

**A Study on the Formation Mechanism of Frontline
Managers' Digital Leadership in Corporate
Intrapreneurship**

Wenyi Qiu

University of Stirling

A thesis submitted for the degree of Doctor of Management

October 2025

Abstract

In the fast-developing digital economy, traditional approaches to enterprise development and business models are constantly challenged and reshaped, driving firms to quickly pursue paths toward digital transformation. Large traditional enterprises actively seize opportunities arising from digital development by initiating strategic intrapreneurship. In this process, the use of digital technologies and methods to transform products or services, improve production processes, and adjust business models and organizational forms provides an essential foundation for intrapreneurship, in which the leadership of intrapreneurs plays an indispensable role. In this regard, this dissertation investigates the constitutive elements and formation mechanisms of frontline managers' digital leadership within the process of intrapreneurship.

This research employs both qualitative and quantitative methods to focus on two core issues to conduct in-depth and systematic research: (1) What are the structural dimensions of frontline managers' digital leadership? and (2) How is digital leadership of frontline managers formed during the process of intrapreneurship? By answering these questions, this research enriches the theoretical understanding of the construction, measurement, and mechanisms of digital leadership within intrapreneurship. The study is composed of two main parts.

Study One, based on the specific contexts of the case enterprises, identifies the structural dimensions of frontline managers' digital leadership and develops a digital leadership scale, whose reliability and validity are tested through empirical research. Drawing on an investigation of a large enterprise group undergoing digital transformation, in-depth interviews were conducted with frontline managers of 18 intrapreneurial projects. The findings reveal four structural dimensions of digital leadership: digital strategic thinking, digital operative management, digital orchestrating and integration, and digital executive capability. A questionnaire was then designed based on the interview results, and data from a survey of 222 employees were analyzed to confirm the reliability and validity of the developed digital leadership scale.

Study Two addresses how digital leadership of frontline managers formed during the process of intrapreneurship. Key events reflecting changes in digital leadership throughout the process of intrapreneurship were traced and analyzed chronologically to identify formation mechanisms. The results indicate that digital leadership, in

collaboration with business function development, drives the dynamic evolution of intrapreneurship across three stages: startup, growth, and expansion. (1) In the startup stage, frontline managers primarily rely on digital strategic thinking and digital executive capability, leveraging internal and external digital resources to enable effective utilization. (2) In the growth stage, digital operative management and digital executive capability dominate, with business development driven by digital logic and service innovation. (3) In the expansion stage, digital orchestrating and integration and digital executive capability play a central role, ensuring effective organizational operation through digital business growth and parallel multi-business advancement.

This research makes three theoretical contributions to the field of digital leadership. First, it identifies the structural dimensions of frontline managers' digital leadership, thereby deepening the understanding of its essential nature. Second, it develops and validates a digital leadership scale for frontline managers with sound reliability and validity, expanding empirical research in this domain and providing practical tools for cultivating and developing digital leadership in enterprises. Third, it deconstructs the process of intrapreneurship, revealing how digital leadership and business development interact to drive intrapreneurship across three stages, thereby offering a novel theoretical perspective for future research.

Key words: digital leadership; intrapreneurship; frontline managers; formation mechanism

Acknowledgments

Outside the window, the night is deep, and the message of spring has long permeated the entire city. The green bamboo along the Grand Canal is growing vigorously. This river of life, which has flowed gently for thousands of years, has connected the cultural exchanges and knowledge integration between the cities of Beijing and Hangzhou, weaving together the entirety of my five-year doctoral journey. Five years ago, I resolutely made the decision to head north to the capital for my studies at the age of forty. Now, five years later, in the stillness of the night, I type out this series of words of gratitude from my window.

As I complete my doctoral thesis, my heart is filled with emotions and gratitude. This long and fulfilling academic journey has not only provided me with rich knowledge and profound insights in the field of innovation and leadership, but also allowed me to meet many excellent mentors and friends who selflessly supported and helped me along my path of growth. At this moment, I express my deepest gratitude to them with sincere feelings.

Firstly, I would like to express my utmost respect and heartfelt gratitude to my supervisors, Professor Gao Wenshu and Professor Rob Angell. Both supervisors have not only set an academic benchmark for me with their profound expertise, rigorous academic attitude, and excellence in work, but also deeply influenced me with their noble ethics and charisma. From the selection of the thesis topic to the research design, from the literature review to the empirical analysis, and finally to the writing of the thesis, every step reflects their hard work and wisdom.

Next, I would like to thank all the teachers and fellow students at University of Chinese Academy of Social Sciences and the University of Stirling who have participated in the DMAN project. I am grateful to Professor Wang Xiaoming for his recommendation, which gave me the courage to pursue further studies once again. I appreciate the dedicated guidance from Professor Sun Zhaoyang, which has enabled me to persevere when facing academic challenges. And my heartfelt gratitude goes to Professors Wang Min and Zhao Ou for their selfless assistance! My sincere thanks also go to Jing Jie, the class monitor, and my classmates Wang Yong, Fu Ling, and Huang Huimin for their genuine encouragement! I will always cherish the tranquil moments spent in Wangjing Campus, where the ivy climbs the walls, yearning for the rich experiences waiting in far-off Scotland. I fondly remember the wonderful times

of learning-transformational leadership, cutting-edge advancements in management, the evolution of digital platforms, and the entrepreneurial growth of enterprises... Professors overcome the challenges posed by the pandemic, connecting across mountains and seas, while classmates engage in academic discussions and share insights from all corners of the world. This strong academic atmosphere and the spirit of unity and friendship have not only enriched my knowledge during my doctoral studies but also brought me friendship and warmth.

In addition, I would also like to thank my family-my wife Yu Lanlan, my sons Qiu Yongze and Qiu Yongshu who are still in school. They are my eternal strong support. Their silent dedication and support enable me to immerse myself in academic research.

Finally, I want to thank all the people who have helped and supported me. I am grateful to both prestigious universities in China and the UK for providing me with a good academic environment and research conditions. I want to express my gratitude to the team members who participated in the relevant project during my PhD. Their professionalism and teamwork spirit have greatly benefited me in the research process. Thank you to all the participants in my study, without their support, my research would not have been possible.

In the field of innovation and leadership, we are in an era full of challenges and opportunities. With the rapid development of globalization, digitalization, and artificial intelligence technology, organizations are facing unprecedented changes and transformations. As team leaders in enterprises, we need to continuously learn and innovate to respond to the “questionnaire” presented by the times, leading the organization to success. I have had the privilege of witnessing and participating in the research of this field in the waves of the times. Although there is still much room for improvement.

Once again, I thank all those who have supported me. It is because of you that I am not alone on the journey to a PhD, and it is because of you that I continue to move forward in the academic ocean. I will always remember this unforgettable experience, cherish every bit of help and support, and with a grateful heart, continue to explore and pursue excellence in the field of innovation and leadership.

I still vividly recall the admission interview when Professor Wang Xiaoming asked me: “Why do you decide to pursue a doctoral degree after having worked for

eighteen years?” At that time, my response consisted of three points: First, as an academic who has been involved in teaching and research at universities for nearly a decade, pursuing a doctorate has always been an enduring aspiration. Second, after extensive experience in human resource management within enterprises, I recognized the necessity of engaging in systematic theoretical study to transcend routine practices and overcome professional plateaus. Third, it is both my responsibility and obligation to serve as a role model for my two children, who are currently in primary and secondary school.

As I near the completion of my PhD journey, I remain firmly committed to these three principles. This conviction serves as a lasting memory.

Contents

Abstract	i
Acknowledgments	iii
Contents	vi
List of Tables	ix
List of Figures	x
1 Introduction	1
1.1 Research Background	1
1.2 Research Objectives	9
1.3 Significance of the Study	11
1.3.1 Theoretical Significance	11
1.3.2 Practical Significance	12
1.4 Research Content	14
1.5 Research Contributions	15
1.6 Technical Route	16
1.7 Chapter Conclusion	17
2 Literature Review	19
2.1 The Emergence and Evolution of Digital Leadership	20
2.1.1 From E-leadership to Digital Leadership	21
2.1.2 Dimensionality and Measurement of Digital Leadership	30
2.1.3 Digital Leadership from Individual and Organizational Perspectives	34
2.2 The Emergence and Development of Corporate Intrapreneurship	44
2.2.1 The Concept and Types of Intrapreneurship	46
2.2.2 Research on Corporate Intrapreneurship	50
2.3 Chapter Conclusion	60
3 Methodology	63
3.1 Research Paradigm	63
3.2 Overall Research Framework	65
3.3 Research Design and Methods	65
3.3.1 Study One: Structural Dimensions and Scale Development of Frontline Managers' Digital Leadership	65
3.3.2 Study Two: The Formation Mechanism of Frontline Managers'	

Digital Leadership in Intrapreneurship	68
3.4 Case Selection	70
3.4.1 Basic Information of the Case Enterprise	70
3.4.2 The Emergence and Process of Intrapreneurship	74
3.4.3 Introduction to Intrapreneurial Projects under the Context of Digital Transformation	76
3.4.4 Rationality Analysis of Case Enterprise Selection	85
3.5 Data Collection	86
3.6 Research Ethics Considerations	89
3.7 Chapter Conclusion	91
4 Study One: Structural Dimensions and Scale Development of Frontline Managers' Digital Leadership	92
4.1 Research Objectives	92
4.2 Case Selection	92
4.3 Qualitative Inquiry	93
4.4 Qualitative results and domain definitions	94
4.5 Importance and Necessity of Scale Development	99
4.6 Validity and Reliability	101
4.7 Chapter Conclusion	105
5 Study Two: Formation Mechanisms of Frontline Managers' Digital Leadership in Intrapreneurship	106
5.1 Background and Research Objectives	106
5.2 Case Selection	107
5.3 Data Collection	108
5.4 Data Analysis	109
5.5 The Three-Stage Process of Intrapreneurship and the Development of Digital Leadership	110
5.6 The Process of Digital Leadership Driving Intrapreneurship	119
5.6.1 The Process of Digital Resource Utilization	119
5.6.2. The Process of Digital Logic Formation	121
5.6.3. The Process of Effective Digital Organization	122
5.7 Chapter Conclusion	123
6 Conclusion	125
6.1 General Discussion of Findings	125

6.2 Structural Dimensions and Formation Mechanism of Digital Leadership	126
6.3 Theoretical Exploration and Contributions	128
6.4 Practical Applications and Implications	131
6.4.1 Practical Significance	131
6.4.2 Analysis of Leadership-Related Concepts	132
6.5 Limitations and Future Research Directions	134
References	139

List of Tables

Table 1.1 The Transformation from an Analog Economy to a Digital Economy .	4
Table 2.1 A Summary of the Distinguishing Characteristics of E-leadership Versus Digital Leadership	30
Table 3.1 List of Case Projects	87
Table 4.1 Example of Open Coding for Interviewee 1	95
Table 4.2 Example of Open Coding for Interviewee 2	96
Table 4.3 Selective Coding Results	97
Table 4.4 Standard Load Coefficients of Digital Leadership Items	103
Table 4.5 AVE values and CR values of the four dimensions of Digital Leadership	104

List of Figures

Figure 1.1	Technical Roadmap	17
Figure 3.1	Term Frequency Analysis of WM Group’s “13th Five-Year Plan” ...	72
Figure 3.2	Term Frequency Analysis of WM Group’s “14th Five-Year Plan” ...	73
Figure 4.1	Conceptualization of the Structural Dimensions of Digital Leadership	99
Figure 5.1	Data Structure	110
Figure 5.2	Process Framework of Intrapreneurial Digital Innovation	124

1 Introduction

1.1 Research Background

With the vigorous development of emerging digital technologies such as Big data, Block-chain, Cloud computing, artificial intelligence (AI) and 5G (the fifth generation mobile communication technology), human society is accelerating towards the digital era (Zhang, 2018). In the wave of the digital era, these emerging digital technologies are constantly accelerating the deep integration and mutual shaping with the economy and society, changing people's daily life style, reshaping the social structure, leading a new round of economic and industrial transformation, and promoting the reconstruction of the economic development landscape (Wang Xing, 2017).

Since 2015, China has further strengthened the top-level design of economic and social digital transformation, successively issuing a series of policy documents to provide solid policy support for the digital transformation and development of various fields of the economy and society. According to *The 13th Five-Year Plan for Economic and Social Development of the People's Republic of China*, it was explicitly proposed that the construction of "Digital China" should be accelerated (State Council of the People's Republic of China, 2016). In the following several years of government work reports, further emphasis was placed on the goals of building a cyber powerhouse, Digital China, and a smart society. In 2020, against the backdrop of the sustained impact of the COVID-19 pandemic and the obstruction to the development of the real economy, the government work report of that year once again stressed the need to continue introducing supportive policies, comprehensively promote "Internet Plus", and create new advantages in the digital economy. *The 14th Five-Year Plan for Economic and Social Development of the People's Republic of China* further proposes to embrace the digital era, activate the potential of data elements, and accelerate the development of a digital economy, digital society, and digital government, driving the transformation of production methods, lifestyles, and governance models through holistic digital transformation (State Council of the People's Republic of China, 2021). After nearly a decade of sustained policy support and continuous development, the value added of core digital economy industries in China reached 14.09 trillion yuan in 2024, accounting for 10.5% of GDP (National Bureau of Statistics, 2025). From a macro perspective, the ongoing digital transformation across various sectors of China's economy and society exhibits the

following three characteristics.

Firstly, efforts should be made to comprehensively advance the digital transformation of government functions and administrative operations, coordinate the intensive development of government application systems across all industries and sectors, ensure interconnection and collaborative coordination, and comprehensively enhance government performance capacity. Additionally, it is essential to establish comprehensive standards and regulations for data property rights transactions, cross-border transmission, and security protections; this includes clarifying ownership, usage rights, and revenue rights of data to promote rational development and efficient utilization of data resources. Furthermore, constructing a national unified data sharing and open platform will expand the orderly release of foundational public information data. Leveraging data sharing as a strategic entry point, it is crucial to break down information silos, facilitate the circulation and sharing of data resources, and provide data support for the growth of the digital economy.

Second, active engagement in the formulation of international rules and standards in the digital domain is essential to augment China's global influence and discursive power. Recent initiatives include promoting the establishment of the "Global Digital Economy Alliance" within the United Nations framework, leading the development of the *Global Initiative on Data Security*, which has garnered signatures from 67 countries; coordinating for the launch of e-commerce negotiations at the WTO, including proposals for cross-border e-commerce customs regulation standards. At the corporate level, leading enterprises have achieved breakthroughs in technical standard development; Huawei has actively participated in 3GPP, leading the formulation of key standards such as 5G network slicing and Massive MIMO; Alibaba Cloud has spearheaded the development of international standards for cloud computing service level agreements (SLAs). These international collaborations effectively promote the globalization of the digital economy and contribute to the gradual construction of an open, inclusive, and equitable digital economic environment (Reference, 2019; Zhang Yang, 2020; Li Feng, 2023; He, 2022).

Thirdly, it is necessary to promote the deep integration of digital technologies with the industrial economy, thereby accelerating both digital industrialization and industrial digitalization. Digital industrialization serves as the foundation and precursor of the digital economy, while industry digitalization represents the application scenarios and technological empowerment of the digital economy. The

two are characterized by supply – demand linkage, collaborative innovation, scenario coupling, and value co-creation (Shan et al., 2025). On the one hand, supportive policies and concrete initiatives have accelerated the process of digital industrialization, fostered the growth of digital industries and created new drivers of economic growth. On the other hand, traditional industries are advancing digital transformation through intelligent upgrading and other means to reduce production costs, improve operational efficiency, and achieve full-chain digitalization from production to circulation to consumption, thereby increasing industrial value-added and core competitiveness.

Under the rapid advancement of the digital economy, the traditional development approaches of business and enterprises are being disrupted. Chinese companies are actively seeking digital innovation or digital transformation. In the era of the digital economy, internet companies, with their natural digital genes, quickly capture market trends, use data-driven decision-making mechanisms, rapidly iterate products and services, continuously optimize business processes, achieve agile transformation, and thus maintain a leading position in fierce market competition. These internet companies demonstrate strong adaptability and flexibility. In contrast, the digital transformation journey of large traditional group enterprises is more challenging. These companies are forced to re-examine their business models and top-level designs due to both internal and external factors. Internal factors include the need to improve operational efficiency and optimize resource allocation, while external factors encompass market competition pressure, changes in policy environment, and shifts in customer expectations, among others. However, regardless of internet companies or large traditional enterprises, they need to break traditional thinking patterns, use digital technology to restructure business processes, optimize organizational structures, and redefine interaction modes with customers, suppliers, and other stakeholders during the digital transformation process.

With the advent of enterprise digital transformation, the organization's innovation genes are being reshaped and activated. The widespread application of massive data and intelligent algorithms continues to accelerate market rapid iteration, making traditional innovation models relying on experience inadequate in the face of exponential competition pressure. Therefore, organizations urgently need to build an “human-machine co-creation” innovative ecosystem, combining the precise advantage

of digital algorithms with the deep insights of human intuition to achieve efficient advancement of innovation.

In this process, enterprise leaders must actively leverage digital means from the perspective of organizational sustainable development to promote the enhancement of individual and organizational capabilities, thus improving the efficiency and accuracy of decision-making. McManus (2021) explains the profound changes occurring in resource acquisition, competitive advantages, and other eight aspects during the transition from an analog economy to a digital economy (see Table 1.1), with particular emphasis on the shift in the leader's role from "operational management" to "transformational orchestration." (McManus , 2021).

Table 1.1 The Transformation from an Analog Economy to a Digital Economy

Transformation	Past	Present
Areas that are digitalized	Information only	Everything
Resource acquisition approach	Ownership	Ecosystem
Competitive advantage	Market entry barriers	Burden of growth
Customers	Centered on customers	Insights into customers' "jobs to be done"
Transaction model	Scarce and costly	Numerous and low-cost
Access to information	Limited	Universalized
Product release	Based on scheduled plans	Real-time launch
Innovation	Risk-averse, high-stake bets	Experimentation, rapid iteration
Growth expectations	Linear growth	Exponential growth
Role of digitalization	Tactical	Strategic

Note 1: Ryan McManus. The rise of digital leadership[J]. *Dialogue Review*, 2021, 12(2): 34-38.

In the meanwhile, the leadership theories under past enterprise management models also urgently need to be inherited and developed. Existing studies have generally concurred that in the startup stage of an organization, leaders often penetrate individual influence at various management levels with their distinctive personalities, relying on individual charm to control organizational members (Liu et al., 2011). However, as the organization continues to expand and management levels become increasingly complex, this leadership model relying on individual charm is gradually outdated and unable to meet the realistic needs of modern organizational management. In the current digital economy and market environment, rapid expansion of organizations has become a norm. Many enterprise organizations have failed to timely build a leadership model that matches their scale during rapid expansion. According

to Deloitte's *Scaling Agile Leadership Principles* | *Deloitte Insights*, 73% of organizations that attempted to scale agile teams failed to achieve effective transformation due to inappropriate leadership behaviors, with the root cause consistently traced to a lack of leadership rather than issues related to tools or processes (Deloitte, 2025). This not only restricts the further development of the organization but also poses new challenges to management practices. Therefore, it is of great significance to explore the structural dimensions and formation mechanism of leadership during the organizational change in the digital age.

Leadership in the digital economy era is itself undergoing profound and complex transformations. Specifically, these mainly include:

Firstly, the source of leadership is becoming increasingly complex and diversified. In traditional organizations, the process of leaders using leadership is mainly a relatively closed-loop awareness environment, that is, a leader's leadership is based on their past leadership experience and cannot be fully integrated with the rapidly changing digital age background (Jiang, 2011). From the leader's perspective, relying on past experiences to make decisions is natural. Leader's growth process usually involves a transition from being led to leading others, a transition that often makes them more inclined to rely on existing knowledge systems and experience patterns. However, with the advent of the digital economy era, there exists the possibility that the leadership sourcing model shaped by the past closed environment may limit or even undermine the scientific validity and effectiveness of leadership. This is because, in the digital economy era, the way knowledge is spread and obtained has fundamentally changed, and traditional knowledge monopolies have been broken. Knowledge exchange is no longer limited to one-way output, but shows explosive interactive characteristics. In a digital background, the channels for knowledge acquisition become more diverse, and the formation and development of leadership must also break through the limitations of traditional internal management systems of organizations. Leaders need to expand their horizons to a broader social development background, draw knowledge and inspiration from rich external resources in order to keep their leadership up to date. This diverse knowledge background can not only help leaders better respond to the complex and ever-changing market environment, but also promote the continuous evolution and development of leadership in the new era.

Secondly, the object of leadership exhibits significant "hidden" characteristics.

From the perspective of traditional Chinese Confucian thinking, the effective implementation of leadership often depends on the use of “benevolence and authority”, that is, the flexible application of emotional appeasement or institutional constraints according to the situation. However, in the digital environment, the expression of emotions by the leader becomes more concealed, and employees express their feelings through various digital platforms and channels, which often exceed the scope of leadership monitoring (Liu and Yang, 2015). Therefore, leaders find it difficult to accurately grasp the true emotional state of employees. The digital economy era also exacerbates the concealment of informal organizations. The formation and communication mechanisms of informal organizations have become more complex and difficult to detect. Especially in situations of complex organizational structures, their interests become more diverse, making it difficult for leaders to effectively control all informal organizations. The concealment of followers in this digital era not only increases the difficulty of exercising effective leadership, but also may leave leaders lacking sufficient means to exert influence when dealing with informal groups and employees.

Currently, research on digitalization and leadership has mainly focused on the impact of digital technology on leadership, the concept and structural dimensions of digital leadership, and the effects of leadership in digital contexts.

First, the impact of digital technology on leadership. Overall, scholars believe that, although traits such as caring and kindness required in leadership in digital contexts are similar to traditional leadership (Sutton, 2010), competence and team building skills are also essential. However, the process of leaders influencing their subordinates is mediated by technology, which affects superior-subordinate relationships, leadership behaviors, etc. (Dalwai, 2019; Huo et al., 2008; Kahai, 2004). Even, digital technology changes the way leaders and subordinates perceive things, express emotions, communicate norms, values, and collective cultures (Kahai and Avolio, 2017). Hence, leaders need to make corresponding changes to deal with the changes in communication and work processes brought about by digital technology (Kahai and Avolio, 2017).

Secondly, the concept and structural dimensions of digital leadership. Avolio (2000) first defined the new changes brought by digital technology to the field of leadership by conducting a review study and proposed the concept of “E-leadership”. He defined it as a social influence process that promotes changes in the behavior,

emotions, attitudes, etc. of organizations, teams, and individuals under the mediation of advanced information technology (Avolio, 2000). Scholars generally agree that E-leadership refers to a leader's ability to integrate resources, motivate and influence employees, and continuously achieve individual and organizational goals through the use of information technology as a medium in an information-based context. With the evolution of technologies in network and information toward emerging digital technologies such as cloud computing and artificial intelligence, digital leadership, which originated from E-leadership, has become an advanced leadership concept characterized by digital features due to the technological revolution (Jameson et al., 2022). Digital technologies profoundly affect enterprise management and are embedded in organizational transformation processes, driving the shift from E-leadership in the information era to digital leadership in the digital era (Ju, 2021). Comparatively, digital leadership places greater emphasis on the leader's role in guiding holistic organizational transformation in the digital age, and serves as a comprehensive approach to achieving full-scale digital transformation (Eberl & Drews, 2021). Based on this, Roman et al. (2019) proposed the SEC model for digital leadership in the public government sector, stating that digital leadership includes six abilities: digital communication, digital socializing, digital transformation, digital team, digital technology, and digital trust. In addition, Larjovuori et al. (2018) found through qualitative research on 8 service industry enterprises in Finland that the focus of leadership in digital transformation lies in four aspects: strategic vision and execution, leading corporate cultural change, empowering and leading social network developments. Cortellazzo et al. (2019) outlined the skills and abilities needed for leadership in the digital age through a literature review, including abilities in digital media communication, rapid decision-making, managing disruptive changes, managing connectivity, mastering digital technology, and developing leadership skills.

Lastly, the impact of leadership in the digital context. Scholars' research indicates that leadership in the digital context has an impact on the effectiveness of virtual teams and organizational performance. At the same time, during the digital transformation process, the CEO and executive team of the enterprise play a decisive role in the success of the digital transformation, and major events can inject new impetus into the enterprise's digital transformation (Berman and Korsten, 2014; Avolio, 2003; Pulley and Sessa, 2001; Larson and De Church, 2020).

Based on the above, existing research has revealed the process by which digital

technology changes the influence of leadership, elucidating new requirements for leaders' capabilities. Scholars have also defined the concept of digital leadership, preliminarily analyzed the structural dimensions of digital leadership, and begun to discuss its impact. However, leadership is a concept involving hierarchical structures. Depending on the management level, position, and identity, leaders exhibit different elements of leadership. For example, the leadership of executives focuses on strategy and overall goals, while mid-level leadership emphasizes execution and local tasks (Nichol and Cottrell, 2014). Existing literature primarily focuses on Western contexts, making it difficult to fully capture the specificity of Chinese enterprises' practices in digital transformation. More importantly, most of them mainly focus on senior executives in enterprises, with scarce systematic research on the structural dimensions of digital leadership for frontline managers, a lack of in-depth exploration of the mechanism of digital leadership. In addition, existing research has predominantly focused on Western contexts, making it difficult to fully capture the distinctive characteristics of Chinese enterprises in their digital transformation practices.

Research by Gallup further indicates that frontline managers' leadership has a direct impact on employee engagement, which in turn determines market share. Their findings demonstrate that customer loyalty, a decisive factor for market share, is largely shaped by customer perceptions of employee engagement. Moreover, employee engagement directly depends on the performance of frontline managers. Whether frontline managers possess managerial talent directly influences employee retention and turnover (Li, 2002).

In this dissertation, frontline managers refer to the leaders responsible for intrapreneurial projects within enterprises. They are tasked with implementing project strategies, achieving performance targets, and leading project teams. Positioned at the intersection of vertical and horizontal information flows, frontline managers serve as a bridge between the strategic vision of top management and the concrete practices of grassroots employees. Compared with senior executives, the leadership transformation of frontline managers has attracted limited scholarly attention. This may be attributed to differences in management span, depth of inquiry, and the proceduralized nature of decision-making compared with senior leaders. Nevertheless, as leaders most closely connected with grassroots employees, frontline managers play a critical role in digital transformation.

With the deepening advancement of digital transformation, corporate governance

concepts, organizational structures, and management approaches have undergone continuous transformation. The role of frontline managers has also been subtly shifting, increasingly assuming three key roles: enterprise leaders, information communicators, and decision participants.

First, as enterprise leaders, frontline managers are responsible for leading and managing subordinates. They must set clear goals, monitor performance, identify problems in real time, and ensure the quality of work. They also need to cultivate a positive team atmosphere, engage in effective communication, value employees' opinions and suggestions, and support staff development, thereby enhancing overall team performance.

Second, as information communicators (Jia, 2003), frontline managers act as vital conduits facilitating the flow of information within increasingly flattened organizational structures. Downward, they convey and implement the intentions and decisions of senior management; upward, they effectively channel grassroots employees' feedback and perspectives to higher levels.

Finally, as decision participants, frontline managers are assuming a new and increasingly important role. With the trend toward organizational flattening and the adoption of autonomous team management, middle management layers have diminished, and the responsibilities of frontline managers have expanded. They are therefore taking on more significant strategic functions and participating more actively in organizational decision-making and implementation.

Existing studies have shown that in the digital era, frontline managers require stronger strategic thinking and broader perspectives, as well as higher levels of technical and managerial competence, in order to cope with increasingly complex market environments and competitive pressures. Therefore, examining the development of frontline managers' leadership in the digital era helps reveal their roles and challenges in digital transformation and intrapreneurship, providing both theoretical support and practical guidance for enterprises seeking comprehensive and high-quality transformation and development.

1.2 Research Objectives

Based on the research question above, this study focuses on corporate intrapreneurship proactively initiated by large Chinese enterprises, with a focus on

digital leadership required by enterprises in the digital economy era. It aims to conduct an in-depth analysis of the structural dimensions and mechanisms of frontline managers' digital leadership through a combination of qualitative and quantitative research methods, construct a comprehensive and systematic theoretical framework, and comprehensively describe "what" and "how" digital leadership functions. At the same time, this study hopes to provide theoretical guidance for the development of digital leadership and how to effectively transform digital leadership to promote intrapreneurship. Specifically, the main targets of this study include the following three aspects:

First, this study aims to explore the structural dimensions of frontline managers' digital leadership. In the digital age, the deep integration of emerging digital technologies with the economic and social sectors has led to profound changes in organizational forms and leadership. Digital leadership should not be isolated as a type of leadership or leading process, but should be seen as an organic combination of leadership and leading processes. Although existing literature has made preliminary definitions of digital leadership, there is still a lack of systematic and scientific research on the structural dimensions of digital leadership in organizations. This not only limits a clear understanding of the breadth and depth of digital leadership, but also hinders the in-depth development of related empirical research. Therefore, the primary goal of this study is to analyze the structural dimensions of digital leadership, and through comparative analysis, to lay a foundation for the development of digital leadership in enterprises.

