledge but also adapt to changes in the external environment by engaging in dynamic learning through methods such as learning by doing, trial-and-error learning, and improvisational learning. This openness and learning attribute address the shortcomings of RBV and core competence theory, enabling firms to rapidly adapt to environmental changes and maintain a competitive edge.

(3) Dynamic capabilities maintain and strengthen competitive advantage by timely analyzing competitors' changes

One key feature of dynamic capabilities is the ability to keenly grasp market dynamics. By systematically and scientifically tracking and monitoring the external environment, firms can timely predict competitors' strategic moves, adapt to changes, and create new competitive strengths. For example, dynamic capabilities enable firms to maintain and enhance competitive advantage in hyper-competitive environments by discarding outdated capabilities and

developing new ones.

(4) The comprehensive nature of dynamic capabilities facilitates the acquisition and maintenance of competitive advantage

Dynamic capabilities are both specific operational capabilities and abstract guiding principles. The concrete perspective views dynamic capabilities as actionable abilities, routines, and processes, while the abstract perspective considers them as a guiding philosophy. Dynamic capabilities can be measured through specific indicators and can also be embedded as a macro-level guiding philosophy within the corporate culture, influencing and guiding daily operations. This integration helps firms sustain competitive advantage over the long term.

(5) The complexity of dynamic capabilities makes them difficult for competitors to imitate, thereby promoting sustained competitive advantage

The complexity of dynamic capabilities, along with the complexity of a firm's processes, makes it challenging for competitors to replicate them. For instance, Walmart has achieved and maintained a lasting competitive advantage in the fiercely competitive retail industry through its complex and efficient supply chain management system. This characteristic of dynamic capabilities helps firms create barriers to imitation by competitors, enabling them to sustain their competitive advantage over the long term.

2.2.4 Summary of the DCV

Teece et al.'s theory is highly universal in scope but relatively weak in terms of practical implementation. While they emphasize the importance of dynamic capabilities, they do not provide detailed guidance on how to effectively implement these capabilities in different industries or environments. Future research should further explore how to apply these abstract concepts to practical business operations, particularly in the context of small- and medium-sized enterprises (SMEs) or firms in emerging markets.

Eisenhardt and Martin (2000) argue that dynamic capabilities are not only firm-specific but also exhibit commonalities across different firms. These commonalities can serve as best practices for responding to market changes. However, they fail to fully explain how common dynamic capabilities manifest across firms and how these commonalities evolve with market environment or technological changes. Although common dynamic capabilities offer an attractive framework, their practical operability still requires further empirical testing.

Winter (2003) distinguishes between dynamic capabilities and ordinary capabilities, enhancing theoretical clarity. However, this distinction can lead to confusion in practice,

particularly in business management, where it is difficult to clearly define whether certain capabilities belong to dynamic or ordinary capabilities. The theoretical framework needs further refinement to provide greater clarity in practical applications.

Zollo and Winter (2002) propose that dynamic capabilities are developed through deliberate learning processes, which facilitate knowledge accumulation and integration within organizations. Although they emphasize the importance of conscious learning for the development of dynamic capabilities, in most practical business settings, learning processes are often unsystematic, particularly in resource-constrained or rapidly expanding firms. While deliberate learning is ideal, how to transform it into an efficient, continuous learning mechanism in practice remains unresolved.

Helfat (2022) argues that externally-oriented dynamic capabilities enable firms to directly interact with and influence the external environment through mergers, alliances, and other strategies, thereby enhancing their adaptability. However, this view is primarily applicable to resource-rich large enterprises. For resource-limited SMEs, how to effectively apply externally-oriented dynamic capabilities has not been deeply discussed. Moreover, the operationalization and measurement of externally-oriented dynamic capabilities still require further development.

Zahra et al., (2006) emphasize that dynamic capabilities are closely related to the role of managers, who respond to environmental changes by reconfiguring resources and routines, particularly in the context of entrepreneurial firms. However, how managers can identify and effectively utilize dynamic capabilities in practice has not been adequately explained. Additionally, the development of dynamic capabilities in entrepreneurial firms is often constrained by resources, and existing research has not sufficiently explored how to cultivate and enhance these capabilities under resource limitations.

C. L. Wang and Ahmed (2007) decompose dynamic capabilities into innovation, absorptive, and adaptive capabilities. However, this categorization does not fully account for the specific needs and environments of different firms. For example, high-tech firms and traditional manufacturing firms may have significantly different demands for innovation capabilities. Future research could further refine the specific manifestations of various types of dynamic capabilities across different industries.

In summary, most of the theories in the literature, particularly the dynamic capabilities frameworks, while highly universal at the theoretical level, lack practical operability and adaptability in real-world applications. Given the significant differences in firm size, industry type, and market environment, the flexible application of dynamic capabilities theory according to these differences remains an underdeveloped area in current research. Managers play a

critical role in identifying and developing dynamic capabilities, particularly in entrepreneurial firms. However, the literature does not provide sufficient discussion on how to systematically cultivate managers' ability to recognize and utilize dynamic capabilities. Future research should focus on how managers can make effective decisions and allocate resources in complex environments. Most studies on dynamic capabilities concentrate on large firms and developed markets, with few addressing the dynamic capabilities of entrepreneurial firms. The development of dynamic capabilities in emerging markets and SMEs is evidently different from that in large enterprises, and future research should pay more attention to the unique challenges and needs of these firms.

2.2.5 Empirical studies on firm’s dynamic capabilities

2.2.5.1 Antecedents of dynamic capabilities

Bornay-Barrachina et al. (2023) explored how dynamic capabilities in innovative firms are influenced by strategic leadership, particularly in the development of sensing, seizing, and reconfiguring capabilities. The study focused on understanding the complex interaction between organizational learning (including exploratory and exploitative learning) and strategic leadership (including transformational and transactional leadership) in the process of developing dynamic capabilities. Data were collected through questionnaires from a sample of 106 firms, with respondents including managers from production and marketing departments, as well as human resources managers. The data analysis employed multivariate and hierarchical regression analysis to test the hypotheses, with independent analyses conducted for data from production and marketing departments to observe how the variables behaved across different departments.

The findings of this study demonstrated that organizational learning and strategic leadership play critical roles in the development of dynamic capabilities. Exploratory learning and exploitative learning were found to have varying levels of importance in the development of dynamic capabilities in different departments. Furthermore, transformational leadership was shown to significantly moderate the effect of exploratory learning, enhancing its impact on dynamic capability development. These results are significant for understanding how effective organizational learning and leadership can improve a firm’s dynamic capabilities, helping the firm sustain competitive advantage in dynamic environments.

Asija and Ringov (2021) introduced a corporate governance perspective, highlighting the crucial roles of board monitoring and management incentives in dynamic capabilities,

especially under varying levels of environmental dynamism. The research found that in stable environments, board monitoring amplifies the value of complex routines dynamic capabilities by reducing managerial discretion. However, in dynamic environments, board monitoring amplifies the negative effects of complex routines dynamic capabilities. The structured and codified nature of complex routines limits its flexibility, making it difficult for management to adjust quickly to new situations, thus reducing its value. Performance-based incentives further exacerbate the negative impact of complex routines.

Buccieri et al. (2021) explored the role of dynamic capabilities in international new ventures (INVs) from emerging markets and analyzed the moderating effect of international entrepreneurial culture (IEC) in this process, particularly in turbulent market conditions. The study sample consisted of 286 international new ventures from India's high-tech industries, including information technology, electronics, aerospace, biotechnology, and pharmaceuticals. The research findings indicated that IEC had a significant positive impact on dynamic capabilities, suggesting that IEC enhances a firm's sensing, seizing, and reconfiguring capabilities, thereby improving its dynamic capabilities. Additionally, dynamic capabilities were found to have a significant positive impact on international performance, further confirming the critical role of dynamic capabilities in enhancing a firm's international performance.

2.2.5.2 The impact of dynamic capabilities on firm performance

Ilmudeen (2024) examined how IT governance mechanisms and IT-enabled dynamic capabilities (ITDC) enhance firm performance in dynamic environments. The study employed a quantitative research method, using survey data from 188 senior IT and business managers in Sri Lanka for empirical analysis. Although the moderating effect of a dynamic environment was not significant, the overall findings indicated that IT governance mechanisms and ITDC play a crucial role in improving firm performance. This suggests that effectively governing IT resources and developing IT-driven dynamic capabilities can significantly contribute to a firm's success, even in rapidly changing environments.

Clampit et al. (2022) examined the impact of dynamic capabilities on the performance of small and medium-sized enterprises (SMEs) during the COVID-19 pandemic. Specifically, they explored whether dynamic capabilities could predict SMEs' operational levels and revenue changes during the pandemic, as well as the moderating role of firm size in this relationship. The findings indicated that dynamic capabilities had a significant positive impact on SMEs' operational levels and revenue changes during the pandemic. Firms with higher dynamic

capabilities were better able to adapt to market changes, maintaining stable operations and revenues during the crisis.

Ma et al. (2021) studied the impact of IT, absorptive capacity, and IT-enabled dynamic capabilities (sensing, seizing, reconfiguring, coordinating) on firm performance. Data were collected through online surveys from target respondents, including IT directors, IT managers, and business managers, yielding 241 valid samples. The empirical research validated the relationship between IT, absorptive capacity, dynamic capabilities, and firm performance, emphasizing the critical mediating role of absorptive capacity between IT and firm performance. The results demonstrated that firms could significantly enhance their absorptive capacity and overall performance through effective IT management and the development of dynamic capabilities.

Ayegba (2021) divided dynamic capabilities into six dimensions: product innovation capability, strategic decision-making capability, strategic flexibility, technological capability, firm efficiency capability, and the complexity of technological turbulence. The study analyzed the mediating role of dynamic capabilities between firm networks and the performance of SMEs. The results showed that all dimensions of dynamic capabilities had a significant positive impact on firm survival, with competitive intensity and technological turbulence being key variables that enhance firm survival.

Monferrer et al. (2015) explored how dynamic capabilities in Spanish firms influence the growth of born-global companies through social networks. Born-global firms are those that are globally oriented from their inception and rapidly enter multiple international markets, typically within three years of their founding. These firms target international markets right from the start, not just the domestic market, and often rely on innovative products, services, or business models to gain a competitive advantage in global markets. The study identified three key dimensions of dynamic capabilities: sensing capability, absorptive capability, and transformative capability. These dimensions work together to improve a firm's innovation capacity and market responsiveness. The enhancement of dynamic capabilities was shown to significantly promote firm growth, including the expansion of market share and improvements in financial performance.

Nguyen (2019) explored the mechanisms by which social networks and dynamic capabilities impact the growth of small and medium-sized enterprises (SMEs) in Vietnam. The study focused on the mediating role of dynamic capabilities between social networks and SME growth, with the aim of providing strategic and policy recommendations to enhance the dynamic capabilities and social network development of Vietnamese SMEs. Data were

collected through a survey of Vietnamese SMEs, and structural equation modeling (SEM) was used for empirical analysis and hypothesis testing to validate the research model and hypotheses. The results showed that dynamic capabilities had a positive impact on financial growth indicators but had no significant effect on non-financial growth indicators. Dynamic capabilities acted as a mediator between social networks and SME growth.

T. Li (2019) used normative analysis to construct a conceptual model linking organizational flexibility, dynamic capabilities, and firm performance. The study then employed empirical analysis through a quantitative research approach, collecting primary data via surveys. A self-developed scale was used to measure dynamic capabilities across three dimensions: environmental sensing capability, resource integration capability, and organizational change capability. The results indicated that the various dimensions of dynamic capabilities played a mediating role between organizational flexibility and firm performance.

H. P. Wang (2019) conducted a study targeting middle and senior managers, using structured questionnaires to validate the impact of four dimensions of dynamic capabilities—adaptive capability, integrative capability, relational capability, and market sensing capability—on firm performance. The study concluded that managers' adaptive, integrative, and relational capabilities have a significant direct impact on competitive advantage, while the direct impact of market sensing capability is not significant. However, market sensing capability indirectly influences competitive advantage through value co-creation. The study found that value co-creation plays a crucial mediating role between dynamic capabilities and competitive advantage, especially in the case of market sensing capability, where a full mediating effect through value co-creation on competitive advantage was confirmed.

Dai (2019) explored the relationship between dynamic capabilities, business model innovation, and firm performance in startups. Results indicated that both dynamic capabilities and business model innovation positively contribute to startup performance. However, the impact of different dimensions of dynamic capabilities on firm performance varied significantly. Specifically, organizational learning capability, organizational innovation capability, and resource integration capability had a direct positive impact on firm performance, while resource reconfiguration capability and strategic isolation mechanisms indirectly impacted performance by influencing business model innovation. Dynamic capabilities were found to have a significant positive effect on value creation innovation, but their influence on value capture innovation varied. Business model innovation acted as a mediator in the relationship between various dimensions of dynamic capabilities and firm performance.

2.2.4.3 The impact of dynamic capabilities on innovation

Kadyrova and Shapira (2023) attempted to understand how nonprofit organizations can identify opportunities, seize them, and transform their operations through specific skills and processes (i.e., micro-foundations) to create social value and achieve sustainable development. The study adopted a qualitative case study approach, conducting in-depth analyses of 20 small nonprofit organizations across five metropolitan areas in Europe. Data were primarily collected through face-to-face interviews, supplemented by organizational websites and other documents. The interviews were analyzed using thematic analysis, where data were coded and categorized, ultimately leading to the development of a conceptual framework on the micro-foundations of dynamic capabilities.

The study's findings were as follows:

(1) Micro-foundations of Opportunity Sensing Capability

Personal Experience and Networks: Many founders identified unmet social needs through personal experiences and existing social networks.

Knowledge Integration: Organizations reimagined ways to address social problems by integrating knowledge from various sources.

Understanding of Social Problem Context: Through dialogue with partners and target groups, organizations developed a deeper understanding of the background and nature of social issues.

(2) Micro-foundations of Opportunity Seizing Capability

Social Value Orientation: Organizations prioritized user safety and needs throughout the various stages of innovation design. They also selected partners who shared their values to collaboratively design and deliver services.

Practical Use of Resources: Organizations actively sought and utilized limited resources through donations, fundraising, and multi-party collaborations to ensure service sustainability.

Flexible Processes: By employing short-term planning, rapid decision-making, and timely feedback to user needs, organizations established flexible processes to adapt to changing environments.

Micro-foundations of Transformation Capability:

Organizational Restructuring: Organizations enhanced their professional image and ability to access resources by changing their legal status (e.g., transitioning from informal to formal structures).

Organizational Learning: Through experimentation and accumulated experience,

organizations continually optimized their processes and utilized existing knowledge and infrastructure to develop new social innovation projects.

Through case studies, this study demonstrates how small nonprofit organizations utilize dynamic capabilities to create public value during the social innovation process. Despite limited resources, these organizations effectively address social issues by employing flexible processes and practical resource utilization. The findings provide practical guidance for nonprofit managers, helping them understand and apply dynamic capabilities to foster social innovation and achieve sustainable organizational development.

Ho et al. (2024) utilized a quantitative analysis method to examine time-lagged data from 456 SMEs in Australia. The study aimed to explore how Strategic Human Resource Management (SHRM) and Entrepreneurial Orientation (EO) influence innovation in SMEs through dynamic capabilities, which include sensing, seizing, reconfiguring, coordinating, learning, and enhancing. The results supported the significant roles of SHRM and EO in enhancing dynamic capabilities and innovation in SMEs. Specifically, EO not only directly strengthened dynamic capabilities but also further promoted innovation by enhancing these capabilities. However, the moderating role of EO on the relationship between SHRM and dynamic capabilities was not significant. This could be because, in firms where EO is already strong, the necessity of HRM policies and practices is well-established, and further EO may not be needed to enhance their effect.

Soluk et al. (2021) explored the role of dynamic capabilities in digital business model innovation (BMI) within family businesses. Specifically, the study examined how family influence fosters digital BMI through three dynamic capabilities: knowledge utilization, risk management, and marketing capabilities. Using survey data from 1,444 companies in Germany, including both family and non-family businesses, the findings indicated that family influence has a positive impact on dynamic capabilities. Dynamic capabilities significantly improved firms' levels of digital BMI. Knowledge utilization capabilities helped firms manage uncertainty effectively during digital BMI, risk management capabilities enabled firms to address new risks posed by digital technologies (such as cybersecurity and intellectual property protection), and marketing capabilities allowed firms to better understand and respond to rapidly changing markets and customer needs. The study highlighted the mediating role of dynamic capabilities: dynamic capabilities fully mediated the relationship between family influence and digital BMI. This means that family influence enhanced digital BMI through dynamic capabilities rather than having a direct effect. Interestingly, environmental dynamism weakened the positive relationship between family influence and dynamic capabilities, which

was contrary to the researchers' hypothesis. While family businesses had an advantage in static environments, the positive impact of family influence on dynamic capabilities diminished in dynamic environments.

Steen et al. (2021) explored how the dynamic capabilities model facilitates innovation in large-scale, cross-enterprise projects. The research employed a quantitative analysis method, analyzing data from companies involved in large oil and gas projects to validate the applicability of Teece's dynamic capabilities model in this environment. The findings revealed that the "sensing, seizing, and reconfiguring" model of dynamic capabilities effectively explains innovation in cross-enterprise projects. There was a significant interaction between sensing activities (such as information gathering and disclosure) and seizing activities (such as project network capabilities and adaptive problem-solving), indicating that their relationship is not merely linear.

Coombes and Nicholson (2021) focused on how dynamic capabilities enable opportunity identification, evaluation, and collaborative co-creation in a public-private partnership (PPP) case, leading to value co-creation and capture beyond the firm’s boundaries. The study employed a case study approach, analyzing a PPP example in a northern city in England, involving two companies—Build Invest and Northern Care Partnership. The findings revealed that Build Invest's CEO, David, during a visit to the U.S., sensed a business model innovation opportunity that highlighted the potential to adjust the company's business model toward developing new products/services and entering new markets. This sensing capability enabled the firm to identify new market needs and opportunities amidst uncertainty. After identifying the opportunity, David collaborated with Northern Care Partnership's CEO, Mark, to jointly bid for and win their first Private Finance Initiative (PFI) project. This project offered not only financial and construction opportunities but also involved the ongoing management of facilities. This demonstrated the firm’s capability to seize opportunities by designing innovative business models and securing the necessary resources and capital. After successfully completing the first PFI project, Build Invest reconfigured its resources, restructuring the company and creating a new open business model. This new model not only met customer needs but also optimized internal resource allocation, showcasing the firm’s dynamic transformation capability. This case highlighted how dynamic capabilities facilitated collaborative innovation and value co-creation across organizational boundaries in the context of a PPP.

Wei (2019) first selected representative firms from different industries for in-depth case analysis, collecting first-hand data through semi-structured interviews to validate the applicability of the theoretical model. The study results indicated that dynamic capabilities have

a significant positive impact on a firm's innovation performance. Specifically, niche construction capability, niche misalignment capability, and niche co-opetition capability were identified as key components of dynamic capabilities, all of which positively influence innovation performance. In competitive environments, external species invasion and local species variation were found to significantly affect niche construction, niche misalignment, and niche co-opetition capabilities, respectively. External species invasion primarily impacts firms' niche construction and misalignment capabilities through mechanisms such as technological spillover and market competition. Local species variation, on the other hand, influences firms' niche co-opetition capabilities through business model innovation and changing market demands.

Williamson (2016) explored how Chinese companies develop and utilize dynamic capabilities during rapid innovation processes. Through inductive analysis of case studies from several successful Chinese innovation firms and two rounds of semi-structured interviews, the study found that leading Chinese companies have developed various dynamic capabilities, enabling them to thrive in highly competitive markets and accelerate innovation. These dynamic capabilities include:

Rapid “start-sense-improve” cycles to sense fast-changing market opportunities.

Flexible assembly-line product development processes to quickly seize opportunities.

Concurrent engineering to redesign new product development processes, thereby accelerating innovation.

Modular product development processes to facilitate the rapid introduction of new products.

Organizational structures combining vertical hierarchy with horizontal flexibility to achieve rapid transformation and continuous innovation.

These capabilities are not only dependent on internal organizational structures and processes but also on the perceptions and behaviors of company leadership, operational management, and frontline employees. Although dynamic capabilities may not directly result in technological breakthroughs, they enable companies to maintain leadership through constant rapid innovation, thereby sustaining competitive advantage. This study highlights the importance of dynamic capabilities in the context of globalization, particularly in highly competitive markets where firms need dynamic capabilities to maintain their competitive edge. The research also pointed out that the formation and effectiveness of these capabilities are largely dependent on the characteristics of the local environment, including consumer behavior, resource and talent availability (or scarcity), the stage of economic development, the nature of competition, and local culture. This suggests that the transfer and application of these

capabilities may be limited in different markets.

Helfat (1997) selected several high-tech firms as research subjects, focusing on those facing rapidly changing market environments during their R&D processes, to evaluate the relationship between knowledge complementarity, asset complementarity, and dynamic capabilities. The study found that a high level of knowledge complementarity significantly enhances a firm's dynamic capabilities. This manifests in the firm's ability to more quickly identify and exploit market opportunities, improving R&D efficiency and innovation capacity. The improvement in dynamic capabilities directly contributed to better firm performance, as evidenced by expanded market share, higher product innovation success rates, and stronger financial performance. Through empirical analysis, the study confirmed the importance of knowledge and asset complementarity in the accumulation of dynamic capabilities.

2.2.4.4 The impact of dynamic capabilities on competitive advantage

Ng and Ahmed (2024) investigated how firms leverage dynamic capabilities and various types of innovation to achieve timely responsiveness, thereby gaining a competitive advantage in supply chain management. Specifically, the study analyzed two dynamic capabilities—sensing capability and reconfiguration capability—and their roles in product, process, and management innovation to enhance firms' timely responsiveness. The research employed an empirical analysis method, using survey data from 1,112 high-tech firms in Malaysia, selected from the Orbis database.

The results showed that sensing capability significantly promoted product and process innovation but had no significant impact on management innovation. On the other hand, reconfiguration capability significantly promoted product, process, and management innovation. The study highlighted the crucial role of dynamic capabilities in different types of innovation, helping firms improve their responsiveness within the supply chain. Sensing and reconfiguration capabilities were particularly effective in fostering product and process innovation, and the role of reconfiguration capability in management innovation was also validated.

Ng (2022) used a multiple case study approach, conducting in-depth interviews and data analysis with seven high-tech SMEs in Malaysia to explore how these firms update resources in their projects. The study aimed to understand how high-tech SMEs renew their resources through dynamic capabilities during innovation projects to adapt to environmental changes, seize new business opportunities, and remain competitive in fiercely competitive markets. The focus was on uncovering how these firms update resources through acquiring new technological

resources, using prototyping methods, solving project issues, and learning from clients' R&D activities.

The study identified four primary ways in which high-tech SMEs update resources during projects:

Acquiring New Technological Resources to Meet Client Needs: Resource gaps are identified during departmental meetings, and advanced technologies and equipment are acquired through increased capital expenditure to fill these gaps.

Using Prototyping Methods: During the project design phase, firms use prototyping methods, allowing for trial and error and feedback to refine models and ensure the final product meets client needs.

Creating New Resources by Solving Project Issues: Project teams conduct on-site investigations to identify problems and collectively solve them during operational meetings, generating new technical knowledge.

Learning from Participating in Clients' R&D Activities: By participating in clients' R&D activities, project teams gain insights into clients' unique product needs and technical know-how.

The research demonstrated that dynamic capabilities play a crucial role in resource renewal and adaptation to environmental changes in high-tech SMEs. By acquiring new resources, employing prototyping methods, solving problems, and engaging in clients' R&D activities, these firms are able to create new resources during innovation projects, thereby enhancing their competitiveness and adaptability.

Z. P. Li (2020) explored the impact mechanism of dynamic capabilities on the competitive advantage of tourism enterprises, with value co-creation as a mediating variable and customer trust as a moderating factor. The research identified three dimensions of dynamic capabilities: resource integration capability, market sensing capability, and adaptability. The results showed that resource integration capability and market sensing capability had a significant positive impact on the competitive advantage of tourism enterprises, while adaptability did not have a significant direct effect. Additionally, the study confirmed the mediating role of value co-creation and the moderating role of customer trust. The research provided practical pathways for tourism enterprises to enhance their competitive advantage, emphasizing the importance of dynamic capabilities and value co-creation.

J. B. Li (2019) employed a case study method, selecting six typical startup companies. The study involved interviews with entrepreneurs and managers, as well as the collection of relevant secondary data to validate and refine the theoretical model. The findings revealed that both

explicit and tacit knowledge sharing positively influenced the competitive advantage of new firms. Dynamic capabilities, including absorptive capacity, adaptability, and innovation capability, had a significant impact on the competitive advantage of new firms. Both explicit and tacit knowledge sharing positively affected different dimensions of dynamic capabilities. Dynamic capabilities acted as a mediator between knowledge sharing and competitive advantage in new firms.

Jiang (2011) combined normative and empirical research with qualitative and quantitative methods to study the impact mechanism of supply chain dynamic capabilities on a firm's competitive advantage. The results indicated that different dimensions of dynamic capabilities—information sharing capability, responsiveness, integration capability, coordination capability, learning capability, and reconfiguration capability—had varying degrees of influence on enhancing a firm's competitive advantage. Dynamic capabilities improved supply chain management and operational efficiency, thereby increasing a firm's market responsiveness and innovation capability, ultimately boosting its competitive advantage.

Fainshmidt et al. (2019) developed a theoretical framework to explain the relationship between dynamic capabilities and competitive advantage. The study surveyed 162 companies in Israel across multiple industries, operating in environments with varying levels of dynamism and resource abundance. The study concluded that the effectiveness of dynamic capabilities in achieving competitive advantage depends on the fit between the firm's strategic orientation and environmental conditions. Specifically, dynamic capabilities are more suitable for supporting differentiation strategies in dynamic and resource-abundant environments, while in resource-scarce environments, they are better suited to supporting low-cost strategies. In stable and resource-abundant environments, dynamic capabilities have a limited role, but in stable and resource-scarce environments, they can drive competitive advantage through low-cost strategies.

Khan et al. (2020) employed a multiple case study method, selecting four successful circular economy firms in Italy as research subjects. Data were collected through in-depth interviews with senior management, as well as secondary sources, including the firms' sustainability reports, media interviews, press releases, and information from the companies' official websites. The study found that dynamic capabilities play a significant positive role in the implementation of the circular economy. The case firms identified circular economy opportunities by leveraging four micro-foundations of "sensing" capabilities: market monitoring and technology scanning, idea generation, knowledge creation, and experiential learning. They implemented these opportunities through three micro-foundations of "seizing"

capabilities: strategic planning, business model and governance, and collaboration. Additionally, the firms used four micro-foundations of "reconfiguring" capabilities: organizational restructuring, technology upgrading, knowledge integration, and adaptation of best practices.

2.2.4.5 A summary of empirical studies on dynamic capabilities

Asija and Ringov (2021) found that corporate governance mechanisms, particularly board monitoring and managerial incentives, play a key role in influencing dynamic capabilities, specifically in the context of complex codified routines (TPS) and simple rules (EM) capabilities. Their study provides strong theoretical support for the value of TPS dynamic capabilities in stable environments and the advantages of EM dynamic capabilities in dynamic environments. However, the research overlooks the differences in governance structures among small and medium-sized enterprises (SMEs) and how resource-constrained firms can flexibly apply these dynamic capabilities.

Buccieri et al. (2021) explored how international entrepreneurial culture (IEC) enhances dynamic capabilities to improve international performance in international new ventures (INVs) in emerging markets, particularly during periods of market turbulence. While the study confirms the positive influence of IEC on dynamic capabilities, it focuses too heavily on international new ventures, neglecting the development of dynamic capabilities in non-high-tech or localized firms. Companies in emerging markets may require different dynamic capability strategies when facing varied market disruptions.

Ilmudeen (2024) investigated the role of IT governance mechanisms and IT-driven dynamic capabilities (ITDC) in improving firm performance under dynamic environments. However, the study lacks detailed explanations of how to increase the engagement of non-IT departments or how SMEs with limited resources can implement these IT governance mechanisms effectively.