Second, this study intends to develop a measurement scale for frontline managers' digital leadership tailored to the Chinese context. Currently, existing digital leadership measurement tools are relatively scarce and mainly focused on the western context. However, the demand for digital leadership in organizations is increasingly prominent in the digital economy era, hence the urgent need to construct a digital leadership scale suitable for the Chinese context. To ensure the scientificity and applicability of the scale, this study will strictly follow the scientific process of scale development, comprehensively explore and grasp the structural dimensions of digital leadership in the Chinese context. Through this standardized development process, the scale can not only accurately measure various structural dimensions of frontline managers' digital leadership, but also provide strong support for the research and practice of digital leadership in Chinese enterprises.

Third, this study aims to uncover the mechanisms through which frontline managers' digital leadership functions in the process of intrapreneurship. In the digital economy era, digital transformation has become the core driving force for companies to achieve sustainable development. Therefore, focusing on frontline managers' digital leadership and its mechanism in the intrapreneurship, it provides a systematic and comprehensive research framework and practical guidance for how companies can efficiently leverage digital leadership in the process of digital transformation, and further promote organizational digital innovation.

1.3 Significance of the Study

This study explores the structural dimensions and mechanisms of frontline managers' digital leadership, which is of great value to the theory development and practice innovation of digital leadership.

1.3.1 Theoretical Significance

First, this study aims to enrich and expand the theories of leadership in the digital age. Currently, scholars define the concept of digital leadership from different dimensions of the impact of digital technology on leadership, and have primarily formed three perspectives: (1) the first is the capability theory, which is from the perspective of capabilities, emphasizing the reshaping of leaders' abilities by digital technologies; (2) the second is the process theory, which is from the process perspective, believing that digital technologies mainly change the process through which leaders influence employees; (3) the third integrates both approaches, arguing that in digital contexts, digital technologies exert a significant dual influence on both leaders characteristics and leadership processes.. This research has shown that digital leadership develops in tandem with the practice and development of enterprises' business, representing a co-evolutionary process with organizational management activities. This insight expands the theoretical horizons of leadership in the digital era.

Second, this study deepens the understanding of the structural dimensions of digital leadership in enterprises. Although there is some overlap between the concept of digital leadership and traditional leadership in a sense, the uniqueness of digital leadership in terms of structural dimensions and influencing mechanisms still warrants further exploration by scholars (Men, 2020). With the rapid development of

China's digital economy, increasing numbers of enterprises are formulating and implementing digital strategies to drive innovation and transformation, highlighting the growing importance of digital leadership in organizational reform and development. Against this backdrop, comprehensively analyzing the structural dimensions of digital leadership not only facilitates a deeper understanding of the nature of digital leadership in Chinese enterprises but also enables comparative analysis of enterprise versus public-sector digital leadership, as well as Chinese versus Western contexts.

Third, this study develops an empirical measurement tool for digital leadership in the Chinese context. Existing digital leadership measurement instruments are relatively limited and largely concentrated in the public sector. However, enterprise digital leadership differs significantly from public-sector digital leadership, with the former placing greater emphasis on strategic vision and the execution of action (Xu et al., 2011). Moreover, as enterprises grow, they must carefully manage relationships with the political environment and stakeholders. In China, the background of economic transformation and the relationship-oriented social structure make this demand particularly salient. Notably, the development of China's digital economy reflects a typical top-down design from government that cascades into implementation, further highlighting the importance of enterprise leaders' ability to grasp and respond effectively to policy dynamics. If existing public-sector digital leadership scales were applied to Chinese enterprises, issues of both applicability and rationality would arise. On this basis, developing a reliable and valid scale capable of objectively capturing the realities of Chinese management practice is of critical theoretical importance for advancing research and empirical analysis of enterprise digital leadership in China.

1.3.2 Practical Significance

Firstly, this study aims to provide a solid theoretical foundation for developing digital leadership in enterprises. With the accelerating penetration of digital technology, more and more enterprises are beginning to pay attention to and actively explore the development paths of digital leadership. However, before any organization advances in this process, it is necessary to clearly define what exactly digital leadership that enterprise leaders should possess, and what structural dimensions it consist of?. In organization management, managers often rely on experience to

generally summarize the structural dimensions of digital leadership, and based on this, they carry out relevant development work. However, this experiential-based approach often fails to achieve significant results, leaving managers confused. This study, through a thorough analysis of the structural dimensions of digital leadership, comprehensively reveals its characteristics that frontline managers should possess, helping them understand the essence and structural dimensions of digital leadership more clearly. On this basis, managers can formulate more targeted development strategies according to the specific structural dimensions of digital leadership, thereby effectively improving the digital leadership level of enterprise leaders and promoting high-quality transformation and development of enterprises in the digital economy era.

Secondly, the aim of this study is to provide scientific and technical support for evaluating the digital leadership of corporate leaders. To uncover the essence and structural dimensions of digital leadership, it is necessary not only to clarify the structural characteristics of leaders' digital leadership, but also to employ scientific and effective measurement tools for precise assessment. Unlike traditional leadership development, the development of digital leadership are more complex and unique, which poses higher requirements for enterprises in formulating its development strategies. This study combines qualitative and quantitative research methods to explore the development of a digital leadership scale, and empirically test its reliability and validity, providing powerful technical support for enterprises to carry out targeted assessments.

Finally, this study provides a practical path for effectively transforming digital leadership to drive intrapreneurship within enterprises. With the continuous deepening of the digital economy, massive and diversified information constantly emerges, making the external environment where companies operate increasingly complex and volatile. This adds to the difficulty for enterprises to deal with uncertainty, presenting unprecedented challenges to leaders in terms of information acquisition, analysis and integration, and decision-making capabilities. Against this backdrop, how to translate digital leadership into the driving force for organizational innovation and intrapreneurship becomes a key issue in enterprise management practice. This study aims to assist leaders in identifying development positioning in the digital wave, achieving efficient transformation from digital leadership to organizational innovation capability, and thus standing out in the fierce market competition.

1.4 Research Content

This study focuses on the frontier developments of the structural dimensions and mechanisms of digital leadership from two perspectives. Study One concentrates on the structural dimensions of frontline managers' digital leadership. Using a case study approach, this study collects data through in-depth interviews and field observations of frontline managers in enterprises, conducts multi-dimensional and in-depth analysis, and explores the structural dimensions of digital leadership. On this basis, a quantitative research approach is applied to develop a digital leadership scale for frontline managers tailored to the Chinese context, with strong reliability and validity. Study Two focuses on decoding the formation mechanism of frontline managers' digital leadership in the process of intrapreneurship, further exploring how digital leadership drives organizational transformation and innovation. By integrating qualitative and quantitative methods, the two studies are closely interlinked and progressively deepened, jointly advancing research into the structural dimensions and formation mechanisms of frontline managers' digital leadership. The specific research contents are as follows:

Study One: Structural Dimensions of Frontline Managers' Digital Leadership. Through deconstruction, refinement, and in-depth analysis of data collected from interviews with frontline managers in enterprises, this study strictly follows the research procedures of open coding, selective coding, and theoretical coding. The investigation is centered on the question: What are the structural dimensions of digital leadership? Based on this, the study explores the structural dimensions of frontline managers' digital leadership and its effects. Finally, following a systematic and scientific scale development procedure, the digital leadership scale was developed.

Study Two: Formation Mechanisms of Frontline Managers' Digital Leadership in Intrapreneurship. Centered on the question: How does digital leadership function as a mechanism in the process of intrapreneurship? this study employs case study methods (Siggelkow, 2007) and traces key events of frontline managers' digital leadership over the timeline of intrapreneurship. The analysis examines the concrete contexts, key leadership activities, and emerging strategies to identify the formation mechanism of digital leadership during the process of intrapreneurship.

1.5 Research Contributions

The potential innovations of this study are reflected in the following aspects:

First, this study deepens the research on frontline managers' digital leadership. Through a systematic review of domestic and international literature and an understanding of the new characteristics of the digital era, this study emphasizes the particular importance of business strategy and digital technology empowerment in enterprise digital transformation. Accordingly, this study defines frontline managers' digital leadership as the capability and influencing process through which frontline managers, guided by digital strategic thinking, leverage digital technologies to enhance information integration, continuously address managerial challenges, elevate professional value, and drive positive changes in individuals, teams, and organizations in terms of motivation, emotion, cognition, behavior, and performance.

Second, this study constructed a structural model of digital leadership. A review of the literature reveals significant differences between enterprise and public-sector digital leadership, with the former placing greater emphasis on organizational vision and business strategy. Through in-depth analysis, this study identifies four core dimensions of frontline managers' digital leadership: digital strategic thinking, digital operative management, digital orchestrating and integration, and digital executive capability.

Third, this study develops a digital leadership scale tailored to the Chinese context, providing a scientific tool for empirical research. Currently, the number of existing digital leadership assessment tools is limited and mostly focused on the public sector, making it difficult to meet the practical needs of Chinese enterprises for digital leadership assessment. Therefore, it is particularly urgent to develop a digital leadership scale that fits the Chinese context. Through a combination of qualitative and quantitative research methods, this study completed the development of the digital leadership scale. The final scale consists of 4 dimensions and 20 items, which have been verified to have good reliability and validity. The development of this scale not only provides a reliable tool for empirical research on digital leadership in the Chinese context, but also offers a scientific methodological guidance for related assessment work.

Fourth, this study reveals the mechanisms through which digital leadership functions in the process of intrapreneurship. The study found that in the process of

corporate intrapreneurship, digital leadership, together with business functions, promotes innovation development in three stages. (1) In the Startup Stage, frontline managers primarily rely on digital strategic thinking and digital executive capability, realizing digital resource utilization through internal collaboration of digital resources and external integration of digital technologies. (2) In the Growth Stage, they primarily draw on digital operative management and digital executive capability, driving business development through digital logic and service innovation. (3) In the Expansion Stage, they rely mainly on digital orchestrating and integration and digital executive capability, ensuring effective organizational operation through digital business growth and parallel multi-business development.

1.6 Technical Route

This study, based on literature analysis and inductive reasoning, conducts in-depth observation of case enterprises' practices to explore the structural dimensions and formation mechanisms of frontline managers' digital leadership in the process of intrapreneurship.

Chapter One is the Introduction. This chapter starts from the development necessity of leadership in the digital era, introducing the research background and its significance. By analyzing the shortcomings of existing research on digital leadership theory, it identifies gaps in theory, raises the main research objectives, questions, contributions, and presents the overall framework and structure of the dissertation.

Chapter Two is the Literature Review. It primarily synthesizes the similarities and differences between e-leadership and digital leadership, outlines the current research progress and theoretical gaps in digital leadership, and highlights its contextual nature. At the same time, it reviews the concepts of intrapreneurship and summarizes key theoretical contributions in this field. On this basis, the study situates digital leadership within the context of intrapreneurship and explores the formation process of frontline managers' digital leadership as they take on intrapreneurial roles.

Chapter Three is the Methodology. This chapter introduces the research paradigm, overall research design, case selection, data collection, and ethical foundations of this study.

Chapter Four is the Study 1: Structural Dimensions and Scale Development of Frontline Managers' Digital Leadership. Based on first-hand data from in-depth

interviews and research, this study conducts open coding, selective coding, and theoretical coding testing to identify the structural dimensions of digital leadership, thereby exploring a structural model of frontline managers' digital leadership.

Chapter Five is the Study 2: Formation Mechanisms of Frontline Managers' Digital Leadership in Intrapreneurship. Drawing on interviews with 18 frontline managers, this study focuses on the functioning and mechanisms of digital leadership in intrapreneurship, ultimately constructing a process framework for the formation of frontline managers' digital leadership.

Chapter Six is the Discussion and Conclusion. It provides a summary and synthesis of the dissertation. It reviews the main findings and theoretical innovations, highlights the theoretical contributions and practical implications, identifies the limitations of the study, and offers directions for future research.

The specific technical roadmap is shown in Figure 1.1.

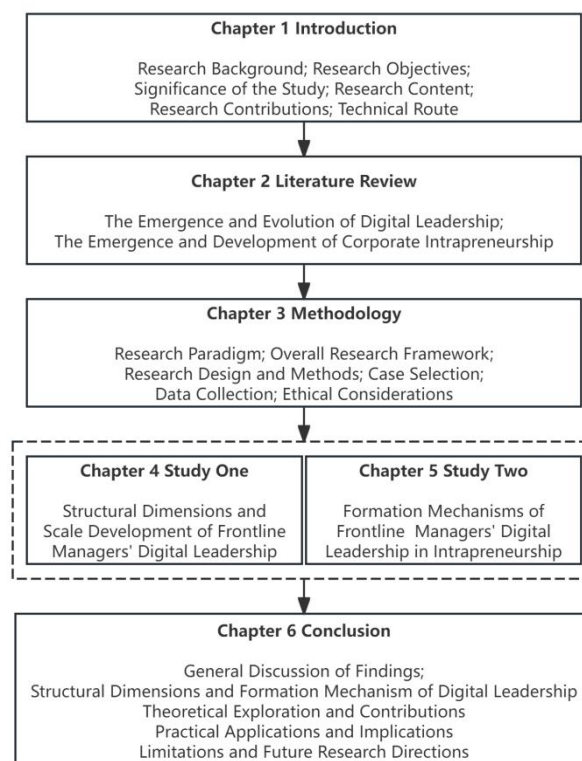


Figure 1.1 Technical Roadmap

1.7 Chapter Conclusion

This chapter focuses on the current situation of digital economy development at home and abroad, analyzes the impact and challenges brought by digital technology to enterprise management. Based on this, taking digital leadership as the research entry

point, the research content, methods, and technical roadmap are clearly defined. It adopts a research method that combines qualitative and quantitative approaches, deeply analyzing the structural dimensions and function mechanisms of digital leadership, aiming to construct a systematic theoretical framework, comprehensively interpret the connotation of digital leadership and its impact on organizational innovation in enterprises.

2 Literature Review

Leadership is essentially the interaction between the leader, followers, and the leadership context. Leadership is closely associated with the leadership context. From the evolutionary trajectory of leadership theory, early research, which represented by trait theory and behavioral theory, emphasized leaders' reliance on hierarchical authority and experiential judgment to control organizations and followers, which pay less attention to its context adaptability. Although contingency theory first introduced the idea of leadership's context adaptability, its largely static analytical framework struggles to meet the agility demands of rapid technological iteration. Overall, while these traditional leadership theories demonstrated strong explanatory power in the industrial era, they reveal clear limitations in today's digitally intensive environment, particularly in their overreliance on command-and-control approaches and insufficient attention to dynamic adaptability.

In the 1970s, transformational leadership theory (Bass, 1978) challenged traditional paradigms by emphasizing the use of vision and moral inspiration to unlock followers' potential. This shift made leadership theory more applicable to complex contexts such as organizational change and innovation during periods of industrial transformation. Specifically, its core dimensions include idealized influence, intellectual stimulation, and individualized consideration. However, under the impact of informatization and digitalization, transformational leadership also shows limitations, as its relatively static framework of moral influence struggles to cope with the agility required by continuous technological and informational change.

The rapid evolution of digital technologies has accelerated the upgrading of organizational digital governance capabilities, expanding the temporal and spatial boundaries of managerial work. Organizations are increasingly required to understand and respond to digital challenges within dynamic environments (Xie et al., 2021). Digital technologies reshape cognition, emotional expression, communication patterns, norms, values, and collective culture between leaders and followers, requiring leaders to adapt accordingly (Kahai, Avolio, & Sosik et al., 2017). Evidence from successful cases of organizational digital transformation shows that leaders typically possess not only digital competencies aligned with job demands but also the ability to facilitate others' adaptation to digital environments (Philippart, 2021). From the development logic of leadership theory, the advantages of traditional leadership do not

automatically transfer into the digital era. The disruptive impact of digital technologies has propelled leadership into a new stage, which is digital leadership (Avolio et al., 2000). This paradigm highlights three key transformation dimensions: data-driven decision-making, where real-time analysis replace experience-based judgment; agile response mechanisms, which establish “sense-respond” cycles to address uncertainty; and ecosystem-based collaboration, which breaks down organizational silos and fosters cross-boundary innovation networks. In this context, the central challenge of leadership has shifted from “how to command” to “how to continuously adapt,” with effectiveness increasingly dependent on foresight into technological trends and the cultivation of organizational resilience.

2.1 The Emergence and Evolution of Digital Leadership

Currently, with the continuous development of digital technologies such as cloud computing, big data, Internet of Things, 5G, and artificial intelligence, a new round of industrial revolution-Industry 4.0, has emerged globally. Against this backdrop, the organizational structures of enterprises are undergoing comprehensive digital transformation encompassing operations, management, and business models. This is a fundamental organizational change triggered by digital technologies (Philip et al., 2023). For example, companies leverage the advantages of digital technologies to change organizational structures, achieve business transformation, or create new business models (Warner and Wager, 2019). The digital transformation of organizations is not only about the application of digital technologies, but also closely related to leaders who drive digital strategies and determine the future prospects of organizations (Yao et al., 2023). The key to successful digital transformation lies in leadership styles that facilitate organizational reform and innovation in the digital age (Karippur and Balaramachandran, 2022). Due to the new characteristics that digital technologies and digital application scenarios bring to leadership, digital leadership as an effective leadership for managers to influence employees to achieve innovation and high-quality development has emerged (Araujo et al., 2021). This section aims to systematically review relevant domestic and international literature, clarify the frontier developments of leadership, existing problems, and future research directions of digital leadership studies, and provide insights for subsequent in-depth research.

2.1.1 From E-leadership to Digital Leadership

Since the 1990s, information technology has gradually entered the daily operations of enterprises, triggering academic attention to the role of leaders in the process of enterprise informatization. Scholars such as Avolio (2000) proposed the concept of “E-leadership” to emphasize the importance of leadership in the adoption of advanced information technology by enterprises. They believe that E-leadership is a social influence process that, with the help of advanced information technology, can change the characteristics of individuals, teams, and organizations in terms of attitudes, emotions, thoughts, behaviors, and performance (Avolio, 2000). E-leadership mainly occurs in environments mediated by information technology. In this situation, not only can communication between leaders and followers be conducted through information technology, but also the information collection and dissemination necessary to support organizational work can be carried out through information technology.

Scholars have classified the concept of E-leadership into two categories based on different target audiences, one of which is similar to traditional leadership, suggesting that the target audience of E-leadership is also people. Avolio and colleagues (2000) first introduced the term “E-leadership” to describe leaders in organizations who have made significant adjustments to adapt to advanced information technology (AIT) against the backdrop of global economic transformations driven by AIT. They analyzed the relationship between leadership and advanced information technology, and proposed that “E-leadership is a social influence process mediated by advanced information technology that affects the attitudes, emotions, thoughts, behaviors, or performance of individuals, teams, or organizations” (Avolio et al., 2000). Subsequently, Avolio and Kahai (2003) conducted further research on “E-leadership,” suggesting that it exists in work environments mediated by information technology. “E-leadership” uses information technology to assign tasks to employees, organize workflows, and utilize information as a resource to support organizational decision-making. Avolio and colleagues (2014) continued to refine the concept and definition of “E-leadership,” describing it as a social influence process embedded in proximal (the backgrounds of leaders and followers) and distal (the overall organizational environment and culture) contexts, mediated by AIT, capable of generating changes in attitudes, emotions, thoughts, behaviors, and performance.

Another approach is to see the target audiences of E-leadership as information technology, considering E-leadership as the effective utilization and integration of electronic and traditional communication methods by leaders (Wart et al., 2016; Liu et al., 2018). It involves understanding current information and communication technologies, selectively adopting new communication methods for oneself and the organization, and possessing the technical abilities to use these selected information and communication technologies. Furthermore, scholars like VanWart (2017) argue that the definition of E-leadership proposed by Avolio et al. (2014) is more suitable for abstract levels, emphasizing the impact of using or not using Information and Communication Technologies (ICT). However, the actual alternative style is the “traditional” leadership style, which is regulated through face-to-face communication (oral and auditory), rich non-verbal communication and on-site physical cues, as well as material and “low-tech” communication materials. The convenience of communication through ICT has had a particularly significant impact on written methods compared to traditional physical communication, replacing not only memoranda, guides, and other traditional communication media, but also frequently replacing meetings (such as listservs and document sharing) and traditional phone messages (such as text messages).

In China, early leadership studies with a technical background often use terms like “E-leadership” to represent “informational leadership” and “E-leadership”. Huo Guoqing et al. (2008) defined informational leadership as “the ability of leaders in the information age to attract and influence followers, stakeholders, and continuously achieve the goals of groups or organizations”. The concept of informational leadership focuses on the impact of information technology as an organizational context on leaders, followers, stakeholders, and other members, revealing that the ability of leaders to allocate resources in the environment is the main focus. It emphasizes that the ultimate goal of informational leaders is to rally members and stakeholders within the organization to achieve common organizational goals. Researchers like Liu Zhui et al. (2015) defined E-leadership as “the ability of leaders in the knowledge economy era to integrate resources, motivate, influence employees to continuously achieve personal and organizational goals through information technology as a medium” (Liu Zhui, Yan Shudi, 2015). The concept of E-leadership in the perspective of these researchers mainly focuses on the dynamic process of E-leadership that needs to continuously adapt to the changing information technology in

the background of technological innovation, emphasizing that E-leadership should transition from “top-down” control to democratic distributed leadership.

Based on the above research, it can be found that E-leadership is generated in the electronic environment mediated by digital technology, especially the internet. Its foundation for exerting influence is a certain understanding of digital technology and importance attached to it. In the workplace, E-leadership can fully utilize the efficiency and convenience of digital technology, regularly establish efficient communication channels with employees, cleverly use digital technology to drive various management tasks, and provide timely feedback to employees through digital means. Therefore, E-leadership is the ability of leaders to integrate resources, motivate and influence employees, and continuously achieve personal and organizational goals in a digital context through the use of digital technology as a medium. E-leadership was initially defined as the ability and process of leaders using information technology to influence followers in an electronic network environment to achieve organizational goals (Avolio and Kahai, 2003). It emphasizes leadership behaviors in a virtual work environment constructed based on electronic media (such as emails, online meetings, etc.).

Accompanied by technological upgrades and leaps, traditional network information technology is transforming towards emerging digital technologies such as big data, cloud computing, Internet of Things, 5G, blockchain, and artificial intelligence. This has given rise to a more transformative concept of digital leadership, incorporating it into the entire organizational process, thereby driving the shift from E-leadership in the information age to digital leadership in the digital age (Ju, 2021). Digital leadership refers to leaders’ ability to drive organizational innovation, transformation, and sustainable development in the context of digital transformation, by grasping digital technologies, culture, and strategies (Bassellier and Benbasat, 2007). It not only focuses on the use of technology but also emphasizes leaders’ role in leading overall organizational transformation in the digital age. Compared to E-leadership, which focuses on using information technology to support existing businesses, digital leadership is a holistic approach to achieving digital transformation of the entire organization through digitalizing processes, business models, leadership development, and personnel management (Eberl and Drews, 2021). With the advent of the artificial intelligence era, the connotation of digital leadership has been further deepened. Zhang Bin (2026), drawing on the technology acceptance model, finds that

digital leadership in the AI era exhibits new characteristics of human-machine collaboration. Leaders are required not only to possess technological vision and strategic judgment, but also to strike a balance between algorithmic decision-making and human-centered management, while addressing the ethical and management challenges brought about by AI. This indicates that, in the AI era, digital leadership has evolved into a systematic leadership paradigm encompassing cognitive reconstruction, capability upgrading, and management transformation. Traditional E-leadership mainly emphasizes the mediating role of information technology in the leadership process, while digital leadership focuses more on the mindset and behavior patterns in the digital age (Ma Yue, 2019). In this scenario, E-leadership has been integrated and expanded into a broader digital leadership framework. Therefore, digital leadership is the evolution of E-leadership from the early information age to the current digital backdrop. E-leadership emphasizes leaders' utilization of information technology and its effects, while digital leadership focuses on changes and enhancements in leaders' mindset, capabilities, and influence processes within the entire digitally dominated organization. It can be seen that digital leadership, derived from E-leadership, has evolved into an advanced leadership concept with digital characteristics due to technological revolution (Jameson et al., 2022).

With the deepening of discussions on digital leadership, an increasing number of scholars have begun to explore the role of leaders in the process of corporate digital transformation (Gardner, 2010). Against this background, researchers represented by Narbona suggest that digital leadership in the digital age is a unique leadership capability that exhibits characteristics fundamentally different from traditional leadership, utilizing new technologies. Narbona uses the term "Digital Leadership" to describe the qualities demonstrated by leaders in a digital environment via the use of digital tools. Oberer and Erkollar further point out that digital leadership involves a rapid, cross-level, team-centric, and innovation-oriented collaboration model. Benitez et al. summarize the essence of digital leadership as the ability to utilize digital, marketing, business, and strategic leadership skills (Benitez, 2022). Fang Yue also proposes that digital leadership should be a core attribute and ability that businesses must possess in the digital age (2019). Avolio et al., based on adaptive structuration theory, define digital leadership as a social influence process embedded in a proximal context (leader-follower background mediated by information technology) and a distal context (entire organizational environment and culture), impacting the thoughts,

behaviors, and performance of organizational members through advanced information technology. However, this definition abstracts the leadership scenario, making it difficult for people to understand and apply digital leadership (Van Wart, 2017). Subsequently, scholars have supplemented the connotation of digital leadership from different application scenarios. For example, Huang Ronghuai et al. suggest that digital leadership in school is the ability of school leaderships to attract and influence all teachers and students and a wide range of staff to carry out information construction and continuously achieve the school's information development goals. Li et al.(2016) believe that digital leadership should be examined from the perspectives of business strategy driving (strategic execution and technological transformation) and digital technology empowerment (competitive potential and service delivery), proposing six enterprise digital leadership qualities: agile leadership, complex skill development, architecture design, digital innovation, value creation, and value protection. In terms of leadership technology, some scholars argue that in digital leadership, the traits of traditional leadership have not changed, but rather the medium of communication and dissemination has changed. The essential difference between digital leadership and traditional leadership lies in whether leaders faithfully use digital technology to enhance and improve leadership (Avolio, 2014). In addition, VanWart et al. (2017) define digital leadership as the ability of individuals and organizations to effectively select and use information and communication technologies to achieve their goals. Roman et al.(2019) believe that the use of information and communication technologies is not just about using specific tools for communicating, but is more of a process about digital creation. They propose that digital leadership is a social influence process aimed at changing the attitudes, feelings, thoughts, behaviors, and performance of organizational members through technology, with the aim of medium, intending to change members' attitudes, feelings, thoughts, behaviors, and performance. It is evident that scholars' exploration of digital technology in digital leadership has gradually shifted from simple digital utilization to the process of digital development. For example, Belitski et al.(2019) state that digital leadership is a dynamic process that integrates organizational culture and technological knowledge and interacts with internal and external technologies and personnel. Roman et al.(2019), through digital teaching case studies, affirm that digital leadership involves the effective use and creative integration of digital and traditional communication methods. Liu et al.(2018), focusing on technological

inclusiveness, suggest that narrow digital leadership involves the simple use and mixing of digital and traditional communication methods, while broad digital leadership is the digital innovation process of virtual communication, knowledge management, and the system itself. Scholars have redefined digital leadership from the dimensions of leadership technology and leadership scenarios. Torre et al.(2020), through semi-structured questionnaire interviews, summarize four key points of digital leadership: multidimensional concepts, social processes, technology mediation, and digital management and communication. Some scholars believe that digital leadership is very effective in maintaining organizational performance, with rapid decision-making, continuous sense of urgency, and faster pace making digital leadership an important part of organizations (Mustajab, 2020; Kulshrehtha, 2021).

In addition, there are researches that define digital leadership from two perspectives: capabilities and behaviors. From a capabilities perspective, digital leadership is seen as the ability of leaders to effectively utilize digital technologies in a digital background, with the goal of increasing value, improving business performance, and achieving digital transformation. This view considers digital leadership as the integration of leadership skills and digital capabilities, consisting of digital, marketing, business, and strategic leadership skills (Benitez et al., 2022). It indicates that digital leadership is essentially the ability of leaders to adapt to the digital environment (Duan, 2020). From a behavioral perspective, it emphasizes leadership behavior and influence processes, where digital leadership is considered as leadership practices integrated with mathematical technologies, exerting influence over organizations through digital technology and leadership attributes (Jagadisen et al., 2022; Rudito and Sinaga, 2017). Overall, there is a clear tendency towards a capabilities-based concept of digital leadership. This conceptualization describes the qualities of leadership in adapting to the digital age, such as communication through digital media, quick decision-making, managing disruptive changes and network connections, as well as developing digital and leadership skills (Cortellazzo et al., 2019). These perspectives reveal the current definitions of digital leadership, which typically focus on leaders' use of digital technologies or the integration of traditional leadership skills with digital capabilities. In fact, digital leadership reflects the enhancement of leaders' abilities, behaviors, and management styles in a digital background, as well as their impact on followers' thoughts, emotions, and behaviors to lead organizational digital transformation, value creation, and sustainable growth

(Fang, 2019; Oberer and Erkollar, 2018). Therefore, from either perspective, the essence of digital leadership involves the integration of digital technology with organizational management, changes in leaders' attitudes and behaviors, and the enhancement of organizational effectiveness. This form of leadership is not just a simple application of digital technology, but rather the coupling of digital technology and organizational management in leadership traits, emphasizing the synergy between leadership and digitalization (Ju, 2021).

There are three main perspectives on the study of digital leadership: social impact, leader trait, and organizational change.

From the perspective of social impact, digital leadership mainly focuses on its influence on employees, teams, or organizations. Avolio et al. (2000) believe that digital leadership is a social influence process that can effectively change the attitudes, emotions, and behavioral performances of individuals, teams, and organizations through advanced information technology. Roman et al. (2019) point out that digital leadership is an abstract concept involving the use or non-use of information technology to change the behavior and psychological states of followers.

From the perspective of leader traits, the research focuses on the roles and digital capabilities that leaders need to possess in the organizational digital transformation process (Jackli, 2020). It is believed that digital leadership is a skill that leaders must master when facing the challenges of the digital age, enabling them to effectively use digital technology to influence and guide teams, thereby achieving organizational goals and enhancing the digital literacy and overall performance of the team (Saputra, 2020). Tian et al. (2023) define digital leadership as the ability of managers to create a clear, meaningful vision and guide organizational members to successfully implement digital transformation strategies.

The perspective of organizational change focuses on the role of digital leadership in organizational change and performance improvement (Oberer, 2018). Researchers believe that digital leadership, characterized by speed, cross-level cooperation, and team-centric approaches, can effectively drive the digitalization process of enterprises (Dwei, 2021), ensuring the successful execution of digital strategies. Kane et al. (2019) further point out that digital leadership combines digital technology with leadership, demonstrating leaders' active embrace of digital change, motivation of team innovation, and ability to quickly adjust organizational structure and processes to respond to change. Albannai et al. (2025), drawing on dynamic capabilities theory,

further reveal the intrinsic mechanisms through which digital leadership drives organizational change, proposing that digital leadership systematically enables enterprises to achieve successful transformation by developing three core dynamic capabilities: digital sensing, digital seizing, and digital transformation.

Overall, digital leadership is an emerging concept developed in the context of the digital age, which embodies more contemporary development features compared to traditional leadership (Huo et al., 2008). Through a review of relevant literature, it can be summarized that digital leadership has four significant characteristics:

Firstly, digital leadership depends on the use and influence of digital resources. Unlike traditional leadership, digital leaders use digital technology as a production tool in the environment of digital transformation, utilizing digital devices and services to establish relationships with organizational members. This kind of leadership emphasizes the effective use of digital labor materials by leaders to better guide the team towards common goals (Van Wart et al., 2019) (Gilli et al., 2023).

Secondly, digital leaders need to have strong digital ability. Several scholars have pointed out that in the process of digital transformation, leaders must have a strong willingness to adapt through role learning and role perception in order to enhance their own digital skills and literacy. Specifically, leaders need to have knowledge of digital technology and be able to establish and maintain responsible teams, enhance trust in virtual environments, and improve the agility and adaptability of the organization in the digital environment (Larjovuori et al., 2016). This means that in the process of organizational digital transformation, leaders need to have the ability to make top-level design and scientific decisions based on digital technology.

Thirdly, digital leaders should have empathy. This trait enables leaders to perceive the emotions of followers and have the ability to think about issues from the followers' perspective. Leaders achieve emotional interaction with team members through sympathy, empathy, and empathy (Zheng Xiaoming, Liu Chenlin, 2020), which is particularly important in a digital environment.

Lastly, the goal of digital leadership is to influence the work performance of followers. Many scholars believe that digital leadership is the ability of leaders to use information technology to bring about changes in the attitudes, emotions, thoughts, behaviors, and performance of organizational actors (Avilio, 2014; Roman, 2019). This indicates that digital leaders need to not only focus on their own leadership process, but also understand how to stimulate the potential of the team through

information technology in order to improve overall work performance.

From the above literature analysis, we can summarize the differences between E-leadership and digital leadership in the following aspects (as shown in Table 2.1).

First, the difference in focus. E-leadership mainly focuses on the use of electronic media in the leadership process, with an emphasis on communication, coordination, and management in a virtual environment through electronic tools to ensure smooth work progress; digital leadership emphasizes organizational digital transformation, innovation, and strategic development, seeing digital technology as the core force driving organizational change, and focusing on shaping digital culture and formulating digital strategies.

Second, the difference in leadership scope. E-leadership is more focused on using electronic methods to enhance leadership skills in existing work modes, especially in leading virtual teams and remote work scenarios. Its leadership scope is relatively narrow, mainly revolving around the work environment built by electronic media; digital leadership involves a comprehensive transformation of the organization, including digital transformation in aspects such as business models, organizational structure, and culture. Its leadership scope is broader, covering the entire digital development process of the organization.

Third, the change in the role of technology. Electronic leaders mainly use electronic technology to connect dispersed team members, viewing technology as a tool for communication and coordination to improve work efficiency; while digital leaders not only view technology as work tools but also as a core component of organizational strategy. Leaders need to deeply understand the potential of digital technology and integrate it into various aspects of organizational strategic planning, operations management, and innovation development.

Fourth, the differentiation in capability requirements. E-leadership requires leaders to have good abilities in using electronic media, managing virtual teams, and communicating and coordinating in a networked environment; while digital leadership, in addition to the mentioned abilities, also requires leaders to have the ability to formulate digital strategies, shape digital culture, insight into the trends of digital technology development, and change management abilities.

In summary, organizations can draw on the relevant theories and practical experiences of E-leadership when managing virtual teams and remote office scenarios, and need to leverage digital leadership to lead comprehensive digital transformation

and innovation development.

Table 2.1 A Summary of the Distinguishing Characteristics of E-leadership Versus Digital Leadership

	E-leadership	Digital leadership
Focus	- Centers on applying electronic media in leadership processes. - Emphasizes using digital tools for communication, coordination, and management in virtual environments to ensure operational efficiency.	- Focuses on organizational digital transformation, innovation, and strategic development. - Treats digital technologies as core drivers of systemic change. - Prioritizes digital culture cultivation and strategic digital planning.
Leadership Scope	- Enhances leadership skills through electronic means. - Leadership Scope is primarily within digitally mediated work environments.	- Encompasses holistic organizational transformation, including business models, structures, and culture. - Covers the end-to-end digital evolution of the organization.
Role of Technology	- Views technology as a tool for connecting distributed teams. - Views technology as a tool for facilitating communication and coordination.	- Treats technology as a strategic pillar. - Requires deep understanding of digital technologies' transformation capabilities, integrating its potential into strategic planning, operations, and innovation. - The leader possesses the capability to formulate digital strategies, shape digital culture, gain insights into digital technology trends, and manage organizational change, among others.
Competency Requirements	- Utilizes electronic media effectively. - Manages virtual teams proficiently. - Communicates and coordinates seamlessly in digital environments.	The leader needs to fulfill the guiding role of digital leadership.

2.1.2 Dimensionality and Measurement of Digital Leadership

As the definition of digital leadership becomes clearer, more scholars have focused on the dimensions of digital leadership. Westerman et al. (2012) proposed a digital leadership model that can be divided into two dimensions: the attitudes, abilities, and behaviors that leaders need in the digital age (e.g., digital literacy/capabilities), and the ability to drive digital transformation (e.g., strong leadership skills). They suggest that CEOs and other senior executives should undergo digital self-transformation while pushing corporate digital transformation. At the same time, they proposed four key practices for transformation management: transformative vision, digital governance, engagement, and IT-business relationships. They emphasized that organizational digital transformation can be achieved through a shared vision and coordination mechanisms. Ju (2021) further argued that leaders need to strengthen five areas of capability-digital communication, digital socialization, digital transformation, digital teamwork, and digital trust-in order to develop digital leadership.

Kane et al. (2015), in collaboration with Deloitte, proposed a digital maturity model that evaluates enterprises' digital maturity across five dimensions: barriers, strategy, culture, capability development, and leadership. Through interviews, respondents were asked to "imagine an ideal organization and describe how, through digital technologies and capabilities, it could improve business processes, attract talent, and drive new value creation." The results indicated that respondents ranked leadership as the top factor in IDC's (International Data Corporation) digital transformation capability scoring system. Leadership, in their view, encompasses dimensions such as digital awareness, the rate of product/service innovation, value co-creation within ecosystems, digital risk tolerance, and market capacity for core business digital transformation. Kane et al. emphasized that these five dimensions are critical determinants of the success of digital transformation. Building on this, Kane et al. (2015) developed a model for assessing cultural maturity in enterprise-level digital transformation, in which the measurement of digital leadership was incorporated as a key subdimension. This dimension particularly highlights leaders' ability to innovate and to interact dynamically with the external environment.

In the Chinese context, Dong Xiaoying et al. (2020) argued that the level of digital leadership is reflected in four main areas: whether digital transformation responds effectively to technological and market challenges, whether it initiates and advances digital transformation strategies and goals, whether it achieves the expected outcomes of digital transformation, and whether it mitigates innovation and management risks to ensure effective strategy implementation. Xu Mingxia and Yan Xiangzhe (2026) extended the analysis to the industrial chain level, proposing that the digital leadership of leading firms in the industrial chain comprises six structural dimensions: digital strategic steering capability, digital technology application and innovation capability, data resource integration capability, organizational change and collaboration capability, digital risk management capability, and digital talent developing capability. These dimensions are further categorized into four types: conservative, idealistic, cross-boundary, and disruptive. This study enriches the conceptualization of digital leadership from an industrial synergy perspective and offers additional insights into understanding the role of digital leadership within broader systems.

Misra et al. (2019) stressed that "leaders must lead first" in digital transformation. Leaders must first align their own mindset with digitalization in order to guide

employees to adopt new ways of working. They identified key skill dimensions required for leading digital transformation processes, including: skills for adapting to new technologies, fostering design thinking, designing and delivering new digital experiences, digital communication and computational thinking, critical adaptive thinking, agile methods, adaptive thinking, as well as emergent and responsive thinking.

Promsri (2019) conducted a systematic analysis of online resources, using keywords such as Digital Leadership, Digital Leaders, Characteristics of Digital Leaders, and Qualities of Digital Leaders. This study summarized six key characteristics of digital leaders: (1) digital knowledge, namely an understanding of the potential of digital change; (2) vision, defined as clear objectives for the digital transformation process; (3) customer centricity, that is, taking into account customers' expectations and aspirations for digital processes; (4) agility, referring to adaptability to rapidly changing workflows; (5) risk-taking (creating an experimental atmosphere), which involves establishing a constructive culture of critique that allows trial, error, and innovation; and (6) collaboration, meaning the strengthening of cooperation among employees across locations, time zones, and cultural contexts.

In the educational field, Damayanti and Mirfani (2021) proposed the need for leaders in educational fields to establish and exercise digital leadership. They used a qualitative research design employing survey questionnaires and semi-structured interviews to collect data. They conducted closed-ended surveys on the teachers, staff, and students of Ma Nurul Falah to determine their perceptions of effective digital leadership and how it is reflected during the COVID-19 pandemic and in the new educational system. Subsequently, they presented five dimensions of digital leadership in the field of educational management, including: leadership and vision dimension, learning and teaching dimension, productivity and professional practice dimension, support, management, and operational dimension, assessment and evaluation dimension, etc.

Some qualitative studies have employed interviews and surveys, using grounded theory or content analysis to extract the elements of digital leadership. Grounded theory research paradigms adopting in-depth interviews and three levels of coding have been used to construct multidimensional structural models of digital leadership in enterprises and universities (Fan et al., 2022; Imran et al., 2020; Li and Miao, 2020). Based on a content analysis of interview data from eight Finnish service companies,

Larjovuori et al. (2018) identified four leadership priorities for digital business transformation: strategic vision and action, leading cultural change, empowerment, and guiding networks. In the Chinese context, Li Yanping and Miao Li (2020) applied grounded theory to interview data from 58 Chinese enterprise leaders, constructing a conceptual model of the structural dimensions and impacts of digital leadership in Chinese firms. They proposed that Chinese enterprise digital leadership comprises five capability dimensions: digital strategic thinking, digital organizational change, digital environmental control, digital communication and networking, and digital talent development. They further suggested that enterprise managers should develop a deeper understanding of the intrinsic characteristics of digital leadership and apply these capability dimensions in leadership development practice to improve organizational performance.

In quantitative studies of digital leadership structures, scholars have primarily used online and offline surveys to identify its dimensions, laying the foundation for scale development and empirical research. Magesa and Jonathan (2021), based on a survey of highly digitalized organizations in Tanzania, identified four key roles of digital leadership: the inspirational role, the visionary role, the uncertainty-absorbing role, and the innovative role, thereby demonstrating the skills required of digital leaders in organizational digital transformation. Similarly, Hamzah et al. (2021), drawing on surveys of principals in Malaysian national secondary schools, examined digital leadership across five dimensions: visionary leadership, a learning culture for the digital age, professional practice excellence, system improvement, and digital citizenship. These dimensions were aligned with the digital leadership standards for administrators published by the International Society for Technology in Education. Duan Ke (2020), through a survey of 114 domestic enterprise leaders, also concluded that digital-era leadership can be summarized into four aspects: mindful change capability, professional business capability, environmental awareness capability, and interactive resonance capability. Within these, mindful change capability included willingness to change and articulating values; professional business capability included digital literacy and business transformation; environmental awareness capability included adapting to the times and agile response; and interactive resonance capability included cross-boundary interaction and role resonance. Wen Hanqiuko (2021) further proposed that digital leadership can be evaluated from four aspects: digital economic insight, digital economic learning capability, digital asset

management capability, and digital talent development capability.

Overall, the exploration of the structure of digital leadership has mainly adopted qualitative methods such as Grounded Theory and content analysis, with relatively fewer quantitative studies. By using both qualitative and quantitative research methods and synthesizing the current research findings on the dimensions of digital leadership structure, it can be found that digital strategy, digital insights, digital transformation, and digital talent development are key components of digital leadership.

2.1.3 Digital Leadership from Individual and Organizational Perspectives

2.1.3.1 Individual Factors Influencing Digital Leadership

Scholars have pointed out that digital leadership is significantly influenced by leaders' personal traits and skills. Liu (2018), based on a study of 318 public-sector employees in Seoul, demonstrated that leaders' personal traits (energy, achievement needs, responsibility, and flexibility) and skills (analytical skills, continuous learning ability, professional technical skills) will positively influence digital leadership through their willingness to use technology. Sahyaja and Rao (2018) summarized the factors influencing digital leadership at the individual level, mainly including leaders' emotional intelligence, intelligence quotient, numerical intelligence, and personal qualities. The study found that these personality traits will affect leadership ability, with leaders who have high emotional intelligence, high intelligence quotient, high numerical intelligence, and excellent personal qualities tending to have higher levels of digital leadership. However, this study only stays at the theoretical level and further empirical exploration is needed. Zhao Yapu et al. (2024), based on the high-order ladder theory, constructed an analysis framework of "cognitive flexibility - digital leadership - digital transformation," proposing that the cognitive flexibility of managers is a key cognitive characteristic that influences enterprise digital transformation, and digital leadership is a key path through which managerial cognitive flexibility affects enterprise digital transformation. At the same time, they integrated the trait activation theory and proposed that external IT capabilities of organizations are key situational factors that affect how managerial cognitive flexibility exerts influence. Further empirical analysis using enterprise survey data revealed that managerial cognitive flexibility drives the construction of digital

leadership, which in turn has a positive impact on enterprise digital transformation, and external IT capabilities play a positive moderating role in the relationship between managerial cognitive flexibility and digital leadership.

In the face of complex digital challenges, leadership attributes are also crucial for effective leadership in the digital environment (Kane et al., 2019; Kreutzer, Neugebauer, and Pattloch, 2018). In the digital environment, possessing agile leadership capabilities is one of the key traits of digital leaders. As stated by O'Reilly III and Tushman (2011), digital leaders should not only be able to perceive changes in the competitive environment, but also be keenly aware of potential changes in technology, customers, and competitors, and set strategic priorities based on this. In the exploration realm, digital leaders need to closely connect with emerging customer needs, pay attention to undeveloped markets, and be adept at leveraging new technologies to drive innovation. This is because, in the process of digital transformation, it is necessary to effectively combine exploratory and exploitative capabilities in order to support new opportunities for value creation. In the context of digitalization, this means exploring the application of digital technologies in different business domains, uncovering new business models and growth opportunities (Havermans, Den Hartog, and Keegan, 2015). Meanwhile, digital governance practices also play an important role in the development of digital leadership. Bongiorno et al. (2018) point out that digital governance practices can support organizational change, promote collaboration and communication across organizational boundaries, and create a shared digital decision-making culture in organizations. For digital leaders, establishing effective digital governance mechanisms to ensure data security, compliance, and efficient utilization of digital resources is an important guarantee for effective leadership. Therefore, factors such as leadership attributes, perception of environmental changes, the combination of exploration and development capabilities, and digital governance practices provide strong support for leaders to lead organizational development in the digital age.

From the employees' perspective, digital leadership directly influences both employee creativity and job performance. Firstly, digital leaders with excellent digital communication skills (Karakose, 2021; Frank, 2019; Somerville, 2013) can effectively collaborate with employees through various digital channels. This collaboration promotes open and transparent communication, allowing employees to easily share their ideas, thoughts, and innovative insights. In fact, leveraging online

social networks has been proven to have great potential in influencing and changing individual behavior (Anastasei, 2023). Therefore, by utilizing digital platforms, online social networks, and tools, digital leaders can promote brainstorming, idea sharing, and collaborative problem-solving, thus fostering a culture of innovation and creativity within the organization (Saputra, 2021). Secondly, digital leaders play a crucial role in fostering employee creativity through the integration of organizational culture and digital capabilities (Sasmoko, 2019; Mihardjo, 2018). When leaders prioritize digital capabilities and organizational cultural values, employees acquire the knowledge, skills, and resources needed to explore and experiment with digital technologies. This effective integration of elemental resources enables employees to creatively use digital tools and knowledge for their work and problem-solving (Sasmoko, 2019). Additionally, leaders establish a sense of purpose and direction by articulating a clear vision and demonstrating how digital technology enhances individual and team performance. This enables employees to explore new ideas, take appropriate risks, and think beyond traditional boundaries, ultimately creating a more creative work environment (Benitez, 2022). Scholars have also conducted empirical research on the impact of digital leadership on employee creativity. Scholars like Zhu et al. (2022) conducted a two-stage survey of 357 employees from various companies in China, further revealing the positive impact of digital leadership on employee creativity, the mediating effect of employee job redesign, and the moderating role of individual-organizational fit in this relationship. Some scholars argue that leaders with digital leadership can inspire innovation awareness among employees. Eberl and Drews (2021) point out that a digital leadership style encourages employees to maintain curiosity, continuously expand their knowledge, helps change employees' attitudes and values, makes employees more responsible, and thus encourages innovation. Weber et al. (2022) found that leadership behaviors focused on articulating a digital vision help cultivate employees' motivation to achieve the vision and stimulate innovative behaviors. Erhan et al. (2022) surveyed 320 department managers in the Turkish textile industry and found that digital leadership significantly influences various dimensions of innovative work behaviors. Regarding the effectiveness of digital leadership at the individual level, scholars have discussed not only the impact of this leadership on employee behavior and capabilities but also its impact on senior executives themselves. Specifically, to determine the relationship between digital leadership and the mental health of senior executives, Zeike et al.

(2019) conducted on-site interviews and online surveys with 368 senior executives in a large German company. The study found a significant positive correlation between digital leadership and mental health. Furthermore, digital leadership can promote employees' digital collaboration, enhancing their digital skills necessary in a digital background (Saputra et al., 2021). Employees' perception and acceptance of digital leadership stimulate their innovative behaviors, including exploring, generating, advocating, and implementing novel ideas, thereby utilizing their personal innovative abilities to improve employees' job performance (Erhan et al., 2022; Li and Miao, 2020).

Digital leadership can also enhance both task performance and contextual performance. It is noteworthy that leaders use digital technology to enhance communication, collaboration, and knowledge sharing, ultimately improving task performance (Kane, 2015). Under the drive of digital technology, organizational structures are evolving towards flatter and more decentralized structures. In a digital environment, knowledge and information become more visible and easily shared, giving followers more autonomy (Schwarzmüller et al., 2018) and ensuring their voices are heard at all levels of the organization (Lynn Pulley and Sessa, 2001). With the increasing distribution of information within organizations, power tends to be decentralized. Digital transformation allows followers to participate in many decision-making processes in real-time, enhancing their involvement. Therefore, leaders are expected to adopt a more inclusive leadership style (Schwarzmüller et al., 2018), by seeking and considering followers' ideas in daily decisions through two-way communication and interaction. Scholars believe that higher autonomy and involvement of followers can drive them to have a greater sense of responsibility for their work. For example, researchers have shown that leaders who utilize online networks succeeded in leading employees to achieve better performance outcomes by emphasizing safety management standards. Therefore, through effective utilization of digital platforms, social media, and other tools, digital leaders promote open and transparent communication channels, allowing employees to share their ideas, thoughts, and perspectives. This favorable environment fosters effective collaboration and problem-solving, ultimately enhancing task performance (Chio and Cho, 2020). Additionally, digital leadership plays a crucial role in fostering an innovative and learning culture within organizations and has a positive impact on task performance (Grant, 2012). Digital leaders align the development of digital capabilities with

organizational cultural values, providing employees with the necessary knowledge, skills, and resources to explore and experiment with digital technology. This integration enables employees to creatively utilize digital tools and platforms, promoting innovative work and problem-solving approaches. Digital leaders who effectively communicate and promote a digital vision inspire employees to embrace digitalization and creatively rethink their roles and responsibilities (Benitez, 2022). By clarifying a clear vision and demonstrating how digital technology enhances individual and team performance, leaders establish a sense of purpose and direction among employees, enabling them to excel in tasks. From the perspective of situational performance, digital leaders enhance the ability of employees to demonstrate willingness for altruistic behavior and their transformative vision, fostering team spirit and facilitating goal achievement, ultimately enhancing situational performance (Grant, 2012; Su, 2019; Charlton, 2019). The technical capabilities of digital leaders and their effective utilization of information resources positively impact task and situational performance (Widodo, 2021). Therefore, through the use of digital technology, digital leadership is poised to become a crucial determinant of employee performance, cultivating an innovative culture and promoting a digital vision. In other words, by enhancing communication, collaboration, knowledge sharing, and creativity, digital leadership contributes to improving task performance. Furthermore, their ability to inspire and motivate employees, as well as instill a sense of purpose, further enhances situational performance.

Digital leadership also exerts a significant influence on employees' agility and psychological well-being. Zhou Hong et al. (2024), drawing on cognitive-affective personality system theory and social information processing theory, explored the mechanisms and boundary conditions through which digital leadership influences employee agility. Empirical analysis revealed that digital leadership positively influences employee agility through digital self-efficacy and harmonious work passion. With the deepening of digital transformation, the complexity of leaders' work is continuously increasing. Compared to traditional leaders, leaders in the digital age need to pay more attention to psychological management. The Job Demands-Resources Model (JD-R model) is one of the mainstream organizational behavior theories, which reveals the impact mechanism of digital leadership on leaders' psychological well-being. Scholars represented by Zeike investigated 368 senior managers in a large ICT company in Germany based on the JD-R model. The study

showed that the stronger the skills of digital leadership, the higher the psychological well-being of leaders (Zeike, 2019). Dewi conducted a survey in a government organization in Indonesia with 16,179 employees. Data analysis of 1,899 managers found a significant positive impact of digital leadership on psychological well-being (Dewi, 2021). Larjovuori et al. (2016) explored the impact relationship between digital leadership and employee well-being in the process of organizational digital transformation. The research found that the relevant behaviors of digital leadership can increase employees' information technology pressure, but through the buffering of the second mediating path of technology work engagement, it can ultimately bring technology-related happiness to employees. Li Zhenli et al. (2024) discussed the impact of digital leadership on employees' proactive change behavior and the chain mediating effect of employee empowerment and job engagement based on the conservation of resources theory. Through data analysis at two time points, it was found that digital leadership has a significant positive impact on employees' proactive change behavior; employee empowerment mediates the significant positive impact of digital leadership on employees' proactive change behavior; employee job engagement similarly mediates the significant positive impact of digital leadership on employees' proactive change behavior; employee empowerment and job engagement have a chain mediating effect between leaders' digital leadership and employees' proactive change behavior.

In summary, individual factors—including personality traits, cognitive flexibility, skills and competencies, and psychological qualities — play a critical role in the formation and exercise of digital leadership. These factors not only influence employee creativity, task performance, and contextual performance, but are also closely associated with employee agility, psychological well-being, and proactive change-oriented behaviors, thereby providing strong support for organizational digital transformation.

2.1.3.2 Organizational Level

Organizational factors are important drivers of the development of digital leadership. Literature review found that existing studies mainly focus on two factors: the application of digital technology within organizations and the dissemination of digital culture. With the rapid development of digital technology and the widespread use of big data in organizational management, more and more leaders are making

decisions through intelligent analysis of big data (Van, 2015). The environmental changes brought by digital technology require leaders to formulate and implement digital strategies, and to use appropriate leadership styles to promote digital development in order to improve organizational performance and maintain organizational competitiveness. For example, Kraft's research found that E-leadership is the result of the development and application of digital technology in a VUCA environment (Kraft, 2019). Cortellazzo and other scholars (2019) also pointed out that the environmental changes brought about by digital technology play a promoting role in the formation of digital leadership. Braf and Melin (2020) pointed out that the development of digital technology has influenced job design and leadership styles within organizations. In addition to the external environment, digital culture is also an important endogenous factor of digital leadership. Culture and leadership are mutually influential. Digital culture, as a type of organizational or corporate culture, supports, recognizes, and nurtures employees to work and collaborate using digital technology within the organization (Saputra, 2020). Saputra defines digital culture as digital thinking patterns and digital values. He conducted a cross-sectional analysis of 280 employees of a state-owned transportation company in Indonesia and found that digital culture has a positive and significant impact on digital leadership, and developing digital culture within an organization helps improve the digital leadership capabilities of supervisors or managers.

With the enterprise's digital transformation and upgrade, leaders are constantly exposed to new technologies and new models, prompting them to shift from traditional linear thinking to a more innovative and adaptive digital mindset. A deep understanding of digital technology enables leaders to better leverage digital leadership. In addition, during the process of digital transformation, leaders need to effectively communicate and collaborate with different departments, different levels of employees, and external partners. Digital transformation strategy provides leaders with a common goal and vision, enabling them to better unite team forces and inspire employees' innovative enthusiasm. By driving the implementation of digital transformation projects, leaders can demonstrate their digital leadership, winning the trust and support of employees and partners. The digital transformation strategy also establishes the organization as a digital pioneer in the industry, enhancing the leaders' influence and voice within the industry. It is evident that the digital transformation strategy is also an important factor in driving the generation and development of

digital leadership.

The effectiveness of digital leadership in driving organizational innovation has been highlighted by several studies involving different countries, industries, and organizations of various sizes. Studies have found that in leading Chinese enterprises undergoing digital transformation, digital leadership has stimulated organizational innovation in areas such as strategic positioning, resource capabilities, technology products, and business ecosystems to enhance organizational performance and development (Li and Miao, 2020); in European small and medium-sized enterprises, digital leadership enhances innovation performance through platform digitalization (Benitez et al., 2022); in the manufacturing industry in Malaysia, digital leadership positively impacts an organization's dynamic capabilities, networking capabilities, and innovation capabilities (Jagadisen et al., 2022); in the Indonesian telecom network industry, digital leadership and innovation management have beneficial effects on the digital disruption of existing telecom companies (Wasono and Furinto, 2018). Digital leadership can facilitate customer-experience-oriented business model innovation (Mihardjo et al., 2019b) and can also leverage dynamic capabilities to promote enterprise innovation (Mihardjo and Rukmana, 2018; Mihardjo et al., 2019a; Sasmoko et al., 2019). Ardi et al. conducted an empirical study with owners and executives of 32 digital companies and found that transformational digital leadership has a positive impact on organizational innovation, with knowledge-based empowerment interaction acting as a mediator between digital transformational leadership and organizational innovation capability (Ardi, 2020). Benitez et al. found in their empirical study of 117 European companies that digitalization capability of platform serves as the mediating variable between digital leadership and innovation performance; digital leadership does not directly impact innovation performance, but rather requires higher-order capabilities (i.e., platform digital capability) to influence a company's innovation performance (Benitez, 2022). Xie Peng et al. (2023) surveyed 256 middle to senior-level enterprise managers and found that digital leadership significantly promotes organizational innovation. Digital leadership drives organizational innovation by enhancing digital platform capabilities. Environmental competitiveness not only positively moderates the relationship between digital leadership and digital platform capability, but also positively moderates the relationship between digital leadership and organizational innovation. Environmental competitiveness has a promoting effect on the mediating role of digital platform

capability. Tian Hongna et al. (2023), based on online research, found that digital leadership has a significant positive impact on green innovation in enterprises. Green organizational identification partially mediates the relationship between digital leadership and green innovation, while digital threats play a negative moderating role between digital leadership and green innovation.