Clampit et al. (2022) highlighted the importance of dynamic capabilities during crises but overlooked the long-term effects and the role of dynamic capabilities in the recovery phase post-crisis. Future research should explore how firms adjust their long-term strategies following a crisis and how dynamic capabilities evolve during recovery.

Ma et al. (2021) confirmed the significant impact of information technology, absorptive capacity (ACAP), and IT dynamic capabilities on firm performance, particularly the mediating role of absorptive capacity in the relationship between IT and performance. However, the study does not fully address how firms lacking IT infrastructure or technical support can enhance absorptive capacity. Moreover, the synergy between IT and other key resources remains underexplored.

Monferrer et al. (2015) proposed that social networks support dynamic capabilities, but they overlooked the impact of cultural and regional differences, particularly how multinational enterprises balance local and global dynamic capabilities in different markets.

In summary, research on dynamic capabilities offers a broad theoretical framework, especially regarding how leadership, governance mechanisms, and IT governance can enhance dynamic capabilities. However, most of these studies are conducted within specific industries or contexts, limiting their general applicability. Future research should focus more on the differences between SMEs and large multinational enterprises in the process of implementing dynamic capabilities, as well as the similarities and differences in dynamic capability needs across industries. Many studies, such as those by Bornay-Barrachina et al., Asija, and Ringov, use questionnaires and regression analyses to measure dynamic capabilities, which, while providing valuable empirical data, may not fully capture the real responses of firms in complex environments. Future research should explore more dynamic and real-time measurement tools, incorporating big data analysis or real-time behavioral tracking to provide more accurate assessments of dynamic capability performance. While several studies emphasize the dynamic capabilities of SMEs (Ayegba, 2021; Ilmudeen, 2024), there is a lack of in-depth exploration of how large firms manage complex dynamic capability issues. Large firms, with their complexity in resources, organizational structure, and global expansion, require dynamic capability strategies different from those of SMEs, an area that warrants further investigation.

2.3 TMT’s dynamic capabilities

With the continuous improvement of the entrepreneurial environment and policies, China has become one of the most dynamic countries for innovation and entrepreneurship in the world. However, due to the inherent weaknesses of startups, more than half of new ventures fail within the first five years. In the context of rapid changes and uncertainty, breaking through the dual constraints of resources and opportunities to achieve entrepreneurial success has become a key challenge for both academia and practice. The development and utilization of dynamic capabilities by entrepreneurial teams is a crucial source of their competitive advantage.

Entrepreneurial executives must leverage their dynamic capabilities to adapt to the constantly changing environment, efficiently allocate resources, and seize emerging opportunities. These capabilities include the ability to sense changes in the market, reconfigure internal resources, and innovate within their business models. As startups often face resource constraints, the ability to dynamically adjust and innovate becomes vital to their survival and

long-term success.

2.3.1 The concept of TMT's dynamic capabilities

Through a review of the literature, this study found that research focusing on the dynamic capabilities of individual entrepreneurial team members remains limited. Most studies continue to concentrate on dynamic capabilities at the firm level.

Helfat and Peteraf (2015) emphasized the micro-foundations of dynamic capabilities at the individual managerial level. Their research introduced the concept of "managerial cognitive capability," highlighting the critical role of managers' cognitive abilities in the development and execution of dynamic capabilities. The study particularly focused on how these cognitive abilities lead to performance differences between firms. By integrating insights from cognitive psychology, social psychology, cognitive neuroscience, and behavioral decision theory, the study analyzed the cognitive foundations of dynamic capabilities and proposed a theoretical framework.

The authors conducted a detailed analysis of how managerial cognitive capabilities influence strategic change based on existing literature. The study found that "managerial cognitive capability" refers to the mental activities that enable managers to perform tasks such as sensing opportunities, seizing opportunities, and reconfiguring resources. These capabilities encompass perception, attention, problem-solving, reasoning, language, and social cognition. Cognitive capabilities influence how managers perceive and interpret information, make decisions, and implement strategies. Managers with superior cognitive capabilities are better equipped to handle complex and uncertain environments, thereby helping firms gain a competitive advantage.

Pennetta et al. (2024) conducted a bibliometric analysis to explore the distinctions between entrepreneurial and managerial capabilities, as well as their dynamic aspects, in order to reveal how these capabilities develop in the rapidly changing global economy. The study also examined their roles in driving innovation and enabling firms to adapt to environmental changes. The findings indicated that terms such as "skills," "capabilities," "competencies," and "personal traits" are frequently used in both management and entrepreneurship literature. Dynamic capabilities were found to be increasingly important in both domains.

In the management and entrepreneurship fields, terms like "competency" were more often associated with managerial capabilities, while "capability" was more linked to entrepreneurial capabilities. However, dynamic capabilities emerged as a bridge between the two, emphasizing

their interconnectedness in the modern business environment. The study provided evidence of the prominence of dynamic capabilities in the literature, indicating their critical role in helping firms adapt and innovate in response to changing market conditions.

The research identified three main dimensions of dynamic capabilities: adaptive capacity, absorptive capacity, and innovative capacity. These capabilities are crucial in driving organizational change and sustaining competitive advantage. The study highlighted the overlap between managerial and entrepreneurial capabilities, noting that managers and entrepreneurs increasingly share many common capabilities in modern business practices. The frequent appearance of these capabilities in the literature suggests that the boundaries between the roles of managers and entrepreneurs are becoming blurred.

2.3.2 Empirical research on TMT's dynamic capabilities

Kor and Misangyi (2008) conducted a study aimed at exploring the impact of top management team (TMT) experience on a firm's dynamic capabilities and performance. They examined how TMT experience enhances a firm's dynamic capabilities, including the ability to sense opportunities, seize opportunities, and reconfigure resources, thereby improving firm performance. The study used longitudinal data involving multiple publicly traded companies. Data sources included company financial reports, the resumes of top management team members, and market data.

The findings revealed that TMT experience has a significantly positive impact on the development of dynamic capabilities within firms. Experienced management teams were found to be more effective at sensing market opportunities, seizing those opportunities, and reconfiguring resources to adapt to market changes. Dynamic capabilities served as a mediating factor between TMT experience and firm performance. Specifically, TMT experience indirectly improved firm performance by enhancing the firm's dynamic capabilities. Firms with stronger dynamic capabilities were able to respond more flexibly to market changes, leading to improved performance. This included enhanced innovation capacity, faster market response times, and more efficient resource allocation.

Shi (2021) explored the mechanisms of entrepreneurial team dynamic capabilities and their impact on entrepreneurial performance through systematic review, case study, and survey methods. Entrepreneurial team dynamic capabilities refer to the ability of entrepreneurial teams to purposefully acquire, integrate, and renew internal and external resources and capabilities in rapidly changing environments to identify and exploit opportunities. Based on the resource-

based view, cognitive theory, and capability theory, entrepreneurial team dynamic capabilities encompass two fundamental dimensions: opportunity recognition capability and opportunity exploitation capability.

Opportunity Recognition Capability refers to the team's ability to sense potential entrepreneurial opportunities by acquiring and integrating internal and external resources and capabilities. This includes the team's keen perception of market changes, technological developments, and customer needs, as well as the ability to share and integrate information among team members.

Opportunity Exploitation Capability refers to the ability to reconfigure and deploy resources and capabilities to successfully commercialize potential entrepreneurial opportunities. This includes the team's ability to allocate resources, optimize business processes, develop market entry strategies, and address challenges and obstacles in the commercialization process.

Building on this, Shi (2021) conducted a longitudinal case analysis of Zhubajie.com, a major crowdsourcing platform in China, and proposed a theoretical model in which entrepreneurial team cognition promotes the development of dynamic capabilities. The results revealed that the generation of entrepreneurial team dynamic capabilities is a cognition-driven process that follows the logic of "team cognition - value co-creation - dynamic capabilities."

2.3.3 Summary of TMT’s dynamic capabilities

Helfat and Peteraf (2015) introduced the concept of "managerial cognitive capability," emphasizing the importance of managerial cognition in the development and execution of dynamic capabilities. This was a significant contribution in linking managerial cognition with dynamic capabilities and proposing a theoretical framework. However, despite emphasizing the role of cognitive capability in strategic change, the study lacks systematic empirical validation, particularly in terms of how to measure and enhance managerial cognitive capabilities, leaving many questions unanswered.

Pennetta et al. (2024) utilized bibliometric analysis to highlight the overlap between managerial capabilities and entrepreneurial capabilities, identifying dynamic capabilities as a crucial connection between the two. However, this bridging concept lacks specific operational guidelines, particularly regarding its application in actual corporate management. Moreover, while the bibliometric analysis reveals the frequent mention of dynamic capabilities, there is limited discussion on how these capabilities are employed across different roles, such as entrepreneurs and managers. Future empirical research could explore the differences in the

manifestation of dynamic capabilities between these two roles.

Kor and Misangyi (2008) provided empirical evidence on how the experience of top management teams (TMTs) influences dynamic capabilities. However, the impact of such experience may vary depending on industry and market dynamics. Although the study was supported by longitudinal data, an over-reliance on TMT experience may lead to path dependency, potentially limiting a firm's innovation capacity. Future research could focus on how training and external learning can compensate for the lack of team experience or explore how young management teams can quickly accumulate effective dynamic capabilities.

Shi (2021) used specific case studies to illustrate the formation process of dynamic capabilities within entrepreneurial teams, particularly in enhancing firm performance through opportunity recognition and exploitation. However, the study's limitations lie in its dependence on case analysis, making it difficult to generalize the findings to other entrepreneurial teams across different industries or contexts. Additionally, the research mainly focuses on internal team interactions and resource integration, neglecting the influence of external factors (e.g., market conditions, policies) on the development of dynamic capabilities in entrepreneurial teams. Future research could integrate more cross-industry empirical data to explore how entrepreneurial teams' dynamic capabilities manifest in different environments.

2.4 Upper echelon theory

2.4.1 Definition and composition of UET

Upper Echelons Theory (UET) was first proposed by Donald Hambrick and Phyllis Mason in 1984. The theory posits that the personal characteristics of top executives—such as their experiences, values, and personalities—have a profound influence on an organization’s strategic decisions and overall performance (Hambrick & Mason, 1984). At its core, UET asserts that organizations are, in many respects, reflections of their top managers, particularly in terms of strategic direction and decision-making processes.

According to UET, when facing highly complex and uncertain decision environments, executives tend to rely on their past experiences, cognitive structures, and value orientations to interpret issues and make strategic choices. Given the individual differences in cognitive capabilities and mental models, executives with differing characteristics are likely to make different strategic decisions, ultimately shaping organizational outcomes. The theory emphasizes the following key propositions:

Executives' personal backgrounds shape how they select and interpret information;

Strategic choices are manifestations of executives' cognitive frames;

Organizational performance is an indirect outcome of executive characteristics.

Hambrick and Mason's (1984) conceptual framework—linking executive characteristics → strategic choices → organizational outcomes—has become a foundational model for subsequent empirical research. This model encompasses the following three components:

(1) Managerial Characteristics:

These refer to observable attributes of top executives (e.g., CEO and top management team), including age, educational background, career experience, tenure, and social origin. Such traits reflect the executives' knowledge base and cognitive styles, as well as implicit values and risk preferences, which in turn affect how they process information and make strategic judgments.

(2) Strategic Choices:

The strategies adopted by an organization are seen as externalized expressions of the cognitive frameworks and preferences of its top managers. Executives with different backgrounds may exhibit varying tendencies in strategic orientation—for instance, diversification, innovation investment, or international expansion. For example, highly educated executives or those with cross-industry experience are more inclined toward innovation strategies, while risk-averse executives may prefer conservative approaches.

(3) Organizational Outcomes:

Strategic choices ultimately influence firm performance through mechanisms such as resource allocation, organizational restructuring, and market behavior. Organizational outcomes encompass a range of indicators including financial performance (e.g., profitability, return on assets), market response, growth potential, and even long-term survival and sustainability.

The significance of the Upper Echelons Theory lies in its challenge to the traditional assumption that firms are purely rational decision-making entities. Instead, it establishes a behavioral foundation by linking organizational strategies closely to the individual characteristics of top executives. This theoretical lens offers a powerful explanation for organizational heterogeneity, emphasizing that corporate strategies are not formed through purely objective logic, but rather constructed through the subjective cognition of top managers. Such cognitive path dependence and bounded rationality also shape the firm's long-term strategic trajectory.

A substantial body of empirical research has since extended this theoretical framework, examining variables such as CEO succession, TMT diversity, and executive power structures,

and their effects on strategic choices and firm performance. As a result, UET has become a foundational pillar in the field of strategic management.

In a retrospective article, Hambrick (2016) reviewed the evolution of UET over the past three decades. He noted a clear shift from early research that primarily relied on demographic proxies (e.g., age, tenure, education) toward studies that delve deeper into underlying psychological mechanisms and mediating processes. He further advocated for future research to explore executive cognition, social dynamics within top teams, and their interaction with external environments, in order to enhance the explanatory power of the theory.

2.4.2 Empirical studies

Wang et al. (2022), based on Upper Echelons Theory, explored the impact of heterogeneity in the characteristics of TMT on corporate innovation performance, focusing specifically on companies listed on China's Growth Enterprise Market (GEM). The article points out that although differences in TMT backgrounds are considered relevant to corporate decision-making and performance, their specific impact remains inconclusive, particularly regarding their role in innovation performance. This study categorized TMT heterogeneity into: superficial heterogeneity, such as gender and age (innate and difficult to change), and deep heterogeneity, such as educational background and tenure (acquired and adjustable). Empirical results showed that superficial factors (gender and age heterogeneity) had no significant impact on innovation performance, while deep factors (educational background and tenure heterogeneity) had a significant and negative impact. This study supports the application of Upper Echelons Theory in Chinese startups and suggests that the negative effects of "deep background differences" should be emphasized rather than simply pursuing diversity.

Zhang and Zhang (2024), drawing on Upper Echelons Theory, examined the mechanisms through which top management team background characteristics affect firm innovation performance, with a particular focus on the role of TMT diversity under different levels of environmental dynamism. Using a sample of A-share listed manufacturing firms in China, their empirical analysis revealed that functional background diversity within TMTs significantly enhances innovation output, especially in highly dynamic environments. Furthermore, the study identified a moderating role of corporate governance structures in this relationship, reinforcing the applicability of UET in non-Western contexts.

Sperber and Linder (2018) examined how various configurations of TMT characteristics influence firm innovation. The study showed that no single executive trait (e.g., age, educational

background, or tenure) is sufficient to determine innovation outcomes. Rather, specific combinations of traits—such as being young yet experienced, or having a high educational background with moderate tenure—jointly shape innovation levels. Environmental dynamism was also found to moderate these configurations.

Bennat and Sternberg (2022), also working within the UET framework, explored how CEO characteristics influence a firm's adoption of the "Doing-Using-Interacting" (DUI) innovation model. The study contrasts this with the more traditional "Science-Technology-Innovation" (STI) approach, which often fails to capture the experiential, interactive, and knowledge-transfer-driven innovation typical of SMEs. Findings suggest that key CEO traits—including educational background, diverse professional experience, and risk preferences—significantly affect a firm's propensity to pursue DUI-based innovation strategies.

Chronopoulou (2024) investigated how "neotribal sociality" shapes executive social identity and strategic decision-making within organizations. The author argues that in today's highly digital and media-saturated environments, executives are not merely rational decision-makers but also cultural agents who construct meaning through group identification. The study emphasizes that upper-echelon characteristics should not be confined to demographic attributes (e.g., age, education) but must also account for informal dimensions such as cultural background, social participation, and emotional attachment.

Quinn et al. (2024) examined how cognitive traits of top executives at Guinness Nigeria influenced their use of management accounting information during the company's strategic expansion. The study highlighted the role of CEO and senior executives' background characteristics—such as education, professional experience, and tenure—in the adoption and interpretation of strategic information. The findings suggest that individual executive traits not only determine their sensitivity to external information but also shape organizational resource allocation and risk preferences, thereby exerting a critical influence on the firm's strategic expansion trajectory.

Kaur (2025), from a meta-theoretical integrative perspective, explored how managerial attention functions as a cognitive mediator in the formation and deployment of knowledge-based dynamic capabilities. The study argued that executives' cognitive characteristics and attentional focus influence the efficiency of the sensing, seizing, and transforming processes essential for dynamic capabilities. These cognitive dynamics, in turn, affect a firm's ability to build and sustain competitive advantage. By integrating UET with Dynamic Capabilities Theory, the study offers a theoretical foundation for understanding the linkage between executive characteristics and organizational capabilities, providing direction for future

frameworks that merge UET and DC.

2.4.3 Literature commentary

A substantial body of empirical research has been conducted within the framework of Upper Echelons Theory (UET), examining how executive characteristics influence strategic behavior and organizational performance. On one hand, many studies continue to follow the classical three-stage model proposed by Hambrick and Mason (1984) which links demographic characteristics, strategic choices, and organizational outcomes. These studies emphasize observable executive traits such as age, education, tenure, and functional background, and their impact on innovation, transformation, and performance (Sperber & Linder, 2018; Wang et al., 2022; Zhang & Zhang, 2024).

On the other hand, an emerging stream of research is moving beyond linear models to investigate deeper-level executive attributes such as cognitive structures, cultural identity, and psychological motivations. For example, variables such as CEO mindset, cultural affiliation, and attention have been incorporated into analytical frameworks, revealing their profound impact on strategic behavior. These developments have extended UET's explanatory reach and practical relevance, offering new perspectives on how firms adapt to uncertainty (Bennat & Sternberg, 2022; Kaur, 2025; Wang et al., 2022).

Nevertheless, current research faces several limitations in terms of theoretical integration, mechanism identification, and contextual adaptability. First, few studies have systematically linked executive traits to organizational dynamic capabilities, leaving unexplained how top management characteristics influence firm adaptation and innovation through internal processes. Second, in high-uncertainty, high-growth contexts—such as technology start-ups or digital transformation—UET lacks sufficient support from dynamic analytical mechanisms. Third, in emerging markets like China, the institutional moderating effects on executive characteristics remain underexplored.

2.5 Chapter summary

This chapter provides an in-depth literature review on the theoretical framework and concepts for understanding executive dynamic capabilities and their impact on firm performance. Building on the challenges faced by entrepreneurial firms in navigating turbulent and complex market environments, as discussed in Chapter 1, this chapter explores two key theoretical perspectives: the RBV and the DCV.

The RBV posits that a firm's unique internal resources are the primary source of competitive advantage. It argues that companies capable of developing, protecting, and utilizing resources that are valuable, rare, inimitable, and non-substitutable (VRIN) hold a favorable competitive position. However, the RBV has inherent limitations when applied to dynamic environments. For entrepreneurial firms like Company X, where adaptability and innovation are critical for survival and success, RBV alone is insufficient.

To address these limitations, scholars have proposed the DCV to extend the RBV, emphasizing the firm's ability to integrate, build, and reconfigure resources to respond to rapidly changing external conditions. The DCV is particularly relevant for entrepreneurial firms that operate in resource-constrained and fast-changing markets. Key dynamic capabilities include the ability to identify opportunities, integrate resources, and adjust business processes in response to external pressures, enabling firms to maintain flexibility and competitiveness. For entrepreneurial firms, these capabilities often rely on the leadership and strategic decision-making of top executives. In this regard, the UET plays a crucial explanatory role, demonstrating how the personal traits, cognitive abilities, and experiences of the TMT significantly influence strategic choices and, in turn, impact firm outcomes.

Based on the integration of the Dynamic Capabilities View (DCV) and Upper Echelons Theory (UET), this study proposes the theoretical framework illustrated in Figure 2.3.

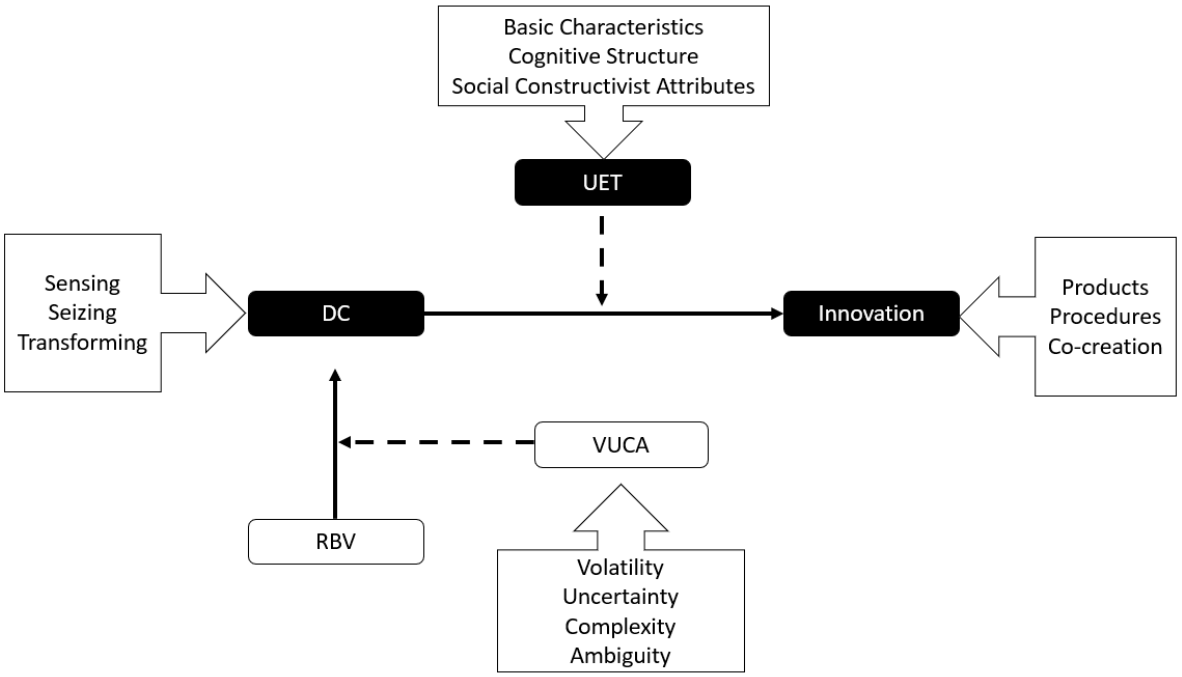


Figure 2.3 Theoratical model of this study

Chapter 3: Research Methods

This study adopts a qualitative empirical research approach, combining the collection of primary and secondary data through a single longitudinal case study and in-depth executive interviews. The aim is to explore how the dynamic capabilities of the top management team (TMT) at Company X influence the firm's innovation outcomes and entrepreneurial performance. Through longitudinal case analysis, the research examines the evolution of dynamic capabilities across different developmental stages of Company X. Meanwhile, executive interviews provide first-hand insights and experiences, enriching and validating the findings of the case study.

3.1 Case study

3.1.1 Rationale for method selection

The choice of a single longitudinal case study is grounded in its ability to offer a deep and nuanced understanding (Yin, 2003) of how a specific enterprise's TMT develops and transforms its dynamic capabilities over time and how these capabilities impact the firm's innovation and entrepreneurial performance. The greatest strength of a single-case design lies in its depth and detail (R. K. Yin, 2009). By focusing on Company X as a specific case, this study enables a thorough investigation of how the firm responds to changes in the external environment, market demand fluctuations, and technological innovation, as well as how its executive team mobilizes and adjusts its dynamic capabilities to tackle challenges at different growth stages (Baskarada, 2014).

The longitudinal aspect of the study further strengthens the analytical power of this approach (Piekkari & Welch, 2018). By analyzing data from multiple time points corresponding to different developmental phases, the research traces the TMT's decision-making processes, strategic shifts, and capability transformations. This design allows for a more precise capture of the evolution of dynamic capabilities, highlighting how the executive team adapts its strategies, addresses stage-specific challenges, and leverages its competencies to drive innovation in a fast-changing environment.

Moreover, single-case longitudinal research avoids the confounding effects that often arise

in multiple-case studies (Piekkari & Welch, 2018; Yazan, 2015), enabling a focused and in-depth examination of internal organizational dynamics without excessive external interference. In the context of a complex and rapidly evolving market environment, this method is particularly well-suited for uncovering how dynamic capabilities evolve in tandem with shifts in both internal and external conditions, ultimately shaping innovation performance. Therefore, a single longitudinal case study not only provides rich empirical data on the evolution of dynamic capabilities but also offers robust support for theoretical development and practical applications in the field.

3.1.2 Case selection and background

The selection of Company X as the case for this study is grounded in several key considerations:

(1) Industry context and strategic alignment

Company X is an artificial intelligence enterprise focused on digital transformation, offering intelligent solutions for sectors such as electricity, water conservancy, and rail transportation. In recent years, the company has benefited significantly from national industrial policies, particularly the "14th Five-Year Plan (2021)," which emphasizes smart grid development, new infrastructure construction, and digital transformation. Against this policy backdrop, Company X has experienced rapid growth and achieved notable success. Positioned within a high-growth industry, the company exemplifies how entrepreneurial ventures can leverage strategic alignment and dynamic capabilities to seize opportunities and achieve accelerated development under strong policy support.

(2) Representativeness of entrepreneurial stages

Founded in 2006, Company X has undergone multiple phases, including the initial start-up stage, rapid expansion, and eventually, public listing. These distinct stages make the firm a highly representative entrepreneurial case. Strategic decision-making and the dynamic capabilities of the TMT have been closely tied to each stage of the company's evolution, offering rich empirical material for analysis. The company's strategic responses to shifts in industry conditions, market demand, and technological advancements—such as adjusting strategies, reallocating resources, and enhancing team capabilities—demonstrate high research value.

(3) Dynamic capabilities of the TMT

Throughout its entrepreneurial journey, Company X has demonstrated exceptional leadership and strategic agility within its top management team. Particularly when faced with

rapid technological change, intense market competition, and evolving policy landscapes, the TMT has effectively leveraged dynamic capabilities to navigate challenges and drive enterprise growth. This makes Company X a compelling case for examining how dynamic capabilities evolve within entrepreneurial top management teams and how these capabilities influence innovation outcomes and overall organizational development.

In sum, Company X presents both representativeness and typicality as a research case. The dynamic capabilities, strategic decision-making processes, and adaptive responses exhibited by its executive team throughout various entrepreneurial stages provide a rich foundation for in-depth case analysis. This case helps uncover how dynamic capabilities interact with innovation performance and enterprise growth in entrepreneurial contexts.

3.1.3 Case data sources

To ensure both the breadth and depth of this research, a variety of data sources have been employed to support comprehensive and objective case analysis (Yin, 2003). The main sources of case data are as follows:

(1) Company annual reports

Annual reports serve as a crucial source for analyzing the long-term development and strategic decision-making of a company. By examining the financial data, strategic goals, and management discussion and analysis sections, researchers can gain insights into the firm's strategic adjustments, performance outcomes, and top management decision-making at different points in time. Since Company X is listed on China's STAR Market (A-share), it is required to publicly disclose its annual reports in accordance with China Securities Regulatory Commission (CSRC) regulations. This ensures transparency and accessibility of key strategic and financial information. In this study, annual reports are used as foundational data to analyze the relationship between the dynamic capabilities of the top management team (TMT) and innovation performance.

(2) External media reports

External media coverage—including industry news, market analysis reports, executive interviews, and expert commentary—provides a valuable external perspective. Such sources reflect the interaction between the company and its external environment, including policy shifts and competitive dynamics. These reports help interpret how the TMT identifies and responds to environmental changes. Furthermore, public and industry reactions captured by the media offer a means to validate the company's strategies and decisions from an external

viewpoint.

(3) Internal meeting minutes

Internal meeting minutes are a critical source for understanding the decision-making processes of the TMT. Analysis of discussions from strategic meetings, business planning sessions, and project evaluations enables researchers to uncover the team's decision-making patterns, communication mechanisms, and resource coordination strategies. These records reveal how dynamic capabilities are applied in practice, offering authentic insights into decision-making processes and implementation paths.

(4) Company archives

Company archives include key documents related to organizational development, such as strategic plans, project reports, and internal evaluation documents. These materials chronicle the company's strategic decisions, goal setting, market positioning, and project execution across different development stages. The data helps reconstruct the challenges faced and solutions adopted, revealing how the TMT adjusts its dynamic capabilities in response to evolving internal and external conditions to drive organizational growth.

(5) Chairman's speeches

The speeches and public statements of the company's chairman offer additional qualitative insights into the company's vision, leadership style, and strategic thinking. These materials supplement the above data sources and help interpret how leadership narratives align with the company's strategic evolution.

The specific data sources used in this study are detailed in Table 3.1.

Table 3.1 Overview of primary data sources for the case study

No.	Data Type	Description	Quantity / Time Frame	Research Purpose
1	Annual Reports	Contain financial data, strategic objectives, and Management Discussion & Analysis (MD&A), disclosed annually as required by CSRC.	6 reports from 2018 to 2024	To understand strategic adjustments, financial performance, and executive decision directions across stages; provide a basis for quantitative analysis.
2	External Media Reports	Include industry media, financial news, executive interviews, and policy analysis from public sources.	Over 30 articles (e.g., Caixin, 36Kr, official website)	To supplement understanding of the external environment's impact on strategy and dynamic capabilities; offer external validation of strategic outcomes.
3	Internal Meeting Minutes	Cover records from executive strategy meetings, project review	Over 20 sets of minutes (2021–2024)	To analyze the decision logic, communication patterns, and resource

		sessions, and annual planning discussions.		integration process of the executive team; provide real-time application evidence.
4	Internal Company Documents	Include strategic plans, project reports, internal evaluations, and major event records.	12 internal documents (2009–2024)	To reconstruct key strategic paths across different development stages; trace the evolution of dynamic capabilities in response to environmental shifts.
5	Chairman's Speeches	Public statements from the chairman delivered at AGMs, in interviews, and within annual reports.	6 instances (3 in annual reports, 2 interviews, 1 AGM speech)	To reveal top-level design and strategic vision; understand the team's perception of external challenges and internal capabilities.

Source: Created by this study

3.2 Semi-structured interviews

3.2.1 Interview objectives and significance

In this study, semi-structured interviews serve as a critical method for acquiring information on the dynamic capabilities of the executive team at Company X. By enabling direct dialogue with senior managers, the interviews aim to obtain first-hand insights into the company's development processes, thereby enhancing and validating the findings of the case study. Through face-to-face communication, this research seeks to understand how the executive team has applied dynamic capabilities across different stages of growth to navigate a complex and evolving internal and external environment, drive innovation and entrepreneurship, and extend the theoretical framework.

The primary objective of the interviews is to uncover how the executive team utilizes its dynamic capabilities to make adaptive strategic adjustments in response to market uncertainty, technological disruption, and policy shifts—thereby contributing to the firm's innovation performance. These strategic decisions often hinge on the accurate sensing and interpretation of environmental changes. Insights gathered through the interviews will assist the researcher in understanding how strategic reorientation, resource reconfiguration, and capability development are enacted to ensure the company's sustained innovation and growth across various stages. This direct form of data collection complements other sources and further enhances the depth of understanding of how dynamic capabilities function.

Secondly, the interviews provide empirical support for the theoretical analysis. The

perspectives and experiences shared by the executive team offer valuable operational insights, particularly concerning how dynamic capabilities concretely influence innovation outcomes. These empirical inputs not only enrich the theoretical model but also enhance its practical applicability and explanatory strength. The executives' feedback enables a more grounded understanding of the formation and application of dynamic capabilities throughout different phases of organizational development, deepening the analysis of their relationship with innovation and entrepreneurial performance.

In conclusion, by eliciting detailed experiences and strategic reflections from Company X's leadership, the interviews serve a dual purpose: providing robust empirical validation for the case study findings and offering evidence-based support for refining the theoretical framework. This approach contributes to a more comprehensive and in-depth data foundation, ultimately improving the scientific rigor and practical relevance of the study's subsequent analyses and conclusions.

3.2.2 Selection of interviees

This study selects three technology-oriented firms listed on China's STAR Market—Company X, Company Y (Youfang Technology), and Company Z (Qipai Technology)—as case study subjects. These firms were chosen for their strong representativeness in terms of entrepreneurial background, technological orientation, growth trajectories, and organizational characteristics. All three were founded around 2006, originating in emerging technology domains. Over more than a decade of development, they have successfully entered the capital market, exemplifying the typical trajectory from entrepreneurial inception to public listing. Throughout their development, these firms have faced the dual challenges of high technological uncertainty and rapid market shifts, yet have continuously built and evolved their internal dynamic capabilities, resulting in sustained technological breakthroughs and product innovation.

Company X specializes in artificial intelligence-driven digital transformation. Leveraging proprietary AI algorithms and industrial knowledge graphs, it provides intelligent solutions for infrastructure sectors critical to the national economy and people's livelihoods, such as power, water resources, and rail transportation. It is characterized by an "industry-empowerment innovation" model. Company Y (Youfang Technology) focuses on the R&D and industrialization of IoT communication modules and solutions. As a key player in China's industrial IoT connectivity sector, it continuously invests in low-power wide-area networks and cellular communication modules, reflecting a "technological specialization-based growth" path.

Company Z (Qipai Technology) concentrates on microelectronics and high-performance sensors. By persistently optimizing core chips and sensing algorithms, it provides critical hardware for downstream applications such as intelligent manufacturing and autonomous driving, demonstrating a strong orientation toward a “deep-tech platform-based” development strategy.

Despite operating in different business domains, these three companies share several common features: first, they are all exemplary “hard-tech” ventures that have established differentiated competitive advantages in niche markets through core technological capabilities; second, during their rapid growth, they have all undergone team structure evolution, organizational mechanism adjustments, and strategic reorientation, with clearly traceable dynamic capability formation pathways; third, from their early stages, they have focused on industries with high technological barriers, achieving significant innovation outcomes and demonstrating strong growth potential and adaptability to uncertainty. From a firm lifecycle perspective, these companies collectively represent the full developmental arc of hard-tech entrepreneurial firms—from startup to growth and capitalization—making them highly valuable cases for exploring how dynamic capabilities evolve within entrepreneurial teams and influence innovation performance.

Although the three companies are all entrepreneurial technology firms founded around the same time, operating in complementary technological fields, and listed on the STAR Market, they differ in terms of product form, industry applications, organizational structure, and development strategy. This “similarity within difference” provides a valuable analytical foundation: it enables researchers to more precisely distinguish which dynamic capability pathways are unique to Company X, and which may reflect common patterns among high-growth technology enterprises. This, in turn, enhances our understanding of the core components and evolutionary logic of executive team dynamic capabilities.

The executive team members were selected as the primary interviewees in this study, with participants covering several key functional areas, including the president, various vice presidents, and department heads. These senior executives are directly involved in strategic decision-making processes and possess a deep understanding of the firm’s innovation capabilities and developmental trajectory. Their insights are thus critical for comprehensively capturing the dynamic capabilities embedded within the top management team.

The selection criteria for interviewees included: long-term tenure at Companies X, Y, and Z, enabling them to witness the firms’ growth from inception to maturity; active participation in major strategic decisions across different developmental phases; and holding core functional

roles that allow for in-depth perspectives on innovation and dynamic capability evolution. For instance, the presidents were chosen for their overall responsibility in corporate operations and strategic development, underpinned by extensive experience in strategic management. Vice presidents from distinct functional domains—such as marketing, R&D, and operations—were selected for their specialized expertise and managerial experience. Additionally, technical directors or heads of product innovation were included due to their critical roles in driving technological advancement and innovation activities.

Detailed information on the interview participants is presented in Table 3.2.

Table 3.2 Inteweiee and interview information

No.	Code	Company	Title	Field	Years of work experience/Years of company establishment	Interview time	Interview duration (min)	Transcribed text (words)
1	CX01	Company X	President	Management and strategy	19/19	December 17, 2024	55	13
2	CX02	Company X	Vice President	Operation	19/19	January 20, 2025	65	17
3	SS01	Subsidiary Company X	Vice President	Production	19/19	January 20, 2025	44	12
4	CX03	Company X	Vice President	Market	19/19	January 24, 2025	75	18
5	HT01	Subsidiary Company X	Vice President	Products	3/3	February 5, 2025	58	18
6	CX04	Company X	Chairman	R&D	19/19	February 9, 2025	68	19
7	SS02	Subsidiary Company X	CTO	R&D	3/3	February 7, 2025	63	20
8	SS03	Subsidiary Company X	Vice President	Market	3/3	February 7, 2025	64	19
9	SS04	Subsidiary Company X	Vice President	Operation	3/3	February 5, 2025	59	18
10	CX05	Company X	CTO	Products and plans	18/19	February 21, 2025	77	20
11	SS05	Subsidiary Company X	General Manager	Marke and plans	3/3	February 21, 2025	50	11
12	CX06	Company X	General Manager	Operation	18/19	February 18, 2025	66	18
13	CX07	Company X	Director and Deputy General Manager	Operation and production	18/19	February 11, 2025	80	17
14	CX08	Company X	President	Management and strategy	19/19	February 12, 2025	99	28
15	HT02	Subsidiary Company X	CTO	R&D	3/3	March 1, 2025	55	16
16	HT03	Subsidiary Company X	COO	Corporate management	3/3	March 1, 2025	65	18
17	HT04	Subsidiary Company X	General Manager	Operation and production	3/3	March 1, 2025	60	16
18	YF01	Company Y	General Manager	Corporate management	19/19	March 1, 2025	50	11
19	YF02	Company Y	Vice President	Strategy	19/19	March 1, 2025	56	12
20	YF03	Company Y	Chairman	Management and strategy	19/19	March 17, 2025	49	12

21	YF04	Company Y	Vice President	Operation and production	19/19	March 22, 2025	64	14
22	YF05	Company Y	Vice President	Operation and production	18/19	March 23, 2025	59	14
23	YF06	Company Y	President	R&D	17/19	March 23, 2025	50	13
24	QP01	Company Z	Vice President	HR	19/19	April 2, 2025	66	16
25	QP02	Company Z	Chairman	Strategy	19/19	April 2, 2025	62	16
26	QP03	Company Z	Vice President	Operation and production	19/19	April 2, 2025	54	14
27	QP04	Company Z	President	R&D	19/19	April 9, 2025	50	13
28	QP05	Company Z	Vice President	R&D	18/19	April 9, 2025	47	10
29	QP06	Company Z	Vice President	Operation and production	18/19	April 10, 2025	70	18
				Total			1789	461

3.2.3.1 Interview design

Based on the objectives and theoretical framework of this study, a series of semi-structured interview questions were developed. These questions aim to explore the dynamic capabilities of the top management teams, the firms' innovation performance, and the impact of changes in the external environment. To gain in-depth insights into these themes, the study employed a semi-structured interview approach. This method combines the systematic nature of structured interviews with the openness of unstructured interviews, ensuring both consistency in addressing the research questions and flexibility to allow interviewees to provide richer and more nuanced responses (Alshenqeeti, 2014).

The flexibility of the semi-structured format enabled the researchers to adapt to emerging topics during the interview process and uncover deeper insights, thereby facilitating a more comprehensive understanding and analysis of the research themes (Kahn & Cannell, 1957; Warren, 2002).

The interview protocol consists of five main sections, with the full outline provided in Appendix A:

1. Basic Information on the Company and Executive Team: This section collects information on the company's development history, main business focus, and the composition and responsibilities of the executive team.

2. Understanding and Practice of Dynamic Capabilities: This part investigates the interviewees' understanding of dynamic capabilities, as well as the team's specific actions in identifying market opportunities, integrating resources, and responding to environmental changes.

3. Corporate Innovation and Performance: This section explores innovations in products, management, services, or business models, and how such innovations are reflected in the company's innovation performance.

4. Environmental Adaptation and Strategic Adjustment: Questions in this section address the firm's competitive position within the industry, the sources of its competitive advantage, and how the executive team responds to complex policy shifts and market changes.

5. Future Outlook and Recommendations: The final part discusses which dynamic capabilities the executive team considers essential to enhance in the future, along with their recommendations for other entrepreneurial firms in managing the dynamic capabilities of their TMTs.

Prior to the formal interviews, two industry experts were selected to participate in pilot

interviews to test and validate the effectiveness and appropriateness of the interview questions. The purpose of the pilot test was to assess whether the questions could effectively guide interviewees to engage in in-depth discussions relevant to the research themes and to make necessary adjustments based on their feedback.

Specifically, the pilot interviews aimed to ensure that each question was clearly understood by the participants and could elicit specific and meaningful responses; to evaluate whether the sequence of questions facilitated a coherent flow of conversation and, if necessary, to adjust their order; and to confirm that the questions were sufficiently open-ended to allow interviewees to elaborate freely, thus uncovering unanticipated insights.

Based on the feedback obtained, the interview questions were refined and adjusted by incorporating more specific contextual descriptions and follow-up prompts to enhance both depth and breadth of responses. This feedback mechanism is an essential component of semi-structured interviews, ensuring that the questions effectively elicit comprehensive reflections on the core research topics. Through these preparatory steps, the semi-structured interviews played a central role in this study by enabling the collection of high-quality, analytically valuable qualitative data, thereby laying a solid foundation for an in-depth understanding of top management teams' dynamic capabilities and their influence on corporate innovation performance.

3.2.3.2 Interview procedure

Each interview lasted between 1 to 2 hours. This duration was chosen to ensure that senior executives had sufficient time to elaborate on their insights and experiences, while avoiding fatigue or a decline in concentration that might compromise data quality. Through careful time management, interviewers were able to conduct in-depth discussions on key topics, ensuring that each question received thorough attention.

Face-to-face interviews were employed to ensure high data quality and authenticity. This method facilitated the establishment of trust between the interviewer and the respondent, enabling participants to express their views and experiences more openly (Kahn & Cannell, 1957). All interviews were audio-recorded to ensure the accuracy and completeness of the data. Audio recordings not only captured responses precisely but also provided reliable material for subsequent analysis.

Interviews were conducted in company meeting rooms to ensure a quiet, private, and comfortable environment. The privacy of the setting encouraged candid expression, while the comfort helped reduce participants' stress and promoted a more natural flow of communication.

These conditions created a favorable setting for interviews, enhancing the authenticity and depth of the data collected.

After each interview, the researcher immediately transcribed and organized the audio recordings. This approach ensured timely documentation and reduced the risk of data loss or inaccuracies due to memory decay. Transcriptions allowed for more detailed analysis of the interview content, facilitating the identification of key themes and patterns for subsequent coding and theory development.

3.2.3.3 Data collection

During the data collection phase, interviews continued until theoretical saturation was reached. After completing 25 interviews, data began to show signs of repetition. To confirm data saturation, four additional interviews were conducted, which revealed no new significant insights. At this point, data collection was concluded, with a total of 29 in-depth face-to-face interviews completed.

From December 2024 to April 2025, the study conducted a total of 29 interviews, yielding 1,789 minutes of audio recordings. The initial transcription of recordings was carried out using iFlyTek's voice recognition software. To ensure transcription accuracy, the automatically generated texts were manually reviewed and revised. This process resulted in a final set of transcripts totaling approximately 461,000 Chinese characters. Both the transcribed texts and original audio files were then imported into MAXQDA 2020 for qualitative coding and analysis.

3.2.3 Data analysis method

Coding involves categorizing and organizing raw qualitative data into meaningful themes, concepts, and relationships. Coding is typically conducted in multiple stages, each serving a distinct analytical purpose (Charmaz, 2015; Pidgeon & Henwood, 2004):

(1) Open coding

This is the initial stage of analysis, where the researcher closely examines the textual data, identifying and labeling all potentially meaningful ideas, behaviors, events, and expressions. The purpose of open coding is to break down the data in an open-ended way, allowing all possible concepts to emerge without the constraint of a predetermined framework (Birks & Mills, 2015).

(2) Axial coding

Building upon the open coding results, axial coding involves identifying relationships among the emerging themes and concepts. This stage seeks to reassemble the data in a coherent

structure by linking categories and subcategories, thus beginning to form the backbone of a theoretical framework (Birks & Mills, 2015).

(3) Selective coding

In this final stage, the researcher focuses on integrating and refining the core categories, identifying central themes that represent the essence of the data. Selective coding aims to construct a cohesive analytical model that captures the key dynamics and provides theoretical answers to the research questions (Birks & Mills, 2015).

Coding connects raw data to theoretical insight. It enables researchers to systematically extract latent patterns and relationships without relying on pre-existing theories. The coding process is inherently iterative and reflexive; researchers frequently revisit the data to refine and validate emerging constructs. This feedback loop ensures that the resulting theory remains rigorous, grounded in empirical evidence, and closely aligned with the lived experiences and perspectives of the participants (Birks & Mills, 2015; Dey, 2004).

3.3 Reliability and validity

Reliability refers to the consistency and stability of research findings across different times and contexts (Maxwell, 2008; Tenny et al., 2017). In this study, reliability is primarily reflected in the standardization and consistency of data collection and analysis processes. By ensuring a systematic and replicable approach to interviews and case studies, the study enhances the credibility and dependability of its findings.

Validity refers to the extent to which the research accurately captures the characteristics and phenomena of the subject under investigation and effectively measures the intended constructs (Maxwell, 2008; Tenny et al., 2017). In this study, validity is demonstrated through in-depth interviews and comprehensive case analyses, which ensure that the dynamic capabilities of executive teams and their impacts on innovation and entrepreneurial performance are thoroughly explored and accurately represented.

To strengthen both the reliability and validity of this research, a multi-source data strategy was employed. By integrating interviews and case study methods, the study enhances the credibility and richness of the findings. The data sources include:

(1) Interviews

Although Company X serves as the primary case in this study, a single-case design inevitably poses limitations in terms of external validity when constructing theory. By incorporating Companies Y and Z—both of which are highly comparable to Company X—as

comparative cases, the study is able to examine whether the dynamic capability development paths identified in Company X exhibit broader generality. This approach enhances the explanatory power and robustness of the research findings. Such a design aligns with the principles of theoretical sampling, which is particularly valuable for developing theories with transferable mechanisms.

In qualitative research, researchers' interpretations inherently involve a degree of subjective construction. By conducting interviews with senior executives from Companies Y and Z, the study enables retrospective validation and logical triangulation of the explanatory pathways identified in Company X. In practice, when all three companies' executive teams demonstrate convergent reasoning on certain themes, the interpretations derived from Company X are granted greater theoretical legitimacy and argumentative rigor.

Moreover, for certain ambiguous or contested aspects in the Company X case—such as the motivations behind key transformation decisions or the external triggers of capability adjustments—the analogous experiences shared by Companies Y and Z provide contextual parallels that help clarify causal linkages. This contributes to greater transparency and a more coherent causal narrative in the interpretive process.

(2) Case analysis

A longitudinal case study of Company X was conducted to trace the evolution of its strategic adjustments and dynamic capabilities over time. This provided a systematic perspective for understanding the relationship between dynamic capabilities and innovation performance. The case analysis also allowed for the triangulation and validation of insights obtained from the interviews, thereby deepening the analytical rigor of the research.

The combination of multiple data sources enabled cross-verification, reducing potential biases associated with any single method and enhancing the reliability of the results. By linking interview and case study data, the study more accurately identifies and interprets the mechanisms through which executive team dynamic capabilities influence outcomes.

3.4 Triangulation

Triangulation is a widely recognized strategy for enhancing the reliability and validity of qualitative research. By cross-verifying results through multiple data sources and analytical perspectives, triangulation ensures the robustness and consistency of research conclusions.

In qualitative research, data triangulation is one of the key strategies to ensure the credibility and explanatory power of findings. Although this study is centered on an in-depth case analysis

of Company X, relying solely on internal sources within a single firm may introduce biases stemming from individual perspectives, organizational culture, or selective disclosure during interviews.

To address this, interviews with senior executives from Companies Y and Z were incorporated. During the interviews with Company X, certain topics—such as resource allocation logic at critical transformation points, the rationale behind adjustments in team decision-making structures, and the evolution of external collaboration mechanisms—were sometimes discussed only by executives from specific departments or positions, leading to partial or fragmented information. By engaging with Companies Y and Z, the study gains alternative viewpoints on similar themes across different organizational contexts. In some cases, these external interviews helped reveal mechanisms that were underexplored or absent in the Company X narrative, thus filling information gaps and expanding the theoretical depth of the analysis.

Moreover, by comparing the perceptions and practices of executive teams across the three companies on common strategic and organizational issues, it becomes possible to distinguish between dynamics that are case-specific to Company X and those that reflect generalizable patterns in the broader high-tech sector. This comparative validation helps identify which mechanisms carry genuine theoretical relevance, while also guarding against over-theorization based on idiosyncratic organizational experiences..

3.5 Potential limitations and challenges with mitigation strategies

During the research process, several limitations and challenges may arise. This study acknowledges the following key concerns and outlines strategies to address them:

(1) Subjectivity of data

The interview data primarily rely on personal accounts from members of the executive team, which may contain subjective interpretations or biases, especially when discussing sensitive corporate issues. To address this challenge, the study adopts a semi-structured interview format, which allows for openness and flexibility in responses, encouraging participants to express their views more freely. Additionally, multiple rounds of interviews and cross-validation of perspectives among different executives from different companies help mitigate individual bias and enhance the reliability of the findings.

(2) Representativeness of the case selection

This study focuses on a single case—Company X—which may not fully represent the

dynamics of firms across different industries or contexts. To minimize this limitation, the research provides a detailed contextual analysis of Company X, including its developmental trajectory, industry characteristics, and market environment. While the findings from the case study offer in-depth insights, any generalizations are made cautiously and are always discussed in conjunction with relevant theoretical frameworks to evaluate broader applicability.

(3) Determining data saturation

Identifying the point at which data collection reaches saturation is a methodological challenge. Insufficient interviews may lead to incomplete data, while excessive interviews could overcomplicate analysis and delay the research timeline. To manage this issue, the study adopts a continuous monitoring approach during data collection, closely tracking the emergence of new themes and concepts. Data collection will cease once no new substantive information arises from additional interviews, thereby ensuring theoretical saturation without unnecessary redundancy.

By proactively addressing these potential limitations, this study aims to maintain methodological rigor and strengthen the trustworthiness of its findings.

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Chapter 4: Analysis of the Interview Results

4.1 Dynamic capabilities of the executive team in the emerging stage

In the emerging stage, firms typically face critical challenges such as limited resources, high market uncertainty, and significant survival pressures. In such an environment, the dynamic capabilities of the executive team become a central factor in determining whether the enterprise can survive and establish an initial competitive advantage. Based on interview data, four primary capability paths exhibited by the executive teams during this phase were identified: (1) building capabilities to cope with uncertainty, (2) forming a cognitively strategic sensitivity structure, (3) rapid iteration centered on customer value, and (4) achieving product realization through a dual engine of concept and market.

4.1.1 Capability-building paths for coping with environmental uncertainty in the emerging stage

In highly uncertain entrepreneurial environments, emerging companies often face multiple challenges such as resource constraints, market ambiguity, and fierce competition. To survive, entrepreneurial teams must construct a capability system that enables them to rapidly identify opportunities, flexibly adapt to change, and effectively translate insights into market value. Through systematic coding and categorization of the interview data (see Table 4.1), this study identifies three dominant capability domains: (1) opportunity recognition and market positioning, (2) rapid response and entry strategy under resource constraints, and (3) customer orientation and product value realization.

Table 4.1 Coding results: capability-building paths for coping with environmental uncertainty in emerging companies

Main Category	Subcategory	Specific Code Excerpts
Opportunity Recognition and Market Positioning	Niche sectors	"Different companies may adopt different approaches. In our case, we primarily thought about survival in the beginning—how to find a niche market that would allow a start-up to stay alive." (CX)
	Overlooked areas by large firms	"Initially, we aimed to find opportunities in areas that large companies were not paying much attention to. I think this was very important."
	Blue ocean markets	"In the early stage, we explored carefully to identify areas that were still part of a blue ocean. Once we had identified the

		product direction, we tried to leverage every resource available to turn it into a marketable product." (HT)
	First-mover advantage	"In the initial stage, although the product still had some shortcomings in quality and performance, we insisted on quickly pushing for market layout and promotion, seizing the initiative and building recognition and trust among customers first."
	Breakthrough points	"You need to look at things comprehensively, but overall competition is hard… So we wondered if we could make a breakthrough at a particular point to lead the trend." (QP)
	Market gaps	"To address such market gaps, we mobilized resources from all sides. Our solution significantly reduced overall costs, and by simplifying the design, we improved product reliability and ease of maintenance."
Rapid Response and Entry Strategy under Resource Constraints	Limited resources	"We took it step by step, based on our limited conditions and market needs. In the beginning, our capabilities were limited, so we couldn't possibly respond to every demand." (QP)
	Opportunism	"In the early stage, especially when the team was being formed, there was a lot of opportunism. We couldn't clearly differentiate between directions or project types, and sometimes even quality—we relied more on quantity. The leadership team's main strength was the ability to seize opportunities as they emerged." (SS)
	Quick market entry	"In the start-up phase, what matters most is insight into market changes and quick entry. With a small team and limited capabilities, we needed to capitalize on timing advantages to get in early and seize the opportunity."
	Riding market trends	"We caught a very good market opportunity during the entrepreneurial stage and launched a strong product. Combined with a favorable market trend, we grew very quickly." (YF)
	Fast-track product development	"In the early days, we definitely aimed to develop our product solution quickly and efficiently."
	Rapid product launch	"At the beginning, our priority was to seize market opportunities and quickly launch our products… At that time, competition in this field was still sparse, so we focused more on quick opportunity recognition, fast product development, and rapid iteration."
Customer Orientation and Product Value Realization	Impress at first encounter	"When entering a new field, if you really want to make a breakthrough, you must firmly seize key market opportunities. Once you get in front of a client, you need to impress—demonstrate brand strength and professionalism. This is critical to opening the market and building trust."
	Solving real problems	"For a start-up team, the most important first step is simply to survive. In the early stage, we weren't pursuing grand technologies, but solving real problems and finding valuable entry points. The key was whether we could identify real customer needs and create even a preliminary, practical solution."
	Meeting customer needs	"Without launching new products and meeting customer needs with bestsellers, the company simply wouldn't have grown."
	Creating hit products	"Back then, we didn't think that much. We just believed that if we had a good product, that would be enough." (YF)

4.1.1.1 Opportunity recognition and market positioning

In the emerging phase, uncertainty arises from multiple dimensions including market conditions, technology trends, and policy dynamics. Identifying unmet needs becomes a prerequisite for entrepreneurial success. The interviews reveal that the participating firms tend to focus on niche sectors, blue ocean markets, or underserved areas overlooked by major incumbents. For example, some firms deliberately avoid direct competition with industry leaders, instead opting to establish a foothold in segmented tracks or by exploiting competitors' weaknesses to identify viable entry points. This phenomenon demonstrates the executive team's highly developed opportunity recognition capability, characterized by a fast-loop mechanism of environmental scanning – opportunity evaluation – differentiated positioning, which reflects the "sensing" component of dynamic capabilities theory.

4.1.1.2 Rapid response and entry strategy under resource constraints

Due to limitations in manpower, capital, and technology, emerging companies must adopt high-efficiency market entry strategies under constrained conditions. The interviewed firms often exhibit opportunistic tendencies, swiftly mobilizing resources and launching products when detecting market gaps or momentum. The phrases "rapid entry" and "quick product launch" were frequently mentioned, indicating a preference for speed over perfection in early-stage product development. This strategy is not only a response to resource constraints but also a competitive logic aimed at establishing first-mover advantages and capturing customer attention. It exemplifies the seizing capability in dynamic capability frameworks.

4.1.1.3 Customer orientation and product value realization

Customer demand serves as the core driver of product design and value realization in entrepreneurial firms. Several executives emphasized that their companies were "*not developing sophisticated technologies for their own sake*," but rather focused on solving real-world problems and meeting client needs, with the goal of creating market-appealing "*hit products*." This orientation pushes firms to define products around customer pain points and iterate based on feedback, with the aim of gaining early trust through market-winning solutions. The behaviors observed in this category illustrate a high level of market empathy and value conversion awareness, even at the nascent stage, forming the origin of their core product competitiveness.