Digital leadership is also closely associated with organizational performance. According to the transformational leadership theory, if digital transformation is viewed as a type of organizational change, the role played by the change implementer will determine the overall experience of the change recipients. The digital age has accelerated organizational change, leaders should have the ability to adapt to change, adjust business strategies in a timely manner, and help employees adapt to change in order to enhance organizational performance in a competitive environment. Therefore, digital leadership plays a strong driving role in improving organizational performance. Basuki et al. based on the dynamic capability theory, combined with data analysis of the manufacturing industry in Indonesia, pointed out that leadership style plays an important promoting role in corporate performance through dynamic capabilities (Basuki, 2015). Mihardjo et al. collected relevant data from 88 senior managers in an Indonesian telecommunication company through online questionnaires, and their study found that digital leadership has a positive impact on innovation management and dynamic capabilities, and market orientation moderates the relationship between digital leadership and dynamic capabilities (Mihard, 2019). Li Yanping and Miao Li (2020) found that leaders are good at using digital strategic thinking to view the long-term development of enterprises through in-depth interviews with enterprise leaders, promoting innovation in value proposition, target customers, and customer relationships, which helps enterprises discover effective market opportunities, achieve strategic positioning innovation, and enhance the competitiveness and organizational performance of enterprises. Qihai (2024) explored how and when digital leadership affects the competitive advantage of China's 139 hidden champion enterprises based on data from 434 managers. The research findings show that digital leadership affects the competitive advantage of enterprises through exploratory innovation and exploitative innovation, and value co-creation enhances the impact of exploratory innovation on competitive advantage positively, while weakening the impact of digital leadership on competitive advantage through exploitative innovation. Further, Yao Meifang and Liu Guannan (2026), drawing on the resource-based view and dynamic

capabilities theory, constructed a moderated mediation model to uncover the intrinsic mechanism through which digital leadership influences intrapreneurial performance. The study found that ambidextrous learning (including exploratory learning and exploitative learning) plays a partially mediating role between digital leadership and intrapreneurial performance, while organizational innovation climate positively moderates the relationship between digital leadership and ambidextrous learning. This study not only validates the positive effect of digital leadership on performance but also refines the internal pathways through which digital leadership functions from the perspectives of “learning transformation” and “contextual reinforcement,” providing a more complete mechanistic explanation for understanding how digital leadership drives organizational performance.

New contexts such as digital workplace have emerged as new research trends in recent years. Since the onset of the COVID-19 pandemic, many organizations have allowed their employees to work from anywhere, leading to the emergence of digital workplaces where employees can complete their tasks by remotely connecting, communicating, and collaborating with other colleagues. The dynamic capabilities of organizations play a crucial role in facilitating this transformation of the workplace. Given the recent nature of this phenomenon, researchers, practitioners, scholars, and policymakers have shown considerable interest in understanding the role of organizational dynamic capabilities in the digital transformation of the workplace, as well as the role of digital leadership in enhancing organizational performance and driving the digital transformation process. Consequently, Sheshadri et al. (2023) developed a research model based on a literature review and a review of dynamic capabilities theory. The study found that organizational dynamic capabilities have a significant positive impact on the digital transformation of the workplace, which, in turn, improves employees’ work-life balance, thereby enhancing both employee performance and organizational performance. Some scholars followed a mixed-method approach, deriving a theoretical model of the relationship between digital leadership and innovation performance through a multiple case study of 10 enterprises, and empirically testing it on a sample of 117 European companies. The results revealed that digital leadership enhances a company’s innovation performance through the digitalization of the company’s platforms (Benitez et al., 2022). Shuang Ren et al. (2022) systematically review the paradigm shift in leadership research in the digital era. They point out that traditional “face-to-face leadership” studies

confront a validity crisis in contexts characterized by virtual collaboration, algorithmic mediation, and big data feedback. They call for the adoption of new approaches, such as computational modeling and machine learning, to advance leadership research from a descriptive to a more predictive paradigm (Shuang Ren, Justin A. DeSimone, Xue Zhang, Wei He, and Xinxin Ma, 2022). Based on a global survey of 700 executives, Amit S. Mukherjee (2023) proposes the VUCA+7 framework, identifying seven mechanisms through which digital technologies reshape the leadership environment (e.g., skill decentralization and increased transparency). He argues that leadership should shift toward an integrated paradigm centered on fostering creativity, building collaborative networks, and promoting inclusive governance.

The emergence and development of digital leadership are closely tied to organizational context. Therefore, selecting large enterprises that are actively leveraging digital technologies to drive intrapreneurship as empirical settings provides a valuable research entry point for examining the structural dimensions and formation mechanisms of digital leadership.

2.2 The Emergence and Development of Corporate Intrapreneurship

At present, influenced by multiple factors such as geopolitical conflicts and great-power competition, the global macroeconomic environment is becoming increasingly severe and complex, while competition within and across industries continues to intensify. This situation requires enterprises to respond proactively to the challenges of digital transformation in order to secure unique competitive advantages for sustainable development. Against this backdrop, entrepreneurship has gradually become an important topic in both management research and practice. Entrepreneurial activities encompass two key aspects: the startup of new companies and intrapreneurship within existing companies (Antoncic and Hisrich, 2003). Entrepreneurship refers to risk-taking behavior in the process of establishing and managing an independent company, whereas intrapreneurship refers to entrepreneurial behavior that occurs within existing organizations or companies, whereby employees identify and develop innovative opportunities aligned with the firm's growth (Douglas and Fitzsimmons, 2013).

Corporate Intrapreneurship is a strategy that attempts to establish new business

within a company, helping organizations balance management efficiency with the need for flexible innovation. Unlike external entrepreneurship, corporate intrapreneurship emphasizes innovation within the existing framework of the company. It allows companies to make strategic adjustments and expand business using their own resource advantages without relying solely on external innovation or mergers and acquisitions. By empowering employees and supporting the creation of new goals through sub-unit structures, corporate intrapreneurship promotes the flow and matching of company resources, enabling companies to discover new business opportunities. It has become a powerful weapon for large companies to iteratively innovate internally, accumulate disruptive value, and gain competitive advantages. Compared to independent entrepreneurs who bear all business risks, corporate intrapreneurs usually retain their positions and stable income, facing less personal risk. Therefore, corporate intrapreneurship provides a relatively secure way to explore new business opportunities and offers intrapreneurs a certain degree of safety. Therefore, focusing on how to stimulate the vitality of corporate intrapreneurship is crucial for organizations to quickly adapt to dynamic environments.

In recent years, many well-known companies such as 3M, Google, and IBM have successfully launched innovative products or services through corporate intrapreneurship, maintaining their competitiveness in the market. Corporate intrapreneurship, as a subfield of entrepreneurship, has received wide attention from scholars, and related studies are emerging continuously. Existing research generally holds that corporate intrapreneurship is closely related to the reform and development of enterprises as well as the enhancement of their competitiveness. Intrapreneurship contributes to innovation activities and enhances internal performance of businesses (Antoncic and Hisrich, 2001; Hornsby et al., 2013), playing a crucial role in strengthening organizational efficiency and driving value creation (Kearney and Meynhardt, 2016). Research has also shown that intrapreneurship enables companies to adapt to external changes and revitalize their operations (Ireland et al., 2003; Morris et al., 2011), thereby contributing to long-term organizational development. Specifically, employee participation, empowerment, job autonomy, and well-designed incentive systems can effectively stimulate innovation intentions and the exploration of opportunities, which in turn enhance the long-term strategic performance of enterprises (Adeyeye et al., 2015). Therefore, systematically studying intrapreneurship is of great significance for enriching enterprise management theory

and guiding managerial practice.

Although corporate intrapreneurship has been widely adopted in business management practice, the complexity of its transformation and the unknown nature of exploration also make theoretical research in this field challenging. Based on the above background, this section will systematically review existing research on corporate intrapreneurship, explore its conceptual development, core theories, and key issues. Through a review of relevant literature, this section will elucidate the core concepts of corporate intrapreneurship, the differences and connections between corporate intrapreneurship and other related concepts. And starting from different perspectives of research levels, such as organizational level and individual level, it will sort out the factors affecting corporate intrapreneurship, analyze and propose key factors for promoting the success of intrapreneurship.

2.2.1 The Concept and Types of Intrapreneurship

In the 1970s, as corporate intrapreneurship activities within companies began to gain traction, the academic community started to pay attention to this topic. At that time, many businesses gradually realized that maintaining innovative capabilities is crucial for sustaining a competitive advantage in an ever-changing market environment. Large companies often appeared cumbersome and slow to respond when facing challenges from emerging small entrepreneurial firms, making it difficult to quickly adapt to changing market demands. As a result, some companies began to motivate employees through intrapreneurship, encouraging them to creatively think and practice within the existing organization to drive innovation. However, at this stage, scholars had not yet explicitly defined the concept of intrapreneurship, with research mainly focusing on methods and means to promote effective motivation of internal entrepreneurial teams and employees within an enterprise. Some studies proposed the concept of intrapreneurship to distinguish it from individual entrepreneurship (Peterson and Berger, 1971). Hippel (1977) pointed out that corporate intrapreneurship is intrapreneurial activities conducted by a team within an existing company, aimed at exploring innovative businesses for the company. The earliest scholars to discuss intrapreneurship were Pinchot (1985) and Drucker (1986). According to Pinchot (1985), intrapreneurship involves utilizing new opportunities and creating economic value within a company. Meanwhile, Drucker (1986) believed

that intrapreneurship is closely related to the growth and creation of new possibilities for a company.

Starting in the 1980s, academia and the corporate sector began to systematically study the role and mechanisms of intrapreneurship. Research during this period gradually clarified that innovation is the key to maintaining enterprise's vitality in rapidly changing markets environment, and that relying solely on external entrepreneurship for innovation is not sufficient. Scholars began to explore how to stimulate new product development, new market expansion, and the reshaping of business processes through the cultivation of corporate intrapreneurship spirit within companies. At this stage, intrapreneurship was closely related to other concepts such as corporate innovation, strategic renewal, and organizational innovation. Based on existing literature, academic research at the time had a wide variety of definitions for intrapreneurship. Mill (1983) viewed intrapreneurship as a multidimensional concept covering market and technological innovation, risk-taking, and proactive behavior, and analyzed in detail how differences in organizational nature and form affected the extent of intrapreneurship. Burgelman (1983) further deepened this definition, defining intrapreneurship as the establishment of new business activities using internal resources within an enterprise to drive diversification. Vesper's (1984) definition focused more on the behavior of intrapreneurship, defining it as innovative activities carried out by employees under spontaneous action or leadership support, emphasizing the importance of employee initiative and leadership support in the innovation process. Relatively speaking, Pinchot's definition of intrapreneurship was the most representative and influential at the time. Pinchot (1985) believed that intrapreneurial behavior similar to that of a free market could also occur within companies. He proposed that intrapreneurship was innovation activities that took place within large companies with the purpose of creating internal test markets, improving management, and technology.

In the 1990s, businesses gradually realized that intrapreneurship was not just a tool to drive innovation, but the core means to achieve strategic renewal and long-term growth. Intrapreneurship during this period evolved from experimental small-scale innovation activities to becoming part of the overall strategy of businesses. Companies began to view intrapreneurship as a key approach to gaining sustained competitive advantage, entering new markets, and adapting to environmental changes. Companies began to encourage employees to actively participate in innovative

projects by providing resources, establishing innovation incentives, and fostering a culture of tolerance for mistakes. Google became a typical case of intrapreneurship during this period. By the late 1990s, Google introduced the famous “20% time policy,” encouraging employees to spend 20% of their time each week developing personal projects that interested them and could also promote Google’s development. This led to important product innovations such as Gmail and Google Maps. In line with corporate practice, the theory of intrapreneurship during this period was further deepened. Kuratko et al. (1990) defined intrapreneurship as employees developing business opportunities through self-motivated strategic actions. Relative research elaborated that intrapreneurship involves implementing bottom-up innovations and adaptive changes within an organization, even if initially not fully supported by management (Block and MacMillan, 1993; Carrier, 1996). Guth and Ginsberg (1990) pointed out that intrapreneurial activities could lead to significant changes in business, strategy, or structure, often involving the initiation of new business and organizational transformation through strategic renewal. Similarly, Zahra (1991, 1993) described intrapreneurship as an organizational renewal process aimed at enhancing a company’s competitive position and performance through product, process, or market innovation. Covin and Miles (1999) provided a broader definition of intrapreneurship as a collection of activities such as strategic renewal, continuous reengineering, domain redefinition, and organizational rejuvenation. Sharma and Chrisman (1999) further analyzed intrapreneurship from a more detailed perspective, suggesting that it encompasses not only the establishment of new business entities within an organization, but also various dimensions of strategic renewal and innovation, reflecting the complex dynamic process within an organization.

After entering the 21st century, corporate incubators and accelerators have become new forms of intrapreneurship. Some large companies have started to establish internal incubators or accelerator programs to help employees or small teams incubate, test, and accelerate their innovative ideas, further promoting the systematic development of intrapreneurship. In recent years, with the rapid development of technology and the deepening of globalization, digital transformation, open innovation, and corporate’s social responsibility have become new research directions for intrapreneurship. In the digital and intelligent environment, companies use intrapreneurship to address market uncertainties, fulfill social responsibilities, and become a new research hot spot. During this period, research on intrapreneurship is in

a growth stage, and scholars have given a more comprehensive and systematic definition to intrapreneurship. Xue Hongzhi and Zhang Yuli (2003) believe that intrapreneurship involves the reintegration of internal organizational resources, product development, organizational structure transformation, and the creation of new business units. This strategy not only motivates employees to engage in intrapreneurial activities by changing company culture and organizational structure but also constructs an internal market, uses market mechanisms to allocate resources and manage personnel systems, and adapts to a constantly changing environment. Studies by Zahra et al. (2009) and Yiu and Lau (2008) emphasize that intrapreneurship activities include process innovation, market development, and product innovation, aiming to enhance corporate competitive advantage and sustainable development through organizational innovation, strategic renewal, and risk-taking. Teng (2007) defines intrapreneurship as activities that identify and utilize intrapreneurial opportunities that can enhance corporate performance. Corbett et al. (2013) divide intrapreneurship into two forms, namely venture capital and strategic intrapreneurship, the former involving the development of internal and external new businesses, and the latter including organizational innovation and strategic renewal activities aimed at creating competitive advantage. Neessen et al. (2019) view intrapreneurship as the process of identifying and utilizing intrapreneurial opportunities by intrapreneurial employees within the company, helping the company achieve organizational strategy renewal and enhance competitiveness through the incubation and growth of new businesses.

According to the research of Gawke et al. (2019), three types of definitions of intrapreneurship in companies can be identified. The first type focuses on the orientation of intrapreneurship. Employees show initiative, develop innovation, and take certain risks for the company (Augusto Felício et al., 2012). The second type focuses on the results of intrapreneurship in the company, analyzing employee participation in intrapreneurship and their contribution to it (Hornsby et al., 2009). The third type focuses on employee behavior, which promotes intrapreneurship at the enterprise level, including employee intrapreneurial and strategic renewal behavior aimed at enhancing the company's ability to respond to external and internal changes (Gawke et al., 2017). These definitions collectively depict a multi-level, multi-dimensional framework of intrapreneurship, emphasizing that organizational innovation and strategic renewal are key to enhancing corporate competitiveness and

adapting to market changes.

In conclusion, although numerous studies have examined intrapreneurship, the perspectives on corporate intrapreneurship vary widely, resulting in conceptual ambiguity. A universally accepted definition of the concept remains contested (Parker, 2011; Menzel et al., 2007). For example, at the organizational level, corporate intrapreneurship reflects entrepreneurial spirit or activities within existing organizations. This encompasses a series of processes undertaken inside established firms, which not only lead to the creation of new ventures but also include the development of new products, services, technologies, managerial techniques, strategies, and competitive postures, among other innovative activities (Antoncic and Hisrich, 2001). At the individual level, corporate intrapreneurship is regarded as the innovative activity of employees within existing organizations who possess entrepreneurial traits (Pinchot, 1985). Scholars have also emphasized the distinction between entrepreneurs and intrapreneurs. Intrapreneurs are agents who leverage organizational resources to realize new ideas within their employing firms (Pinchot and Pellman, 1999; Baruah and Ward, 2015; Camelo-Ordaz et al., 2012; Farrukh et al., 2017), whereas entrepreneurs cultivate and implement ideas by creating new firms (Gartner et al., 1988). Blanka (2019) further developed a framework for intrapreneurship, highlighting its multi-level characteristics: intrapreneurship is a process through which employees identify and exploit opportunities by demonstrating innovativeness, proactiveness, and risk-taking, enabling organizations to create new products, processes, and services, initiate self-renewal, or launch new ventures to enhance competitiveness and performance. Drawing upon these scholarly contributions, this study defines corporate intrapreneurship as intrapreneurial activities, supported by organizational support and resource allocation and carried out by employees within the company, drive business innovation and value creation, thereby achieving strategic renewal and long-term growth

2.2.2 Research on Corporate Intrapreneurship

Currently, research on corporate intrapreneurship mainly focuses on three areas. First, studies examine the influence of individual-level factors on corporate intrapreneurship. Research indicates that employees' gender, proactive personality, experience and skills, cognitive abilities, and interpersonal networks affect their

ability to make sound decisions when opportunities arise, thereby increasing their likelihood of becoming intrapreneurs. Second, organizational-level factors have been explored. Elements such as enterprise scale optimization, investment in digital infrastructure, and the presence of transformational leadership help foster a corporate culture that encourages intrapreneurship. Third, environmental-level factors have been considered. External market competition, access to funding, regulatory systems, industry dynamics, and technological development directly influence the emergence and growth of intrapreneurial projects.

2.2.2.1 The Impact of Individual Level on Intrapreneurship

Research on the individual characteristics of intrapreneurs primarily addresses demographic variables, personality traits, human capital, social capital, and organizational belonging.

First, regarding demographic variables, scholarly findings are not consistent. Some studies suggest that education and age are negatively correlated with the innovative performance of intrapreneurs (Camelo-Ordaz et al., 2012). By contrast, other studies indicate that higher levels of education increase the likelihood of engaging in corporate intrapreneurship (Urbano and Turro, 2013).

Second, regarding personality traits, researchers have attempted to identify specific traits of corporate intrapreneurs (Williamson et al., 2013). Sinha and Srivastava (2013) explored the impact of personality traits and work values on corporate intrapreneurship. The study found that extraversion, as well as work values such as altruism, creativity, management, and achievement, have a positive impact on corporate intrapreneurship, while neuroticism is negatively correlated with it. Research based on entrepreneurial value system indicates that values such as persistence, ambition, creativity, willingness to take risks, and optimism have a positive impact on corporate intrapreneurship (Camelo-Ordaz et al., 2012). Proactive personality is considered to have a significant impact on corporate intrapreneurship, as employees with a proactive personality are more likely to become intrapreneurs and actively engage in corporate intrapreneurship projects (Rigtering and Weitzel, 2013). Zhu et al. (2014) conducted an in-depth exploration of individual personality traits. In the context of innovative contests within organizations, the study examined the influence of employees' creativity and proactivity on their performance in the contest. The study measured the number of ideas proposed by employees, the number of ideas accepted, and the number of comments on others' ideas. The results showed

that higher creativity was positively correlated with proposing more ideas, while higher proactivity was positively correlated with the number of ideas accepted. Based on these findings, the authors developed a framework covering four different innovation roles: followers (low creativity and proactivity), proactive founders (low creativity, high proactivity), innovative creators (high creativity, low proactivity), and intrapreneurs (high creativity and proactivity). Additionally, the characteristics of intrapreneurs were described as a combination of thinkers, doers, planners, and workers who effectively combine vision with action.

Third, regarding human capital, researchers distinguish between general and specific human capital. General human capital refers to skills, knowledge, and experience that are helpful in various contexts for completing tasks, while specific human capital refers specifically to skills and experience related to corporate intrapreneurship. Parker's (2011) study suggests that general human capital has a significant impact on entrepreneurship and corporate intrapreneurship. Other studies based on human capital theory also point out the importance of general human capital in providing necessary entrepreneurial skills (Gwynne and Wolff, 2005; Martiarena, 2013) and abilities. Bjornali and Støren's (2012) study further emphasizes the relationship between knowledge transfer capability and intrapreneurs, where employees with knowledge transfer capability can combine organizational knowledge, social capital, and networking skills, while capabilities related to efficiency and productivity do not have a significant impact. Similar to entrepreneurial activities, specific human capital - in the form of opportunity identification - also plays a crucial role in corporate intrapreneurship. According to Urbano and Turro's (2013) research, the ability to identify business opportunities significantly enhances the likelihood of corporate intrapreneurship. Martiarena's (2013) study further defines opportunity identification as a key element that distinguishes intrapreneurs, entrepreneurs, and ordinary employees. The study indicates that entrepreneurs are able to identify more business opportunities compared to intrapreneurs, while intrapreneurs exceed ordinary employees in this regard. Furthermore, for engineers, the importance of opportunity identification and entrepreneurial opportunities is increasing. Solymossy and Gross's (2015) longitudinal study shows that engineers' focus has shifted from identifying engineering opportunities to identifying entrepreneurial opportunities. Guerrero and Peña-Legazkue (2013) studied specific human capital and its impact on corporate intrapreneurial activities. The research shows that employees with corporate

intrapreneurship experience are more likely to pose potential risks to the organization due to behaviors such as leaving for entrepreneurship. Additionally, compared to other forms of human capital based on educational level, corporate intrapreneurship experience has a greater impact on corporate intrapreneurship. The value of different types of knowledge has also been widely studied. Research finds that potential knowledge, the ability to turn knowledge into adaptive capabilities, is of particular value to enterprises because it enables them to adapt to changes in the environment. Potential knowledge is stored in individuals and can be seen as a form of knowledge capital. If companies do not value individuals' contributions to potential knowledge, individuals may seek to maximize their personal returns on potential knowledge, thereby choosing to become independent entrepreneurs. On the other hand, entrepreneurial self-efficacy is widely mentioned in the research, involving individuals' perception of their ability to deal with competitive challenges, which influences the behavior patterns of entrepreneurial employees. Johnson and Wu (2012) highlight the impact of external entrepreneurial support and suggest that entrepreneurial self-efficacy is a key factor driving intrapreneurship. Douglas and Fitzsimmons (2013) studied the differences between entrepreneurial intentions and corporate intrapreneurial intentions, finding that entrepreneurial self-efficacy is associated with both, but has a more significant impact on entrepreneurial intentions. The study speculates that individuals with higher entrepreneurial self-efficacy are more inclined towards self-employment, while those with lower entrepreneurial self-efficacy, although having entrepreneurial intentions, are more likely to be corporate intrapreneurs. Furthermore, Globocnik and Salomo (2015) emphasize the importance of corporate intrapreneurial self-efficacy and suggest that employees with high self-efficacy are more confident in independently developing their ideas.

Fourth, regarding social capital, it has been widely discussed. Given that entrepreneurship and entrepreneurs are embedded in the social system, an important focus of research on corporate intrapreneurship within organizations is on social capital. The networks established by intrapreneurs and their roles within these networks have become a central topic in research on corporate intrapreneurship. According to scholars, individual characteristics of intrapreneurs include their personal networks (Urbano and Turro, 2013), networking skills (Gwynne and Wolff, 2005), and relationships outside organizational boundaries (Bicknell et al., 2010). These findings are consistent with Pinchot's (1985) views on intrapreneurs and their

ability to think across organizational boundaries. Social capital is a special resource that derives from interactions among individuals and facilitates individual behavior. Trust is a basic requirement for benefiting from social capital. Within organizations, corporate intrapreneurship often involves deviating from traditional practices and challenging established norms, making trust particularly crucial in the corporate intrapreneurship (Edú Valsania et al., 2016), especially the trust of top management which is essential for driving corporate intrapreneurial behavior (Rigtering and Weitzel, 2013). Wakkee et al. (2010) also emphasize the importance of trust between employees and management, suggesting that trust relationships can enhance employee self-efficacy.

Fifth, the study also focuses on organizational belonging. Intrapreneurial activities initiated by intrapreneurs within the organization are embedded in the existing organization. Therefore, much research has focused on the organizational identification of individual intrapreneurs. Studies have shown that due to low organizational identification, entrepreneurial employees tend to leave the company and pursue their own ideas. When exploring the relationship between entrepreneurship and corporate intrapreneurship, Johnson and Wu (2012) tested the job satisfaction model and the person-environment fit model. Unlike the traditional assumption that low job satisfaction leads to turnover, their research results show that in cases of high job satisfaction, entrepreneurs are more likely to leave the company. Researchers believe that this phenomenon occurs because these entrepreneurs have accumulated rich industry experience while serving as employees, which is enough for them to leave the industry and start a new business. Therefore, despite being satisfied with their current job, these entrepreneurs choose to leave the company and pursue their entrepreneurial dreams. Furthermore, further research on organizational identification suggests that an individual's organizational tenure may have a negative impact on their innovation performance in corporate intrapreneurship. Many studies have provided new perspectives on understanding the complex relationship between job satisfaction and entrepreneurial behavior. Camelo-Ordaz et al. (2012) argue that long organizational tenure may be associated with a passive attitude in decision-making and resistance to change, reducing employees' willingness to display innovative behaviors and implement new ideas. Additionally, employees' organizational identification is also an important factor. Moriano et al. (2014) studied the impact of organizational identification on corporate intrapreneurship behavior and

found a positive correlation between organizational identification and corporate intrapreneurship behavior. Employees who highly identify with the organization view the organization's success and failure as their own, exhibit high levels of involvement, and display behaviors that go beyond their role. These highly motivated employees engage in behaviors that surpass their organizational roles, actively participating in corporate intrapreneurship activities.

Research not only focuses on grassroots employees but also on the role of middle managers in driving intrapreneurial behavior. Research indicates that the personality and behavior of middle managers and their influence on employees are critical. The personality and attitudes of managers are core factors in inspiring intrapreneurial activities (Bouchard and Basso, 2011). Further research has explored the specific behaviors of managers. Kuratko et al. (2005) emphasize the unique role of middle managers. This study focuses on analyzing the role of middle managers in intrapreneurship, demonstrating how middle managers recognize, refine, and guide intrapreneurial opportunities, as well as how they identify, acquire, and deploy the resources required to pursue these opportunities. The research emphasizes that middle managers not only endorse the company's intrapreneurial views from top executives but also transmit their value-creation potential to key actors. In addition, the study points out that intrapreneurial behavior can also yield results at the individual level, where personal positive evaluations can significantly influence the perceptions of middle managers and encourage them to engage in intrapreneurial behavior. This process highlights the crucial role of middle managers in promoting a culture and behavior of intrapreneurship. Scholars not only focus on the individual intrapreneurial behavior of middle managers but also extensively study the influence of middle managers on other employees. Moriano et al. (2014) focused on management practices and their impact on intrapreneurship, particularly how leadership style and employee organizational identification interact in corporate intrapreneurship behavior. The study found a positive correlation between transformational leadership style and corporate intrapreneurship behavior. In addition, organizational identification acted as a mediator between transformational leadership and employee corporate intrapreneurship behavior. Similarly, authentic leadership, characterized as future-oriented, proactive, and trustworthy, showed a positive correlation with employee corporate intrapreneurship behavior. Edú Valsania et al. (2016) studied the relationship between authentic leadership and employees' corporate intrapreneurship

behavior. Similar to the findings of Moriano et al. (2014), the results of the study indicated that organizational identification partially mediated the relationship between authentic leadership and employees' corporate intrapreneurship behavior. Based on these research findings, scholars point out that appropriate leadership styles can significantly influence the effects and development of intrapreneurship within the company, emphasizing the crucial role of leaders' behaviors and styles in driving intrapreneurship within the company. These studies highlight how leadership within the organization shapes the intrapreneurial ecosystem within the company, inspiring employees to engage in corporate intrapreneurship behavior and thereby promoting overall innovation and progress within the organization.

2.2.2.2 The Impact of Organizational Level on Intrapreneurship

The research of Åmo and Kolvereid (2005) indicates that individual level innovation and organizational level approaches are crucial in stimulating intrapreneurial behavior. In contrast to observations at the individual level, the influence of organizational level on intrapreneurship provides another perspective for the in-depth development of intrapreneurship theory.