4.1.2 Strategic sensitivity capability structure in high-uncertainty environments

In rapidly changing and highly uncertain market environments, startups aiming for breakthrough growth must possess keen awareness of external environmental changes and the ability to respond quickly. Especially in China, where the institutional context is policy-driven, technology evolves quickly, and markets fluctuate greatly, a company's strategic decisions often depend not only on internal capabilities but also on the establishment of a "strategic sensitivity capability structure" that focuses on policy trends, technological advancements, and industry opportunities. This section summarizes three key capability categories (see Table 4.2) based on in-depth interviews with senior executives from multiple entrepreneurial companies: policy-oriented perception and response capability, technology trend identification and integration capability, and strategic opportunity conversion and organizational execution capability. These three capabilities form the core pathways for startups to build strategic sensitivity, gain first-mover advantages, and successfully implement opportunities in a complex environment.

Table 4.2 Strategic sensitivity capability structure in high-uncertainty environments: coding

Main Category	Subcategory	Specific Code Excerpts
Policy-Oriented Perception and Response Capability	Policy Signal Identification and Response	Starting in 2024, we noticed that China National Railway Group (CRRC) focused on low-temperature inspections and emphasized this in its policies. They also established a dedicated department for leading the development of standards for ground inspection. At that time, we felt that with the momentum of the national and local economies, there would soon be more investment in this area. (HT)
	Policy Event-Driven Strategic Response	How did we find this opportunity? The opportunity came from several points: firstly, national and industry policies; … and third, from capturing opportunities, such as after the June 4th incident in 2022, CRRC immediately launched its AI implementation plan. (HT)
	Field Activation Driven by Policy Attention	Due to certain accidents, railway line patrols gained high-level attention from the government, which effectively drove opportunities in this field. (HT)
	Dual-Dimension Strategic Judgment Ability (Policy + Space)	In the current global development trend, especially with increasing competition between China and the US, industries across the country are experiencing intense 'involution,' with fierce market competition. In this environment, we must be more cautious and forward-looking when facing new opportunities and industry choices. We consider two key factors in strategic judgment: firstly, whether the industry has enough development space and long-term growth potential; and secondly, whether it is a direction supported by national policies.
	Industry Insight Under National Strategic Guidance	For example, in water resources, the Ministry of Water Resources began promoting 'digital twins' in 2021, and later the demand for smart water management, especially under the large strategic context of 'Digital China.'
Technology	Technology Trend	The second point is the awareness and judgment of

Trend Identification and Integration Capability	Identification and Forecasting	technology development trends. Currently, technologies like artificial intelligence are developing rapidly, bringing profound changes to productivity and impacting traditional business systems. As a company, we must have keen perception of technological changes and anticipate the uncertainty they may bring, preparing for technological reserves in advance.
	New Growth Identification Driven by Technology Integration	For this reason, the country is promoting structural reforms driven by technological innovation, hoping to use new productivity to disrupt old models, break traditional thinking, and create genuine new growth points. Otherwise, we would be passively caught in homogeneous competition and efficiency loss. So we must clearly understand 'new technologies, new productivity.' When we can deeply combine these new technological features with the actual scenarios of traditional industries, we will find that many untapped opportunities exist within traditional industries.
	Preemptive Trend Identification for Unformed Concepts	At that time, even though the concept of 'low-altitude economy' had not been introduced, the application of drones in various industries already showed a clear development trend and could meet the actual needs of social development.
Strategic Opportunity Conversion and Organizational Execution Capability	Product Matching Ability with Policy Trends	For example, in 2010, when the State Grid proposed a strategy for intelligent and digital transformation and began planning the construction of digital substations, we seized this opportunity. The senior management team quickly identified and integrated internal resources to develop products that met the digital transformation needs of the State Grid. In those years, the company achieved rapid growth because of this.
	R&D Organization Ability in Strategic Alignment	Starting in 2015, the State Grid further proposed the need for the digital transformation of transmission lines. On one hand, there were increasing numbers of lines, and management personnel were relatively insufficient. On the other hand, the country's reliability requirements for grid operation were constantly increasing. Therefore, the State Grid clearly stated that the production and operation services of transmission lines should be digitalized in the future. We identified this opportunity immediately and quickly initiated related R&D, launching products that met the needs for the digital transformation of transmission lines, further driving the development of the company's business.

4.1.2.1 Policy-oriented perception and response capability

In China's institutional environment, policies often serve as strong "guiding signals," significantly influencing resource allocation, technological routes, and market spaces in industry development. The interview data show that senior management teams in startups generally exhibit high sensitivity to policy signals, allowing them to quickly identify strategic trends released by central or industry regulatory departments, such as policies like the "*National*

Railway Group's special deployment," "*digital twin*," and "*Digital China*." These signals serve as critical triggers for adjusting enterprise strategies and product direction. This capability is reflected not only in the interpretation of explicit policy documents but also in the ability to interpret and assess the implied policy stance behind sudden events, forming the core competitive advantage for enterprises to adapt swiftly to changes in the macro institutional environment.

4.1.2.2 Technology trend identification and integration capability

In dealing with high uncertainty, another key capability is the perception and understanding of cutting-edge technology trends. The development of technologies such as artificial intelligence, drones, and digitization has not only altered the operational logic of industries but also provided new growth avenues for enterprises. Some senior executives pointed out that before a complete market concept was formed (such as before the concept of "low-altitude economy" was introduced), the company had already begun to make strategic moves based on a "scenario-technology" linkage model. This ability reflects the senior management team’s proactive "predictive reserve" and "scenario-based conversion" when facing technological uncertainty. By deeply integrating new technological features with industry pain points, they create solutions with differentiated competitive advantages.

4.1.2.3 Strategic opportunity conversion and organizational execution capability

Having policy perception and technology recognition capabilities is only the premise for strategic sensitivity. More importantly, it is about how to convert these external signals into actionable business outcomes. The interviewed enterprises generally demonstrated strong strategic opportunity conversion and resource organization capabilities. Once a new policy direction or market window is identified, they are able to quickly organize internal resources for product development, customer engagement, and implementation. For instance, after the State Grid proposed the digitalization of transmission lines, the enterprise immediately initiated research and development, launching a product that met the requirements, thus achieving a quick closure of the loop from external signal to internal outcome. This ability demonstrates how senior management teams, under high pressure, transform sensitivity and execution capabilities into actual competitive advantages in strategic execution.

4.1.3 Value co-creation with customers

After understanding the broader development direction that the government aims to promote,

startups should identify the points of alignment within this direction that meet customer needs and address customer pain points, which should serve as the guiding principle for product research, development, and innovation. Startups often face resource and experience constraints, and while technological innovation is important, an over-reliance on it without considering customer needs can result in technologies that are detached from market demands, ultimately failing to generate commercial value. From the perspective presented in interviews, which emphasized that "*products that solve customer problems and create value are good products*," it is clear that enterprises should always remain sensitive to customer pain points, even when focused on technological innovation. Whether it is a technological breakthrough or product function innovation, the emphasis should be on solving real customer problems. Through a systematic review of the interview data, this study identifies three core dimensions of customer-oriented capabilities: strategic awareness of customer orientation and value co-creation, demand response mechanisms, and organizational coordination and execution capabilities (see Table 4.3). These capabilities form a closed-loop logic that spans from "cognition" to "insight" to "transformation," illustrating how startups build an innovation and response system driven by value, centered around the customer.

Table 4.3 Coding of customer-centered value co-creation

Main Category	Subcategory	Specific Coded Excerpts
Customer-Oriented Strategic Cognition and Value Co-Creation Capability	Customer-Oriented Value Perception	Sometimes, individuals may overemphasize their technological superiority ... adopted a customer-centric approach. (CX)
	Innovation Logic of Customer Channels	Our innovation is centered around the customer—whatever type of innovation ... accordingly. (HT)
	Identification of Customer Needs	Identifying the needs of our service recipients is, in fact, a crucial and highly significant task.
	Understanding Hierarchies of Customer Needs	From the evolution of basic to higher-level needs ... shifting towards high performance and cost-effectiveness.
	Customer-Oriented Adjustment	In the early stages, we struggled to find a suitable product direction ... more appropriate entry point. (HT)
	Customer Empowerment	When entering a new domain without mature products ... our product system gradually evolved from scratch to pilot implementation and eventual formalization.
Demand Response Mechanism and Organizational Collaborative Execution Capability	Understanding Hierarchies of Customer Needs	On one hand, we must grasp top-down strategic direction from customer leadership ... bottom-up feedback integration.
	Assessing Demand Rigidity	When we first received the opportunity, we conducted a systematic evaluation ... urgent and realistic need.
		From an industry-wide perspective—in sectors like electricity, rail transport, and water conservancy ... significantly improving operational efficiency and

		coverage.
	Identifying Industry Opportunities Based on Pain Points	There was consensus that this approach could significantly address pain points in traditional power transmission inspections ... viable product opportunity.
		A product may lead the market by six months ... strategically guide development.
		During a technology project in Anhui ... The idea resonated with customers, who were facing the same issues.
	Understanding and Responding to Demand	In this rapidly changing era ... swiftly meet evolving customer demands.
	Micro-Demand-Triggered Innovation	This specialty initially developed sporadically ... pursued with strong sensitivity to future potential.
	Integration of Technology and Customer Needs	In 2012, our core business was still focused on substations ... adapt product upgrades and market responses efficiently.

4.1.3.1 Strategic awareness of customer orientation and value co-creation capability

This study found that the senior management teams of startups generally possess a customer-centric strategic awareness. They emphasize that "*a good product is not about technological leadership, but about solving customer problems,*" clearly asserting that customer value should take precedence over technological leadership. In the product innovation process, enterprises do not simply output technical solutions; instead, they engage in continuous innovation based on the evolving logic of basic to advanced customer needs. Several interviewees mentioned that customer feedback itself serves as the starting point for product design. Especially when there are no mature cases or industry precedents, customers play the role of "enabler" to some extent, driving the product from 0 to 1 through providing questions, feedback, and co-building scenarios. This suggests that customers are not just passive demand-side participants, but active "co-creators" in the enterprise's strategic capability system.

4.1.3.2 Demand response mechanism and organizational coordination execution capability

In addition to the customer-oriented strategic awareness, enterprises also demonstrate strong demand response mechanisms and cross-departmental coordination capabilities at the operational level. Enterprises can quickly identify changes in customer demand based on feedback from frontline employees and form an efficient linkage among "R&D—marketing—manufacturing" within the organization. Multiple cases revealed that it was precisely through feedback from frontline workers and teams that the enterprise gradually discovered new directional opportunities. Notably, the senior management teams emphasized the "*two-way feedback*" principle—giving attention to both the strategic demands of high-level customers

and the practical needs from frontline operations. This combination of "*top-down guidance*" and "*bottom-up validation*" forms the basic operational logic for enterprises to continuously adjust products, optimize functions, and achieve precise market positioning. In a highly competitive environment, this mechanism has become crucial for maintaining customer loyalty and ensuring product differentiation.

4.1.4 From concept formation to market breakthrough: a dual-driven pathway of product evolution

Under the combined influence of a complex and ever-changing policy environment and highly dynamic customer demands, startups often do not follow a linear product development process. Instead, they gradually build their product and market foundation through an interplay of ambiguity and feedback. This section focuses on the logic of product formation under two typical trajectories—policy-driven and customer-driven—and summarizes two corresponding capability structures (see Table 4.4). The first is the path of fuzzy concept development and model project diffusion under policy-driven conditions, which emphasizes how firms capitalize on policy windows to construct product prototypes based on top-down intentions and scale up through pilot and model projects. The second is the path of agile development and collaborative iteration under customer-driven dynamics, illustrating how firms achieve technological and market breakthroughs through high-frequency feedback and iterative co-creation when mature solutions are lacking. Together, these two paths reveal the dual-engine mechanism that enables startups to transition from "concept identification" to "product realization" in uncertain environments.

Table 4.4 Codes from conceptualization to market breakthrough

Main Category	Subcategory	Specific Coded Excerpts
Policy-Driven Development of Ambiguous Concepts and Demonstration-Based Diffusion Pathways	Ambiguous Concept Development	We are currently developing a reservoir management software system platform. The project originated from a concept mentioned during discussions with provincial-level regulatory officials, based on insights from senior officials at the Ministry of Water Resources. Although the concept was initially vague, we anticipated its potential for nationwide promotion. Upon recognizing this opportunity, we immediately mobilized our R&D and planning teams to maintain high-frequency, in-depth communication with the relevant authorities. Through this process, we built the product from scratch.
	Pilot Projects as Entry Points	Approximately two to three years ago, we gained several critical market opportunities by participating in key pilot demonstration projects. These served as invaluable entry points, allowing us to engage with core industry scenarios and laying a strong foundation for

		subsequent business development.
	Initial Project Success and Client Trust	Our first project was completed successfully, fully meeting the client's expectations. It established a solid foundation for future market expansion and earned the client's trust.
	Product Validation Building Client Confidence	In response to emerging market opportunities, we quickly integrated internal resources and achieved promising results during product validation and testing processes, thereby gaining the client's confidence.
	Replication and Promotion of Model Cases	After identifying the opportunity, we actively pursued project implementation and expansion. We began with pilot applications in municipal-level units, gradually extending to the provincial level. Once we had accumulated three to five mature cases at the provincial level, we scaled up to the State Grid Corporation. The headquarters highly endorsed the direction, and by leveraging this strategic window, we achieved rapid nationwide promotion within two to three years.
	Demonstration Effect of Model Projects	The Xiaolangdi project, once completed, became a textbook demonstration case. As it is the top-ranked reservoir under the Ministry of Water Resources, its success carried significant influence and received considerable attention from authorities.
Client-Driven Agile Development and Collaborative Iteration	High-Frequency Communication and Co-Creation	On the technical front, we maintained continuous engagement with the client. At that time, we did not have a mature product, so we repeatedly revised and improved the solution based on the client's feedback. We frequently reported to senior leadership every few days and modified the plan accordingly.
		At that time, we had no actual performance in the North China market, only initial interest. Through ongoing communication and technical discussions with the client, we continuously refined the solution. Eventually, as understanding deepened, the plan evolved to meet the client's technical requirements.
	Rapid Iteration and Process Flexibility	Our R&D team often made overnight modifications, immediately presenting updates to senior leadership for feedback. This enabled fast, repeated iteration. Under such circumstances, we could not adhere strictly to standard procedures; instead, we relied on flexible, innovative practices.
	Continuous Iteration	The product development process involved continuous iteration. Throughout this period, we consistently increased R&D investment and refined the product, ultimately gaining a comprehensive competitive edge.
	Quick Responsiveness	Whenever clients raised a need, we were able to respond swiftly. This responsiveness is one of our company's core strengths.

4.1.4.1 Fuzzy concept development and model project diffusion under policy-driven conditions

In policy-oriented industrial environments, startups at the early stage—often lacking market maturity and customer validation—rely on policy signals as the starting point for product development and directional decision-making. This study finds that multiple interviewee firms have transformed "fuzzy concepts" articulated by regulatory authorities or industry leaders into concrete technical solutions and marketable products through high-frequency communication, co-construction of scenarios, and continuous probing. In this process, pilot projects serve as critical mechanisms for breaking through industry barriers and establishing early-stage achievements. These pilots not only validate product feasibility but also strengthen trust from policy stakeholders.

As pilot projects are successfully implemented, companies follow a stepwise expansion path—"*local to provincial to national*"—ultimately forming a replicable model from point to scale. Strategically influential model projects (e.g., projects under State Grid or subsidiaries of the Ministry of Water Resources) are seen as crucial policy breakthroughs. They not only enhance visibility and legitimacy but also attract broader policy attention and resource allocation. This creates a bidirectional dynamic in which bottom-up feedback reinforces top-down policy promotion, thereby driving broader industry diffusion. This path demonstrates how startups leverage policy windows to transform abstract concepts into tangible products and scale through exemplar projects from technical conception to market expansion.

4.1.4.2 Agile development and collaborative iteration under customer-driven conditions

Complementing the policy-driven path, the customer-driven trajectory represents another critical mechanism startups employ to navigate market uncertainty: agile, feedback-driven product evolution. Interviewed firms commonly reported that in the absence of fully formed products or mature technologies, the R&D process is not guided by internal planning, but by rapid adjustments centered on customer needs and co-creative development. Through frequent communication, immediate feedback, and prompt responsiveness, firms establish a co-evolutionary technical collaboration model characterized by continuous adaptation. This "*customer as examiner, firm as responder*" mechanism allows products to achieve contextual adaptability and functional validation before reaching standardization.

Moreover, startups exhibit a high degree of internal organizational flexibility. Unconstrained by rigid procedures, R&D teams often "iterate overnight" and "deploy quickly," demonstrating extreme sensitivity to temporal windows and customer pace. In this process, the

product is not merely a technological outcome but the result of ongoing co-creation between the enterprise and the customer. As some interviewees noted, "*customer feedback is the starting point of our iteration*." Through this ongoing dialogue and pilot-based evolution, firms build technological superiority and trust-based barriers to entry. Thus, the customer-driven pathway becomes a key strategic model through which startups move from a zero baseline to market breakthrough.

4.2 Analysis of dynamic capabilities of executives during the growth period

During the growth stage, firms have generally overcome the survival challenges of their startup phase. However, they are then confronted with more complex issues: intensifying market competition, diminishing profit margins, and bottlenecks in their initial growth models. At this stage, the dynamic capabilities of the executive team shift focus toward strategic realignment and organizational upgrading. Based on the interviews conducted, executives in the growth stage primarily exhibit the following capability trajectories: (1) building dual-growth capabilities through "product evolution + market expansion"; (2) enhancing the alignment between strategy and organization to integrate and mobilize internal and external resources; and (3) advancing from experience-based to institutionalized management, reflecting a systematic evolution of managerial competencies. Collectively, these capabilities enable the firm to achieve strategic breakthroughs and sustain growth amidst market volatility.

4.2.1 Pathways to building dual-growth capabilities

Startups typically rely on a "dual-engine" growth trajectory to transition from technological accumulation to commercial breakthroughs. On one hand, firms focus on their flagship products, continuously optimizing around core technologies, expanding functionalities, and strengthening management to improve product-market fit and cost efficiency—thereby forming a vertical trajectory of product capability evolution. On the other hand, firms must also establish robust market promotion mechanisms, replicating proven product value from localized contexts to broader geographic regions or industry scenarios—constituting a horizontal logic of market expansion. These two capability sets interact synergistically to form the core support system for startup growth.

4.2.1.1 Vertical evolution of product capabilities

During the early growth phase, establishing a clear product roadmap and iteratively optimizing

it is central to cultivating core competitiveness. This study finds that the interviewed firms typically follow a pathway of "*identifying a core product – continuous product innovation – product line expansion – management optimization.*" Initially, firms screen and concentrate resources on key products that demonstrate both technological advantages and market potential. As market feedback accumulates, product functions are refined, and diversified variants are introduced to meet heterogeneous customer needs. Simultaneously, some firms enhance organizational management and supply chain coordination to reduce costs and increase efficiency across R&D, delivery, and cost control—thereby improving the product's overall market value. This vertical evolution highlights a product-centric value enhancement mechanism, representing the internal engine that drives a firm from "technological feasibility" toward "market success."

4.2.1.2 Horizontal advancement of market expansion

Once a stable product foundation is established, a key task becomes scaling the validated product value across wider markets. The firms studied demonstrate strong capabilities in market expansion and product externalization. On one front, they cultivate deep local market engagement (e.g., in Shandong and Jiangsu), building emblematic use cases and a foundation of customer trust. On another, they progressively replicate these proven solutions into other regions such as North China and Southwest China, adapting them to new industrial application contexts. In practice, frontline marketing personnel play a pivotal role, creating a rapid feedback loop of "market signal – technological adjustment – commercial deployment." Additionally, some firms accelerate new market entry by reusing existing technological modules or platform resources, forming scalable replication strategies across regions and sectors. The development of such capabilities serves as a vital bridge for firms transitioning from "regional breakthroughs" to "national penetration," reflecting their mechanisms of external scaling and replication during growth.

Table 4.5 Coding of the dual-growth capability development path

Main Category	Subcategory	Representative Coding Statements
Vertical Evolution of Product Capabilities	Identifying Core Products	"As the company evolves and new opportunities emerge, we must gradually clarify our main strategic direction, aligning it with our strengths and capabilities to define a core product focus." (SS)
		"Once we made that decision, we cut off many peripheral businesses. We were determined to do this one thing well. If we could succeed here, we believed we would establish a solid foothold in the industry." (HT)
	Continuous Product Innovation	"Our products have been continuously evolving. Initially, we developed monitoring systems for battery-powered DC power supplies… Later, we pivoted to transmission visualization, which was a larger opportunity. That was one innovation… We then launched new products like aerial-ground inspection tools, and are now deploying drone-related solutions." (CX)
	Frontline-Driven Product Promotion	"During rapid growth phases, development often relies on seizing favorable market opportunities… As a leader, it's critical to go to the frontlines, open up the market, and push the product forward."
		"Overall, I still believe that the market is the most critical factor. We're still in a phase of incremental expansion, and market development remains the core."
	Product Diversification	"Previously, we only made communication modules. Then we set a goal: to expand from modules to cloud-device integration—because terminals are closer to users and yield higher margins. We also explored using software to enhance hardware margins. That's how our cloud-management-terminal strategy emerged." (YF)
		"We are also continuously cultivating our presence in existing markets, expanding product categories to provide more comprehensive solutions to clients."
	Cost Reduction and Efficiency Gains through Management Optimization	"As the company enters a more stable phase, market opportunities may also plateau. That's when improving internal management becomes essential to enhance efficiency and reduce costs."
		"Of course, management is important, but it's a gradual process that becomes more relevant once a firm reaches a certain scale. We also need to avoid overemphasizing management at the cost of seizing new market opportunities."
Horizontal Advancement of Market Expansion	Regional Expansion	"Our flagship product—battery performance analysis—started by guiding market demand and working closely with clients to explore solutions. We achieved scale in the Shandong market in 2010, which was a major milestone. After that, we expanded to North China through technology-driven projects." (CX)
		"Expanding beyond Shandong and into the national market was a necessary path for our company's growth… Whenever we encountered obstacles, we did everything possible to mobilize resources and resolve them." (CX)
	Leveraging Technological Advantages to Enter New Markets	"I believe the core executive team must clearly understand the company's capabilities, stage of development, and unique characteristics… We reused our technological advantages to enter new sectors or niche markets. Compared to competitors, we offered substitute products and services at higher efficiency and lower cost."

4.2.2 Organizational support and strategic connectivity through internal-external collaboration

In responding to complex contexts such as policy shifts, technological change, and market uncertainty, startups require not only forward-looking strategic judgment but also resilient and flexible organizational mechanisms. This section synthesizes interview data to identify two core directions in building organizational support capabilities (see Table 4.6). On the one hand, firms develop “inward-facing” project assurance mechanisms by rapidly mobilizing internal resources and adapting organizational structures to meet the demands of strategic responsiveness. On the other hand, they establish “outward-facing” strategic connectivity networks through frequent interaction and collaborative engagement with key external actors such as industry associations, research institutions, and upstream and downstream enterprises. This dual mechanism of internal-external coordination enhances both the efficiency of resource integration and the firm’s capacity for strategic adaptation and innovation in dynamic environments.

Table 4.6 Coding of organizational support and strategic connectivity through internal-external collaboration

Main Category	Subcategory	Statements
Organizational Assurance and Structural Responsiveness through Internal Resource Mobilization	Seeking Support from Internal Experts	"We also sought assistance from company headquarters, technical experts, and the founding team. The leadership even drove overnight to the site to help troubleshoot the issue." (CX)
	Establishing Business Units	"In 2012, the company initiated an organizational restructuring… By 2014, we further advanced the reform and officially established three business units. We aimed to delegate responsibility down to business lines to enhance their autonomy and market responsiveness."
		"Due to the rapid growth of our DC business—particularly in substation monitoring, we urgently needed adjustments. The core of this restructuring was to allow specialized teams to focus on their own domains and deliver more professional products and services. The business unit model basically achieved its intended management objectives." (CX)
		"Our solution design, product finalization, delivery, and services were all integrated into the business unit. This created a shared interest system where goals aligned, leading to improved focus and efficiency."
		"We almost conduct an organizational-level adjustment every year… As demand in the power transmission sector grew, we quickly identified the opportunity and established a corresponding business unit."
	Organizational Restructuring	"With the organizational restructuring in place, the results were evident. Each business domain and technical area developed well. From 2012's recovery to 2015–2016, the company saw consistent upward growth."
		"We quickly perceived the potential of this trend and restructured our internal teams with increased resource allocation."
	Personnel Reallocation to Strengthen Organizational Support	"We reassigned some technical staff to the marketing team to strengthen organizational support."
	Leveraging Internal Company Resources	"Once we identified the market opportunity, we demonstrated core competency in resource integration. We could quickly respond to the market using internal resources and deliver high-quality products and services."
	Developing Small Specialized Technical Teams Internally	"We had to recruit new people, especially in technical roles. The technical route and personnel differed from before, so we formed and cultivated a dedicated small team starting in 2016 when we decided to pursue cloud management." (YF)
	Enhancing Proactivity through Structural Reform	"Given the maturity of our products and industry positioning, it's more effective to delegate decision-making authority to the frontlines instead of letting them constantly escalate problems to upper management. We designed mechanisms to embed responsibility and boost frontline proactivity."

Resource Synergy and Strategic Enablement through External Connectivity	Internal-External Resource Integration	“We emphasize the effective use of internal resources while also leveraging external forces. Only by integrating these can we ensure smooth resource adjustment and support future strategic initiatives.”
	Upward Social Networking	“Upward social networking is crucial. A team’s capabilities are influenced by the networks around it. In our experience, speaking with a minister yields more accurate information than with a division chief. Their perspectives are broader. So we strive to elevate our networking to higher levels.” (SS)
	Integration into Technical Circles	“Technology develops within its own ecosystem. We actively participate in technical associations, seminars, and forums. These help us stay updated (CX)
	Strategic Alignment Mechanism under Industry Association Guidance	“We have extensive interactions with the China Transportation Association. As a leading organization in China’s transportation sector, the Association brings together many experts. Our communication with the Association mainly involves sharing our current strategic direction and key ideas with its leadership. In doing so, the Association can help us ‘take the pulse’ of our development path and provide guidance on whether we are moving in the right direction.” (HT)
	Coorperation with research institutions and universities	“Since 2017, with the rapid advancement of emerging technologies such as artificial intelligence, we began to establish deep collaborations with several universities. Universities possess strong theoretical foundations and talent advantages in cutting-edge technological research, which have helped us quickly address internal gaps, especially in building applied capabilities related to AI algorithms and data processing.”
		“It is absolutely necessary to establish partnerships with external universities or key suppliers. As the company continues to grow, the complexity of our products also increases. Developing a high-quality product requires theoretical guidance and the translation of theory into practice. If we were to rely solely on our internal intellectual resources, it would be quite limited. In fact, the products we are developing may already be supported by mature experience within universities or professional external institutions. Therefore, we can introduce these external resources through mechanisms such as 'funding-for-technology' or 'funding-for-capability' exchanges.”
		“It was precisely through the technical support from universities and partners that we were able to deliver product solutions aligned with customer needs in a short period of time, thereby securing a first-mover advantage in the market. I believe that was a critical window of opportunity had we relied solely on internal accumulation, it might have taken us three to five years to develop a similar product, by which time the market window could have already closed.”

	Coorperation with external teams and other companies	“In the process of product innovation, we do not rigidly adhere to the idea of ‘doing everything ourselves’; instead, we actively seek external collaboration. When there are capable enterprises or teams in the broader ecosystem, we quickly mobilize and integrate these external resources to initiate cooperation. This approach allows us to take a complex technology or system and, with ourselves as the central coordinator, combine the strengths of other units to achieve rapid delivery. Especially in today’s fast-changing market environment, starting from scratch on our own may already be too late.”
	Open mind	“At the same time, we maintain an open mindset toward external collaboration.”
	Coorperation with external experts	“In fact, we were showcasing some of our company’s specialized products at a professional conference in Shandong, where we happened to meet a senior expert from the North China Electric Power Research Institute who was invited to give a lecture. … Through our conversations, we realized that many of the issues we were facing were, in fact, shared challenges.” (CX)
		“For an outstanding enterprise, the key lies in conducting thorough research at the very outset, identifying the most qualified experts and obtaining the most professional advice. Our current products are themselves the result of interdisciplinary integration. … Therefore, it is all the more necessary for us to leverage expert resources with deep technical and application-level expertise within the industry, to support early-stage assessments, solution design, and subsequent joint development. This is the core rationale behind our pursuit of external collaboration.”

4.2.2.1 Organizational assurance and structural responsiveness through internal resource mobilization

When facing new opportunities, technological transitions, or changes in policy orientation, startups often encounter practical challenges such as limited resources and immature systems. This study finds that many firms respond by rapidly mobilizing internal resources and flexibly adjusting their organizational structures to support strategic transitions. Specific practices include the establishment of dedicated business units, restructuring the organization, reallocating specialized personnel, and drawing on internal expert support. These mechanisms not only enhance project-level execution but also demonstrate the firm's structural responsiveness under external pressure. Especially in early-stage development, companies tend to "*start from within*," activating existing resources and building internal support systems to generate small-scale pilot cases, thereby laying the groundwork for broader external collaboration and scaling. Thus, the ability to flexibly reconfigure organizational structures serves as a crucial "*muscle of adaptation*" for startups operating under conditions of uncertainty.

4.2.2.2 Resource synergy and strategic enablement through external connectivity

Beyond internal mobilization, firms also exhibit highly outward-oriented capabilities for integrating strategic resources. The interviews reveal that firms frequently engage with research institutions, industry associations, peer companies, and key clients to access both informational and substantive support. Such interactions provide firms with policy interpretation, industry insights, and strategic guidance. For instance, firms proactively communicate with industry associations to align on strategic directions, engage in "upward socialization" to establish executive-level resource channels, or collaborate with external teams in technical ecosystems to achieve cross-domain innovation. These externally oriented mechanisms not only accelerate access to external information and resources but also enhance organizational learning and strategic adaptability. Respondents consistently displayed a mindset of openness, emphasizing sensitivity to external knowledge, methodologies, and collaboration opportunities, which forms the psychological and behavioral foundation for effective internal-external synergy.

4.2.3 The evolution of managerial capability systems in growth-oriented enterprises

As growth-stage enterprises undergo organizational expansion and encounter increasing environmental complexity, they often transition from experience-based to system-based management approaches. This transformation is characterized by three key developments: the

awakening and upgrading of managerial cognition, the construction of institutional mechanisms and management tools, and the systematic enhancement of organizational management capabilities.

Codings are shown in Table 4.7.

Table 4.7 Coding of the evolution of managerial capability systems in growth-oriented enterprises

Main Category	Subcategory	Statements
Evolution and Awakening of Managerial Cognition	Awareness of the need for professional management through business expansion	"The development of a company is essentially a process of growing from small to large. In the beginning, many tasks were handled by the original team. As market opportunities emerged, how to achieve professional management and create high-quality products became critical issues."
	Shift in managerial focus due to organizational growth	"As a founder and part of the core management team, we faced not only the challenge of seizing market opportunities but also that of managing our team and organization. Especially as the business expanded and the team grew, management became increasingly important."
	Reflection-driven cognitive upgrading	"We started from the grassroots level, so in terms of macro-management, we took more detours. But with each misstep, we learned and improved. Our growth process has been a spiral of continuous learning." (QP)
	From reactive to proactive strategic thinking	"It wasn't until competitors emerged that I realized I had to analyze them, competitors, the market, other industries. Things had been too smooth before, and we didn't pay enough attention to external changes. But after that, we began systematically studying the external environment, customers, suppliers, stakeholders, international trends, domestic policies, industry development, technology, and so on to position ourselves strategically." (YF)
Development of Institutional Systems and Managerial Instruments	Managerial Consensus for Driving Organizational Change	"When we perceive external threats or opportunities, the company must quickly realign its internal resources to respond to these changes. However, in practice, this is not an easy task. … The key lies in whether everyone can genuinely embrace the transformation from within. Assessing opportunities and risks should not only result in consensus among top management but also involve open communication and discussion so that all members participate and reach agreement. Compared with rigid, command-based resource allocation, this consensus-driven approach can better strengthen organizational cohesion and execution."
	Introduction of Strategic Management Tools	"Once you identify such issues, you must deliberately address them. For example, we began to focus on strategic management, how to conduct market analysis, how to clarify roles, departments, and responsibilities, as well as the tools and mechanisms we use to ensure alignment."
		"We have successively implemented transformations in performance management, human resource management, digital transformation projects, and improvements to our R&D systems and processes. Overall, management optimization has been an ongoing process, and we regard the enhancement of organizational capability as our core source of competitiveness." (CX)

	Introducing Process-Oriented Management Mechanisms to Improve Decision-Making Quality	"It's not something that can be settled in just one meeting. We have to go through multiple rounds of investigation and verification, including confirmation from senior executives on the client side. After several rounds of communication and validation, the proposal must also pass through our IPD (Integrated Product Development) screening process before we can determine that it is indeed an opportunity worth investing in." (HT)
	Replacing Experience-Based Leadership with Institutionalized Incentive Systems	"We can no longer rely solely on the personal judgment or leadership style of individual managers for decision-making. On one hand, decisions made on a personal basis are prone to bias and unsustainable outcomes; on the other, such practices consume a great deal of managerial energy and are inefficient. Therefore, we need to strengthen our organizational mechanisms to support decision-making in key areas such as incentives, performance evaluation, and value distribution, achieving system-driven rather than charisma-driven management. This represents a crucial transformation that the company must confront in its management practices."
Systematic Upgrading of Organizational Management Capabilities	Advancing Information System Development to Support Managerial System Upgrading	"As the company has continued to grow, we've become increasingly aware of the importance of building a solid internal management system. Especially in terms of information management, although we launched several systems in the early stages, overall the structure is still not well developed. The data across systems are not fully connected, and most of the existing information systems are fragmented and localized. As a result, they can hardly support the company's needs for efficient coordination and data-driven decision-making during the rapid growth stage. This directly affects the efficiency of internal management and limits our ability to conduct in-depth business data analysis."
	Enhancing Managerial Team Capabilities to Strengthen Overall Competitiveness	"With more competitors emerging, higher expectations have also been placed on our executive team. We have to further enhance the cost-performance ratio of our products, continuously improving product quality, service level, cost control, and product innovation, so that we can maintain our advantage in this highly competitive market."
	Leveraging External Consulting to Address Managerial Knowledge Gaps	"Most of us grew up from frontline business roles, so learning how to truly understand and deal with management issues, and how to view enterprise development from a higher strategic perspective, has become something we urgently need to address. In this situation, attracting external expertise, or what we call 'external brains,' has become a necessary step. Our management knowledge and experience were sufficient in the early stages, but as the company grows, management problems are becoming more complex, and it's hard to cope with them relying solely on our own abilities. That's why we need to learn from and bring in consulting experts with deep management experience to fill in the gaps we might overlook and help us strengthen our organizational capability." (CX)

4.2.3.1 Evolution and awakening of managerial cognition

The "evolution and awakening of managerial cognition" refers to the process through which entrepreneurs and managers, as their firms move from the startup to the growth stage, gradually realize that experience and personal intuition alone are insufficient to sustain the development of increasingly complex businesses. Consequently, they begin to consciously enhance their understanding of strategic management, organizational governance, and systemic capability building. This transformation is often triggered by internal and external challenges, during which managerial cognition shifts from an "*execution-oriented*" mindset to a "*strategy-driven*" one, and from "*individual leadership*" to "*organizational empowerment*."

In the interviews, many founders and senior executives mentioned that their companies initially relied on close-knit teams and business momentum to drive growth. However, as business operations expanded and organizational complexity increased, they began to recognize the significance of management issues. Changes in the market environment also served as a catalyst for cognitive upgrading. As one executive noted: "*It was only when competitors began to emerge that I realized I needed to analyze the competition… including the overall international situation and technological developments, in order to determine our strategic positioning*." This statement illustrates the shift of entrepreneurs from reactive adaptation to proactive strategic learning.

In summary, the evolution and awakening of managerial cognition reflect not only the personal growth trajectory of enterprise leaders but also the cognitive foundation underpinning the transformation of growing firms from rule of man to systematic management. It represents the first step toward organizational professionalization and institutionalization, laying a critical groundwork for subsequent mechanism development and capability upgrading.

4.2.3.2 Construction of institutional mechanisms and managerial tools

The construction of institutional mechanisms and managerial tools refers to the process through which firms, in the course of their growth, transition from experience-based management toward a more structured, process-oriented, and institutionalized management model. This transformation aims to enhance organizational efficiency, standardize managerial behavior, and strengthen execution capacity. It typically manifests through the establishment of clear role divisions, incentive and performance evaluation systems, decision-making procedures, and integrated management toolkits, together promoting the professionalization and normalization of organizational governance.

Interview data reveal both the intrinsic drivers and practical explorations behind this transformation. For example, one executive emphasized: "*In terms of how to motivate employees to create value and how to ensure fair value distribution, it has become increasingly necessary for us to establish a systematic, institutionalized framework… to truly achieve management driven by systems, rather than relying on personal charisma to retain and manage people.*" This statement highlights that as enterprises expand, experience-based and leader-centric management approaches can no longer sustain organizational efficiency, necessitating a shift toward formal system design and standardized processes.

Furthermore, when facing rapidly changing environments or internal adjustments, organizations tend to promote change through "*consensus-based mechanisms*" rather than "*command-driven coordination*." As one respondent noted: "*The key is whether everyone can genuinely embrace the change from within… Compared with rigid, top-down resource allocation, this consensus-driven approach better enhances organizational cohesion and execution*." This reflects that managerial tools are not merely technical instruments but are deeply integrated with organizational culture and team identity.

Overall, the construction of institutional mechanisms and managerial tools marks a critical transition from person-dependent to system-based management. It strengthens the organization's capacity to address complex managerial challenges, improves internal and external coordination efficiency, and represents a vital step toward the modernization of corporate governance.

4.2.3.3 Systematic upgrading of organizational management capabilities

The systematic upgrading of organizational management capabilities refers to the strategic process by which enterprises, as they move toward a mature stage of development, proactively enhance their managerial capacity to accommodate expanding business scales and increasingly complex external environments. This upgrading centers on three key initiatives: the development of information systems, the enhancement of managerial team competencies, and the integration of external professional expertise. Rather than relying on individual experience or intuition, this process emphasizes structural capability building to make organizational management more efficient, scientific, and sustainably controllable.

Multiple interviewees highlighted that as their companies grew, traditional management approaches, rooted in intuition, personal relationships, and ad hoc decision-making, began to reveal significant efficiency bottlenecks and blind spots in execution. The increasing competitive intensity also imposed greater demands on management teams. As one executive

noted: "*With the growing number of competitors, higher expectations are now placed on our executive team's capabilities… only by improving ourselves can we maintain a competitive edge in such an intense market*." This realization has driven enterprises to continuously invest in talent acquisition, organizational empowerment, and managerial training.

At the same time, organizations have become more aware of the limitations of their internal capabilities and have actively sought to engage external expertise to fill managerial gaps. As one company leader explained: "*Attracting external intelligence has become an essential task… by learning from and bringing in consulting experts with profound management experience, we can address details we might have overlooked and strengthen our organizational competence*."

In sum, the systematic upgrading of organizational management capabilities is not a fragmented improvement but a comprehensive system-building initiative aimed at securing future competitiveness. It signifies a critical capability leap from person-dependent to system-driven management and serves as a vital foundation for achieving high-quality governance and enhanced strategic execution.

4.3 Analysis of dynamic capabilities of executives after IPO

4.3.1 Strategic sensing and innovation response mechanisms under uncertainty

As enterprises enter the critical growth stage, they face an increasingly complex and dynamic external environment. Executive teams are thus required not only to possess forward-looking strategic foresight but also to build flexible and effective internal innovation response mechanisms. Together, these two dimensions form the dual pillars of strategic direction and organizational execution: strategic foresight provides directional guidance and enables the timely identification of strategic windows, answering the question of "where to go"; while innovation-driven organizational responsiveness ensures "how to get there" through effective mechanism design, resource coordination, and adaptive learning. This "sensing–response" closed-loop system is vital for maintaining competitiveness and sustaining growth in uncertain environments.

4.3.1.1 Forward-looking strategic foresight

Forward-looking strategic foresight refers to an enterprise's ability to anticipate future changes in customer needs, technological trajectories, and generational shifts, thereby identifying potential opportunities and risks ahead of time. This is achieved through proactive allocation of strategic resources, product evolution planning, and diversified layout of business initiatives,

ultimately enabling the enterprise to build a "*second growth curve*." This capability reflects a firm's strategic sensitivity, temporal awareness, and systemic anticipation, serving as a fundamental basis for long-term competitiveness and resilience.

4.3.1.2 Innovation-driven organizational responsiveness

In innovation initiatives under high uncertainty, the construction of organizational responsiveness becomes a critical leverage point. First, the executive team demonstrates a proactive innovation mindset and high opportunity sensitivity, emphasizing early positioning and seizing first-mover advantages through experimentation and iteration. However, several structural obstacles persist in practice: conflicts between performance-oriented objectives and innovation resource needs often hinder progress, especially under conditions of limited resources where R&D is overly consumed by delivery-oriented projects, undermining long-term product strategy.

Moreover, the rigidity of existing KPI systems, designed primarily for predictable, operational tasks, fails to accommodate the uncertainty and long-term nature of innovation activities. This limits management's motivation and willingness to take innovation risks. To address these constraints, enterprises are experimenting with growth-oriented performance evaluation systems to incentivize rapid development of innovation businesses.

It is worth noting that the enterprises studied generally exhibit strong organizational learning capabilities. Through systematic learning and knowledge accumulation, they respond quickly to industry trends, regulatory changes, and technological developments. This learning capability has become a key foundation for organizational adaptability and innovation performance in dynamic environments.

Codings are shwon in Table 4.8.

Table 4.8 Coding of strategic sensing and innovation response mechanisms under uncertainty

Main Category	Subcategory	Representative Coding Statements
Forward-Looking Strategic Foresight	Customer insight and early strategic positioning	"Customers often have foresight and influence over changes in demand and investment trends for the next two to three years. We must anticipate and understand these trends early to strategically position ourselves and respond to future market changes."
	Identification of key technologies and iterative timing	"In our industry, we must anticipate key technologies that could be realized in the next two to three years. Our product cycle is relatively fast, like major updates every two to three years, so we must accelerate technological investment and talent development."
	Generational shifts and changing customer value preferences	"The demographic structure of customers is changing, and in the next 10 years, a new generation of decision-makers will take the lead. Today it may be the '80s and '90s generations, but soon it will be Gen Z. Their mindset, values, and tech acceptance are completely different. This generational shift will deeply reshape our business and sales models."
	Strategic sensitivity and early risk recognition	"We must plan ahead and not passively react to risks. If our frontline lacks sensitivity to emerging trends or has no contact with younger customers, we may miss or filter out crucial signals, potentially shutting the door to future growth without realizing it."
	Second-growth-curve planning	"We realized early that any product or business will eventually mature. With that foresight, we started planning our 'second growth curve,' which eventually led us to focus on two key sectors: water conservancy and railways."
Building Organizational Responsiveness Under Innovation-Driven Contexts	Proactive Innovation Mindset	"In my view, the more critical capability is the ability to act quickly in the face of opportunity. The very nature of innovation and opportunity recognition is marked by uncertainty. That's why I believe we shouldn't passively wait for new opportunities, we need to proactively explore and experiment. This mindset of 'winning through movement' should be our fundamental attitude when dealing with uncertainty."
	Opportunity Sensitivity	"In today's environment, we must dare to innovate. It's no longer a question of whether we want to, but a matter of no longer having a choice. With the rapid advancement of productivity, both the market and technological landscape are constantly evolving, no technology remains absolutely dominant for long. In fact, even a six-month lead can be a tremendous advantage. Therefore, we must stay sharp and quickly identify innovative product opportunities or strategic directions in such a fast-changing environment."
	Conflicts Between Performance Objectives and Resource Allocation	"In the process of driving innovation implementation, I believe this poses a significant challenge for the company. On the one hand, we must balance current-year resource investments and performance targets to ensure operational stability. On the other hand, innovation is inherently characterized by uncertain timelines and unpredictable outcomes. In actual practice, we have encountered situations where, due to insufficient resource coordination

	or an overemphasis on short-term performance evaluations, some innovative designs were constrained by rigid frameworks, making it difficult for good ideas to be truly realized and translated into outcomes."
Innovation Disruption Caused by R&D Resources Being Consumed by Delivery-Oriented Projects	"At present, product homogenization is a serious issue across the industry. In recent years, our product development efforts have largely been reactive, driven by market demands and the need to respond passively to various highly customized projects. A large portion of our internal resources, especially R&D resources, have been allocated to delivery-oriented projects, which has led to a significant shortage of resources for planning, designing, and promoting next-generation, competitively differentiated products. Although we've made some attempts and investments in innovation, the overall results still fall short of supporting a true breakthrough for the company."
Growth-Oriented Assessment for Innovation Business	"Overall, when it comes to innovation-oriented business, we need to return to its core positioning. These types of businesses often start from a relatively low base and have limited resource foundations. But once we identify them as innovation opportunities, it means they have strong growth potential and may achieve rapid expansion within a short period. Therefore, from a management perspective, we should emphasize a 'growth-oriented' evaluation system, placing business growth as a key performance metric and using institutional mechanisms to drive their accelerated development."
Inhibition of Innovation by Rigid Performance Metrics	"In recent years, the number of competitors we face has increased significantly. Based on tender data, there may be close to a hundred vendors bidding within a single round. In such a highly competitive environment, although the executive team has taken some countermeasures, the results, judging from market feedback, have not been ideal. While the overall business volume of the company is still growing, operating profit has declined noticeably."
	"To be honest, innovation… well, it hasn't been going very well. And why is that? The truth is, the bigger the company, the harder it is to innovate. Because we're bound by KPIs. Once the KPI system is set, it becomes difficult to assign innovation-related KPIs. The headquarters usually doesn't allocate KPIs specifically for innovation, and without that, it's really hard to push innovation forward."
The Role of Organizational Learning Capabilities in Supporting Innovation Opportunity Recognition	"One of the most important characteristics of our company is its strong learning capability. We are not constrained by convention and can continuously adapt to changes in the external environment. Throughout this ongoing learning process, we actively acquire industry knowledge, study national policies, and stay up to date with emerging technologies. At the same time, we have also implemented systematic team-based organizational learning. This continuous learning enables our team to identify opportunities more sensitively and often allows us to perceive market shifts and potential breakthroughs earlier and more accurately than others."

4.3.2 Talent attraction and retention strategies: from recruitment to incentivization

4.3.2.1 Strategic talent acquisition and deployment mechanisms

Faced with talent-related challenges across different stages of development, the executive team demonstrated a high degree of foresight and systematic thinking in talent acquisition and deployment. The company's performance decline in 2011 became a turning point for organizational reflection, during which leadership identified a “shortage of talent” as a critical bottleneck to growth. In response, the company acted swiftly on two fronts to optimize the talent supply structure.

On one hand, it established a partnership with Shandong University of Technology and launched scholarship programs. This not only enhanced the company's academic visibility but also created a stable talent pipeline and a formalized campus recruitment system. On the other hand, the company intensified efforts to recruit individuals for critical positions, especially those with key technical capabilities, to meet the urgent needs of organizational expansion and technological advancement.

Beyond acquisition, the company also recognized that innovative talent requires environmental support as much as recruitment. Executives emphasized the importance of fostering “*a relaxed, professional, and interference-free atmosphere*” by reducing administrative constraints and clarifying role divisions, thereby creating efficient innovation spaces for expert personnel. As product complexity increased, the coordination of multi-party projects imposed new demands on organizational structure. In response, the company gradually established cross-departmental, multi-disciplinary collaboration mechanisms, building a comprehensive project support system that ensured seamless talent integration from onboarding to deployment. Overall, this strategic talent acquisition and allocation system effectively addressed early-stage talent deficiencies and laid a solid foundation for future innovation and expansion.

4.3.2.2 Talent retention and organizational anchoring mechanisms

Sustainable enterprise development depends not only on external talent acquisition but, more critically, on building a robust organizational infrastructure that retains talent, unlocks potential, and supports long-term growth. Interview insights indicate that, after 2011, the company implemented a series of initiatives to enhance talent retention. One notable outcome was the strategic development path for employees, which enabled early hires to grow into mid-level managers, demonstrating the organization's long-term commitment and effectiveness in talent

cultivation.

To further improve overall talent quality and professional engagement, the company took a two-pronged approach. First, it strengthened its internal training system, providing structured, phased learning opportunities aligned with different career stages. Second, it implemented a multi-level equity incentive scheme, extending beyond executives to include long-tenured front-line employees. This fostered a shared vision of "*co-developing and co-sharing organizational achievements*."

The company also adopted a performance- and capability-based evaluation system, replacing seniority-based promotion norms. By clarifying promotion pathways and linking incentives to individual contributions, it effectively stimulated intrinsic motivation and self-driven development among employees.

Furthermore, the company demonstrated a distinctive human-centric management philosophy. Initiatives such as a "*mentorship system*" and a "*filial care fund*" reflected its concern not only for employees but also their families, enhancing emotional attachment and loyalty. Together, these practices formed a long-term talent anchoring platform that underpins the company's organizational evolution, cohesion, and sustainable competitiveness.

Codings about talene attraction and retention are shown in Table 4.9.

Table 4.9 Coding of talent attraction and retention strategies

Main Category	Subcategory	Representative Coding Statements
Strategic Talent Acquisition and Deployment Mechanisms	University Partnerships and Talent Pipeline Development	"In 2011, the company established a partnership with Shandong University of Technology and set up a scholarship program. This initiative became a key strategy for talent attraction. The collaboration enhanced our academic presence and allowed us to attract top students. The scholarship program helped more students learn about the company and built strong ties with the academic community."
		"In 2011, we experienced a notable performance downturn, one of the core reasons being insufficient staffing. A review in 2012 led us to prioritize internal team building. We began to strengthen talent recruitment, especially campus recruitment of undergraduates and postgraduates, thereby creating a stable talent pipeline."
		"Looking back, the 2011 downturn pushed us to increase R&D investment and talent recruitment. That year, we also initiated collaboration with Shandong University of Technology, launching a scholarship to boost our campus visibility. Many students learned about us through this initiative and chose to join our team."
	Recruitment of	"In addition to partnerships with universities, the

	Critical Talent	company ramped up recruitment in 2011, especially for core talent and critical roles. These measures ensured we could attract skilled professionals in the short term to meet urgent technical and organizational needs."
	Supportive Environment for Innovation-Oriented Talent	"Innovation depends on top talent and advanced thinking. The challenge is creating the right environment for experts. We focused on building a relaxed, professional, and interference-free atmosphere so they could focus entirely on their work. Reducing administrative barriers allows professionals to do what they do best, critical for driving technical innovation."
	Cross-Departmental Collaboration and Project Mechanisms	"As the complexity of our products continues to increase, bringing a product from design and development to management innovation is no longer something that can be handled by a single department or specialized function alone. It requires cross-departmental, cross-disciplinary, and multi-domain collaboration. Therefore, we must establish an effective support mechanism to ensure efficient coordination among all stages and teams, thereby facilitating smooth project implementation."
Building Mechanisms for Talent Retention and Organizational Capacity	Shaping Talent Development Pathways	"Looking back, these efforts were extremely valuable. In fact, some of the key employees who joined the company in the following years have now grown into mid-level managers."
	Systematic Employee Training System	"At the same time, we also strengthened the development of our internal training system. As I recall, starting from late 2011 or early 2012, the company began organizing multiple rounds of staff training programs."
	Multi-Level Equity Incentive Mechanism with Broad Coverage	"In terms of talent retention, the company had planned an equity incentive fund from the early stages. This incentive scheme is not limited to core executives, it also covers long-serving employees who have worked at the company for over five years, including shop-floor workers. … This kind of incentive mechanism has strengthened employees' sense of belonging and responsibility, and has effectively reduced the turnover rate."
	Performance-Based Employee Evaluation and Recognition Mechanism	"The company has always upheld the principle of fairness and equity, especially in performance evaluations, promotions, and appointments. We emphasize employees' capabilities and performance rather than seniority or years of service. This approach ensures that the most suitable talents are selected and promoted, thereby driving the company's development." "Through a fair evaluation system, the company ensures that outstanding employees receive proper recognition and rewards, which in turn enhances

		motivation and drives innovation."
	Seniority-Neutral Mechanism for Managerial Selection and Promotion	"Promotion and career advancement are based primarily on ability and performance, avoiding the drawbacks of seniority-based systems and encouraging employees to expand their career development opportunities through tangible contributions."
	Human-Centered Care System	"To support the integration of new employees, we adopt a mentorship system where experienced staff members guide newcomers, helping them quickly adapt to the team and build a more human-centered connection. In addition, to show our care for employees' families, we have implemented a 'Filial Piety Bonus' policy. Specifically, for employees who have worked with us for more than two years, the company sends a box of eggs or a box of milk to their parents every month, reflecting the company's warmth and respect for employees' families."
	Organizational Cohesion Through Equity Incentives and Training Mechanisms	"Our idea of 'sharing' means that as the company develops, employees and partners can participate together and benefit together, realizing co-creation and win-win outcomes. Since 2014, we've promoted this concept on two levels. On one hand, we have intensified systematic training for employees, especially mid- and senior-level managers, aiming to unify values and enhance capabilities to build a more cohesive internal team. On the other hand, we also implemented our first equity incentive program that year, officially bringing a group of core managers into the company's shareholder structure."

4.3.3 Mutual reinforcement: the co-evolution of organizational governance and capability replication

As enterprises enter the mature development stage, single-business models and founder-driven management approaches become insufficient to support the continued advancement of diversified strategies. Against this backdrop, a strong co-evolutionary relationship emerges between the transformation of organizational governance and the extension of core capabilities. On the one hand, the establishment of a group-based governance structure, the implementation of an "internal partner" system, and the enhancement of institutional and incentive mechanisms provide organizational and institutional foundations for the refinement and cross-sector transfer of core capabilities. On the other hand, the general-purpose capabilities accumulated in the firm's core power sector, such as intelligent system design and modularized platforms, have been successfully extended into adjacent industries like water conservancy and railways

through standardization and modularization. This capability spillover, in turn, raises new demands on organizational coordination, talent deployment, and strategic integration, thereby driving further governance transformation. Together, these dynamics form a virtuous cycle of "*governance support – capability deployment – complex adaptation – governance reinvention*," which serves as the foundational pathway for the enterprise's transition toward platform-based and diversified development.

4.3.3.1 Transformation of governance models and the evolution toward a group structure

As firms move into mid-to-late stages of development, their management logic shifts from founder-driven intuition and experiential decision-making toward structured and institutionalized governance. Multiple interviewees emphasized this transition, noting that "*as the company grows, decisions can no longer be made by gut feeling*," signaling a fundamental evolution in governance mindset.

During the company's transformation into a group-level enterprise, significant organizational restructuring was implemented. At the same time, the firm introduced an "internal partner" mechanism, which is a model based on equity incentives, shared values, and interest alignment to deepen employee engagement and foster a sense of collective ownership among core team members. Parallel to this, the company began exploring an "external partner" mechanism, cultivating in-depth collaborations with ecosystem partners to achieve resource complementarity and long-term mutual benefit.

This evolution reflects the enterprise's shift from rule of man to rule of system, and from flat management to platform-based governance. These structural and cultural shifts have laid a solid organizational foundation for future strategic implementation and multi-business coordination.