The relevant research provides insights into key organizational features by focusing on the organization structure and processes that support intrapreneurship, such as the role of company owners, planning activities, and institutionalization processes (Bouchard and Basso, 2011). For example, various formal management processes that empower employees are considered crucial factors in ensuring a conducive environment for intrapreneurship (Feyzbakhsh et al., 2008; Globocnik and Salomo, 2015). Additionally, proponents of relevant organizations need to provide a conducive environment to promote close collaboration among intrapreneurs, reduce hierarchy and bureaucracy, and ensure knowledge sharing and creativity output (Menzel et al., 2007). Researchers also emphasize the importance of organizational empowerment for intrapreneurship. Empowerment aims to enhance employees' autonomy in decision-making and foster proactive behavior. Studies suggest that empowerment plays an intermediary role between authentic leadership and intrapreneurial behavior (Edú Valsania et al., 2016). Menzel et al. (2007) further highlight that using simulation and action-oriented methods when training intrapreneurs helps promote employees' intrapreneurial behavior.

In corporate intrapreneurship, managerial support and commitment are widely regarded as critical driving forces. Research has shown that organizational support

and champions play a vital role in advancing intrapreneurship (Urbano and Turro, 2013). Organizational leaders, especially top management, are key forces driving corporate intrapreneurship behavior within the company, and their role in promoting intrapreneurship should not be underestimated. Parker (2011) pointed out that potential intrapreneurs often do not express interest in intrapreneurship until suitable opportunities are presented by management. Numerous studies have shown that successful implementation of intrapreneurship activities requires strong support from management (Feyzbakhsh et al., 2008; Kirby, 2006). In particular, management's clear commitment to intrapreneurship is not only a prerequisite for initiating intrapreneurship activities but also an essential step in creating a friendly intrapreneurial environment. Apart from management support, the high availability of resources is also a key driver of higher-level corporate intrapreneurship behavior (Menzel et al., 2007; Rigtering and Weitzel, 2013). Therefore, resource access has become an important factor in promoting organizational-related intrapreneurship. Management support and resource availability not only directly influence potential intrapreneurs but also affect employees' opportunities to participate in decision-making processes, thereby influencing their intrapreneurship initiatives. Effective communication of organizational strategies to employees, enhancing their commitment and involvement, is also seen as a key factor in the success of intrapreneurship. Studies have shown that low levels of involvement within the organization (employees being major contributors to the process) and high levels of lateral involvement (employees having broad job responsibilities) are positively correlated with intrapreneurship (Åmo, 2010; Rigtering and Weitzel, 2013). In addition, rewards for intrapreneurs also have a certain degree of impact on intrapreneurship. Apart from recognizing innovative achievements of intrapreneurs (Globocnik and Salomo, 2015), reward mechanisms create a signal effect within the organization, emphasizing that corporate intrapreneurship behavior is desirable (Kirby, 2006; Menzel et al., 2007).

At a more macro level, organizational culture is considered a foundation for successful intrapreneurship. Researchers have shown that fostering an intrapreneurial mindset can help the organization promote the development of an corporate intrapreneurship culture, and further drive organizational change (Hagedorn and Jamieson, 2014). Given that intrapreneurs are characterized by their diverse ways of thinking and their ability to collaborate across organizational boundaries and generate

creativity, the cultural environment they require should be characterized by trial and error, innovative thinking, and the provision of opportunities for experimentation and continuous improvement (Hagedorn and Jamieson, 2014; Kirby, 2006; Menzel et al., 2007).

Different types of organizations have different impacts on corporate intrapreneurship. Bouchard and Basso (2011) conducted an in-depth study on organizational factors at the level of small and medium-sized enterprises, exploring the relationship between organizational intrapreneurial orientation and individual corporate intrapreneurship. The study focused on how the personality traits of managers and organizational characteristics influence intrapreneurial orientation and attitudes towards corporate intrapreneurship. By distinguishing between two types of small and medium-sized enterprises: one type centered around company owners, with limited activities and informal organizational structures of traditional small and medium-sized enterprises; and the other type similar to “miniature large companies,” in which the centrality of company owners is lower, with systematic planning and formal structures, the research revealed that the relationship between corporate intrapreneurship and intrapreneurial orientation is not a simple one-to-one relationship. Different types of companies may exhibit varying degrees of entrepreneurial orientation and corporate intrapreneurship activities. Therefore, the researchers proposed that in traditional small and medium-sized enterprises, high entrepreneurial orientation may be associated with lower or no corporate intrapreneurship activities, while in miniature large companies, high entrepreneurial orientation may be associated with extensive corporate intrapreneurship activities. Camelo-Ordaz et al. (2012) conducted an in-depth study on microenterprises in the creative industry, exploring how individual characteristics and the values of corporate intrapreneurs, such as how innovative intrapreneurs impact innovation performance. In the specific environment of the creative industry, the research particularly pointed out that a necessary business background with management skills has a negative impact on the innovation performance of corporate intrapreneurs in microenterprises, while a creative background significantly promotes the innovation performance of corporate intrapreneurs. Furthermore, Parker (2011) found that consumer-oriented business opportunities are usually related to individual entrepreneurial activities, while enterprise-oriented business opportunities are more likely to stimulate corporate intrapreneurship. This difference may stem from the ability of enterprises in the latter

context to better utilize specific industry knowledge, broader resources, and higher organizational legitimacy. This result emphasizes the importance of sector specificity in understanding corporate intrapreneurship activities in the business field.

2.2.2.3 The Impact of Environmental Level on Intrapreneurship

In research on corporate intrapreneurship, in addition to examining the influence of individual-and organizational-level factors, the impact of environmental-level factors has likewise attracted widespread scholarly attention. Zahra (1993), Badguerahanian and Abetti (1995), as well as Antoncic and Hisrich (2004) have pointed out that environmental characteristics such as dynamism, technological opportunities, industry growth, and new product demand affect intrapreneurship. Furthermore, researchers have also studied the impact of technological and academic backgrounds on intrapreneurship, aiming to provide a broader analytical perspective.

Considering the close connection between intrapreneurship and innovation within the company, intrapreneurship with different technical backgrounds has become the focus of researchers. This type of research particularly focuses on the new roles of engineers in organizations. With changes in the work environment, engineers not only take on managerial responsibilities, but also play a crucial role throughout the innovation process, leading to significant changes in their responsibilities. Menzel et al. (2007) conducted a study on intrapreneurs in the technology field, outlining the active roles engineers play in intrapreneurship activities within companies. The study emphasizes that improving the physical environment, reducing hierarchy and bureaucracy, effective reward mechanisms, and providing guidance and resources for intrapreneurs are key factors in promoting engineers' engagement in intrapreneurship. On the other hand, Williamson et al. (2013) focus on the personality traits of engineers, delving into these traits in detail in their study. The research identifies and reveals differences between engineers and non-engineers in certain key aspects, which have important reference value for selecting engineers suitable for new roles within the company. Furthermore, Solymossy and Gross (2015) reveal how engineers' responsibilities shift from identifying engineering opportunities to identifying entrepreneurial opportunities through a longitudinal study of graduate engineers. Based on this, skill development has gradually become a new focus of research. For example, Gwynne and Wolff (2005) introduce a project specifically designed for female scientists, aiming to cultivate key skills for intrapreneurship through networking, workshops, advice, and mentoring. These studies collectively emphasize

the new roles of engineers in the technology field and their significant contributions to company innovation and intrapreneurship activities.

In the academic domain, corporate intrapreneurship likewise demonstrates both uniqueness and significance. Kirby (2006) advocates the creation of entrepreneurial universities to promote students and employees commercializing their intellectual property and creative ideas. He combines individual attitudes, social support, and corporate intrapreneurship theory, emphasizing the importance of management support, campus-wide entrepreneurial models, corporate intrapreneurial culture, and reward systems for corporate intrapreneurs. Bicknell et al. (2010) studied academic corporate intrapreneurship, focusing on scholars engaged in knowledge transfer activities. The motivation of these scholars is to apply their academic knowledge to areas beyond teaching and research. The research defines scholars' knowledge transfer as academic corporate intrapreneurship and explores the facilitating factors that drive their knowledge transfer activities, such as active engagement in external networks and moderate risk-taking in corporate intrapreneurship activities at universities. Hagedorn and Jamieson's (2014) study starts from the academic perspective of corporate intrapreneurship, emphasizing the necessity of cultivating an entrepreneurial mindset. Different from Kirby (2006)'s research, this study focuses more on implementing organizational change within academic institutions. They believe that, given challenges like budget cuts and intensified competition, academia needs to redefine its strategic positioning with an intrapreneurial mindset, develop collective mental models, and encourage academic corporate intrapreneurship and innovation. These studies describe the complex phenomenon of academic corporate intrapreneurship and demonstrate its potential in promoting knowledge transfer and innovation.

2.3 Chapter Conclusion

Digital technologies and digital application scenarios have endowed leadership with new characteristics, giving rise to digital leadership. Drawing on both domestic and international literature, and building on the four key features of digital leadership identified earlier (digital resource utilization, leaders' digital literacy and empathy, and followers' work performance), as well as considering the critical importance of business strategy and digital empowerment in driving enterprise digital transformation,

this study defines digital leadership as follows: under the guidance of digital strategic thinking, digital leadership refers to the capability and influencing process through which leaders leverage digital technologies to enhance information integration, continuously address managerial challenges, elevate professional value, and promote positive changes in individuals, teams, and organizations in terms of motivation, emotion, cognition, behavior, and performance.

Enterprise digital transformation provides both opportunities and conditions for intrapreneurship within large organizations. Amid the wave of digital innovation, intrapreneurship enables firms to leverage internal resources for strategic renewal and business expansion, helping them identify new business opportunities. It has become an important approach for large enterprises to achieve iterative innovation, accumulate disruptive value, and gain competitive advantage. From the perspective of sustainable development, organizational leaders must actively utilize digital tools to enhance both individual and organizational capabilities, improve decision-making efficiency and accuracy, and ultimately ensure the success of intrapreneurial initiatives. Accordingly, this study defines intrapreneurship as: with organizational support and resource allocation, employees engage in internal activities that drive business innovation and value creation, thereby enabling strategic renewal and long-term growth.

Leadership in academic research is inherently a multi-level construct, with significant differences across hierarchical levels. For example, Nichols and Cottrell (2014) find that leaders at higher levels require more traits such as decisiveness, confidence, and courage, whereas lower-level leaders rely more on agreeableness, cooperation, and supportiveness. Existing studies on digital leadership have predominantly focused on middle and senior managers, while research on frontline managers remains relatively limited. However, in practice, digital transformation and intrapreneurship in large enterprises increasingly depend on the critical role of frontline managers. As organizations move toward flatter structures, which are characterized by fewer hierarchical levels and broader spans of control, frontline managers become deeply involved in transformation processes, and their capability structures evolve more significantly than those of other organizational members. This positions them as key drivers of intrapreneurship, occupying an intermediate role between top management and frontline employees (Bier et al., 2024). Frontline managers are typically defined as those responsible for implementing corporate

strategies, achieving departmental goals, and managing departmental operations (Deng, 2017). They sit at the intersection of vertical and horizontal information flows, acting as a bridge between strategic vision at the top and operational execution at the grassroots level. In the context of digital transformation, frontline managers gain increasing access to resources and greater organizational authority. Beyond their traditional responsibilities for budgeting and resource allocation, they are entrusted with more strategic roles. In this study, frontline managers are defined as those who lead and drive internal entrepreneurial projects within enterprises.

Leadership is fundamentally an interaction among leaders, followers, and situational contexts, and its composition is closely tied to the specific context (Deng, 2016). Digital leadership emerges and evolves within business contexts mediated by digital technologies. Therefore, from the internal logic of digital leadership development, this study focuses on the practical context of intrapreneurship within large traditional enterprises, examining frontline managers as intrapreneurs. It aims to explore the structural dimensions and formation mechanisms of digital leadership in such settings.

Existing literature has not yet systematically examined the formation mechanisms of digital leadership based on clearly defined structural dimensions within the specific context of Chinese enterprises. In particular, there is still a lack of qualitative case-based research on the structural dimensions and formation mechanisms of digital leadership. Moreover, the development of a valid scale for assessing frontline managers' digital leadership has yet to be scientifically and systematically pursued from a quantitative research perspective.

Therefore, to address these gaps, this study focuses on two key questions: what digital leadership of frontline managers is, and how it functions in the process of intrapreneurship. By combining qualitative and quantitative methods, the study aims to explore the structural dimensions of digital leadership, validate the reliability and validity of a digital leadership scale, and examine the mechanisms through which digital leadership operates in corporate intrapreneurship.

3 Methodology

3.1 Research Paradigm

In the context of rapid advancements in digital technologies, enterprise digital transformation has moved beyond strategic planning into the critical stage of execution and implementation. As the key link between corporate strategy and frontline execution, frontline managers play a pivotal role, and the composition, measurement, and mechanisms of their leadership directly affect the outcomes of digital transformation. However, differences in industry characteristics, customer demands, and competitive environments make frontline leadership highly complex and diverse. Traditional positivist and critical research paradigms often struggle to capture the deeper meanings and contextual logic behind such complexity. In contrast, interpretivism emphasizes subjective understanding and meaning construction, offering a unique perspective for exploring frontline managers' leadership.

Interpretivism originated from 19th-century German hermeneutics and was further developed by philosophers such as Dilthey and Heidegger, eventually becoming an important paradigm in social science research. Its core assumption is that social phenomena are not objective realities independent of human consciousness, but are constructed through human interaction, language, and symbols. Therefore, the goal of research is not to uncover universally applicable objective laws, but to understand the meanings that actors assign to their actions.

From an interpretivist perspective, the relationship between the researcher and the research subject is interactive. Researchers need to immerse themselves in the life world of participants and use empathy, understanding, and interpretation to uncover the meanings of social phenomena. In the context of business and management research, interpretivism emphasizes the subjective understanding of organizational phenomena, focusing on the values, beliefs, and meanings underlying the behaviors of organizational members. Applied to the study of frontline managers' leadership, interpretivism views leadership not as a fixed trait or behavioral pattern, but as a system of meanings constructed through interactions between frontline managers and their subordinates, colleagues, and customers within specific contexts. Compared with positivist and critical approaches, this study adopts an interpretivist research philosophy primarily based on the following three aspects of alignment:

From the perspective of methodological fit, intrapreneurship within enterprise

digital transformation is still in a stage of rapid evolution, with no clear consensus yet on its models, pathways, or outcomes. The positivist paradigm, which relies on quantitative measurement and hypothesis testing, typically requires well-established theoretical frameworks and stable variable relationships, making it difficult to capture the dynamic and complex nature of intrapreneurial processes. In contrast, qualitative methods advocated by interpretivism such as in-depth interviews, participant observation, and case studies, enable researchers to enter the real work contexts of frontline managers and uncover the decision-making logic and meaning construction behind their practices in resource integration, team motivation, and technology application. Through interaction with frontline managers, team members, and other stakeholders, researchers can better understand differing perceptions of intrapreneurship, thereby presenting a more comprehensive picture of leadership in its diverse forms.

From the perspective of the research object, leadership of frontline managers in intrapreneurship is highly context-embedded. In manufacturing firms, leadership may be reflected in how managers use digital technologies to optimize production processes and improve product quality; whereas in platform-based ecosystem firms, it is more likely to manifest in rapid responses to market changes and the promotion of business model innovation. Such differences cannot be adequately captured through standardized quantitative indicators and must instead be understood within specific organizational contexts. Interpretivism emphasizes examining phenomena from the perspective of the subjects themselves and, through rich descriptions of their daily practices, revealing the key components and mechanisms of leadership in specific contexts. For example, by tracing frontline managers' decision-making processes in intrapreneurial projects, researchers can uncover how they balance short-term performance goals with long-term innovation investments and how they manage interdepartmental conflicts. These critical insights are often overlooked in quantitative research.

From the perspective of research feasibility, the interpretivist paradigm allows researchers to fully leverage their industry experience and resource advantages. In the context of intrapreneurship practices within large Chinese enterprises, researchers of this dissertation can draw on long-term industry engagement, professional knowledge, and established networks to gain access to firsthand case data more efficiently and build trust with frontline managers. This facilitates close and sustained fieldwork.

Such context-based, holistic inquiry not only provides rich empirical material for theory building but also offers more targeted guidance for enterprise intrapreneurship practices. Through comparative analysis of multiple typical cases, researchers can identify common patterns in frontline managers' leadership, offering valuable insights for cultivating the hybrid managerial talent required for digital transformation.

In summary, the interpretivist research paradigm, with its emphasis on context, meaning construction, and subjective understanding, provides a distinctive perspective and methodological approach for studying intrapreneurship in the context of enterprise digital transformation. It not only compensates for the limitations of positivist and critical paradigms in addressing complex and dynamic phenomena, but also enables a deeper understanding of the essence of frontline managers' leadership, thereby offering theoretical support for the successful practice of corporate intrapreneurship.

3.2 Overall Research Framework

Based on a review of relevant theories and research, this study mainly explores the structural dimensions and mechanisms of digital leadership. Specifically, the research approach will focus on the research questions, select appropriate research contexts and scientific research methods, and determine the principles for selecting case enterprises and interview subjects. Based on this, data collection and analysis will be conducted on the target enterprises, and relevant research conclusions will be drawn. This dissertation intends to conduct two sub-studies. Study One aims to analyze the composition of digital leadership through Grounded Theory, develop a digital leadership scale and validate it. Study Two combined with the dimensions of digital leadership developed on the Study One, analyses how digital leadership come into play, aims to point out the mechanism of digital leadership.

3.3 Research Design and Methods

3.3.1 Study One: Structural Dimensions and Scale Development of Frontline Managers' Digital Leadership

This study adopts an exploratory case study method to identify the structural dimensions of frontline managers' digital leadership, develop a digital leadership scale, and empirically test the reliability and validity of the scale.

(1) Research Methods

Study One employs case study approach for three main reasons. First, the primary aim of this study is to explore the question: “What constitutes frontline managers’ digital leadership in the process of intrapreneurship?” Case study as a research method that can uncover underlying patterns from complex phenomena and build new theories inherently follows an inductive logic, particularly suitable for exploring research questions such as “how” and “what” (Yin, 2013), thus providing a theoretical foundation for subsequent research by delving into the internal mechanisms and characteristics of the research object. Second, through preliminary literature review, it was found that the issues focused on in this study are still in the early stages of research, with plenty of research space for further exploration. Although many scholars have started to pay attention to digital leadership, specific questions about its structural dimensions have not been clearly answered, let alone the subsequent scale development. The case study method, due to its advantages in explaining research phenomena and exploring research depth, is suitable for research areas with weak theoretical foundations (Mao, 2020). Third, the purpose of the study is to clarify the specific dimensions of digital leadership in the complex problem-solving process, which requires rich case materials as support. Case studies can provide detailed and multidimensional data, helping to delve into the research problem. Therefore, this study adopts case study method, combined with the coding logic of text analysis, to systematically code the collected enterprise data, thereby enhancing the rigor and reliability of the research (Mao, 2020).

(2) Research Approach

This study employs case study method. In selecting specific case enterprises, three main considerations were taken into account. Firstly, the intrapreneurship initiatives promoted by the enterprise should be of sufficient typicality. In other words, compared with other firms in the same industry, the case enterprise should have advanced further in digital transformation, established a more solid foundation for intrapreneurship, and demonstrated practices that are highly instructive for peer organizations in the industry. Secondly, the corporate intrapreneurship should have certain stages and personnel coverage. Through in-depth analysis of the ideological activities, decision-making processes, and actions of personnel at all levels in corporate intrapreneurship, it is beneficial for researchers to intuitively perceive the changes in the thinking and behavior patterns of leaders, laying the foundation for

extracting the structure of digital leadership for this study. Finally, the data of the case objects should be accessible to obtain rich first-hand data.

In defining the study subjects, frontline managers responsible for corporate intrapreneurship are selected. This is because frontline managers are the leaders of corporate intrapreneurship. In the process of intrapreneurship, frontline managers, through deep involvement in the transformation practices of the enterprise, experience more significant changes in their skill structure compared to other personnel in the enterprise (senior leaders and ordinary employees). Analyzing how frontline managers identify new development opportunities in the digital environment and lead the enterprise to successfully achieve digital innovation helps to extract the leadership structural dimensions demonstrated by leaders in intrapreneurship.

(3) Scale Development

Under the guidance of the above research principles, the study first selects target enterprises that are highly relevant to the research topic as the research objects. Subsequently, based on literature review, guidance from the research team, and suggestions from external experts, a detailed semi-structured interview outline is drafted, and site visits are conducted to carry out thematic research and information collection on the target enterprises. “Site visit” refers to the on-site observation and experiential activities conducted by the researcher, with the permission of the case enterprise, focusing on the enterprise’s office environment, the daily operational space of the corporate intrapreneurship project team, and the actual application scenarios of digital management tools. During the visit, the researcher refrains from intrusive recording but composes detailed observation notes after leaving the site, covering the date of the visit, the route taken, accompanying personnel, observed physical environment, usage contexts of digital tools, and employee behaviors, among others. It should be noted that the observation notes from site visits are neither independently coded nor used as direct analytical material for constructing theoretical models. Their primary functions are to help the researcher gain a deeper understanding of the specific contexts described by respondents during interviews, such as the “digital work environment” and “cross-departmental coordination scenarios”, thereby enhancing the sensitivity of data analysis; and to serve as a basis for triangulation, that is, cross-validating the findings from the observation notes with the information obtained from the interviews.

After completing the initial investigation, the collected enterprise data is

systematically sorted and analyzed, detailing the typical management and business activities of the case enterprises in corporate intrapreneurship, as well as the perceptions, thoughts, and behavioral performances of the leaders in these activities. Based on this, the Grounded Theory research method is applied to code and analyze the data, delve into the leaders' thinking and behavior, construct the structural dimensions of digital leadership, and interpret its essence. To further validate the saturation of the theory, the study continues to collect secondary data of the target enterprises and conduct supplementary interviews with other relevant personnel of the enterprises to enrich the materials for testing the saturation of the theory.

Based on the scale development, this study collected data through a questionnaire survey to provide empirical support for subsequent reliability and validity analyses, thereby ensuring the scientific rigor and reliability of the research findings. Specifically, the survey participants were employees working in the case enterprises. Prior to completing the questionnaire, all participants were informed that the data would be used solely for academic research and were made aware of the relevant anonymity protection measures. During the questionnaire process, the researcher promptly addressed any questions raised by the participants. After the questionnaires were completed, the researcher examined each response individually to confirm that no items were missing and that pairing could be successfully performed, after which the questionnaires were sealed and stored. This study employed SPSS 25.0 and AMOS 26 for data organization and analysis.

Principal component analysis was conducted using SPSS 25.0 with varimax rotation. Items with eigenvalues greater than 1 and factor loadings exceeding 0.50 were retained, with reference also made to the scree plot and the cumulative variance explained (required to exceed 60%). Confirmatory factor analysis was performed using AMOS 26 to assess the fit of the proposed dimensional structure. For reliability testing, Cronbach's α coefficient and composite reliability were calculated, with values required to exceed 0.70. For validity testing, convergent validity was assessed using the average variance extracted, with values required to exceed 0.50.

3.3.2 Study Two: The Formation Mechanism of Frontline Managers' Digital Leadership in Intrapreneurship

Based on the dimensions of the established digital leadership structure in Study

One, Study Two further explores the mechanism of digital leadership through longitudinal case study method to explain how digital leadership plays a supportive role in corporate intrapreneurship. The specific analysis is as follows:

(1) Research Methods

The specific reasons for choosing case study method in this study are as follows: First, the study aims to explore the mechanism of digital leadership in corporate intrapreneurship, which falls into the category of “How” questions, making the case study method more suitable for analyzing such issues. Second, the formation of corporate intrapreneurship and digital leadership is a long-term dynamic process. Sorting out the process of corporate intrapreneurship based on the temporal milestones of intrapreneurship helps researchers identify the triggers at different stages of transformation, content, leader’s thoughts and actions at different stages of transformation, thereby demonstrating the dynamic nature of the underlying mechanisms. In addition, the formation of digital leadership is not achieved overnight, but is a gradual process of development. Longitudinal case studies can assist researchers in exploring the changes in leaders’ thinking and behavioral capabilities at different periods of digital transformation in the enterprise, thereby helping researchers to comprehensively and deeply explore the research problem.

(2) Research Approach

The selection of research subjects was based on three main considerations. First, contextual completeness: the research context focuses on the entire process of corporate intrapreneurship, and the selected cases are those that have already undertaken intrapreneurial initiatives and achieved tangible outcomes. Second, long-term orientation: the formation of digital leadership requires sustained commitment by leaders; thus, the intrapreneurial activities of the case enterprises should have been continuously advanced under the persistent efforts of their leaders. This allows for an in-depth exploration of changes in leaders’ thinking and behavior over different stages. Third, breadth and depth: to effectively open the “black box” of the formation mechanisms of digital leadership, the intrapreneurial initiatives of the case enterprises should demonstrate sufficient breadth and depth. In other words, these projects should be diverse, covering multiple industries and adopting different business models. Finally, access to sufficient data on the selected cases should be feasible.

Under the guidance of the above principles, interviews and surveys were conducted with frontline managers of the target company to understand its corporate

intrapreneurship and the efforts made by frontline managers in driving the company's transformation process. Subsequently, a description of the corporate intrapreneurship of the company was made based on the collected information, and specific behaviors and roles of frontline managers in the case company were characterized, identifying key behavioral elements and capabilities of frontline managers. Finally, a case analysis was conducted to summarize the mechanism of digital leadership of frontline managers in corporate intrapreneurship.

3.4 Case Selection

3.4.1 Basic Information of the Case Enterprise

This study follows the principle of theoretical sampling in case research (Yin, 2013), using the typicality, content relevance, and data accessibility of candidate firms as criteria for case selection. Guided by these principles, a large, supply-chain-leading enterprise undergoing digital transformation was chosen as the focal case study. To ensure confidentiality, the company's name is anonymized as WM, representing the parent group, while its intrapreneurial business units are denoted as WM1-18.

WM Group is a large-scale listed holding company with over 500 member entities and business operations spanning more than 90 countries and regions worldwide. Since 2011, it has been listed among "the Fortune Global 500" for 15 consecutive years. In recent years, its supply chain business has generated annual revenues exceeding RMB 400 billion, covering key sectors such as steel, coal, chemicals, and automotive services, with the ambition of becoming a leading enterprise in China's supply chain service industry.

During "the 13th Five-Year Plan" period, WM Group was recognized as one of China's first national demonstration enterprises for supply chain innovation and application. Its integrated service models—such as the "Hong Kong–Zhuhai–Macao Bridge supply and distribution project" and the "Haining warp knitting project"—were highly commended by the Ministry of Commerce, solidifying its position as "the industry leader in integrated supply chain services". Despite this leadership, however, WM faces intense competition from fast-rising peers such as Xiamen ITG, CandD Inc., Xiamen Xiangyu, and Zheshang Development, which are catching up quickly and, in some sub-sectors, are poised to overtake. To adapt to a rapidly changing environment, WM's integrated supply chain service model must continuously

maintain innovation vitality. The main challenges can be summarized as follows:

First, impact and challenges of digitalization. On the one hand, upstream and downstream giants in the supply chain are digitalizing their own operations and extending into distribution, thereby squeezing the survival space of traditional integrated supply chain service providers. On the other hand, the widespread application of new technologies compels traditional providers to accelerate digital and intelligent upgrades, while also enabling the rise of new business forms such as industrial internet platforms. In the bulk commodities sector, no mature, replicable models exist, leaving WM to explore its own path. In addition, a shortage of digital professionals has created bottlenecks in technology application, highlighting the urgent need to build comprehensive digital capabilities across teams to support and guide business development.

Second, insufficient internal coordination. Efficient collaboration mechanisms between WM's headquarters and subsidiaries, as well as among different business units, remain underdeveloped. Overlaps in business scope, markets, and customers have even resulted in intra-group competition. Furthermore, symptoms of "big enterprise disease" are evident, with excessive management layers (up to five levels at one point) leading to lengthy information transmission chains and cumbersome cross-department collaboration agreements-manifesting as "departmental silos."

Third, weaknesses in technological and applied innovation. Although WM has elevated innovation to a strategic priority in recent years, its contribution to high-quality development remains limited. Innovation has been concentrated mainly in business models, profit models, and management models. However, as trends such as "integration of trade and industry," "integration of trade and finance," and "integration of domestic and foreign trade" become increasingly prominent, shortfalls in industrial technology innovation and applied innovation have emerged, constraining the growth of its core supply chain services. Greater investment in RandD is required to ensure deeper integration of model and technological innovation, providing lasting momentum for sustainable development.