4.3.3.2 Extension of core capabilities and cross-industry value creation mechanisms

Building upon a stable foundation in the power industry, the executive team demonstrated strategic foresight by abstracting and consolidating existing technological and product capabilities to identify transferable technology modules with public attributes. These modules then served as entry points for strategic expansion into emerging sectors such as water conservancy and railways. As one interviewee put it, "*The AI algorithms and software–hardware platforms we developed in the power sector are, in many cases, transferable*."

Through extensive research, the company observed that the power industry was among the

frontrunners in intelligent infrastructure. These advanced capabilities, once adapted, offered a first-mover advantage and differentiation in other sectors. This approach not only reduced trial-and-error costs in new business incubation but also enhanced the efficiency of capability reuse. In essence, the company established a diversification logic centered on capability spillover, enabling the strategic replication and redeployment of internal strengths across domains to create new industry value.

Codings about organizational governance and capability replication are shown in Table 4.10.

Table 4.10 Coding of organizational support and capability expansion

Main Category	Subcategory	Representative Coding Statements
Transformation of Governance Models and Evolution Toward Group Structure	Management Model Transformation	"One of the key challenges we faced was stepping beyond our traditional electricity-centered management logic to assess development opportunities in other sectors. In this context, transforming our management model became particularly crucial. In fact, starting two years ago, we established wholly owned subsidiaries in water conservancy and rail transport to ensure professional development in those areas."
	Group-Based Development	"Group-based development became an inevitable choice. By clearly defining the nature of each business segment, and even anticipating future ones, group-level management not only allowed for further specialization and refinement, but also strengthened accountability within the leadership team. This process enabled us to better plan for future strategic directions."
		"Group development means we must build a platform-oriented governance structure that supports coordination and collaboration across professional business units. This model gives us broader opportunities and stronger conditions for expansion into new industry scenarios."
	Internal Partner Mechanism	"In 2014, our company officially launched the 'internal partner' strategy, marking a key milestone in the evolution of our management mechanisms."
	External Partner Mechanism	"In response to mounting market pressures, our management team has been continuously seeking breakthroughs in marketing strategy, technology upgrades, and product optimization. For example, we've focused on improving customer satisfaction and building stronger relationships with partners to create a tighter external resource network, which is our 'external partner' strategy. However, given the highly competitive and price-sensitive market environment, the overall effect has been limited."

Core Capability Extension and Cross-Industry Value Creation	Distillation of Generalizable Technological Capabilities	"While our core business has been centered on the electric power sector, we have also expanded into related businesses in the water conservancy and railway industries. Looking back from today's perspective, this strategic choice has proven to be relatively successful. Objectively speaking, a key foundation for this success lies in the accumulation of fundamental capabilities developed during our work providing products and solutions for the power industry. For example, we built strong competencies in market thinking, hardware and software development, and artificial intelligence. Upon distilling these foundational technical capabilities, we realized that many of them possess common or transferable attributes."
	Cross-Industry Knowledge Transfer and Value Re-Creation	"Once these core capabilities were clearly identified, we came to understand that industries beyond power and the grid could also benefit from them. In fact, during our in-depth research into other sectors, we found that the electric power industry was actually ahead in some respects, possessing advanced technologies and experience. As a result, when we applied these accumulated experiences and capabilities to other industries, we found ourselves able to deliver new value to those sectors."

4.4 Chapter summary

Through in-depth interviews with over 20 senior executives from entrepreneurial firms, this study systematically analyzes strategic responses, resource integration, organizational coordination, and capability development across different stages of enterprise growth. The analysis yields 23 core categories, as summarized in Table 4.11, which together illuminate the staged evolutionary patterns and practical mechanisms of dynamic capabilities in entrepreneurial teams.

Table 4.11 Summary of core categories and dynamic capabilities across the three developmental stages of entrepreneurial firms

Stage	Main Category	Dynamic capabilities
Start-up phase	1. Opportunity Recognition and Market Positioning	Sensing and seizing
	2. Rapid Response and Entry Strategy under Resource Constraints	
	3. Customer Orientation and Product Value Realization	
	4. Policy-Oriented Perception and Response Capability	
	5. Technology Trend Identification and Integration Capability	
	6. Strategic Opportunity Conversion and Organizational Execution Capability	
	7. Customer-Oriented Strategic Cognition and Value Co-Creation	

	Capability	
Growth phase	8. Demand Response Mechanism and Organizational Collaborative Execution Capability	Seizing and transforming
	9. Policy-Driven Development of Ambiguous Concepts and Demonstration-Based Diffusion Pathways	
	10. Client-Driven Agile Development and Collaborative Iteration	
	11. Vertical Evolution of Product Capabilities	
	12. Horizontal Advancement of Market Expansion	
	13. Organizational Assurance and Structural Responsiveness through Internal Resource Mobilization	
	14. Resource Synergy and Strategic Enablement through External Connectivity	
	15. Evolution and Awakening of Managerial Cognition	
	16. Development of Institutional Systems and Managerial Instruments	
	17. Systematic Upgrading of Organizational Management Capabilities	
Post-IPO and maturity phase	18. Forward-Looking Strategic Foresight	Transforming
	19. Building Organizational Responsiveness Under Innovation-Driven Contexts	
	20. Strategic Talent Acquisition and Deployment Mechanisms	
	21. Building Mechanisms for Talent Retention and Organizational Capacity	
	22. Transformation of Governance Models and Evolution Toward Group Structure	
	23. Core Capability Extension and Cross-Industry Value Creation	

In the startup phase, firms typically operate in highly uncertain market and technological environments. Executive teams primarily focus on opportunity recognition, resource mobilization, and rapid response, reflected in categories such as "*market opportunity identification and positioning*," "*technology trend recognition and integration*," and "*agile development driven by customer needs."* Firms often rely on flexible organizational structures, acute sensitivity to policy windows, and rapid iteration in response to customer feedback to achieve initial transitions from concept validation to market entry. At this stage, dynamic capabilities are primarily manifested through the rapid development of sensing and seizing capacities.

During the growth phase, as products stabilize and market presence expands, the organizational focus shifts toward capability consolidation, structural development, and resource orchestration. Interview data reveal recurrent themes such as "*vertical evolution of product capabilities*," "*mechanisms for resource coordination and strategic enablement*," and "*evolving managerial cognition*," indicating a growing need for restructuring both internal systems and external relational networks. Dynamic capabilities in this stage include not only the continuation of sensing and seizing but also the emergence of initial transforming capabilities, namely the optimization and adaptation of organizational structures, institutional tools, and management models.

In the post-IPO and maturity stages, challenges transition from issues of survival and scaling to those of sustainable competitiveness and value creation. Executives highlight critical concerns such as "*forward-looking strategic positioning*," "*cross-industry value creation mechanisms*," and "*organizational governance transformation*," revealing a more systemic reflection on strategic organizational capabilities and high-level governance architectures. At this point, dynamic capabilities evolve toward cross-stage capability reconfiguration and continuous renewal, with an emphasis on maintaining strategic flexibility and organizational resilience under uncertainty.

In sum, from resource-constrained rapid responses in the startup phase, to systematized organizational development in the growth phase, and ultimately to strategic expansion and governance transformation in the maturity phase, the dynamic capabilities of entrepreneurial teams exhibit a clearly staged evolutionary trajectory. This trajectory not only reflects the progressive strengthening of the three dimensions of dynamic capabilities, namely sensing, seizing, and transforming, throughout the enterprise lifecycle, but also reveals how executive teams adapt their cognitive frames and organizational action logics in response to changing developmental contexts.

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Chapter 5: Case Study of Company X

5.1 Introduction to the case company

Company X, established in 2006, is an artificial intelligence company focused on digital transformation. It is committed to deeply integrating artificial intelligence, digital twins, drone technology, and industry scenarios, providing artificial intelligence products, solutions, and professional services, empowering industry digital transformation and upgrading. Against the backdrop of national industrial policy support and digital transformation, and benefiting from the continuous advancement of the China's 14th Five-Year Plan's (from 2021 to 2025) new infrastructure and robust smart grid development strategy, Company X has achieved rapid growth in recent years. In 2021, it successfully listed on the Shanghai Stock Exchange's Sci-Tech Innovation Board. As a leader in the practical application of "AI+industry", Company X has successfully promoted the digital transformation of the transmission profession of the State Grid and the Southern Grid, improving operational efficiency and safety. Table 5.1 condenses the key milestones and developments for Company X from 2006 to 2024. Figures 5.1 and 5.2 respectively present Company X's annual revenue and profit from 2006 to 2024. Figure 5.3 illustrates the number of employees and the per capita output during this period.

Table 5.1 Key milestones and developments for Company X

Year	Development Milestones
2006	Establishment of Company X Co., Ltd.
2007	Focus on R&D and establishing business in electric power technology.
2008	Launch of battery online monitoring system; expansion into Shandong and Anhui markets.
2009	Growth in employees; foundation laid for management systems.
2010	Triple increase in contract value; innovation in DC power supply monitoring and smart grid substations.
2011	Introduction of talent development plans; collaboration with Company Y for management standardization.
2012	Recovery of performance post-setbacks; staff increased to 100; organizational structure adjustment.
2013	Steady performance growth; establishment of after-sales service department; increased focus on R&D and customer value.
2014	New Third Board listing; company restructured; focus on financing and humanistic care.
2015	Entry into transmission operation and maintenance market; establishment of Company X Business School.
2016	Further growth and internal organizational optimization; equity incentive plan implemented.

2017	Collaboration with Huaxia Cornerstone Consulting; focus on power transmission R&D.
2018	Emphasis on artificial intelligence; operation of a new plant; significant contracts signed.
2019	Steps toward IPO; introduction of high-end talents and strategic partnerships.
2020	Management restructuring; active response to pandemic; preparation for IPO.
2021	IPO and listing on the Science and Technology Innovation Board; shift to AI and smart solutions.
2022	Expansion into water conservancy and rail businesses; successful power supply for Winter Olympic Games.
2023	Focus on HR management consulting; emphasis on performance-oriented talent development.
2024	Launch of digital transformation project; partnership with Hongmeng Ecological Service Company.

Source: Created by the research

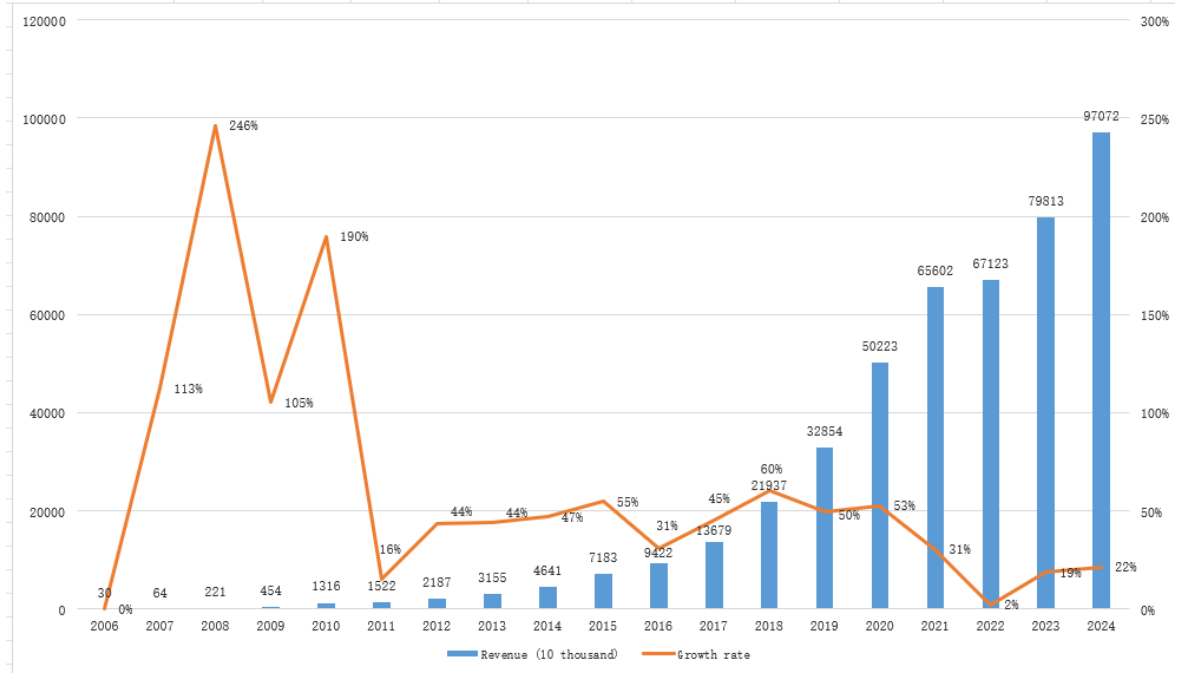


Figure 5.1 Annual revenue of Company X (2004–2006)

Source: Created by the research

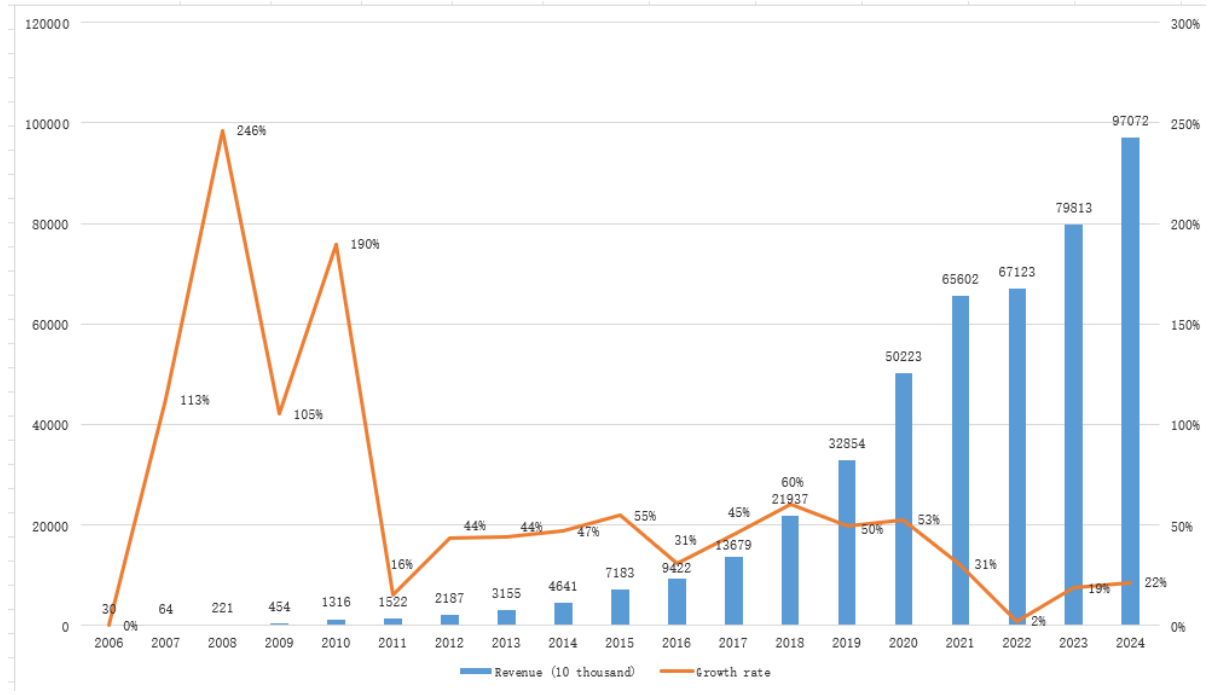


Figure 5.2 Annual profit of Company X (2004–2006)

Source: Created by the research

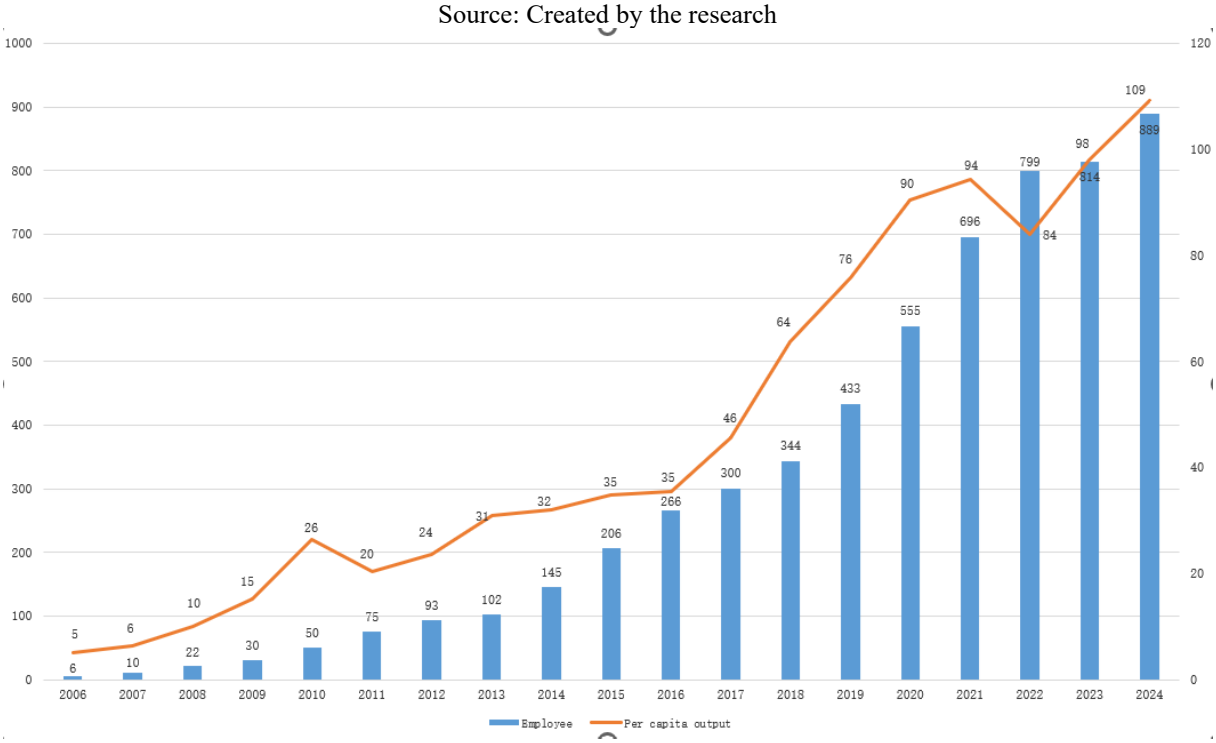


Figure 5.3 Number of employees and per capita output of Company X (2004–2006)

Source: Created by the research

5.2 Emergence: from technological foundation to market establishment (startup phase: from 2006-2010)

The early development trajectory of Company X began with battery performance analysis,

which later expanded into the monitoring and management of direct current (DC) power systems. This path was not incidental but rather stemmed from the founding team's deep technical expertise in the power systems field and their keen insight into industry pain points.

With the advancement of smart grid and intelligent substation construction, the company keenly identified the emerging demand for intelligent substation master control systems around 2010 and gradually transformed from providing single-device analyses to delivering system-level solutions. This strategic shift was highly aligned with the policy direction of the State Grid Corporation of China, as articulated in the Smart Grid Development Plan, which emphasized the priority construction of intelligent substations (State Grid Corporation of China, 2010).

According to the China Electricity Council Yearbook (China Electric Power Yearbook Editorial Committee, 2011), DC power monitoring systems at that time had been designated as key targets for technological upgrading by multiple regional grid companies, providing a practical opportunity for Company X to penetrate and expand in this market.

It is evident that during its early entrepreneurial stage, the company demonstrated a strong technology-driven opportunity recognition capability, not only capturing policy and technological windows but also dynamically adjusting its R&D direction through close interaction with clients. As a result, Company X achieved a remarkable 2,425% profit growth in 2010.

As one senior executive recalled: "*In the first stage, we were mainly engaged in battery performance analysis, and later advanced into DC power monitoring and management. That was more than ten years ago, and around 2010 we began exploring intelligent substation master control systems…*" (Interview data)

Another executive further noted: "*The company encountered a critical market opportunity, extending its business from substation scenarios to the transmission domain. At that turning point, the core management team conducted rapid assessment and unanimously recognized it as a rare strategic opportunity. Consequently, the team concentrated its resources and efforts to ensure the successful implementation of the new project.*" (Interview data)

During this period, Company X exhibited a typical "point-to-surface" pattern of technological breakthrough, first establishing a competitive advantage within a niche domain, and then gradually identifying pathways for expansion. This laid a solid foundation for subsequent business development. In the startup stage, Company X leveraged its acute sensing capability to identify emerging technological opportunities and translated them into early-stage product breakthroughs and initial market foothold, thereby achieving notable innovation

performance.

At this early entrepreneurial phase, the company faced dual pressures: limited financial resources and an underdeveloped market. The team's primary strategy was to rely on customer relationships to reduce uncertainty. By maintaining close communication with existing clients, even when those clients transitioned to new roles, Company X was able to preserve ties and convert those relationships into new business opportunities. This phenomenon of "*opportunity through customer migration*" demonstrates the company's capacity for bricolage within relational networks.

"*Even when our clients moved to new professional positions that seemed unrelated to our core products, we still maintained close contact... Eventually, the relationship became more like friendship, and they were very willing to share their management ideas and experiences in their new fields with us.*" (Interview data)

This practice reflects the team's dynamic capability of opportunity seizing under resource constraints, using social capital to compensate for internal limitations, and leveraging relational networks to access information and collaborative possibilities.

From the perspective of Upper Echelons Theory (UET), this strategic orientation was not accidental, but closely tied to the characteristics of the founding team. With long-term experience in the power industry, the founding members upheld values emphasizing relational orientation and long-term reciprocity. As a result, in the face of market uncertainty, they were more inclined to acquire information and resources through trust-based relationships and accumulated social capital. This aligns with the core proposition of UET, which holds that executives' experiences, values, and cognitive frameworks significantly shape strategic decision-making and capability development (Hambrick & Mason, 1984).

In summary, Company X's early-stage dynamic seizing capability was not only evident in its resource bricolage and relational strategies, but was also deeply rooted in the value orientation and experiential background of the top management team. This interplay among executive characteristics, dynamic capabilities, and innovation performance reveals the underlying logic of dynamic capability evolution in entrepreneurial firms.

5.3 Crisis: strategic reflection following the 2011 performance decline (growth stage: from 2011-2014)

Following the rapid expansion of its startup phase, Company X encountered a significant

developmental bottleneck during its growth stage. Between 2011 and 2012, despite the company's intelligent substation auxiliary control system once serving as its core revenue generator, over-reliance on a single product line and a limited regional market led to a marked decline in performance. According to the company's annual report, profit in 2011 dropped to 910,000 RMB, representing a year-on-year decrease of 82%; in 2012, profit fell further to 520,000 RMB, a 43% decline compared to the previous year.

As one executive recalled: "*The 2011 performance decline, in my opinion, was only the surface-level symptom. The fundamental issue was that from the very beginning, we followed a narrow product path and operated in a limited sales region, this ultimately led to our growth bottleneck.*" (Interview data)

This challenge was not accidental, but rather a classic manifestation of capability rigidity and path dependency. Prolonged reliance on a single product trajectory weakened the firm's adaptability in the face of external market volatility. Strategic inertia and constraints in resource allocation further exacerbated the situation, producing a structural growth bottleneck.

According to the China Electricity Council Yearbook (China Electric Power Yearbook Editorial Committee, 2012), many small- and medium-sized power equipment firms at the time faced similar issues of product over-concentration and strong regional dependency, which significantly undermined their resilience to market fluctuations. These external accounts corroborate Company X's internal reflections, suggesting that the bottleneck was not merely a firm-specific issue, but a structural challenge widely faced by SMEs in the power equipment industry.

In response to the downturn, Company X did not remain passive. Instead, it sought to rebuild its capability base through university–enterprise collaboration and talent acquisition. In 2012, the company launched a partnership with Shandong University of Technology and established the Zhiyang Scholarship on campus. This initiative later expanded to include similar scholarships at Shandong University, Tsinghua University, Beijing Jiaotong University, and other institutions (China Association of Higher Education, 2022). These efforts strengthened the company's connections with top academic institutions, increased its visibility on university campuses, and successfully attracted a large pool of high-potential graduates. Some of these individuals would go on to become key members of the company's mid-level management team.

In parallel, Company X increased its investment in R&D, optimized its incentive mechanisms, and gradually built a more robust talent development and organizational support system, laying the groundwork for future strategic renewal.

From the perspective of dynamic capabilities, these initiatives reflect the firm's knowledge acquisition capability and organizational learning mechanisms. Specifically, through external channels, such as university–enterprise collaborations and joint R&D efforts, Company X continuously acquired new knowledge and skills. Internally, through mechanisms such as talent development programs and incentive systems, the firm was able to absorb, transform, and apply this knowledge. This capability enabled the company to break through the constraints of capability rigidity and path dependence, thereby regenerating its innovation capacity.

This process highlights the firm's transforming capability during the growth stage, namely, the ability to reconfigure and revitalize its innovation base through organizational and human resource policy adjustments. From the perspective of Upper Echelons Theory (UET), the top management team's ability to promote university collaboration and talent strategy stemmed from their high valuation of human capital and forward-looking judgment. This cognitive orientation directly influenced the firm's strategic response to adversity, favoring a "learning-led" pathway out of the bottleneck.

In the process of overcoming structural constraints, university–enterprise partnerships not only addressed the firm's short-term talent supply needs but also injected new technological DNA into the organization. As one executive recalled: "*Our early collaboration with Shandong University in the field of artificial intelligence was extremely valuable... I believe this partnership embedded AI into the very DNA of Zhiyang, it became a core part of who we are*." (Interview data)

Another executive noted: "*Starting in 2012, we emphasized campus recruitment, hiring undergraduate and graduate students directly from universities. Around the same time, we also launched internal training programs to systematically enhance employee capabilities*." (Interview data)

These accounts show that Company X's partnership with Shandong University not only established a talent pipeline but also enabled the gradual integration of next-generation information technologies, including artificial intelligence, the Internet of Things, big data, and digital twins, into its corporate strategy. This collaboration became a critical turning point in the firm's transformation, marking the shift from a single-product power equipment supplier to a provider of comprehensive digital solutions, and laying the technological foundation for future expansion and public listing.

From a dynamic capabilities perspective, this transformation reflects the firm's ability to acquire and internalize external knowledge, thereby breaking existing path dependencies and

embedding emerging technologies into its organizational core. The process exemplifies capability reconfiguration and upgrading. Simultaneously, viewed through the lens of UET, the top management team's strategic foresight and sensitivity to technological shifts served as key enablers of this transition. It was this cognitive orientation that empowered the firm to proactively explore frontier technologies amid both external environmental turbulence and internal constraints, ultimately generating sustainable innovation momentum.

5.4 Leapfrog development: advancing toward organizational and scaled growth (growth phase: from 2015-2020)

Through sustained interaction with its clients, Company X gradually developed a deep understanding of hidden risks and unmet needs in transmission line field operations, particularly regarding operational safety and frequent line trips. In response to these critical pain points, the company initiated a series of targeted technological problem-solving efforts. By engaging in in-depth communication and joint exploration with clients, Company X ultimately developed a transmission line visualization product, which became a market hit between 2015 and 2016, rapidly gaining widespread recognition across the industry.

"*Many ideas emerged through our exchanges with clients… Over time, we gradually developed a clear concept of what our transmission visualization product should be. This product significantly contributed to the company's rapid growth and helped users address key challenges in field management*." (Interview data)

The China Electric Power Yearbook (China Electric Power Yearbook Editorial Committee, 2016) reported that visualization monitoring systems were being widely adopted in power grid safety management practices, creating a favorable market environment for technology providers in this space.

Taken together, these developments demonstrate that Company X not only responded effectively to industry needs, but also achieved differentiated innovation outcomes through co-creation with clients. This stage marked a critical turning point, as the firm began transitioning from a technology-driven startup to a more structured, scalable, and client-integrated organization.

At this stage, the company completed a strategic shift from being a mere technology provider to becoming a value co-creation partner. The transforming dimension of its dynamic capabilities began to emerge, innovation was no longer driven solely by internal R&D efforts

but increasingly incorporated deep client interaction and knowledge sharing as integral parts of the development process. This shift significantly enhanced both the firm's product innovation performance and market influence.