Building on the lessons learned from its 13th Five-Year Plan digitalization efforts, WM used the 14th Five-Year Plan as a strategic opportunity to fully accelerate its digital transformation. The aim is to achieve comprehensive business model upgrading and industrial restructuring through digitalization. WM's 14th Five-Year Plan explicitly requires the rapid establishment of a digital enterprise architecture,



Figure 3.2 Term Frequency Analysis of WM Group’s “14th Five-Year Plan”

A comparison of WM Group’s 13th Five-Year Plan and 14th Five-Year Plan texts highlights several major changes:

First, in terms of strategic direction, the development goal of “supply chain integrated services” proposed in the 13th Five-Year Plan was upgraded in the 14th Five-Year Plan to “intelligent supply chain integrated services.” The latter was explicitly defined as “an upgraded form of supply chain integrated services enabled by digitalization, characterized by platformization, intelligentization, integration, financialization, and internationalization.”

Second, in the exploration of digital business models, relevant references increased dramatically from four instances in the 13th Five-Year Plan to seventeen in the 14th Five-Year Plan. During the 13th Five-Year Plan period, the focus was on internal enablement through digital tools: “leveraging artificial intelligence technologies to replace routine and repetitive tasks in procurement, sales, finance, and capital management with ‘robots’ thereby automating parts of business processes and advancing digitalization in operations and functional management.” By contrast, the 14th Five-Year Plan emphasized the application of data value: “actively exploring external data acquisition or partnerships to continuously broaden data sources, followed by data classification, analysis, and value extraction.” It also highlighted “expanding data services such as business intelligence analysis and value chain analysis based on deep industry insights to create new profit growth points and drive sustained performance growth.”

Third, in terms of digital capability requirements, word frequency analysis shows that the 14th Five-Year Plan places much stronger emphasis on digital capabilities as a

core foundational competence, while the 13th Five-Year Plan has not yet clearly put forward requirements for relevant digital capabilities. The plan stresses cultivating and developing leadership talent capable of driving business model innovation, positioning digital capabilities as a crucial pillar for organizational transformation and decision-making optimization: “Building upon the massive industrial data generated by the daily operations of numerous participating enterprises within the network, and integrating it with artificial intelligence technologies, WM will establish a unified, efficient, and secure big data aggregation, analysis, and feedback system, which will effectively facilitate resource matching across the industrial chain and optimize decision-making.”

3.4.2 The Emergence and Process of Intrapreneurship

The preceding literature review suggests that intrapreneurship is a core means of achieving strategic renewal and long-term growth. It offers a relatively secure way to explore new business opportunities while providing intrapreneurs with a degree of safety. From the perspective of WM Group’s practices, the implementation of a digital strategic transformation has not only generated opportunities for intrapreneurship but also provided the foundation for its advancement.

Digital transformation generates opportunities for intrapreneurship. Digital transformation disrupts industry applications and existing business models, promotes resource integration and ecosystem collaboration, and enhances service efficiency and quality. For example, WM Group used the Internet of Things (IoT) to connect equipment with freight network platforms, thereby accelerating equipment data collection and improving logistics visualization and safety. It adopted blockchain’s irreversibility and traceability to meet corporate requirements for tracking commercial and financial flows, thereby increasing trust and security in upstream and downstream trade. Through big data analytics, it predicted market demand and adjusted bulk commodity supply models in real time. These innovations gave rise to new business models, opening more possibilities for WM Group. For instance, some subsidiaries built regional industrial internet platforms using big data and blockchain technologies to launch supply chain finance services, meeting clients’ financing needs. Against the backdrop of digital transformation, other subsidiaries began to integrate advantageous external resources to form new industrial collaboration ecosystems—for example, an

automobile rescue platform leveraging technological advantages to expand from physical rescue services into an integrated industry ecosystem across upstream and downstream players.

Digital transformation provides the foundation for intrapreneurship. By integrating digital concepts with technological tools during the 13th Five-Year Plan, WM Group had already laid the groundwork for a smart supply chain integrated service model in certain strong business areas. Confronted with the impact of digitalization on traditional models across industries, the group initiated a company-wide top-level digital design and its implementation, accelerating the upgrade from integrated supply chain services to intelligent supply chain integrated services. By aggregating internal and external data and applying analytics to enhance customer experience, optimize operations, and innovate business models, WM established favorable conditions and technological support for promoting intrapreneurship.

Building on its early experiences in the 13th Five-Year Plan, WM Group declared 2019 as the official first year of full-scale digital transformation, marking the start of its intrapreneurship campaign. At the group's 2019 annual union conference, the chairman delivered a keynote speech on "Ten Characteristics and Trends of Enterprise Development in the Digital Era." The speech explicitly called for encouraging intrapreneurship and emphasized supporting organizational reform and performance-based incentives. A key message was that the "era of employment is over; enabling outstanding employees to take ownership and become partners is an inevitable trend." Citing Huawei, Haier, Vanke, and Xiaomi as examples, the chairman advocated a "big platform+small frontline" model that fosters a community of shared interests, shared undertakings, and shared destiny between employees and the company. Under this "partnership-based intrapreneurship" system, organizational functions must shift from "control" to "empowerment," and decision-making must move from "experience-driven leadership" to "professional and intelligent leadership." To achieve this, enterprises must rely on digital transformation to build big data analytics capabilities-transforming "data" into "insights," and converting insights into action-thus driving an intelligent and efficient decision-making loop of "perception-insight-evaluation-response."

In 2020, designated as WM Group's Year of Digital Strategy, the company emphasized intrapreneurship at the strategic level. 2021 was the Year of Digital Transformation Implementation, during which intrapreneurship processes were

embedded in business operations and management oversight. Since then, intrapreneurial initiatives under the digital transformation agenda have gained strong momentum, yielding a series of successful exemplary cases.

3.4.3 Introduction to Intrapreneurial Projects under the Context of Digital Transformation

The WM-1 project concentrates on the rescue platform business amid the increasingly fierce competition in the rescue market. The national automotive rescue market sustains an annual growth rate of approximately 10%, reflecting substantial market potential. However, the rapid expansion of rescue platform companies and their consolidation of small and medium-sized physical service providers have intensified market competition. Physical service providers face mounting operational pressures, characterized by overly narrow business scopes, declining operational efficiency year over year, insufficient operational capabilities, and elevated operating costs, thereby necessitating the development of rescue platform services. As a core element of the rescue platform ecosystem, physical service providers must establish closer ties with the platform through empowerment in products and services. Addressing the operational challenges of physical service providers-specifically their inability to enhance operational capabilities and reduce costs-the rescue platform has developed a “tow truck procurement-financing lease-insurance” model. Driven by the goals of expanding user interaction dimensions and strengthening platform competitive barriers, the rescue platform connects all stakeholders, facilitates the upgrade of the rescue tow truck supply and sales structure, offers a more diversified range of products and services, integrates multiple resources, and realizes value co-creation and sharing.

The WM-2 project is focused on the development of intelligent retail stores. The disruptive advancement of technology has significantly accelerated the automotive “New Four Modernizations” process, intensifying adjustments in the industry structure and competitive landscape, while market consumption stratification has become increasingly pronounced. Consumer demand for automobiles has evolved beyond the product itself to encompass higher-level aspects such as experiential engagement, ideological alignment, self-expression, and value communication. At the same time, the options and channels available to consumers for fulfilling their needs

have become increasingly diverse and multifaceted. The traditional 4S dealership model, which integrates sales and service, must further explore new automotive retail methods to satisfy consumer demand for innovative experiences and business models. WM-2 establish an integrated architecture comprising a unified online intelligent platform and multiple offline comprehensive intelligent carriers, enabling upgrades across operations, technology, and other domains to deliver high-quality, seamless automotive lifestyle services to customers.

The WM-3 project leverages its extensive experience in used car market operations and brand influence, integrates diverse resources, and develops an innovative used car mall model. The WM-3 enterprise leases or collaborates on premises with property owners, undertaking responsibilities for investment promotion, operations, management, and related activities. Utilizing a SAAS-based system, it connects the offline physical market and collects operational data for big data analysis, achieving four core functions: comprehensive coverage of operational scenarios, exhaustive vehicle data acquisition, full control over transaction processes, and complete platform data visualization. This approach provides the trading market with informatization tools and digital management, empowers merchants with expanded business resources, and offers consumers reliable and convenient services. The digital showroom centralizes vehicle exposure to enhance turnover rates. A market settlement center and distribution platform have been established to assist merchants in unified tax planning management, thereby expanding and strengthening existing sales and purchase operations.

The WM-4 project supports distribution services through a “large platform+small front-end” architecture to ensure efficient platform operations. In terms of large platform sharing, an integrated management back-end is shared. Through decentralization of operational management and financial restructuring, process management is streamlined and financial management is comprehensively covered. Employing a management approach of “horizontal to the edge, vertical to the bottom,” combined with the informatization transformation of personnel, finance, and materials, alongside the application of advanced circulation technologies, a single management back-end delivers comprehensive management and service support to the business front-end. Furthermore, the company has established a specialized team responsible for researching macroeconomic and industrial policies, as well as futures and spot trading strategies, providing technical support for business innovation and team

capability development. Secondly, internal resource sharing is prioritized, aiming to dismantle business silos and establish an efficient, collaborative, and mutually beneficial internal cooperation platform. This encourages departments to capitalize on their respective strengths to foster collaboration, facilitating coordinated operations across upstream resources, downstream channels, and capital allocations at the distribution business front end, thereby maximizing corporate benefits. Thirdly, brand and qualification sharing enables the distribution business front end to fully leverage the brand strengths of both the group and the company, utilizing the company's industry influence, distinguished qualifications, and performance to robustly support business cooperation negotiations. Concurrently, the company has established dedicated internal departments responsible for project bidding, business coordination, litigation management, quality control, and related functions across the organization, ensuring the platform's maintenance and development. In terms of small front-end empowerment, the company currently operates subsidiaries across East China, South China, Central China, North China, Southwest, and Northwest regions, in addition to its Zhejiang headquarters, with distribution teams deployed nationwide. Each frontline distribution team operates as a small front-end, founded on the integration of authority, responsibility, and benefits. These teams focus on cultivating high-quality customer segments, distribution territories, and product varieties. They engage directly with end customers to identify needs and, leveraging resource sharing and support from the overarching platform, promptly deliver feedback and solutions to realize efficient, professional, and personalized value creation.

The WM-5 project, which grounded in the development of the platform ecosystem, drives the high-quality advancement of steel futures and spot trading. By fully integrating and partially sharing commercial flow, logistics, capital flow, and information flow, upstream and downstream enterprises within the distribution chain, including manufacturers, traders, logistics providers, warehousing, customers, and project departments, as well as related entities such as banks, insurance companies, and securities markets, are interconnected, enabling comprehensive digital management of the entire process for combined spot and futures operations. The system consolidates functionalities including spot trading, futures hedging, logistics distribution, and financial services. Leveraging real-time data exchange and intelligent analytics, it significantly improves the operational efficiency and risk management capabilities of combined spot and futures operations. Furthermore, WM-

5 has independently developed a contract margin management system, integrated with real-time price alerts from spot and futures markets, ensures that business risks remain controllable. These digitalization initiatives not only optimize the integrated futures and spot business processes but also improve customer experience and enhance market competitiveness, thereby securing a competitive advantage half a step ahead of the market. This enables the organic integration of scale, efficiency, distinctiveness, safety, and sustainable development, thereby sustaining a leading position in the bulk commodities sector.

WM-6 in the medical aesthetics sector, leveraging its proprietary online mall service platform, integrates online and offline resources to establish a digital system encompassing brand development, channel construction, and service enhancement. In collaboration with South Korea's LG Group and others, acting as an agent for premium products such as Yvoire hyaluronic acid, and integrating Eastern aesthetics, a multi-platform synergy is implemented alongside private domain traffic management. Content creation and promotion are conducted on platforms such as Xiaohongshu and Douyin, attracting followers through live streaming and short videos, subsequently channeling traffic into private domains for precise operations and long-term value cultivation. By leveraging digitalization and networked operations, the company has not only enhanced its operational efficiency and service quality but also established a strong brand image.

WM-7 To address the trend of disintermediation and the intensifying competition within the beauty industry, while capitalizing on the rapid advancement of digitalization and the beauty sector, the company's beauty digital transformation innovation project seeks to innovate its development model through the construction of a digital supply chain. This approach, centered on data analytics, delivers comprehensive and refined operational services to brand clients across multiple online channels, integrating distribution, content operation, data, and live streaming services. Consequently, it strengthens the collaborative engagement between the company, beauty brands, and e-commerce platforms, fostering mutually beneficial partnerships. Concurrently, WM-7 is proactively expanding its cross-border operations by establishing a presence in overseas markets such as Singapore, thereby facilitating the export of domestic beauty products. The platform leverages big data analytics to transform traditional procurement models by forecasting consumer demand through the visualization of sales and inventory data, effectively guiding procurement and

sales strategies.

WM-8 seeks to further strengthen the company's service capabilities in government and enterprise centralized procurement by capitalizing on the rapid growth of this market segment. It addresses the increasingly diverse procurement requirements of government and enterprise clients through the development of an OMS order management system, enhancing the platform's front-, middle-, and back-end management to enable comprehensive online processing of all business operations, thereby improving supply-demand alignment and transaction efficiency. Develop and enhance a multidimensional supplier management system to strengthen supplier screening and elimination processes, thereby improving product and service quality and enhancing the customer experience. Focus on customer needs by expanding service offerings and product categories to diversify revenue streams.

WM-9 leverages big data technology and deep learning-based intelligent algorithms to establish data analysis models, enabling abnormal operation vehicle alerts through vehicle analysis models and providing data support for initial inspection personnel. The fuel grade model facilitates automatic evaluation and incentive mechanisms for fuel grades, minimizing subjective human intervention, addressing supplier concerns regarding fuel grade assessments, and significantly enhancing customer satisfaction. By leveraging the fuel management platform, discrete legacy devices — including on-site monitoring, barcode scanners, vehicle number recognition, mobile terminals, law enforcement instruments, and laboratory testing equipment—are integrated. Utilizing Internet of Things technology, hardware allocation is optimized, which not only reduces hardware investment costs but also improves the system's automation level. Based on video technology and employing monitoring devices, mobile terminals, and law enforcement instruments integrated with the system platform, key operational processes are digitally, visually, and graphically archived. Optimal data collection methods are devised to seamlessly integrate application stages, ensuring the openness and transparency of critical information. This enhances product traceability, increases customer satisfaction, and strengthens the enterprise's management capabilities.

WM-10 has successfully established the country's first digital twin factory in the tire industry through digital transformation. By utilizing digital modeling and simulation technologies, transparency and data-driven processes were realized in the

production phase, integrating multiple systems including ERP, MOM, SRM, and CRM to achieve seamless integration and efficient collaboration. The digital transformation of WM-10 has delivered significant outcomes: a 35% increase in direct customer order fulfillment rate, a 15% improvement in production efficiency, a 60% enhancement in real-time data flow, a 25% reduction in product development cycle time, a 0.03% increase in product qualification rate, and an 8% improvement in energy utilization.

WM-11 integrates “Business,” “Planning,” and “Operations” into a unified operational and management model, fully consolidating business processes, data, and information to enable rapid external information acquisition, swift unified directives, standardized on-site operations, and feedback on operational results. An integrated hardware and software platform for management and operations, a pioneering solution in the industry, significantly enhancing operational efficiency, increasing goods turnover by 20%, and reducing inventory costs by 15%. Concurrently, the intelligent system minimizes manual operational errors, improves customer satisfaction, and provides robust support for business development, cost reduction, efficiency enhancement, and safe production, thereby underpinning the realization of development objectives and future strategic expansion.

WM-12, leveraging the characteristics of the industrial cluster economy, deeply engages with the Zhejiang textile industry cluster to address the challenges faced by small and medium-sized enterprises—namely reluctance, apprehension, and incapacity to transform. It establishes a digital intelligence upgrade pathway for the industrial cluster encompassing enterprise digital manufacturing, industry platform empowerment, and ecological knowledge collaboration. The project develops an industrial internet platform, retrofits over 2,000 networked devices, enhances production efficiency by nearly 25%, and achieves a cloud adoption rate exceeding 30% for critical industry equipment. Concurrently, by fully leveraging data elements to drive industrial upgrading, a production and operation rating model has been established to identify enterprises with significant potential through digital profiling. This strategy concentrates resources on addressing deficiencies and enhancing capabilities. In partnership with banks, a digital financial risk control platform has been developed, achieving a breakthrough in realizing the financial value of digital factories. This has enabled turnover financing exceeding 12 billion yuan and reduced financing costs for small and medium-sized physical enterprises by nearly 5%.

Through cross-sector technological integration, the transformation of supply chain digital application scenarios has been advanced, establishing a development pathway that begins with supply chain financial services to aggregate industrial traffic, generates industrial data from this traffic, and subsequently drives industrial innovation through the application of industrial data.

WM-13, in partnership with Digital Science Company, has independently developed an intelligent segmentation algorithm. The intelligent cable segmentation algorithm is based on genetic algorithms, continuously simulating the natural evolutionary process to derive the optimal solution. It is characterized by strong global search capabilities, high algorithmic factor utilization, and supports parallel implementation. Digitalization enables the simultaneous recommendation of multiple distribution schemes: by integrating multiple sales order conditions and corporate requirements, it replaces “manual labor” with “computing power,” achieving the objective of recommending multiple distribution schemes from a single user input, thereby reducing the number of queries. Based on the priority of matching degree, the system will display the top 10 distribution schemes utilizing ‘matching’ relationship materials for user selection. To accelerate the consumption of long-aged inventory materials with a salable length of less than 50 meters, the system will concurrently provide the top 10 distribution plans utilizing materials with a “substitute” relationship. Simultaneously, the system records and analyzes order data for materials with a salable length of less than 100 meters or substitute material plans, using this as one of the performance evaluation metrics for user operations, thereby continuously incentivizing employees to enhance their professional skills while improving inventory turnover.

WM-14, leveraging the business model of “supply chain integrated services combined with industrial chain value extension, industrial banking, and public service platforms,” actively advances digital transformation by successfully launching the Smart Supply Chain Platform (SCP), achieving platform integration, process standardization, application mobilization, data-driven decision-making, and enhanced security. Leveraging digitalization, WM-14 has developed an intelligent supply chain system based on a “large platform + small front-end + stable back-end” architecture, substantially enhancing the integration of digital technologies with supply chain operations. This system effectively meets customer requirements and drives business growth by delivering a comprehensive suite of logistics, financial, informational, and

platform services to agency clients across upstream supply and downstream sales systems. Concurrently, continuous innovation in AI-driven intelligent applications is being introduced to provide robust digital and intelligent support for the integrated development of the supply chain industry.

WM-15 has transitioned from a traditional supply chain integration service model — offering customers procurement, transportation, warehousing, processing, distribution, and supply chain finance—to an advanced model that integrates modern logistics concepts, methodologies, and technologies. It employs databases, the Internet of Things, technological upgrades, and refined management practices to establish a “smart warehouse.” Through seven subprojects, including Warehouse Management System 2.0, Customer Remote Collaboration Platform, and Warehouse Self-service Terminals, it achieves comprehensive digitalization across the entire warehousing process. By leveraging technologies such as the Internet of Things and digital twins, comprehensive visual supervision of cargo transportation and in-warehouse circulation is realized, ensuring visibility and control over critical supply chain processes. Furthermore, through the application of technologies such as mobile order placement and self-service kiosks, the pickup process has been streamlined from 12 steps to 5, enabling centralized customer service operations and reducing operational costs. The smart warehouse also incorporates features such as unmanned weighbridges and intelligent monitoring with early warning capabilities, thereby enhancing risk management. These digitalization initiatives effectively reduce logistics and transportation expenses, lower customers’ overall costs, significantly shorten logistics flow paths and circulation times, and substantially improve circulation efficiency and service capabilities.

In the digital transformation of the scrap steel trade ecosystem, WM-16 has achieved comprehensive online operation and digital management of the scrap steel business by developing a big data platform dedicated to scrap steel business applications. The platform integrates the “five flows”—commerce, logistics, capital, billing, and information—with a data matching accuracy rate of 99.92%, significantly enhancing risk management capabilities. Additionally, the network freight information management platform enables end-to-end monitoring of logistics transportation status, thereby improving transportation efficiency and addressing tax compliance challenges. These digitalization initiatives have not only enhanced operational efficiency and

reduced costs but also supported the evolution of the scrap steel business toward a supply chain value chain model, setting a benchmark for digital transformation within the industry.

Following the deployment of the WM-17 commercial vehicle project, due to dynamic changes in the operations of lessees, guarantors, affiliated parties, leased assets, customer repayments, and relevant external macroeconomic factors, it is imperative to identify, monitor, and address project risk hazards at an early stage. The project's risk management threshold should be advanced by performing dynamic risk grading calculations based on big data encompassing individuals (lessees, guarantors, affiliated parties), assets (leased assets), and events (including risk incidents obtained from follow-ups and external sources). Based on the assigned risk grades, standardized and procedural measures should be applied — ranging from risk monitoring, on-site investigations, and asset preservation to litigation and asset disposal. This approach facilitates comprehensive lifecycle management of the project across pre-lease, lease, and post-lease phases. The data risk control system primarily comprises front-end multi-condition flexible queries, risk warning alerts based on predefined criteria, large-screen displays, and automatic detection and screening of various risk indicators according to cycles established across dimensions such as Lessee, Guarantor, Affiliated Party, Leased Asset, payment collection, return visits, projects, and industry macro categories. It records triggered risk events and, based on weighted values assigned to segmented risk indicators, the system back-end performs dynamic daily risk grading calculations for projects and implements corresponding measures according to the respective project risk levels.

WM-18, in educational practice, has developed a digital education platform that enables efficient integration and sharing of educational resources. The platform integrates functionalities such as online courses, virtual laboratories, and remote training, supporting personalized learning path planning to enhance the overall learning experience. At the same time, it leverages big data analytics of student learning behaviors to inform teaching improvements and optimize curriculum design. Moreover, digital transformation facilitates WM-18's expansion of international cooperation through online communication and remote instruction, attracting global learners and establishing cross-regional educational and business partnerships. Currently, it has initiated efforts to become one of the first pilot units for

comprehensive reform of provincial talent development systems and mechanisms, exploring the “one test, dual certification” model to implement social evaluation reform for supply chain management professional skills

3.4.4 Rationality Analysis of Case Enterprise Selection

The management practices of the case enterprise demonstrate, in multiple respects, that the case selection aligns with the principles of typicality, content relevance, and data accessibility. The detailed analysis is as follows:

(1) Typicality of the case

The research question of this dissertation is: “What are the formation mechanisms of frontline managers’ digital leadership in the process of intrapreneurship?” Building on the experiences of autonomous digital transformation and intrapreneurship during the 13th Five-Year Plan, WM Group formally articulated its digital transformation implementation pathway in the 14th Five-Year Plan, with the goal of driving comprehensive business model upgrading and industrial restructuring through digitalization. In recent years, WM Group has prioritized the support of intrapreneurial projects through multiple initiatives, making it a representative example of enterprise digital transformation and innovation. Throughout this process, WM Group identified the need to strengthen digital leadership, and a number of outstanding frontline managers emerged-fulfilling the theoretical requirements of this study.

(2) Content relevance of the case

Field investigations revealed that frontline managers responsible for intrapreneurship often encountered challenges such as “inability to manage” or “lack of managerial capacity.” In response, WM began to explore how frontline managers could effectively engage in intrapreneurship, thereby gaining deeper insights into the critical pain points of digital leadership in digital innovation. For example, the rescue service digitalization project in 2017 and the warp knitting platform project in 2018 illustrate this process. From WM Group’s managerial practices, it is evident that emerging technologies and models-such as internet-based, digital, and intelligent innovations-have posed major challenges to enterprise reform and development. Some frontline managers, with acute sensitivity to both internal and external environments, identified key factors influencing digitalization, conducted in-depth investigations,

engaged in collective planning, and successfully advanced digital strategies in production, sales, and office operations. By analyzing the interaction processes, decision-making, and cognitive and behavioral transformations of leaders in these typical cases, this study is able to construct the structural dimensions of digital leadership and uncover its mechanisms in the context of corporate intrapreneurship.

(3) Feasibility and accessibility of case data

This study has long focused on WM Group. The author has extensive experience in the supply chain industry and has established longstanding connections with WM Group executives and core managers of its intrapreneurial projects. Years of follow-up research have provided valuable access to the company. WM Group is both able and willing to provide detailed materials on intrapreneurship, and frontline managers are willing to share their reflections and actions during the digital innovation process. These conditions laid a solid foundation for collecting rich primary data for the study.

3.5 Data Collection

This study situates the functioning of digital leadership within the concrete context of corporate intrapreneurship, with a particular focus on exploring its structural dimensions and formation mechanism. The research subjects are frontline managers from various intrapreneurial projects within different enterprises, all of whom were directly responsible for organizing and implementing intrapreneurship under the backdrop of digital transformation. The selection criteria for participants were as follows:

1. They must be responsible for intrapreneurial initiatives;
2. They must serve in the role of frontline managers (first-line supervisors);
3. They must be directly engaged in organizing and implementing digital transformation practices;
4. They must be willing to participate in this study;
5. They must be able to provide analyzable data and relevant materials.

In the process of WM Group's digital transformation, endogenous digitalization generated opportunities for intrapreneurship, which were strongly supported through a series of intrapreneurial projects. These initiatives drove the continuous elevation of leadership requirements for frontline managers and produced a number of outstanding frontline project leaders. To satisfy the principles of theoretical sampling, typicality,

and consistency, this study conducted an in-depth analysis of intrapreneurial projects carried out by the case enterprise in recent years. Frontline managers who had led and driven the entire process of intrapreneurship to successful completion were selected. Ultimately, 18 representative frontline managers were identified. Through interviews and analyses of these managers, the study seeks to construct an accurate and concise structural dimensions, as shown in Table 3.1.

Table 3.1 List of Case Projects

Serial Number	Category	Gender	Age	Education
WM-1	Online platform	male	42	Bachelor's degree
WM-2	Car sales	male	45	Master's degree
WM-3	Used car auction	male	53	Bachelor's degree
WM-4	Steel trade	male	42	Master's degree
WM-5	Steel trade	male	42	Master's degree
WM-6	Aesthetic medicine	male	36	Master's degree
WM-7	Beauty	male	36	Master's degree
WM-8	Production collection	male	42	Bachelor's degree
WM-9	Energy industry	male	39	Master's degree
WM-10	Tyre production trade	female	39	Master's degree
WM-11	Chemical storage	female	44	Bachelor's degree
WM-12	Industrial clusters	male	43	Master's degree
WM-13	Cable manufacturing	male	52	Master's degree
WM-14	Chemical trade	male	52	Bachelor's degree
WM-15	Smart logistics	male	37	Master's degree
WM-16	Scrap trade	male	37	Master's degree
WM-17	Finance leasing	female	46	Master's degree
WM-18	Education and training	male	47	Master's degree

The research data collection process follows the “triangulation” requirement (Yin, 2013), collecting materials through multiple channels such as first-hand interview data, secondary data, and participatory observation. Starting with secondary data, mainly covering the company’s official website information, corporate yearbooks, industry research reports, literature, and media materials, establishing a preliminary understanding of the case company. Prior to conducting interviews, this study conducted a literature review and drew insights from leadership research experts on digital leadership, preparing seven interview questions and corresponding interview guidelines. The interview guidelines are as follows:

The acceleration of digital technology iteration has ushered the digital economy into a new stage of high-quality development. Faced with the opportunities and challenges brought by the digital economy era, higher requirements are put forward

for leadership. Enterprise managers need to fully leverage their leadership decision-making functions to lead the optimization and transformation of development strategies. To further meet the needs of enterprise innovation and sustainable development, explore the leadership and management issues in the context of the digital economy era. This material will serve as the main outline for the interview between the research team and you. Through the interview, we hope to further understand the leadership changes of WM in the context of the digital economy era, including opportunities and threats brought by digital development, personal development, business model transformation, as well as the current status, challenges, and future improvement directions of team management. Thank you for your support!

1. Please introduce the project status, the composition of your project team, and your work content;
2. Can you describe how your work has changed since you took on a leadership role and how your ways of addressing tasks and challenges have changed?
3. What have been some of the challenges you have encountered since leading the project team (including areas where you are not satisfied)? How do you plan to address these challenges or further improve your work in the future?
4. How has the development of digital technology affected your management process? What are some of the best examples of digital management in your work? What were the tasks you faced? What actions did you take and what was the result?
5. What were the expectations of the head office leaders for the project? How does the head office perceive the project under your leadership?
6. What support has the head office provided?
7. What kind of authority do you possess in leading the project? How does digitalization affect your decision making and authority?

Subsequently, the researcher conducted one-on-one, in-depth interviews with 18 frontline managers. Using both open-ended and semi-structured formats, the interviews inquired into their project experiences, developmental trajectories, critical incidents, and courses of action. This approach enabled a comprehensive understanding of the interaction between intrapreneurial projects and their managers, as well as the practical activities through which frontline managers construct digital leadership, with the aim of obtaining the most extensive information possible on the

characteristics of digital leadership. In total, the interviews lasted approximately 18 hours, with an average interview length of 74.6 minutes, a maximum of 125 minutes, a minimum of 28 minutes, and a standard deviation of 34.74. Upon completion, the audio recordings were transcribed into text using iFLYTEK and entered into the research computer, generating about 230,000 Chinese characters of interview material. Statements related to digital leadership were then subjected to semantic extraction and coding, from which the initial concepts were derived.

To obtain more direct evidence, in-depth observational visits were conducted at 18 enterprises. After the formal semi-structured interviews, to track the dynamic evolution of the corporate intrapreneurship project and the developmental trajectory of frontline managers' digital leadership, the researcher engaged in informal, short-cycle, high-frequency supplementary communication with the respondents via instant messaging tools, such as WeChat, DingTalk, Tencent Meeting. This study defines such communication as "online consultation." Following each online consultation, the researcher drafted a structured consultation memo, covering the consultation date, the communication tool used, the unique identifier of the respondent, key discussion points, project phase changes (if any), new challenges or practices reported by the respondent, and the researcher's preliminary interpretation. The memo serves to assist in phase delineation and to support triangulation, that is, cross-validating the findings from the memos with the information obtained from the interviews. During the case data collation stage, triangulation was employed by drawing on multiple data sources and multiple respondents, thereby ensuring cross-validation and enhancing the reliability and validity of the study.

3.6 Research Ethics Considerations

Against the backdrop of digital transformation in Chinese enterprises, studying the transformation of frontline managers' leadership at the business frontlines reflects not only the organizational demand for enhanced employee performance but also the pressing need to rapidly and effectively incubate high-performing frontline teams. From this perspective, the present study conforms to basic ethical norms and represents the fulfillment of social responsibility by a social science researcher from the standpoint of citizenship.

At the same time, the development of digitalized organizations in China entails

the widespread application of big data, cloud computing, artificial intelligence, and blockchain technologies. This requires heightened attention to potential risks of alienation between organizations and individuals in the digital and intelligent context. First, the blurring of work-life boundaries: digital and intelligent technologies strengthen the interconnection between organizations and employees, often placing employees in a tense 24-hour “always-on” work state. This blurs the boundaries between work and personal life, potentially disrupting employees’ private lives and even infringing on privacy. Second, the risk of technological alienation: digital technologies may subtly shape organizational and individual thinking, producing a “one-dimensional” dominance of technology that constrains and alienates human agency. Third, data legitimacy and protection of trade secrets: as digital assets become core assets, data collection may involve issues of corporate confidentiality and legal compliance.

In response, this study took the following steps. First, with regard to value orientation, while recognizing the role of technology in enhancing organizational and individual performance, the study also maintained vigilance against its potential to blur organizational boundaries and intrude excessively into personal lives, thereby building necessary “firewalls.” Second, in terms of methodological choices, the study sought to remain close to frontline business teams by employing observations and interviews, raising open-ended questions, and respecting participants’ voices and choices, thereby formulating policy recommendations accordingly. The privacy and personal perspectives of interviewees were fully respected; informed consent was obtained for all interviews, and the materials collected were used solely for academic research purposes. At the same time, the study strictly adhered to the fundamental principles of interpretivist research. Third, in the process of implementation, the study emphasized the principles of green, harmonious, friendly, reciprocal, and symbiotic research, reinforcing the commitment to social responsibility, protecting trade secrets and intellectual property, and calling for enterprise leaders with the capability to adapt to future organizational forms—leaders who can guide organizations toward truth, goodness, and beauty amid uncertainty.

In May 2023, the ethical application for this study (No. 15848) was reviewed and approved by the General University Ethics Panel.

3.7 Chapter Conclusion

This chapter primarily introduces the interpretivist philosophical stance and establishes the overall framework for examining the structural dimensions and mechanisms of frontline managers' digital leadership. It also explains the corresponding research design and methods.

Based on the five criteria for selecting research subjects, data were collected through multiple channels, including primary interview materials, secondary data, and participant observation, with particular attention given to research ethics. In addition, the chapter briefly outlines the basic profile of the case enterprises, analyzes the key challenges faced by WM Group during the "13th Five-Year Plan" period, and explains its strategic approach to promoting digital transformation during the "14th Five-Year Plan" period.

A review of this process shows that digital transformation has not only created opportunities for intrapreneurship but also provided the necessary foundation for it. The series of successful intrapreneurial practices initiated and promoted by WM Group demonstrate both strong contextual adaptability and theoretical representativeness, thereby offering solid support for the subsequent analysis of the structural dimensions and mechanisms of frontline managers' digital leadership.

4 Study One: Structural Dimensions and Scale

Development of Frontline Managers' Digital Leadership

4.1 Research Objectives

As previous studies have shown, research on digitalization and leadership has primarily centered on three areas: the influence of digital technologies on leadership, the conceptual connotations and structural dimensions of digital leadership, and the effects of leadership in digital contexts. These studies affirm that digital technologies have transformed the leadership process and imposed new demands on leaders' capabilities. Digital technologies reshape leaders' and subordinates' cognition, emotional expression, communication, norms, values, and collective culture, thereby requiring leaders to adapt to new modes of communication and work processes (Kahai, Avolio, and Sosik, 2017). Scholars have clarified the conceptual underpinnings of digital leadership, conducted preliminary analyses of its structural dimensions, and begun exploring its impact. However, there remains a paucity of research focusing on specific groups, such as frontline managers, and specific contexts, such as intrapreneurship. Furthermore, there is insufficient in-depth investigation into the effects and mechanisms of digital leadership. Most existing studies have been situated in Western contexts, with relatively little attention given to the meanings and structures of digital leadership in Chinese enterprises.

The study adopts a case study method, drawing on in-depth analysis of interview data from frontline managers to explore the question: "What are the structural dimensions of digital leadership in the context of intrapreneurship?" Based on this inquiry, the study seeks to explore the structural dimensions and formation mechanisms of digital leadership. The ultimate aim is to extend existing leadership theory and provide theoretical guidance for advancing digital transformation in enterprises.

4.2 Case Selection

This study follows the principle and method of theoretical sampling based on typicality, and applies the criteria of case study design by selecting WM Group as the research object. The case selection is based on three main reasons: (1) Typicality of the case. The research question concerns the formation mechanisms of frontline

managers' digital leadership in the process of intrapreneurship. Building on pilot explorations during the 13th Five-Year Plan, WM Group's 14th Five-Year Plan formally proposed a comprehensive digital transformation pathway, aimed at driving strategic upgrading and reshaping business models through digital change. To meet the requirements of its digital transformation strategy, WM Group actively initiated and supported a series of intrapreneurial projects, gradually becoming a representative example of enterprise digital reform. During this process, WM Group identified and addressed the need to develop digital leadership, with a number of outstanding frontline managers emerging-providing strong grounding for the theoretical framework of this study. (2) Demonstrative value of the case. In the course of exploring how frontline managers could effectively lead intrapreneurship, WM Group introduced policies and systems to support intrapreneurial initiatives. This process revealed issues such as frontline managers "not knowing how to manage" or being "unable to manage," which highlighted the challenges and pain points in developing digital leadership. Analyzing this process shows how WM Group's efforts to promote digital strategic transformation in support of intrapreneurship offer strong practical insights into the construction of digital leadership. (3) Data accessibility of the case. The researcher has extensive experience in the supply chain industry and has established long-term relationships with core personnel of WM Group's intrapreneurial projects through years of follow-up research. In addition, through a series of organized interviews and the collection of secondary data, rich case materials were obtained, enabling triangulation and enhancing the reliability and validity of the case analysis.

In line with the principles of typicality and consistency in theoretical sampling, this study examined the representativeness of WM Group's intrapreneurial projects, and ultimately selected 18 frontline managers who had successfully led intrapreneurial initiatives as the study sample.

4.3 Qualitative Inquiry

The process of data collection in this study strictly adhered to the principle of triangulation (Yin, 2013). Multiple channels were employed, including first-hand interview data, secondary data, and participatory observation, to ensure the robustness

and reliability of the materials collected.

Specifically, the research began with the collection of secondary data—mainly information from the company’s official website, strategic plans, corporate yearbooks, industry research reports, academic literature, and media sources—so as to establish a preliminary understanding of the case enterprise. Before conducting the interviews, the researcher carefully reviewed the relevant literature and incorporated suggestions from leadership scholars regarding the latest advances in digital leadership research. A pre-interview was conducted to refine the interview framework, resulting in a semi-structured interview guide comprising seven key questions.

Subsequently, semi-structured in-depth interviews were conducted with 18 frontline managers, on a one-to-one basis. Both open-ended and semi-structured questions were used to elicit detailed information on work experiences, project development processes, and the construction of digital leadership. The aim was to gain a comprehensive understanding of the interactions between intrapreneurial projects and project managers, as well as the practical activities through which frontline managers developed digital leadership. The total interview duration amounted to approximately 18 hours. The audio recordings were transcribed using iFlytek software into text, yielding a corpus of around 230,000 words. The researcher then conducted semantic extraction and coding of all statements relating to digital leadership, thereby generating the initial set of concepts.

On this basis, on-site observational visits were conducted at the enterprise to obtain more direct evidence. After the research questions were further refined, additional data were collected via online consultations to capture changes in the core competencies of frontline managers during the process of digital leadership development. In the data consolidation phase, multiple data sources and respondents were cross-validated through triangulation, which significantly enhanced the reliability and validity of the study.

4.4 Qualitative results and domain definitions

Based on the proceduralised grounded theory approach to data processing (Strauss and Corbin, 1998), this chapter unfolds around the construction of digital leadership in intrapreneurship based on case evidence, and adopts a structured coding

of data to summarize and infer key emerging concepts.

(1) Open Coding. The researcher applies a line-by-line, sentence-by-sentence, and paragraph-by-paragraph coding approach to extract relevant constructs from the interview content. During open coding, the goal is to stay as true as possible to the interviewees' original words. Coding is done using the exact language and terms used by the interviewees, aiming to capture the characteristics of digital leadership accurately and ensuring that the meaning within the same code entry remains consistent. Examples of open coding are shown in Table 4.1 and Table 4.2.

Table 4.1 Example of Open Coding for Interviewee 1

Original Interview Data of Interviewee 1	Original Concept
• In management, a digital mindset should come first. • The ideal digitalization should be business-driven to promote its success. • Able to coordinate various departments to obtain data from different departments. • Management focuses on asymmetrical issues, the real feelings of customers or the real content of communication, which cannot be reflected in the summary or weekly meeting analysis stage. This is quite important. We pay attention to the communication between employees and customers in process management. This system can help managers understand the communication information between employees and customers. • We will see if there is a change in the proportion of new customers who can make a deal on the same day they come in, which is the first customer transaction rate. We will also look at the follow-up rate. For example, if there are 100 new first-time customers, aside from the initial 10 brought in by employees, how many of the remaining 90 will return within the same month?. There is also the follow-up rate, the ratio of follow-up customers to first-time customers, which can help us clearly feel the employees' level of understanding of the process, or the frequency of their recent follow-ups with customers • Turn the system into a process management tool, not just an assessment tool, although assessment will also refer to this data.	• To have a digital mindset and thinking. • Should have awareness of digitalizing production processes. • Achieve resource interoperability. • Improve workplace communication and collaboration using digital technologies and tools, Use digitalization to enhance business process efficiency.

• Data are the most accurate representation of the results. The quality of the results is not determined by humans, but by data.
--

Table 4.2 Example of Open Coding for Interviewee 2

Original Interview Data of Interviewee 2	Original Concept
• The integration of digital technology with business models is the core driving force behind the platform's rapid growth. • Initially, I thought it was about informatization, but later realized it was more about overall process management during strategic planning. • Especially the team—our management team and even our frontline staff—have raised many demands regarding digitalization. They must understand it and use digital tools to execute tasks. • Creating a team culture that embraces digitalization has allowed us to adapt more quickly. • Previously, we handled 6,000 customer orders (200 per day) with 16 customer service staff, all manually. Now, we manage 130,000 service requests monthly with only 26 support agents. • First, we collect GPS locations of all service technicians, then apply smart dispatch logic to assign the nearest available technician.	• Aligning digital technology with business strategy to achieve strategic coherence • Planning digital technology to support business strategy • Considering employees' perspectives and helping them comprehend digital transformation • Fostering a collaborative environment to accelerate digital adoption • Leveraging digitalization to enhance operational efficiency • Utilizing data-driven optimization to improve service delivery

(2) Selective Coding. Selective coding is used to identify specific entries to extract second-order themes and aggregate the constructs. This study selects, merges, and categorizes the concepts derived from the open coding process to extract key leadership behaviors closely associated with digital leadership. From a theoretical perspective, based on first-order coding results, the data and emergent themes are iteratively processed, identifying theoretically grounded themes (Gioia et al.,2013) to categorize and form second-order themes, as shown in Table 4.3.

Table 4.3 Selective Coding Results

Aggregation Concept	Second Order Theme	First Order Coding
Digital strategic thinking	Construction of digital vision	• Cultivate a digital mindset and awareness • Adopt a digital-first thinking approach to drive utilization
		• Build a shared vision of digital technology's role in business strategy • Plan how digital technology will enable business strategy
	Firm strategic value	• Integrate digital and business strategies for strategic alignment • Identify real challenges in the organization's digital transformation
	Digital team building	• Understand employees' perspectives and help them embrace digital transformation • Train employees to develop new digital technologies
Digital operative management	Digital talent management	• Equip employees to innovate business/operational models and drive change • Develop employees' ability to identify and deploy innovative digital solutions
		• Acquire and leverage cross-departmental data and information resources • Strengthen digital resource integration capabilities
	Multi-resource interconnection	• Enhance unified coordination and allocation capabilities • Ensure digital resources are open, shared, and interconnected (online/offline)
	Digital communication and social	• Collaborate with external stakeholders • Embrace willingness to adopt digital technologies
Digital Executive Capability	Digital technology learning	• Be open to learning various digital/information systems • Participate in digital literacy training programs
		• Use digital tools for real-time monitoring • Leverage data analytics to precisely understand customer needs (beyond traditional experience-based decisions)
	Digital technology practice	• Improve business process efficiency through digitalization

(3) Theoretical Coding. Second-order themes with similarities are further integrated and abstracted into four aggregate dimensions, including “digital strategic thinking,” “digital operative management,” “digital orchestrating and integration,” and “digital executive capability”, as shown in Figure 4.1.

Digital strategic thinking refers to having a digital mindset strategically, that is, being able to use digital thinking to discover, analyze, and solve problems encountered in strategic development within the enterprise, and being able to maintain strategic focus.

Digital operative management refers to having a greater impact on employee development and team building within the enterprise through digital technology and methods, strengthening the digital skills and capabilities development of organizational employees, and being able to use digital technology to achieve digital talent management.

Digital orchestrating and integration refers to improving workplace communication and collaboration, as well as resource acquisition using digital technology and methods externally, and being able to build and maintain good social network relationships through digital technology.

Digital executive capability refers to leaders actively learning and mastering digital knowledge, skills, and tools, and converting them into effective actions that are ultimately implemented in daily practice.

(4) Theoretical Saturation Test. This study adopts the method of cross-validation to test theoretical saturation. Cross-validation involves introducing other independent researchers to evaluate theoretical saturation from different perspectives, effectively avoiding subjective bias from a single researcher. This study invited two leadership experts to independently review all material data, initial concepts, main categories, subcategories, and their logical relationships, questioning, adding, and modifying as necessary. Subsequently, a focused debate was held on the consistency and completeness of each classification. No major discrepancies in main categories, subcategories, or their logical relationships were found, nor were any new core categories emerged. Therefore, this study has achieved theoretical saturation.

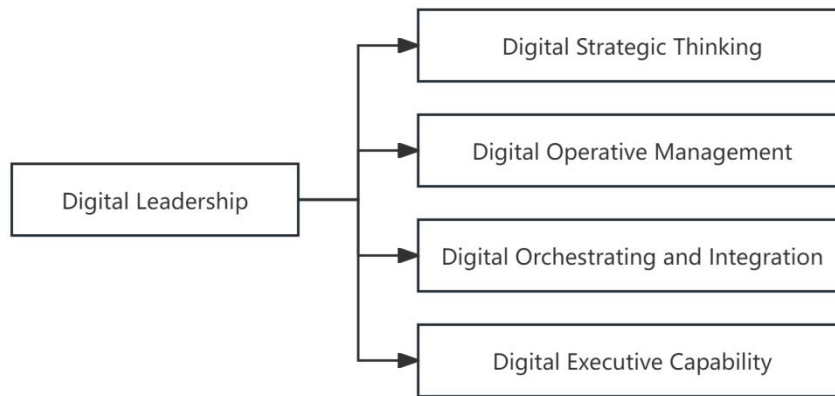


Figure 4.1 Conceptualization of the Structural Dimensions of Digital Leadership

4.5 Importance and Necessity of Scale Development

With the advent of the digital economy era, digital leadership has gradually attracted scholarly attention as an emerging academic concept, and related measurement studies are beginning to emerge. Previous research has made preliminary explorations into the structural dimensions of digital leadership, laying an important foundation for subsequent measurement studies. However, existing measurement research on digital leadership still suffers from several shortcomings:

First, empirical research on digital leadership remains scarce. Current studies mainly adopt qualitative methods to explore the structural dimensions of digital leadership, and the findings tend to be fragmented and scattered, lacking systematic and comprehensive frameworks. For example, Larjovuori et al. (2018), through qualitative research, argued that leadership behavior during digital transformation mainly concentrates on four aspects: strategic vision and action, cultural change, employee empowerment, and network development. Similarly, Cortellazzo et al. (2019), through a literature review, summarized the skills and capabilities required of leaders in the digital era, including communication via digital media, fast and efficient decision-making, managing disruptive change, overseeing connectivity, mastering digital technologies, and developing leadership skills. Although these studies have outlined the preliminary competency features of digital leadership, more empirical research is needed to construct scientifically robust and generalizable measurement tools that can further clarify its structural dimensions.

Second, a lack of measurement tools tailored to corporate digital leadership. Corporate digital leadership differs significantly from digital leadership in the public

sector, thereby necessitating the development of specialized, enterprise-oriented measurement instruments. A review of prior research indicates that corporate digital leadership places greater emphasis on building and implementing strategic visions, driving organizational change, and playing a pivotal role in business transformation. Given the issue of cross-context applicability, this study argues for the necessity of developing a scientific and systematic measurement tool specifically designed to assess corporate digital leadership, in order to more precisely evaluate and understand its distinctive performance and influence in enterprise settings.

Third, limitations in contextual applicability of existing tools. As an emerging concept, digital leadership is shaped by its socio-economic environment and exhibits a high degree of “context sensitivity.” In the Chinese context, the exercise of leadership requires not only attention to the application of digital technologies but also sensitivity to the socio-economic environment and the handling of stakeholder relationships. Particularly under China’s background of economic transition and relationship-oriented social structure (Xu et al., 2011), enterprises rely heavily on leaders’ ability to grasp and respond effectively to policy environments. Furthermore, China’s digital economy is characterized by top-down design from government, followed by progressive implementation across various domains, underscoring the importance of leaders’ capability to interpret and respond to policy dynamics. Applying digital leadership scales developed in Western contexts directly to Chinese enterprises risks problems of contextual misfit, undermining the accuracy of evaluation and potentially impeding effective enterprise transformation and development in the digital era.

To address these issues, this study combined data coding from semi-structured interviews to generate an initial set of 50 descriptive statements corresponding to various subcategories of digital leadership. To ensure that the content semantics of the original items aligned with the construct, one professor specializing in leadership and organizational behavior and two doctoral students in human resource management were invited to review the drafted items in terms of content, wording, and phrasing. Their feedback ensured that the items were concise, clear, and easy to understand, while accurately representing the core dimensions of digital leadership. After rounds of revision, merging, and deletion, a final set of 20 items remained.

4.6 Validity and Reliability

Given the regional disparities in China's level of digital development, this survey primarily targeted employees working in Zhejiang Province--where digitalization leads the nation and where WM Group's successful intrapreneurial cases selected for this study are located. This ensured relative balance and comparability within the respondent group. A total of 225 questionnaires were collected, of which 222 were valid, yielding an effective response rate of 98.67%. The sample characteristics are as follows: by gender, 59.2% male and 40.8% female; by age, 40.7% under 30 years old, 42.3% between 30 and 39, 14.9% between 40 and 49, and 2.1% aged 50 and above.

The measurement scale of digital leadership used in this survey consists of 20 items and adopts a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The study first conducted tests of data suitability. The results indicate that the Bartlett's Test of Sphericity was significant ($\chi^2 = 7047.27$, $df = 190$, $p < .001$), and the KMO measure reached 0.958, demonstrating excellent adequacy. These indicators suggest that the sample data are appropriate and that common variance exists among the variables, providing a solid foundation for subsequent factor analysis. The measurement scale is as follow:

Digital Strategic Thinking

1. My leader has awareness of digital transformation or change.
2. My leader integrates digital technology and business strategy to achieve strategic alignment.
3. My leader understands the gap between the current state of the enterprise and the goals of digital transformation.
4. My leader establishes a shared vision regarding the role of digital technology in business strategy.
5. My leader collaborates with employees to plan how digital technology will achieve business strategy.

Digital Operative Management

6. My leader is able to delve into the front lines to identify the actual difficulties faced by the enterprise in the process of digital transformation
7. My leader has a strong ability to empathize and consider employees' situations and help them understand digital transformation.

8. My leader has the ability to train employees to develop new digital technologies.
9. My leader has the ability to develop employees in innovating strategic business and operational models, and the ability to envision and drive change.
10. My leader has the ability to train employees to effectively identify and successfully deploy innovative IT applications and services.

Digital Orchestrating and Integration

11. My leader possesses good integrated scheduling capabilities for the consolidation and allocation of digital resources.
12. My leader has the ability to acquire and master digital resources such as data and information from different departments.
13. My leader is able to ensure that digital resources are open and shared, with online and offline connectivity.
14. My leader collaborates with external stakeholders to leverage shared digital technology resources to create high-level digital technology capabilities.
15. My leader collaborates with external stakeholders to generate high-level digital technology solutions within the enterprise.

Digital Executive Capability

16. My leader is willing to embrace digital technology.
17. My leader is willing to learn the applications of various digital information systems.
18. My leader cultivates my digital capabilities through books, lectures, and courses related to digitalization.
19. My leader is able to utilize digitalization to improve the efficiency of business processes.
20. My leader can use data to accurately analyze the real needs of customers, rather than relying on past experiences

This study employed principal component analysis with varimax rotation for factor extraction. As shown in Table 4.4, the standardized factor loadings of the scale items range from 0.862 to 0.952, and the cumulative variance explained reaches 88.257%, with all results achieving statistical significance. These findings indicate that the scale items meet empirical research standards and demonstrate high validity and reliability.

Table 4.4 Standard Load Coefficients of Digital Leadership Items

Entry	Factor Load			
	Digital Strategic Thinking	Digital Operative Management	Digital Orchestrating and Integration	Digital Executive Capability
My leader has an awareness of digital transformation or change	0.922			
My leader integrates digital technology and business strategy to achieve strategic alignment	0.93			
My leader understands the gap between the current state of the enterprise and the goals of digital transformation	0.922			
My leader establishes a shared vision regarding the role of digital technology in business strategy	0.941			
My leader collaborates with employees to plan how digital technology will achieve business strategy	0.952			
My leader is able to delve into the front lines to identify the actual difficulties faced by the enterprise in the process of digital transformation		0.93		
My leader has a strong ability to empathize and consider employees' situations and help them understand digital transformation.		0.913		
My leader has the ability to train employees to develop new digital technologies.		0.918		
My leader has the ability to develop employees in innovating strategic business and operational models, and the ability to envision and drive change.		0.942		
My leader has the ability to train employees to effectively identify and successfully deploy innovative IT applications and services.		0.908		
My leader possesses good integrated scheduling capabilities for the consolidation and allocation of digital resources.			0.918	
My leader has the ability to acquire and master digital resources such as data and information from different departments.			0.887	
My leader is able to ensure that digital resources are open and shared, with online and offline connectivity.			0.92	
My leader collaborates with external stakeholders to leverage shared digital technology resources to create high-level digital technology capabilities.			0.863	
My leader collaborates with external stakeholders to generate high-level digital technology solutions within the enterprise.			0.862	
My leader is willing to embrace digital technology.				0.906

My leader is willing to learn the applications of various digital information systems.	0.913
My leader cultivates my digital capabilities through books, lectures, and courses related to digitalization.	0.878
My leader is able to utilize digitalization to improve the efficiency of business processes.	0.922
My leader can use data to accurately analyze the real needs of customers, rather than relying on past experiences.	0.886

A 20-item, four-dimension confirmatory factor model was estimated using AMOS26. The results indicate acceptable fit($\chi^2(154) = 505.036$, $p = .000$; CFI=.951; NFI=.931; RMSEA =.102). 20 items parsimoniously represent the four digital leadership dimensions, and each item taps into a unique facet of each digital leadership dimensions and provides good domain representation.

This study used composite reliability (CR) values and average variance extracted (AVE) values to assess the structural validity and convergent validity of digital leadership. The results are shown in Table 4.5, with composite reliability values for the four dimensions of digital leadership ranging from 0.95 to 0.97, above the threshold of 0.7, indicating ideal structural validity of the four dimensions of digital leadership. AVE values ranged from 0.79 to 0.87, above the threshold of 0.5, indicating good convergent validity of the digital leadership scale.

Table 4.5 AVE values and CR values of the four dimensions of Digital Leadership

Dimensions	Item	AVE	CR
Digital Strategic Thinking (M = 4.10 SD = 0.71)	My leader has awareness of digital transformation or change	0.87	0.97
	My leader integrates digital technology and business strategy to achieve strategic alignment		
	My leader understands the gap between the current state of the enterprise and the goals of digital transformation		
	My leader establishes a shared vision regarding the role of digital technology in business strategy		
	My leader collaborates with employees to plan how digital technology will achieve business strategy.		
Digital Operative Management (M = 4.10 SD = 0.73)	My leader is able to delve into the front lines to identify the actual difficulties faced by the enterprise in the process of digital transformation	0.85	0.97
	My leader has a strong ability to empathize and consider employees' situations and help them understand digital transformation.		
	My leader has the ability to train employees to develop new digital technologies.		
	My leader has the ability to develop employees in innovating strategic business and operational models, and the ability to envision and drive change.		
	My leader has the ability to train employees to effectively identify and successfully deploy innovative IT applications and services.		

Digital Orchestrating and Integration (M = 4.05 SD = 0.71)	My leader possesses good integrated scheduling capabilities for the consolidation and allocation of digital resources.	0.79	0.95
	My leader has the ability to acquire and master digital resources such as data and information from different departments.		
	My leader is able to ensure that digital resources are open and shared, with online and offline connectivity.		
	My leader collaborates with external stakeholders to leverage shared digital technology resources to create high-level digital technology capabilities.		
	My leader collaborates with external stakeholders to generate high-level digital technology solutions within the enterprise.		
Digital Executive Capability (M = 4.13 SD = 0.70)	My leader is willing to embrace digital technology.	0.81	0.96
	My leader is willing to learn the applications of various digital information systems.		
	My leader cultivates my digital capabilities through books, lectures, and courses related to digitalization.		
	My leader is able to utilize digitalization to improve the efficiency of business processes.		
	My leader can use data to accurately analyze the real needs of customers, rather than relying on past experiences.		

4.7 Chapter Conclusion

Based on the literature review, this study conducted structured interviews with 18 frontline managers and employed theoretical coding to identify a four-dimensional structure of digital leadership: digital strategic thinking, digital operative management, digital orchestrating and integration, and digital executive capability. At the same time, confirmatory factor analysis along with reliability and validity tests were performed, and the results showed that all indicators reached desirable levels. Ultimately, a digital leadership measurement scale consisting of 20 items was developed.

5 Study Two: Formation Mechanisms of Frontline Managers' Digital Leadership in Intrapreneurship

5.1 Background and Research Objectives

For a long time, innovation and entrepreneurship have been classic topics in organizational research. At the critical stage of China's economic transformation and the shift from old to new growth drivers, how enterprises can maintain competitive advantage or achieve rapid catch-up through innovation has become an urgent issue. Increasingly, large enterprises are proactively launching intrapreneurship initiatives to seek new engines of growth. For example, PHNIX's fission-style intrapreneurship model, Haier's maker platform, and the technology transfer platform of the Xi'an Institute of Optics and Precision Mechanics are all successful practices of intrapreneurship. Intrapreneurship provides organizations with a flexible pathway for transformation. It not only avoids the substantial risks of wholesale transformation but also enables enterprises to quickly adapt and adjust according to market demand, thereby sustaining vitality and competitiveness amid fierce market competition.