From the perspective of Upper Echelons Theory (UET), this leapfrog development also reflects the strategic sensitivity and relational orientation of the top management team. Due to their long-standing adherence to a "*co-creation with clients*" cognitive frame, the executives were more inclined to involve clients in the R&D value chain. This collaborative approach facilitated the transition of technological outputs from the lab to market-leading products, enabling the company to achieve a breakthrough from internal innovation to industry-wide impact.

5.5 Strategic expansion: from industry focus to cross-sectoral diversification (post-IPO phase: from 2021 till now)

As Company X entered a new stage of development, the external environment was undergoing significant changes. On the one hand, national policy priorities were increasingly emphasizing infrastructure digitalization and intelligent transformation through initiatives such as "*Smart Water Management*" and "*Smart Rail*." On the other hand, the previous growth dividends of the power sector were gradually diminishing, making it imperative for the firm to explore new growth frontiers to maintain sustainable competitiveness.

Drawing upon its longstanding experience in the power sector, including project execution, systems integration, and solution delivery, Company X gradually developed a set of modular and generalizable core capability units. These capabilities not only continued to support the deepening of existing businesses but also provided a strong foundation for cross-sectoral transferability. Key functional elements such as project planning, on-site deployment, operational support, data acquisition, and visualization were modularized into replicable and scalable "capability packages," allowing for flexible recombination and deployment across diverse contexts. It was precisely these structured, transferable modules that enabled the company to respond quickly and efficiently to emerging demands in sectors such as water conservancy and rail transit, facilitating low-friction expansion.

Faced with emerging opportunities, Company X demonstrated sharp strategic foresight by identifying policy windows created by national development strategies. It rapidly launched strategic initiatives in the water and rail sectors, establishing dedicated branches to promote the independent development of new business units, thereby achieving capability recombination

and redeployment.

"*Your future direction must align with the country's strategic priorities. When national strategies, like the one for AI in 2017, are announced, we move without hesitation. That's how we captured the opportunity*." (Interview data)

"*When the national government proposed the 'Smart Water' development strategy, our company paid close attention and responded firmly by laying out strategic plans for water and smart rail sectors. Looking back, that was the right decision*." (Interview data)

Throughout this process, Company X displayed a high degree of strategic agility and policy-sensing capability among its top management team. The company not only realigned its strategic direction in a timely manner, but also adapted its organizational structure and resource allocation to ensure a balanced advancement of both legacy and emerging businesses. This mechanism of capability replication and redeployment supported the rapid implementation and scaling of new business lines, enabling the firm to construct a "*second growth curve*" and pursue an ambidextrous innovation path, deepening existing expertise in its core sector while simultaneously creating value across domains. At the foundation of this cross-sectoral innovation capacity lies the company's modular, general-purpose dynamic capability system.

From the perspective of UET, this transformation was not a coincidence but rather a result of the cognitive characteristics and strategic disposition of the top management team. Faced with a complex and volatile external environment, the executives demonstrated high policy sensitivity, opportunity recognition, and strategic confidence, allowing them to rapidly interpret signals from national strategies and decisively redirect the company's trajectory. This ability to judge and act decisively reflects a core principle of UET: that the cognitive foundations of executives shape the strategic direction of the organization (Hambrick & Mason, 1984).

Interview data suggest that Company X's top management team demonstrates strong capabilities in interpreting public policy and possesses a broad cross-industry cognitive perspective. These traits enabled them to anticipate policy directions even before the release of detailed national guidelines, and to respond strategically based on the firm's existing organizational capabilities. As one executive remarked:"*Sometimes, we act even before official policy documents are issued. It is precisely this cognitive foresight and conviction that allowed us to seize the opportunities in artificial intelligence and smart water infrastructure*." (Interview data)

Furthermore, Upper Echelons Theory (UET) emphasizes that managerial characteristics influence not only strategic decision-making, but also the design of organizational structures

and resource allocation models. In the case of Company X, the top management team did not adopt a centralized control model to push new business development. Instead, they opted to establish independent business units, promoting organizational decentralization and encouraging each unit to pursue autonomous growth according to the characteristics of its specific industry. This organizational design reflects the team's trust-oriented and professionalism-driven cognitive traits, and it also facilitated the modularization of capabilities and their efficient replication across scenarios.

It can be argued that Company X's ability to achieve multi-curve growth and capability transfer across sectors such as electricity, water, and rail is not solely attributable to the firm's dynamic capabilities per se. Rather, it more profoundly reflects the shared cognitive foundations of the top management team, including strategic sensemaking, decision logic, and risk orientation. This cognitive alignment among executives has been a key driving force behind the firm's ability to respond swiftly and transform successfully in uncertain environments.

5.6 Chapter summary

This chapter, through a longitudinal case analysis of Company X from its inception and growth to transformation has revealed the formation, evolution, and reconfiguration pathways of dynamic capabilities across different stages of an entrepreneurial firm's lifecycle. It further highlights the underlying mechanisms driven by the cognitive structures and strategic judgments of the top management team. The firm's development did not follow a linear trajectory, but rather progressed through iterative cycles of resource reconfiguration, capability adaptation, and cognitive renewal, illustrating a typical evolutionary pattern of "*growth–crisis–reconfiguration–leap.*"

From the perspective of dynamic capabilities theory, Company X demonstrated a stage-based evolution across the three core capability dimensions (see Table 5.2).

Table 5.2 Key dynamic capabilities of company X across three developmental stages

Stage	Key Dynamic Capabilities	Description
Emergence Stage	Sensing & Seizing	Technological exploration and initial market positioning.
Growth Stage	Preliminary transforming	Emphasis on the endogenous development of capabilities; realized a systematic shift from individual capabilities to organizational capabilities.
Expansion Stage	Transforming	Core capabilities became modularized and redeployed across multiple scenarios, contributing to the establishment of a "second growth curve."

At the same time, from the perspective of Upper Echelons Theory (UET), the evolution of dynamic capabilities in Company X was not an automatic or spontaneous process, but one deeply shaped by the cognitive patterns, value orientations, and policy sensitivity of its top management team. At several critical strategic junctures, it was precisely the executives' accurate interpretation of national policy directions and acute recognition of strategic windows that enabled the firm to swiftly reallocate resources and reconfigure capabilities. For instance, the company's proactive responses to policy opportunities such as "Smart Water" and "Artificial Intelligence" reflected not only the management team's strategic foresight, but also the exploration-oriented cognitive structure that guided the firm's organizational direction.

Therefore, the development trajectory of Company X illustrates a key mechanism: the generation and evolution of dynamic capabilities is the result of interaction between executive cognitive traits and the firm's opportunity recognition mechanisms. Executive cognition serves as the "steering wheel" of strategic action, while dynamic capabilities function as the engine enabling directional shifts and acceleration.

The analysis in this chapter not only traced the evolutionary logic of capability configurations across different development stages, but also provided a theoretical foundation and case-based evidence for the conceptual model, variable measurement, and mechanism testing presented in the subsequent chapters. Chapter 6 will build upon this analysis by further integrating theoretical insights with empirical research design, proposing research hypotheses, and constructing a conceptual model on the mechanisms through which dynamic capabilities influence innovation performance.

Chapter 6: Discussion and Conclusion

6.1 Key research findings

In this study, two qualitative methods, namely semi-structured interviews and multi-stage case study, were employed. The findings derived from both sources revealed a highly consistent structure of dynamic capabilities, thus forming a methodological triangulation that significantly enhances the credibility and robustness of the research conclusions.

Interview data indicated that the early entrepreneurial stage is dominated by sensing and seizing capabilities. Similarly, the case study results for the emergence stage emphasized a sensing–seizing trajectory characterized by technological exploration and market foothold. Technological exploration, corresponding to sensing, involved continuous efforts such as proof-of-concept validation, technological boundary probing, cross-domain absorption, and prototype development to identify feasibility and potential of core technologies.

Market foothold, corresponding to seizing, was achieved through the rapid rollout of MVPs in limited settings, acquiring anchor clients, and entering niche markets to conduct early-stage market experimentation and value validation. Both qualitative methods consistently pointed out that no transforming capability was observed during the initial stage, only sensing and seizing were evident.

As the firm entered its growth stage, referred to as the scaling transition phase in the case analysis, both types of qualitative data once again converged to depict a highly aligned dynamic capability structure, particularly regarding the emergence and formation of transforming capabilities. Both interviews and case materials emphasized that the core strategic focus had shifted from "opportunity identification and capture" to "organizational structuring, systematization, and capability reconfiguration."

Interview coding for the growth stage yielded seven core categories, revealing the nascent development of transforming capabilities, including structural, process, and cognitive reconfiguration. The case study further uncovered a critical phenomenon during the scaling transition phase: the transformation from individual capabilities to organizational capabilities. In other words, the firm began to move beyond dependence on founders or key technical personnel, instead developing standardized processes, replicable product systems,

institutionalized decision-making, and structured management frameworks.

This stage underscored the importance of endogenous capability building, including internal efficiency improvement, R&D system construction, organizational learning mechanisms, and the development of middle-management teams. It marked a strategic shift from being merely an opportunity capturer to becoming an orchestrator of organizational operations.

As the firm enters the expansion stage , or what is referred to in the case analysis as the stage of organizational expansion and the emergence of a second growth curve , both sources of qualitative evidence continue to reveal a highly consistent structure of dynamic capabilities. At this stage, the firm's core capabilities are no longer confined to a single product line or business unit , but are instead leveraged through cross-stage transforming and capability reconfiguration to enable cross-scenario replication, inter-industry extension, and the evolution toward a more group-oriented organizational structure .

The interviews identified "cross-stage capability transformation" as the central theme of the expansion stage. The coding process yielded six high-order categories, suggesting that the firm had entered a phase of comprehensive capability system upgrading and strategic enhancement at the organizational level , characterized by systematic reconstruction and redeployment across businesses, industries, and organizational boundaries:

(1) Extended temporal horizon of capability vision : Firms begin to engage in forward-looking strategic planning , preparing for multi-market and multi-business competition and proactively shaping their second growth curve.

(2) Innovation-driven organizational response system : Capability innovation extends beyond technical domains to encompass organizational structures, routines, and institutional mechanisms, indicating the formation of a responsive and adaptive organizational capability system .

(3) Strategic talent acquisition and deployment , and the development of talent retention and organizational capacity systems : These reflect a reconceptualization of human capital as a reconfigurable resource pool , marking the entry into a platform-based approach to human capital .

(4) Evolution of governance models : The firm shifts from a single-entity structure to a multi-subsidiary, multi-business group configuration , enabling more flexible and scalable organizational management.

(5) Capability extension across the value chain and industries : Core capabilities evolve from technical capabilities to organizational capabilities , and eventually to capability

platforms that support broad-based innovation and scaling.

The case analysis during the expansion phase revealed two key findings. The firm achieved capability recombination by abstracting and standardizing technical modules , modularizing organizational processes , and reallocating internal resource pools . These capabilities were modularized and embedded as portable assets , enabling rapid cross-scenario redeployment across new markets and industries. This strategic capability orchestration ultimately led to the formation of a sustainable second growth curve.

Findings from both interviews and case study are integrated in Figure 6.1.

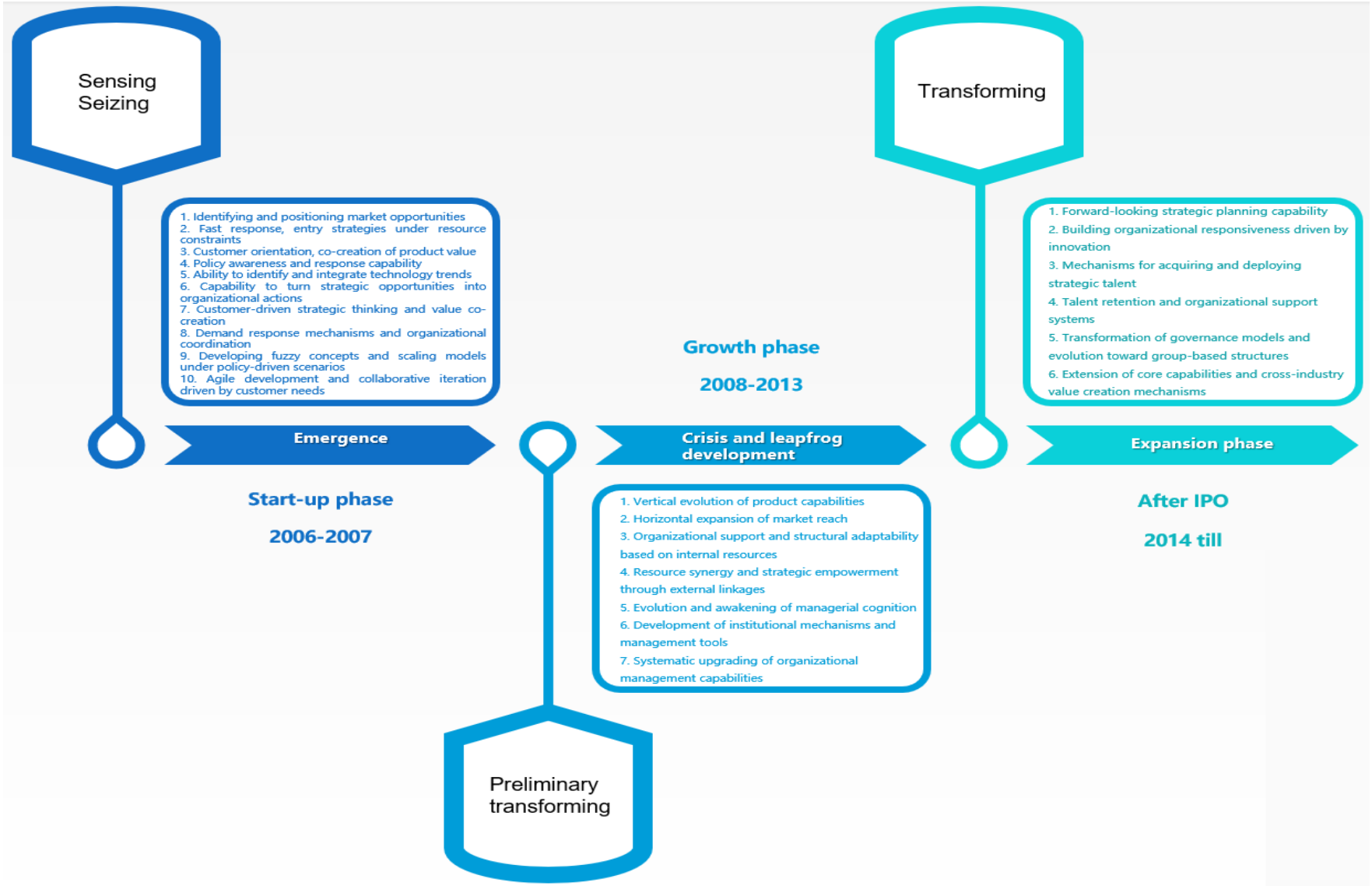


Figure 6.1 Integrated findings of this study

6.2 Discussion

In the early entrepreneurial stage, the firm heavily relied on the market acuity and experiential knowledge of the founding team. Through unstructured information scanning and intuitive judgment, the team was able to identify market voids or structural gaps. This process reflects an early-stage market entry strategy centered on sensing and positioning, aligning with the "opportunity sensing" pathway in the dynamic capabilities framework proposed by Teece (2007).

Startups typically face constraints in financial, human, and distributional resources, and are thus inclined to adopt asset-light, low-cost, and highly flexible exploratory entry strategies. Baker and Nelson (2005) introduced the concept of bricolage in entrepreneurship studies, emphasizing the idea of "making do" by applying combinations of the resources at hand to new problems and opportunities. In other words, entrepreneurs must integrate existing resources in non-conventional ways, seize emergent opportunities opportunistically, and adopt a problem-driven improvisation approach.

Company X's transition from the traditional power transmission industry to smart power monitoring exemplifies this mindset. The firm recognized policy shifts in China as a source of opportunity and strategically enhanced customer interaction, designing products based on pain points and specific needs. Through iterative cycles of "launch–sense–refine", the firm continuously sensed rapidly evolving market signals (Williamson, 2016). This approach also demonstrated active customer involvement in R&D processes, enabling the firm to acquire unique product requirements and technological know-how. Building on this understanding, the project team was able to identify root problems, provide solutions, and generate new technologies and knowledge. This mechanism corresponds to the pathway outlined by Ng (2022), who highlighted how high-tech SMEs sustain competitiveness in innovation projects by leveraging dynamic capabilities.

An increasing number of studies have highlighted the fundamental differences between start-ups and established organizations in terms of resource base, organizational structure, learning trajectories, and knowledge management mechanisms. New ventures are not simply "smaller versions" of large firms, and it is inappropriate to directly apply the organizational logics and resource management theories developed for mature firms. Existing literature emphasizes that start-ups typically exhibit simpler and more flexible structures, with product development and market expansion processes characterized by high dynamism. As these firms

continually probe market boundaries and redefine their business domains, their products, processes, and organizational routines undergo constant evolution. Consequently, knowledge resources and internal knowledge management mechanisms play a critical role during this early stage (Knight & Cavusgil, 2004).

Due to limited resources and a lack of accumulated experience, start-ups tend to rely more heavily on external knowledge search and exploratory learning compared to mature firms. Calantone et al. (2002) suggest that entrepreneurial firms frequently seek knowledge from customers, partners, and other actors within the industry ecosystem to compensate for their internal deficiencies. Such exploratory learning helps expand the experience boundaries and cognitive frames of the entrepreneurial team, enhances opportunity recognition, and stimulates innovative behavior, thereby laying the foundation for early-stage competitive advantage.

The findings from this study's qualitative investigation into the emergence stage are strongly aligned with the theoretical insights above. Both interviews and case analyses reveal that sample firms, despite operating under severe resource constraints, advanced product development and market entry through customer-oriented value co-creation, agile development, and rapid iteration. In this phase, customers served not merely as value recipients, but also as knowledge sources and co-designers of products. Through continuous sensing of customer needs, rapid feedback loops, and on-site scenario-based co-creation, firms achieved synchronous iteration in product functionalities, application scenarios, and technology roadmaps. Throughout this process, firms relied heavily on external knowledge inputs to compensate for internal capability gaps and adopted a “co-learning and co-creation with customers” approach to quickly generate viable prototypes and establish early market footholds.

These findings suggest that the early-stage flexibility observed in start-ups is not incidental, but rather a result of the combined effects of resource scarcity, limited internal knowledge, and a strong reliance on external learning. Unlike established firms, emerging ventures do not depend on rigid processes, codified knowledge, or pre-defined strategies. Instead, they continuously test and recalibrate their value propositions through flexible product development mechanisms, customer-centric value co-creation models, and high-frequency external knowledge search activities.

The evidence from this study not only supports the assertions of Knight and Cavusgil (2004) and Calantone et al. (2002) regarding knowledge search and exploratory learning, but also further reveals that a start-up’s competitive advantage is derived primarily from its capacity for rapid learning and mechanisms of co-creation with customers, rather than from its resource endowments.

In the expansion stage, firms' core capabilities are no longer confined to a single product line or business unit. Instead, they begin to pursue cross-stage capability transformation and strategic reconfiguration, enabling the replication of successful practices across multiple scenarios and the extension of capabilities into adjacent or entirely new industries. This aligns with Williamson's characterization of dynamic capabilities in the context of rapid innovation in China, namely, the deployment of modularized product development processes to facilitate fast product launches, and the design of organizational structures that combine vertical hierarchy with horizontal flexibility to support agile transformation and sustained innovation.

Zahra (2021) argues that traditional research grounded in the Resource-Based View (RBV) often implicitly assumes a consistency in resource management mechanisms between entrepreneurial and established firms. However, this assumption does not hold in real-world settings. Entrepreneurial firms not only possess a weaker resource base, but also operate under highly uncertain technological, market, and institutional environments, resulting in significantly heterogeneous mechanisms for resource acquisition, integration, and deployment. Zahra emphasizes that "managing resources" itself constitutes a critical source of competitive advantage for start-ups, rather than merely the outcome of resource identification and selection.

The case analysis in this study not only traces the evolutionary trajectory of dynamic capabilities across different growth stages in entrepreneurial firms, but further reveals that this evolution is driven not solely by external environmental forces or internal path dependencies, but more fundamentally by the cognitive structures and strategic judgment logic of the TMT. Therefore, the construction and deployment of dynamic capabilities should be understood as the result of an organizational adaptation mechanism co-shaped by managerial cognition.

From the perspective of Dynamic Capabilities Theory (DCT), firms must continuously sense environmental changes, seize opportunities, and transform their resource base to respond to high levels of uncertainty. However, from the lens of Upper Echelons Theory (UET), the development of such capabilities is not automatic; it is profoundly influenced by the cognitive preferences, policy comprehension, and experiential backgrounds of top executives, what can be referred to as the "cognitive upper structure." Company X's ability to make accurate strategic judgments and flexible deployments at multiple turning points in its development can be attributed to the TMT's strong policy sensitivity, risk evaluation capability, and exploratory orientation. These cognitive traits enabled the timely activation and effective translation of dynamic capabilities into organizational innovation performance.

To this end, the present study integrates the two theoretical perspectives and develops a comparative analytical framework to illustrate their complementary mechanisms and

interactive logic. As shown in Table 6.1, dynamic capabilities serve as the "execution engine" of entrepreneurial strategic action, while executive cognition functions as the "steering wheel", shaping the firm's direction, speed, and capacity for strategic adjustment. Together, they constitute the core mechanism through which entrepreneurial firms achieve innovation and sustained growth in rapidly changing environments.

Table 6.1 Theoretical perspectives and mechanism mapping in the case of Company X

Theoretical Perspective	Key Variables / Mechanisms	Manifestation in Company X
DCT	Sensing, Seizing, Transforming, Redeployment	Rapid response to customer and policy demands; organizational restructuring and capability migration; cross-scenario capability replication
UET	Executive cognitive structure, strategic judgment, policy sensitivity, risk preferences	Early identification of policy dividends; proactive cross-industry deployment; establishment of subsidiaries to promote capability modularization and decentralized development

6.3 Conclusions

Drawing upon interview data from senior executives of three STAR Market-listed technology firms, this study identifies and synthesizes seven core components that constitute the dynamic capabilities of TMTs in entrepreneurial firms, thereby addressing RQ1: How can the dynamic capabilities of top management teams in start-ups be defined and what are their key components? The identified capabilities include: market and policy opportunity identification capability, resource integration and exploratory market entry capability, customer orientation and value co-creation capability, institutional adaptation and scenario construction capability, product deepening and market expansion capability, organizational structuring and resource allocation capability, and cognitive enhancement and institutionalization capability

The three-stage empirical evidence from this study further reveals that the dynamic capabilities of entrepreneurial TMTs exhibit clear evolutionary characteristics across development stages and affect firms' innovation and growth performance through different mechanisms at each stage.

In the emergence stage, dynamic capabilities are primarily concentrated on sensing and seizing, with transforming capabilities largely absent. As firms enter the growth stage, the TMT begins to demonstrate nascent transforming capabilities, improving performance through organizational restructuring and process institutionalization. In the expansion stage, transforming capabilities become paramount, showing a systemic reconstruction pattern that

spans products, scenarios, and industries. At this stage, firms typically encounter growth bottlenecks and must transition from linear growth to a second growth curve.

To address this challenge, top management must possess the ability to modularize core capabilities and rapidly redeploy them in new scenarios or sectors. This form of advanced transformation goes far beyond internal organizational restructuring. It represents a process of capability platforming, enabling the firm to transfer and scale capabilities across business units, value chains, and even industries, thereby unlocking new avenues for growth. These conclusions collectively provide a comprehensive answer to RQ2.

The multi-stage evidence from this study suggests that dynamic capabilities in entrepreneurial firms are not organically generated at the organizational level, but are instead deeply embedded in the cognitive structures, value orientations, policy comprehension, and strategic judgment logics of the TMT.

In the emergence stage, as organizational knowledge has not yet been institutionalized, managerial cognition serves as the primary, if not sole, source of organizational learning and opportunity recognition. The data reveal that the founders' industry experience, technological expertise, and problem-framing logic shape the firm's initial attention focus. The TMT's openness and exploratory orientation influence their sensitivity to various external knowledge sources (e.g., customer feedback, partner insights, policy windows, and technological trends). Their capacity to interpret policy and external outlook determines whether the firm can identify market gaps and policy dividends early on.

Upon entering the growth stage, the firm begins to promote organizational institutionalization, process formalization, and structural reconfiguration. The TMT's more complex cognitive structures help in identifying organizational bottlenecks and initiating structural optimization. Their learning orientation influences the quality of the organizational learning mechanisms being established, while divergent understandings of growth logic (e.g., efficiency-first vs. expansion-first) determine the focal point of capability transformation. During this stage, the formation of dynamic capabilities begins to transition from person-driven to organization-driven, yet executive cognition remains the guiding force.

In the expansion stage, the firm must move beyond a single product line or industry to explore new growth curves. The TMT's cross-domain cognition shapes their judgment regarding capability transferability; their strategic foresight influences whether they can proactively plan for the second growth curve. Their policy sensitivity and ecosystem awareness affect their ability to recognize emerging industry tracks, while their risk preferences and strategic interpretation frameworks determine whether they are willing, and able to undertake

cross-domain capability redeployment. Therefore, the emergence of advanced transformation capabilities can be fundamentally attributed to the expansion of the executive cognitive horizon, which enables strategic reconfiguration of capabilities.

Synthesizing the three-stage evidence, this study draws the following conclusion. The cognitive characteristics of the top management team serve as the driving force, accelerator, and steering mechanism in the formation of dynamic capabilities in entrepreneurial firms. In the emergence stage, cognition determines what is seen, that is the scope of opportunity sensing. In the growth stage, cognition determines how things are done, the approach to capability reconfiguration. In the expansion stage, cognition determines where the firm is heading, namely the direction of capability platforming and cross-industry migration. These conclusions collectively provide a comprehensive answer to RQ3.

6.4 Research contributions

6.4.1 Theoretical contributions

(1) From the perspective of microfoundations of dynamic capabilities:

This study uncovers the evolutionary process of capabilities in entrepreneurial firms and develops a context-specific framework of dynamic capability microfoundations tailored to the entrepreneurial setting.

First, this study extends the conceptualization of "opportunity sensing" microfoundations. It finds that entrepreneurial firms in the early stage typically exhibit a triadic opportunity sensing mechanism that simultaneously engages technological, market, and policy dimensions. While founders' personal experiences and social networks remain important, what proves more critical is the integration of multi-source knowledge and cross-domain scanning, which together constitute a more dynamic sensing foundation. This finding highlights the compound sensing mechanism developed by entrepreneurial firms under high uncertainty to compensate for internal knowledge deficits.

Second, the study reveals a distinct set of "opportunity seizing" microfoundations specific to commercial entrepreneurial ventures. The evidence shows that early-stage entrepreneurial firms rely heavily on customer co-creation, agile iteration, pilot testing, and rapid market entry strategies. These behavioral mechanisms demonstrate how resource-constrained organizations achieve early competitive advantage through high-frequency interactions, rapid trial-and-error, and template replication. This enriches the traditional literature on dynamic capabilities by

offering a more actionable behavioral layer within the "seizing" dimension.

Third, the study proposes the concept of "cross-stage capability transformation" as a high-order microfoundation. Unlike prior literature that focuses primarily on organizational restructuring or learning processes, this study finds a stage-wise progression of transformation in entrepreneurial firms during their growth and expansion stages, beginning with initial restructuring through institutionalization, followed by modularization of core capabilities, and eventually leading to cross-scenario redeployment and the formation of a second growth curve. This process illustrates that transformation in entrepreneurial firms is not limited to internal restructuring, but evolves into a systematic mechanism of capability platforming and cross-business migration.

(2) Advancing the understanding that "emerging firms are not simply smaller versions of large firms"

This study theoretically responds to and deepens the influential proposition in management and entrepreneurship research that start-ups are not merely scaled-down versions of established firms (Knight & Cavusgil, 2004; Zahra, 2021). The findings reveal that in the early stage, entrepreneurial firms exhibit high flexibility, loose structural configurations, knowledge scarcity, and strong dependence on external sources. Their approaches to opportunity sensing, resource acquisition, value co-creation, and capability building fundamentally differ from those of mature enterprises.

For instance, start-ups rely on unstructured knowledge, customer co-creation, agile iteration, and rapid experimentation, rather than the process-based R&D, systematic decision-making, or stable resource pool allocation typical of large firms. The processes of product development, market entry, and organizational formation are marked by experimentation and real-time responsiveness, reflecting the unique pathways through which entrepreneurial capabilities emerge under uncertainty.

(3) Integrating dynamic capabilities theory and upper echelons theory

This study achieves a theoretical integration of DCT and UET by proposing the concept of a "cognition–capability co-evolution" mechanism in the context of entrepreneurial firms. This perspective directly responds to Zahra's (2021) critique of the traditional Resource-Based View (RBV), which tends to assume similarity in resource management processes across start-ups and large firms, while neglecting the profound differences in resource constraints, environmental uncertainty, and cognitive foundations that characterize entrepreneurial settings.

The study contends that entrepreneurial competitiveness stems not only from the identification and selection of resources, but more critically from the capability to manage

resources under conditions of high uncertainty, a process fundamentally shaped by executive cognitive mechanisms. Through a three-stage qualitative analysis involving interviews and case studies, this research demonstrates that the development of dynamic capabilities in entrepreneurial firms is neither purely externally driven nor entirely path-dependent. Instead, it is significantly influenced by the cognitive structures, strategic judgment logics, policy sensitivity, and risk preferences of the TMT. While the DCT framework posits that firms must continually sense, seize, and transform to respond to rapidly evolving technological and market environments, this study shows that whether dynamic capabilities are triggered, when they are activated, and how they are deployed is contingent upon the cognitive boundaries and interpretive schemas of top executives.

By integrating DCT and UET, the study not only enhances the theoretical explanatory power regarding the formation of dynamic capabilities, but also provides a more nuanced framework for understanding how entrepreneurial firms achieve cross-stage growth under resource-constrained conditions.

6.4.2 Managerial implications

(1) Strengthening the cognitive capabilities of the TMT to improve the activation and deployment of dynamic capabilities

Building on the insights from Upper Echelons Theory, this study finds that dynamic capabilities in entrepreneurial firms are not automatically generated at the organizational level, but are significantly shaped by the cognitive structures, policy sensitivity, risk assessment capacity, and strategic interpretation frameworks of the TMT. Therefore, in practical settings, developing the cognitive capabilities of executives should be treated as a core component of capability development, rather than focusing solely on improvements to institutional design, process optimization, or resource allocation.

The quality of executive cognition directly determines when dynamic capabilities are triggered, how they are deployed, and whether effective strategic actions can be formed at critical developmental junctures.

In light of this, we recommend the following approaches to strengthen TMT cognitive capabilities in entrepreneurial firms:

1. Establish Training Mechanisms to Enhance Policy and Market Sensitivity

Encourage top executives to regularly engage in policy interpretation sessions, industry trend analyses, and cross-sector exchanges, thereby enhancing their anticipatory judgment of

environmental changes and enabling the timely identification of external opportunities and risks.

2. Foster Cognitive Diversity within the Executive Team

Build teams with diverse professional backgrounds, industry experiences, and value orientations, promoting cognitive heterogeneity to avoid groupthink and decision-making blind spots. This diversity enhances the organization's adaptive capacity under uncertainty.

3. Promote Deep Engagement Between Executives and Frontline Scenarios

Encourage executives to directly participate in customer interviews, co-creation workshops, and market validation activities, grounding their cognitive frameworks in real-world contexts. This improves the precision in dynamic capability activation and ensures more effective resource deployment.

(2) Building a modular and transferable "capability platform" to enable cross-stage growth

In light of this study's findings on the cross-stage capability transformation mechanisms in entrepreneurial firms, managers should proactively shift from single-business-oriented capability building to a platform-based approach, where capabilities are accumulable, modularized, and transferable across contexts. While start-ups often rely on individual experience and non-structured capabilities during the early stage, such localized or unit-specific competencies become insufficient as firms scale into new markets or sectors. In contrast, firms that succeed in abstracting, standardizing, and modularizing key capabilities are more likely to replicate success across multiple scenarios, thus achieving a second growth curve.

To this end, we recommend that managers focus on the following three strategic actions:

1. Identify and Codify "Transferable Capability Modules"

Decompose and abstract core competencies, such as customer acquisition, product development, supply chain coordination, and policy navigation, into modular units that can be reused across projects and business lines, rather than being consumed within isolated initiatives.

2. Standardize and Institutionalize Organizational Structures and Processes

Through process mapping, system optimization, and cross-functional coordination mechanisms, elevate individual- or experience-based capabilities into organizational capabilities, thereby creating a structural foundation for cross-context and cross-line replication.

3. Strategically Plan for Cross-Scenario Capability Deployment and Business Migration

Treat capabilities as redeployable strategic assets, and actively identify capability–scenario matching opportunities across new industries, geographic regions, or product lines. Leverage modular capability transfer to reduce expansion costs and shorten experimentation cycles.

Through these mechanisms, entrepreneurial firms can pursue more resilient and adaptive growth paths, transitioning from single-point breakthroughs to the construction of multi-curve

growth trajectories. This enhances not only stage-specific adaptability, but also provides firms with sustained competitive advantages in cross-industry and cross-market expansions.

6.5 Limitations and future research directions

First, this study is subject to limitations in terms of sample size and industry scope.

The research is primarily based on an in-depth single-case study and interview data from several entrepreneurial firms. As such, there are inherent constraints regarding the number of cases and the diversity of industry representation. While qualitative methods are well-suited for uncovering the process mechanisms of dynamic capability development and transformation, the generalizability of findings may be limited when applied to contexts with significantly different environmental conditions, organizational types, or industry characteristics. Future research could enhance the external validity and general applicability of the findings by incorporating a larger sample size, conducting cross-industry comparative studies, or adopting multi-case comparison designs.

Second, this study does not systematically incorporate external environmental variables into the theoretical model.

Although the analysis highlights the influence of technological change, policy dynamics, and industrial cycles on the evolution of dynamic capabilities, these factors were not formally modeled within the theoretical framework. Given that entrepreneurial development is highly contingent on external environmental shifts, future research could extend the current framework by integrating macro-level variables such as technological trends, regulatory environments, and industry cycle fluctuations. Approaches such as contextualized modeling or longitudinal tracking may offer a more comprehensive explanation of the mechanisms driving the formation and stage-wise evolution of dynamic capabilities.

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Annex A: Interview Outline

Dear Sir/Madam,

Hello! Thank you very much for taking the time out of your busy schedule to participate in our interview. The purpose of this interview is to understand how the dynamic capabilities of your company's executive team were formed during its development process, and how the executive team uses these dynamic capabilities to drive business innovation. The information you provide will play a crucial role in our subsequent research. Please answer based on the actual situation of your enterprise and your personal experiences. All information collected in this interview will be used solely for academic research and will not involve the disclosure of commercial secrets. We hope you can share your valuable experience and insights with us.

Thank you again for your participation! Now, let's begin the interview:

I. Basic Information about the Company and TMT Team

1. Could you please briefly describe the development history and main business directions of your company?
2. How many members were in the founding team at the beginning of your company? How many members are in the executive team now?
3. How was your company's executive team formed? What are the main responsibilities of each member?

II. Understanding and Practice of Dynamic Capabilities

4. Scholars have suggested that the ability of a company to identify external market opportunities and threats, integrate internal and external resources, and adapt to a constantly changing external environment constitutes dynamic capabilities. Do you agree with this?
5. How do you understand the dynamic capabilities of your team? In what aspects do you think these capabilities are manifested?
6. In your opinion, how do the focuses of the executive team's dynamic capabilities differ at various stages of entrepreneurship?

7. Could you provide an example of how your company’s executive team identifies market opportunities?
8. Could you give an example of how the executive team reaches a consensus and reconfigures business resources after identifying new opportunities?

III. Corporate Innovation and Performance

9. What innovations has your company made in products, management, services, or business models? Which of these areas primarily reflect your company's innovation?
10. In your opinion, which characteristics, culture, or strategies of your team have influenced the entrepreneurial performance of your company during its startup phase? How have they influenced it?
11. Could you share some specific cases where the dynamic capabilities of the executive team have driven innovation activities in your company in response to environmental changes or new opportunities?
12. How do you think the executive team should assess the performance of innovation projects?

IV. Environmental Adaptation and Strategic Adjustment

13. What is your company's position and competitiveness in the industry, and what are the sources of your competitive advantages?
14. Does your company have many potential competitors? Does the executive team usually adopt proactive market strategies?
15. How does the executive team adjust the company's business strategy in response to complex policy changes or market environmental changes? 16. How would you assess the performance of the executive team in responding to environmental changes and market challenges?

V. Future Outlook and Suggestions

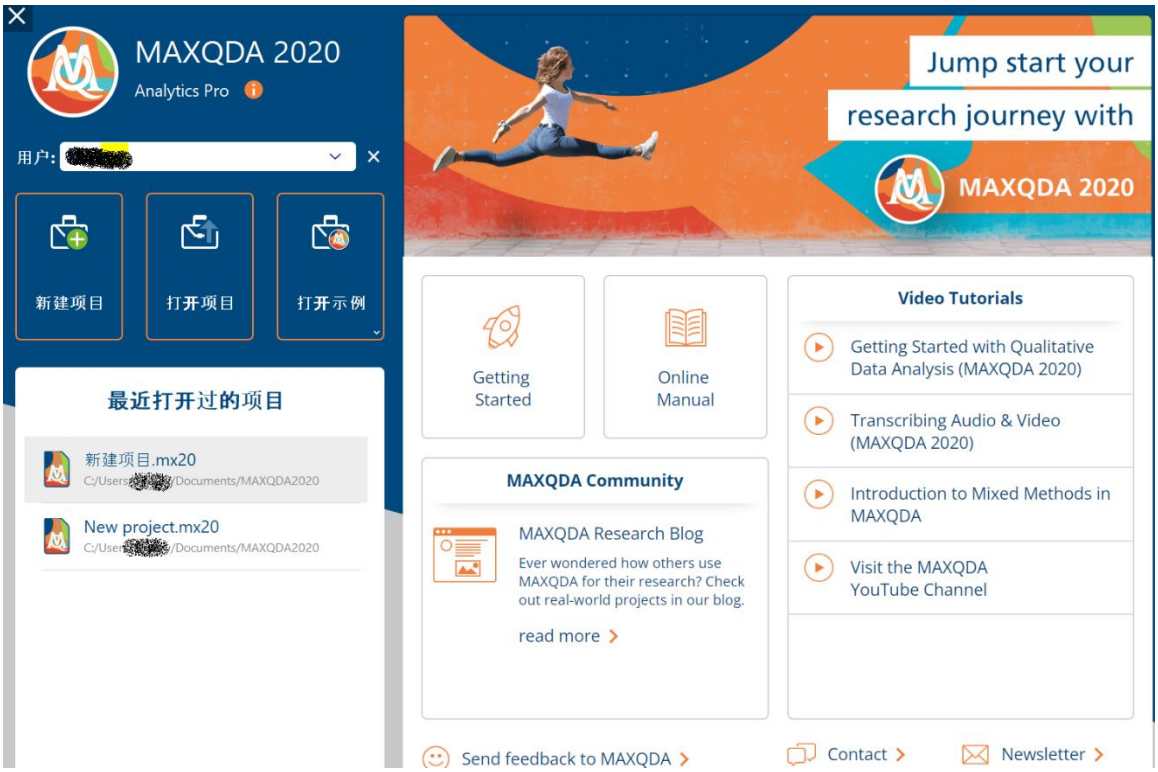
17. In which areas do you think your company’s executive team needs to enhance their dynamic capabilities in the future?
18. What advice would you give to other entrepreneurial companies regarding managing the dynamic capabilities of their executive teams?

Annex B: Example of the MAXQDA Coding Process

This example adheres strictly to the logic of qualitative research coding and illustrates the complete workflow of conducting open coding, axial coding, and selective coding on enterprise interview transcripts using MAXQDA 2020. The procedure ensures systematic rigor, transparency, and traceability, thereby providing methodological grounding for the dissertation's core qualitative analyses.

I. Project Initialization and Data Import

Launching the Project: Open MAXQDA 2020, create a new research project through the main menu, and enter the dedicated analytical interface.



1. Importing Interview Data: Using the "Import" function on the top toolbar, upload all finalized interview transcripts into the project. The files are automatically organized within the left panel for unified management.

2. Interface Layout: MAXQDA's default interface comprises three major operational areas, each serving a distinct function yet jointly forming an integrated data–coding–analysis workflow.

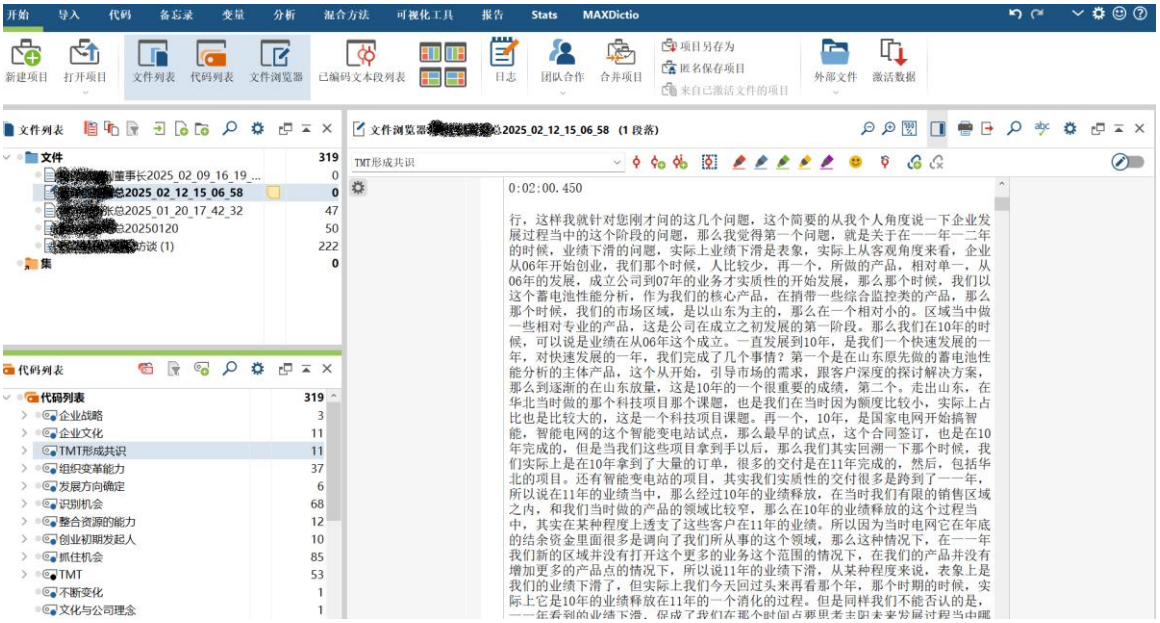
3. Left Panel: Document System: Central repository for all imported transcripts, allowing quick file selection for subsequent analysis.

4. Right Panel: Document Browser: Displays the full content of the selected transcript and supports paragraph-by-paragraph or sentence-level review and precise text selection.

5. Lower Panel: Code System

The core container for constructing and managing the coding scheme, including creating, renaming, hierarchizing, and reorganizing codes.

This initial stage familiarizes the researcher with both the data and software environment, laying the operational foundation for systematic coding.



II. Open Coding: Creating Initial Codes

Open coding involves breaking down the interview text line-by-line or segment-by-segment to extract core concepts and establish initial codes. The objective is to comprehensively capture all salient information within the transcripts and construct a complete preliminary code library.

1. Reviewing Text: Read each transcript in the Document Browser and identify key ideas, actions, or perspectives relevant to the research topic (e.g., “TMT alignment,” “opportunity capture,” “product innovation”).

2. Creating New Codes: When a meaningful concept not yet covered by existing codes is identified, click “New Code” in the “Codes” menu to open the code creation dialog.

Define the code label (e.g., “Corporate Strategy,” “Product Innovation”):

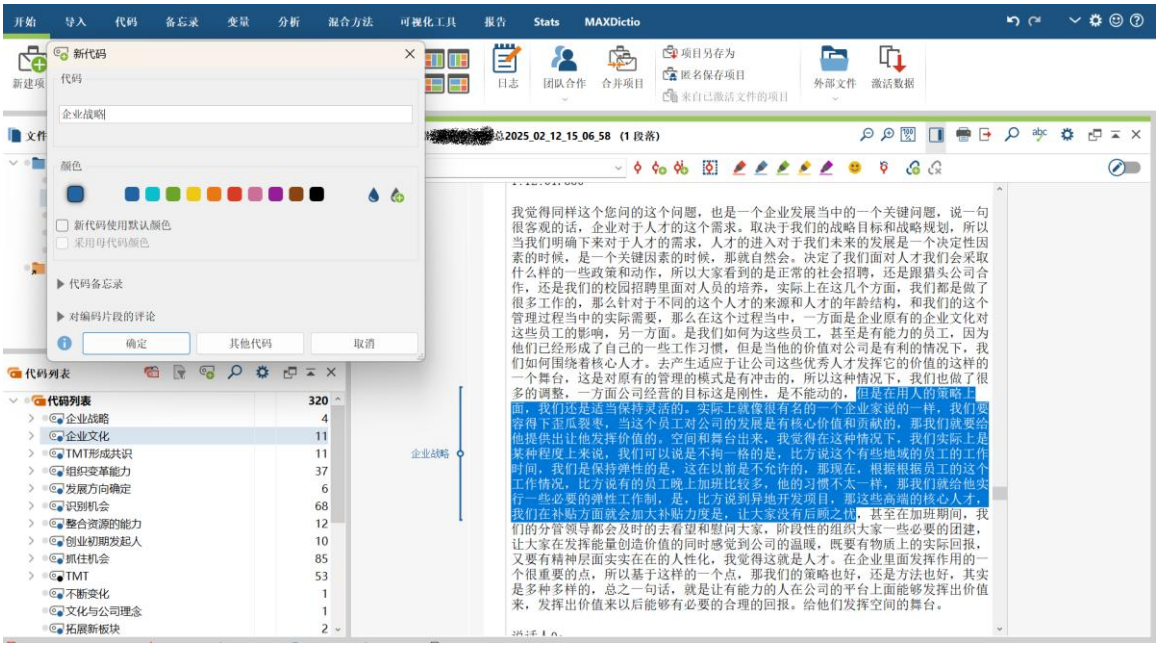
Select a color for visual distinction among thematic groups.

Confirm to add the code to the coding system.

3. Coding Text Segments: Highlight a relevant text segment in the Document Browser and

assign it to the corresponding code. MAXQDA automatically marks the coded section with a visual coding stripe, showing its link to the code and reinforcing traceability.

Through fine-grained disaggregation of the raw text, this stage generates a rich and exhaustive set of initial concepts to support the later construction of a structured coding system.



III. Axial Coding: Building the Coding Framework

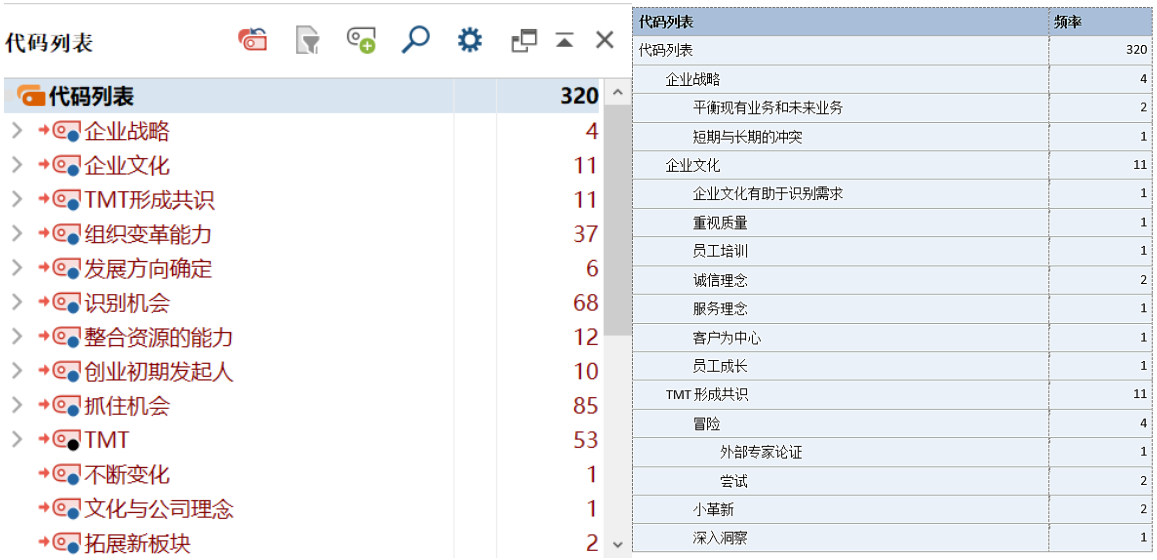
Axial coding organizes, refines, and integrates the initial codes into higher-order categories. The core objective is to extract analytical themes and establish a coherent hierarchical coding structure.

1. Code Categorization: Systematically review all initial codes and group conceptually similar or logically related codes under broader parent categories (e.g., “risk-taking,” “experimentation,” and “minor innovations” categorized under “TMT Consensus Formation”).

2. Building a Systematic Framework: Through iterative abstraction and consolidation, construct a hierarchical coding system. For example, “Product Innovation” and “Technological Innovation” may be categorized under “Products and Services,” which further belongs to the broader theme “Opportunity Capture.”

4. Updating the Code List: After restructuring, the Code System panel displays the full coding hierarchy and automatically updates each code’s frequency count (e.g., “Opportunity Capture” appears 85 times; “Opportunity Identification” appears 68 times), providing clear insight into thematic prominence.

This stage produces a logically coherent, analytically meaningful coding framework that guides the subsequent systematic coding of all transcripts.



代码列表	频率
代码列表	320
企业战略	4
平衡现有业务和未来业务	2
短期与长期的冲突	1
企业文化	11
企业文化有助于识别需求	1
重视质量	1
员工培训	1
诚信理念	2
服务理念	1
客户为中心	1
员工成长	1
TMT 形成共识	11
冒险	4
外部专家论证	1
尝试	2
小革新	2
深入洞察	1

IV. Selective Coding: Applying the Coding Framework

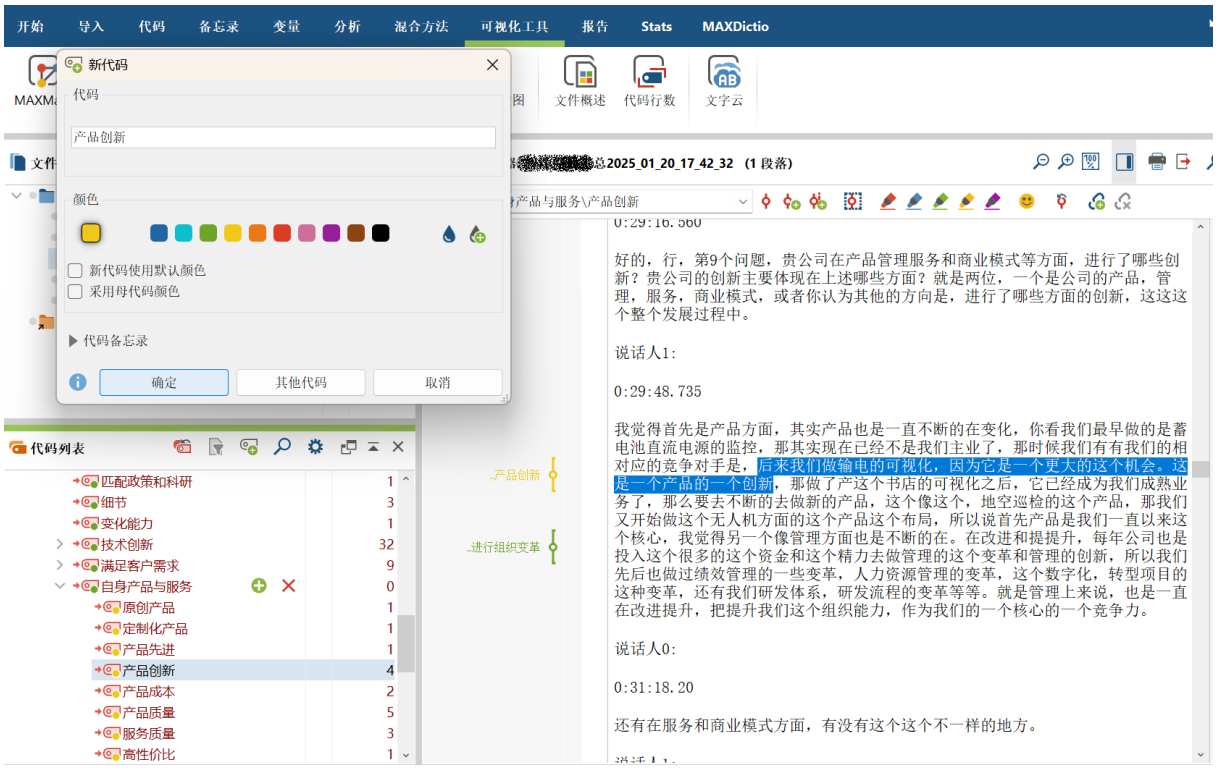
Selective coding involves systematically applying the established hierarchical coding scheme to all interview data. This step evaluates the framework's applicability across cases and ensures thematic consistency.

Using the theme "Product Innovation" as an example:

1. Cross-File Application: When analyzing a new transcript and encountering discussions on "innovations in product management, services, or business models," the researcher directly applies the existing codes rather than creating new ones.

2. Accurate Matching and Coding: Select text segments describing innovation practices—such as the evolution "from battery DC power monitoring, to transmission visualization, to UAV product deployment"—and code them under the established path: Products and Services → Product Innovation.

4. Visual Validation:MAXQDA automatically links the text to the assigned code via coding stripes and updates code frequencies. By clicking the code in the Code System, all "Product Innovation" excerpts across transcripts can be retrieved instantly, enabling cross-case comparison.



V. Coding Validation and Reflexive Review

Upon completing the full coding procedure, MAXQDA's analytical tools are used to verify and refine coding accuracy while documenting analytic decisions to enhance transparency and reliability.

1. Code Retrieval and Verification: Use the retrieval function to examine all text segments linked to a given code, assess coding accuracy, correct misassignments, and supplement missing coding.

2. Memo Documentation: Throughout the coding process, use memos to record conceptual insights, coding rationales, category formation logic, emerging questions, and uncertainties. This ensures traceability and supports rigorous reporting in the dissertation.

This stage strengthens the validity, reliability, and methodological rigor of the coding results.

VI. Academic Presentation of Coding Results

After completing and verifying the coding work, the researcher transforms the software-generated coding outputs into academically appropriate analytical content.

Export major categories, subcategories, and corresponding raw excerpts from MAXQDA.

Abstract and refine initial codes into core analytical categories aligned with the study's theoretical perspective.

Filter and academically paraphrase interview excerpts: remove redundancies, refine expressions, and retain essential meanings.

Present the results in structured analytical tables (e.g., Chapter 4, Tables 4.1–4.9), linking main themes, subthemes, and exemplary quotes.

This translation from software operations to scholarly presentation ensures that qualitative findings are academically robust and aligned with dissertation conventions.

VII. Workflow Summary

This study completed qualitative coding of enterprise interview data in MAXQDA 2020 following the standardized workflow: Project Initialization → Open Coding → Axial Coding → Selective Coding → Validation & Reflexive Review → Academic Presentation. The process systematically transforms raw transcript content into initial concepts, develops a hierarchical coding structure, and ultimately constructs the analytical framework that underpins the dissertation's qualitative findings.