With the rapid development of new-generation digital technologies, human society is accelerating its entry into a new era of digital production. This transformation has not only reshaped the industrial structure and economic development pattern at the macro level, greatly enhanced social productivity, but also completely overturned the external environment of enterprises, placing them in a more dynamic and complex business ecosystem (Hanelt et al., 2021). In addition, digital transformation has profoundly impacted the organizational structure, operation mode, and business model of enterprises (Chen, Wang, and Chen, 2020). In order to maintain and enhance core competitiveness in the digital wave, and expand the diversity of enterprise development, Chinese enterprises have actively promoted digital transformation in response to the trend of the times. However, research data shows that the proportion of enterprises successfully completing digital transformation is still low, and most enterprises face many difficulties and challenges during the transformation process, with the effectiveness of digital transformation closely related to the capabilities of intrapreneurs (Xu , 2010). Against the backdrop of continuous changes in internal and external environments, traditional deterministic

thinking and leadership models have difficulty coping with the complex challenges that enterprises face in the digital environment. The new leadership context requires higher demands on enterprise leadership, urging leaders to keep pace with the times and undergo self-transformation. This demand has driven the emergence of a digital leadership model, providing new theoretical and practical guidance for enterprises' digital transformation.

For a long time, the emergence, transformation, and development of leadership have been central concerns of scholars. Over the past few decades, a large number of researchers have explored the dimensions, formation, and influencing mechanisms of leadership from the perspective of leadership situations, generating rich leadership theories. With the advent of the digital economy era, there has been a profound transformation in the context and mechanisms of leadership, leading to the emergence of a new concept-digital leadership. Since Avolio (2000) first formally proposed the concept of digital leadership, it has been widely recognized in both academia and practice over the past two decades. However, compared to traditional leadership theories, digital leadership theory is still in its early stage of development and has not yet formed a complete system.

This study centers on the core question: "How does digital leadership function as a mechanism in the process of intrapreneurship?" To address this "how" question, the research adopts a case study approach (Yin, 2013). Furthermore, this study traces key events along the timeline of intrapreneurship to identify how digital leadership emerges, evolves, and exerts its mechanism of influence.

5.2 Case Selection

The sample in Study Two is consistent with that in Study One. For Study Two, successful intrapreneurial projects launched by WM Group during its digital transformation were selected as case study samples. These included the Empowerment Platform for Warp Knitting Industry, the Automobile Rescue Project, the Digital Beauty Supply Chain Project, the Thermal Power Digital Control System, and the Smart Automotive Store Project. The diversity among these projects enhances the robustness of the research (Santos and Eisenhardt, 2009).

5.3 Data Collection

To explore the mechanisms through which digital leadership functions in the process of corporate intrapreneurship, this study strictly followed the principle of triangulation (Yin, 2013), integrating multiple data sources to ensure data richness and reliability, including first-hand interview data, secondary data, and participatory observation.

At the initial stage of the research, secondary materials such as the case enterprises' official websites, strategic plans, corporate yearbooks, industry reports, academic literature, and media coverage were systematically collected to establish a preliminary understanding of the organizational background and intrapreneurial environment. Prior to conducting interviews, the researcher reviewed the latest literature on digital leadership and intrapreneurship, drew on methodological guidance from leadership scholars, and conducted pilot interviews. Based on this preparation, a semi-structured interview protocol containing five core questions was developed. Subsequently, one-to-one semi-structured in-depth interviews were conducted with 18 frontline managers. The interviews combined open-ended and semi-structured formats, covering participants' career experiences, the development of their intrapreneurial projects, and the formation of digital leadership capabilities. This approach aimed to comprehensively reveal the interaction between intrapreneurial initiatives and managerial practices, as well as the formation and functional mechanisms of frontline managers' digital leadership.

In addition, through site visits to the participating enterprises, the researcher conducted participatory observation to obtain direct evidence regarding organizational climate, management practices, and leadership behaviors, thereby complementing the interview data. Based on the core research questions, the researcher also continuously tracked the dynamic changes of the case firms during the intrapreneurial process through online consultation methods, including WeChat, email, and online meeting, to collect supplementary materials. During the stage of organizing case data, multiple data sources, such as interviews, secondary documents, observations, and online consultations, and perspectives from different respondents were triangulated to construct a chain of evidence, thereby enhancing the reliability and validity of the research.

5.4 Data Analysis

Following the procedural grounded theory approach proposed by Strauss and Corbin (1998), this chapter focuses on the core issue of the functional mechanism of digital leadership in the intrapreneurial process. Based on the collected case data, a structured coding approach was adopted to identify and summarize emerging key constructs.

First, the researcher conducted first-order open coding on all interview transcripts (Strauss & Corbin, 1998). The interview content was coded line by line, sentence by sentence, and paragraph by paragraph to extract relevant constructs. During open coding, the researcher aimed to preserve the original words of the interviewees as much as possible, using participants' own words and expressions to develop codes. This ensured that the characteristics of digital leadership were represented authentically and that the meaning of each coding category remained consistent.

In the second stage, the researcher iteratively moved between further data analysis and relevant literature review, repeatedly comparing similarities and differences between empirical case evidence and theoretical insights in order to identify theoretical explanations for the first-order concepts. Through grouping, aggregation, and conceptualization, these concepts were clustered into second-order themes. Specifically, the concepts extracted during open coding were selected, merged, and categorized to identify the key actions linking digital leadership and business operations in the intrapreneurial process. Building on the first-order coding results, the researcher repeatedly refined the emerging themes from a theoretical perspective by iterating between data and theory, thereby identifying more theoretically grounded themes (Gioia et al., 2013) and forming second-order themes.

Finally, the second-order themes were integrated into aggregate dimensions, enabling the inductive development of a conceptual framework that connected the concepts emerging from the data (Gioia et al., 2013). To further theorize these aggregate dimensions, the relationships among them were identified, and existing theories of intrapreneurship and digital leadership were consulted to refine the final coding structure. The subsequent case analysis is based on the analytical framework of "Digital Resources Utilization, Digital Logic Formation, Effective Digital

Organization”, which was established through the chain of evidence, as illustrated in Figure 5.1.

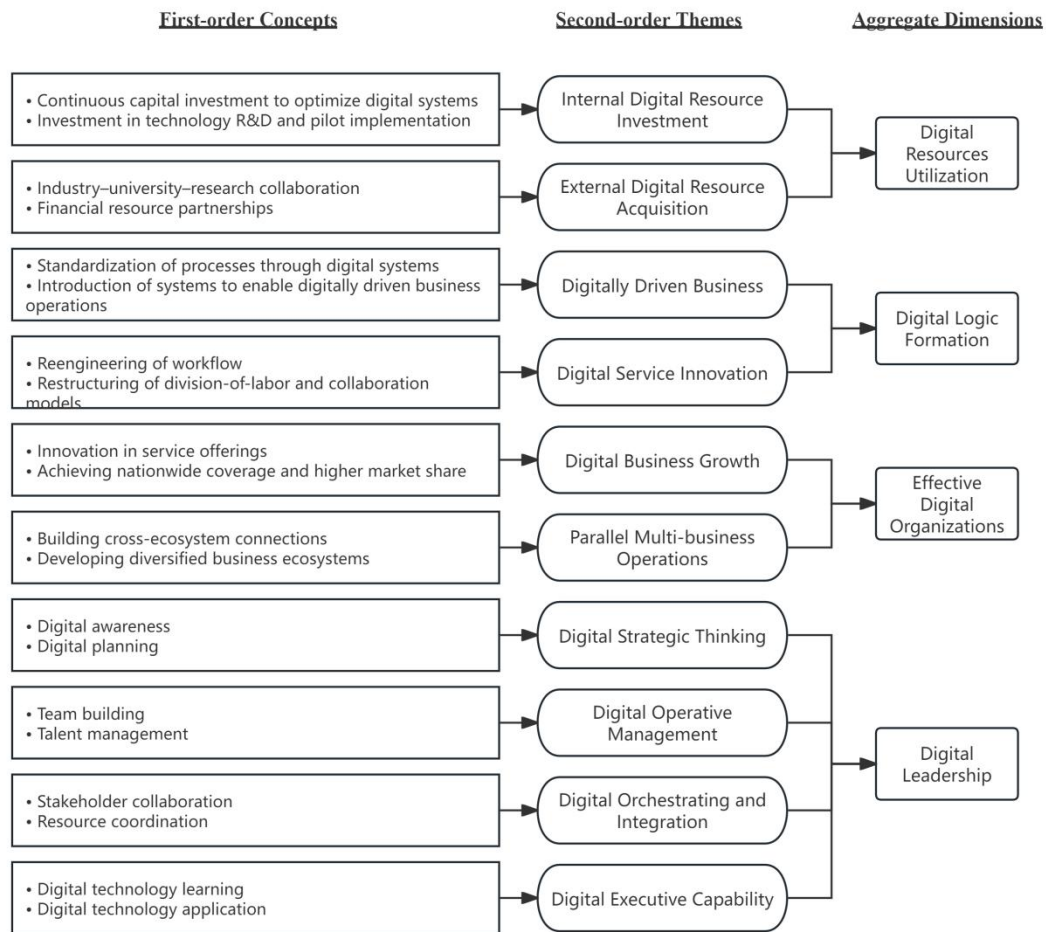


Figure 5.1 Data Structure

5.5 The Three-Stage Process of Intrapreneurship and the Development of Digital Leadership

From in-depth observation and analysis, the development processes of these case projects can generally be divided into three stages: Startup, Growth, and Expansion. Focusing on these distinct phases, this study examines the specific contexts, key leadership activities, and emerging strategies associated with each stage.

It is evident that, although WM Group’s intrapreneurial projects belong to different industries, all of them--operating in highly competitive markets--have faced profound shocks as a result of digital transformation. For example, distribution is gradually shifting from simple trade to integrated services. In the future, distribution will no longer just sell products, but will generate profits by relying on products and

providing additional services such as logistics, finance, information, business, and technology. As a result, these companies are gradually transforming from traders to supply chain integrated service providers. Currently, the distribution industry is mainly dominated by single business formats, with linear connections between upstream and downstream, and a lack of synergy between different companies. With the increasing impact of the Internet on the industry, the distribution industry will develop towards a model of multiple innovations, integrated services, multi-dimensional networks, distribution as an experience, and a focus on ecological cooperation.

Taking WM-4 as an example, with steel manufacturers accelerating the disintermediation process, downstream steel traders must confront the reality of intensifying competition by leveraging digital tools to reform their organizational models and business practices. For WM-7, distributors are beginning to use social media to sell a large amount of beauty and baby products, posing a great challenge to WM-7's services and product market. For WM-3, market competition intensifies, "other companies seize market share through licensing advantages and subsidy policies, limiting the company's business expansion"; the differences and uncertainties in policies restrict intrapreneurial development, "significant differences in subsidy policies in different regions, such as Ningbo and Taizhou, have affected the company's business layout and profit margins"; the rapid changes in the external environment require the company to have the ability to quickly adapt to new technologies and models; the international market is complex, in international business expansion, "the company faces differences in regulations, culture, and market environments in different countries and regions, increasing the complexity and risks of business operations"; although the company recognizes the importance of digitalization internally, it still faces the problem of insufficient digitalization capability in practical operations, the company needs to form a culture that supports digitalization internally, and promote employees to shift from traditional thinking to digital thinking, "this requires leadership guidance and organizational culture change." For WM-9, "competitors may seize market share through more advanced technologies or lower costs".

In terms of coping strategies, companies like WM-5, WM-10, and WM-14 have adopted platform ecosystems as their primary lever. By focusing on vertical specialization ("one centimeter in width, one kilometer in depth") while expanding

horizontal product category boundaries, they have established relatively solid competitive moats. Meanwhile, WM-8, WM-11, and WM-18 leverage digital tools to center their strategies around customer needs, optimizing customer experience to gain a competitive edge. WM-13 replaces “manual labor” with digital “computing power” to rapidly match relational materials. WM-17 employs dynamic data-driven risk tiering calculations. WM-15 has built a smart warehousing system with intelligent monitoring and early warnings. WM-16 developed a scrap steel business management system for end-to-end digital control, which have significantly enhanced its integrated service capabilities.

1. Startup Stage

(1) Initial Situation

The WM-1 project team was originally a physical service company, mainly providing transportation and rescue services for 4S stores and new cars. The company has 64 rescue vehicles, with revenue of about 19 million yuan, and the service frequency reaches up to 6,000 times per month. However, the physical operation model has obvious bottlenecks, such as limitations on the number of vehicles and low operational efficiency. The emergency rescue industry market is highly competitive, and with more companies entering the market, the competition will intensify. Enterprises need to continuously enhance their competitiveness to deal with the competition for market share.

The WM-2 project team mainly relies on traditional sales models and a simple customer management system, lacking systematic data management and customer relationship management tools. With the intensifying market competition and diverse customer demands, higher requirements are posed on service quality and efficiency. “There is a need to develop a more comprehensive customer management system to achieve real-time data collection and analysis,” enhancing customer satisfaction and sales efficiency.

The team responsible for the WM-9 project is in charge of the power plant environmental protection project, which needs to optimize environmental protection processes through digital means to meet the strict national environmental standards. The team collaborates with Zhejiang University to leverage the university’s theoretical research advantages, develop algorithms and models applicable to environmental protection processes, convert manual operation experiences into digital rules, and solve the complexity of on-site processes.

The WM-12 project team entered the spinning industry, which is a traditional and highly competitive field. Small and medium-sized enterprises generally face difficulties in financing and low management efficiency. The team is positioned to solve the problems of SMEs through supply chain finance and digital means, helping them enhance competitiveness. The team has limited resources, mainly relying on the support of the parent company and its own innovative thinking.

(2) Key Activities

WM-1 provides rescue services through its own vehicles, accumulating customer resources and operational experience. Understanding customer needs and market pain points to provide direction for subsequent transformation. Attempted to develop a digital system, but progress has been slow due to technical difficulties and large capital investment.

WM-2 accumulates customer resources and market experience through the sales of imported cars. Introduce a simple customer management system (such as an Excel spreadsheet) to record customer information and sales data. Understand customer needs and market pain points to provide direction for future digital transformation.

WM-9 cooperates with universities to develop algorithms and models suitable for environmentally friendly processes, transforming manual operation experience into digital rules. The system was piloted in factories to verify its effectiveness and reliability. The pilot operation was successful, with the system running stably in some factories, achieving environmental standards and reducing operating costs.

The WM-12 project provides financing support to small and medium-sized enterprises through equipment collateral and accounts receivable management. The team offers financing support to SMEs through a supply chain finance model, solving their cash flow issues. For example, by utilizing equipment collateral and accounts receivable management, clients can secure funding support.

(3) Specific Strategies that Emerge

Through entity operation, WM-1 has initially established standardized service processes, enhancing customer satisfaction. With a clear focus on rescue services as the core, the business scope is gradually expanding. Despite the slow progress in system development, it has accumulated technical experience and talent base for the subsequent digital transformation.

WM-2 begins to focus on customer relationship management through initial digital tools to enhance customer satisfaction. Optimizing sales processes, increasing

sales efficiency, and reducing customer wait times.

WM-9 optimizes environmental indicators and reduces operating costs through real-time monitoring and automatic control. Digital leadership does not completely replace manual work, but assists decision-making through technological means, enhancing efficiency while preserving human judgment and flexibility. “Digital systems can achieve automated start and stop, but ultimately human judgment is still needed,” said a frontline manager of WM-9. He believes that traditional manual experience can be transformed into replicable and optimized rules through digital means, reducing dependence on individual experience and enhancing decision stability and efficiency. “By using artificial intelligence technology, learning from big data, and solidifying operational experience, it is no longer manual operation but rather the system controlling it.”

WM-12 addresses the funding issues of small and medium-sized enterprises through supply chain finance, enhancing customer stickiness. By integrating a large number of customer resources, it forms economies of scale and enhances market competitiveness. Frontline managers of WM-12 believe that leadership needs to possess digital thinking and decision-making abilities. The authority and decision-making abilities of leaders need to be combined with digital tools. The core of digital leadership lies in how to use digital tools to support decision-making, rather than relying entirely on data. He mentioned, “The digital mechanism itself is built by us, because there is such a requirement, the entire logic is organized by people, and we often use its results to make decisions.”

2. Growth Stage

(1) Initial Situation

The information technology involved in the emergency rescue industry is changing rapidly, and companies need to continually conduct technical research and innovation to maintain their competitiveness. However, technical research and development are uncertain and costly. Once the research and development fails or the technological achievements do not meet market demands, it will bring huge economic losses to the company. The frontline manager of WM-1 realized the bottleneck of entity operation and decided to shift to a light asset model, integrating social resources. By acquiring the system code of a failed Internet transformation enterprise for 480,000 yuan, he obtained a preliminary digital system, but the system requires a large amount of customization and optimization.

WM-2 began to explore digital transformation, introducing a more advanced customer management system. Realizing the need to develop a more comprehensive customer management system to achieve real-time data collection and analysis.

Team WM-9 needs to further optimize the system to deal with the resistance from frontline employees to the new system. Frontline employees have limited adaptability to digital systems and may require additional training and time to master new skills. Some employees may resist the new system and be unwilling to change their traditional way of working. WM-9 frontline leaders mentioned, “Frontline employees may be more inclined to rely on manual experience rather than the new system.”

After achieving initial success in the early stage, the WM-12 team entered the growth phase, starting to deepen their business model and exploring how to further enhance business efficiency and competitiveness through digital means. The team’s goal is to optimize business processes and effectively utilize data through digital transformation, thereby improving customer satisfaction and business profitability.

(2) Key Activities

WM-1 invested a large amount of capital and technical force to optimize and customize the acquired systems. By digitalizing the system, they optimized the rescue process and improved service efficiency. Through real-time monitoring and data analysis, they optimized the decision-making process, reduced manual intervention, and enhanced management efficiency. “After the monitoring system went live, until the rescue personnel exceeded the overtime, it was then that our association personnel followed up.” Emphasizing the combination of digital tools and human decision-making, using technology to improve efficiency while retaining human judgment and flexibility. “Employees only intervene to understand, not to forcefully intervene.” By optimizing traditional service processes through technological means, they improve efficiency and standardization. “Through systemization to automatically review, we will check whether information such as missing photos, the number of case photos, the file size of photos, and the trajectory of the case are complete.”

WM-2 has invested a large amount of capital and technical resources in developing and optimizing the Customer Management System (CM system) to enhance system stability and functionality. By collecting customer data through the system, analyzing customer behavior and needs, sales strategies are optimized. Through digital systems, the sales process is optimized to enhance customer

experience. Gradually expanding coverage to more regions, improving market share.

Frontline leaders of WM-9 believe that digital leadership not only involves the application of digital technology, but also requires managers and employees to have the ability to adapt to digital tools and drive changes in management processes. “Digital systems require people to maintain and manage them, and the digital literacy of frontline staff needs to be improved.” Providing frontline employees with training on the operation of digital systems to help them adapt to new ways of working.

WM-12 introduced the ERP system, trying to improve management efficiency through digital means; introduced MES system and intelligent hardware to enhance production efficiency and data management capabilities. The team realized the importance of digitalization and started exploring ways to improve management efficiency through ERP and MES systems. Despite initial challenges such as system mismatch and data management difficulties, they gradually accumulated experience. Recruiting high-quality talents, providing internship opportunities, and gradually enhancing the team’s digital capabilities.

(3) Specific Strategies that Emerge

WM-1 improves service efficiency and management level using digital systems, achieving standardized operations. By optimizing service processes and enhancing customer experience, it gradually expands its market share.

WM-2 uses digital systems to improve customer management and service efficiency, achieve standardized operations. By collecting and analyzing data, optimizing customer experience, and increasing customer satisfaction. By optimizing service processes and enhancing customer experience, gradually expanding market share. Start exploring cooperation with upstream and downstream companies, and building customer relationship management ecosystem.

WM-9 translates manual operation experience into digital rules, reducing reliance on manual experience and improving the stability and consistency of operations. Adjusting management processes to ensure the effective integration of digital systems into daily operations, enhancing overall management efficiency. Cultivating team members’ digital capabilities through project practice, while providing incentives to encourage active participation in projects.

WM-12 uses ERP system to improve management efficiency, enhances production efficiency through MES system and smart hardware, optimizes credit system through data model, and enhances business efficiency and risk control

capability. By recruiting high-quality talents and providing internship opportunities, gradually enhance the team's digital capabilities to support business development. Improve customer satisfaction and enhance customer stickiness through digital means, further consolidating market position. WM-12 frontline managers believe that digital leadership needs to form a culture within the organization, enabling team members to understand the value of digitalization and integrate it into daily work.

3 Expansion Stage

(1) Initial Situation

The WM-1 platform has covered 20 provinces nationwide, with a leading market share in some provinces. The digital system is continuously improving, resulting in a significant increase in service efficiency. The company needs to further enhance the stability and functionality of the system to meet the rapidly growing business demand. At the same time, it needs to address data security and privacy protection issues. In terms of technology, there is a need to further optimize the system and improve its level of intelligence, such as AI photo recognition and smart dispatching.

WM-2 has covered multiple regions, the digital system is constantly improving, and customer management and service efficiency have significantly improved. The company needs to further enhance the intelligence level of the system to cope with the rapid growth of business demands. At the same time, the company needs to address data security and privacy protection issues.

Different departments within WM-9 may have differences in mindset and workflow, leading to difficulties in collaboration. The project advancement requires coordinating the interests and resources of multiple departments, increasing management complexity. It is mentioned that "cross-departmental collaboration is needed, but there may be conflicts of interest between departments". The system has run successfully in the pilot factory, and the team is prepared to expand the digital environmental protection system to more factories.

After the successful growth stage of WM-12, the team entered the expansion stage, beginning to consider further expanding the business. The goal of the expansion stage is not only to increase the scale of the business, but also to extend the industrial chain.

(2) Key Activities

WM-1 improves team collaboration efficiency, enhances information transparency, and improves customer experience through digital platforms. The

platform sends SMS notifications to customers and operators when receiving a case, allowing them to see in real time how far the driver is and roughly estimate how long it will take. Integrating social resources, collaborating with multiple rescue enterprises to expand service coverage. Continuing to expand service coverage and increase market share by deep cooperation with upstream and downstream enterprises to build a complete rescue service ecosystem. Introducing AI technology to enhance the intelligence level of the system, such as photo recognition and intelligent dispatching.

WM-2 continues to expand its service scope and increase market share. Deeply cooperate with upstream and downstream enterprises to build a complete customer relationship management ecosystem.

According to the actual situation of each factory, WM-9 adjusts system parameters and operation strategies, gradually promoting them in other factories. Provide digital system operation training to employees of new factories to help them adapt to the new way of working. Form interdisciplinary teams to coordinate cooperation between different departments and resolve conflicts between technical solutions and practical operations.

WM-12 achieves resource sharing and business collaboration through the data center, improving decision-making efficiency. By establishing data models, customers are rated on multiple dimensions to optimize the credit system. The team has started to focus on data integration and analysis, optimizing the credit system by establishing data models and rating customers on multiple dimensions. For example, in cooperation with Talon Bank, data is incorporated into the bank's credit model, realizing the business value of data. Through digital means, the team has innovated business models and reduced funding costs.

(3) The Specific Strategies that Emerge

WM-1 breaks through the bottleneck of physical operation and achieves rapid expansion by integrating social resources. It cooperates deeply with upstream and downstream enterprises to build a complete rescue service ecosystem and enhance customer experience. By utilizing big data analysis to optimize operational decisions, it improves operational efficiency.

WM-2 collaborates deeply with upstream and downstream enterprises to build a complete customer relationship management ecosystem, enhance customer experience. Utilizing big data analysis to optimize operational decisions and improve operational efficiency. By optimizing service processes and enhancing customer experience,

further expanding market share.

Frontline managers of WM-9 believe that digital leadership requires managers to coordinate cooperation between different departments, break down information silos, promote team collaboration and data sharing. “The promotion of digital systems requires cross-departmental collaboration, and there may be differences in mindset between different departments.” Form cross-disciplinary teams, leverage their respective professional strengths, and solve complex problems in projects. Regularly communicate with various departments, coordinate the contradictions between technical solutions and actual operations, and ensure smooth project progress.

WM-12 achieves resource sharing and business collaboration through the data center, improves decision-making efficiency, and promotes business model innovation. It cooperates with banks to incorporate data into the bank’s credit model, realizing the commercial value of data and reducing funding costs.

5.6 The Process of Digital Leadership Driving Intrapreneurship

The study finds that the primary process of intrapreneurship can be broadly divided into three stages: “Digital Resource Utilization”, “Digital Logic Formation”, and “Effective Digital Organization”. These intrapreneurial projects all operate in complex competitive environments, where rivals seek to capture market share through more advanced technologies or lower costs. In response, frontline managers gradually recognized the core value of data, acquiring and leveraging digital resources. Once these digital resources were obtained, intrapreneurs identified business pain points and sources of innovation. At this stage, “Digital Logic Formation” occurred, marking a transition to a new phase in which business transformation was driven by digital logic. Finally, intrapreneurship required the realization of “Effective Digital Organization”, thereby driving digital business growth and expanding the ecological value of the projects.

5.6.1 The Process of Digital Resource Utilization

During the implementation of intrapreneurship project, internal digital resource input is the foundation for realizing intrapreneurship, involving various resources such as funds, manpower, and technology. Internal digital resource input refers to the resources invested in the digital innovation process to achieve business process optimization, data management, system development, and technological innovation,

including funds, manpower, and technology. Enterprises need to invest large amounts of funds in digital system development, technological research and development, and business optimization. For example, as mentioned by WM-1, despite the slow progress in digital system development, the company continues to invest funds to optimize the system. In addition, as mentioned in the interview with WM-9, the company collaborated with Zhejiang University to develop algorithms and models for environmental protection processes, investing a large amount of funds in technological research and development and pilot operation. In WM-12, the company invested funds in the development and optimization of the supply chain finance system to improve business efficiency.

During intrapreneurship, enterprises need to acquire not only internal digital resources but also external resources to support digital transformation. For example, WM-9 collaborated with Zhejiang University to leverage the university's strengths in theoretical research and to develop algorithms and models applicable to environmentally friendly processes. Similarly, WM-12 partnered with financial institutions to introduce supply chain financial services, thereby addressing the funding challenges faced by small and medium-sized enterprises.

Digital strategic thinking refers to the action and ability of leaders to develop and implement digital strategies in the process of digital innovation, including insights into market trends, forward-looking technology applications, and overall planning for digital transformation. The top management of enterprises needs to have keen market insights to formulate digital strategies to enhance the competitiveness of the enterprise. For example, in WM-1, the leadership realized the necessity of digital transformation. In WM-9, the leadership collaborated with universities to introduce advanced technology, optimize environmental protection processes, and enhance the competitiveness of the enterprise. In WM-12, the leadership solved the funding problems of small and medium-sized enterprises and enhanced customer stickiness through supply chain finance and digital methods.

Digital executive capability refers to a leader's ability to learn and practice digital technologies in the process of digital innovation, including the application of digital tools and using data analysis to understand customer's real needs. For example, WM-1 tries to develop a digital system. WM-2 introduces a simple customer management system (such as an Excel spreadsheet) to record customer information and sales data.

5.6.2. The Process of Digital Logic Formation

The concept of data-driven business refers to enterprises using digital technologies to transform data into the basis for business decisions, optimize business processes, enhance operational efficiency and customer experience, thereby driving business growth and innovation. In practical cases, WM-1 achieved standardized operations of rescue services by acquiring and optimizing a digital system. Through real-time monitoring and data analysis, the enterprise reduced manual intervention while retaining individual judgment and flexibility, significantly improving service efficiency and management level. WM-12 introduced ERP and MES systems, gathering order data from downstream buyers in the knitting industry on the platform, predicting the demand for fabric types, and informing knitting enterprises to arrange production reasonably, realizing a data-driven Customer-to-Manufacturer (C2M) production process.

Digital service innovation refers to the use of digital technology by companies to redesign and optimize service processes, enhance service quality and customer experience, and create new business models. WM-2 achieved real-time data collection and analysis, as well as optimized sales strategies through the development and optimization of customer management systems. By digitalizing systems, companies not only improve customer satisfaction but also gradually build a customer relationship management ecosystem. WM-9, on the other hand, optimized environmental protection processes through digital systems, enabling real-time monitoring and automatic control, thus reducing operational costs.

Digital operative management refer to the company's internal leadership through digital technology and means to have a greater impact on employee development and team building, strengthen the digital skills and capabilities development of organizational employees, and have the ability to use digital technology to achieve digital talent management. The leadership of WM-9 provides digital system operation training for frontline employees to help them adapt to new ways of working. The leadership of WM-12 introduces ERP and MES systems to optimize production processes and data management, while recruiting high-quality talents to gradually enhance the team's digital capabilities. By cultivating the team's digital capabilities, the sustainable development of the company is promoted.

In this period, digital executive capability refers to the ability of leaders to

proactively learn and master digital knowledge, skills, tools, and other key work resources during the process of digital innovation, and to transform them into effective actions that are ultimately implemented in daily practice. The leadership of WM-1 drives the digital transformation of the rescue process by acquiring digital systems and optimizing them for customization. The leadership of WM-9 introduces AI technology and big data analysis to convert human experience into digital rules and optimize management processes. WM-12 analyzes and processes historical data to predict future operations and arrange early actions for production.

5.6.3. The Process of Effective Digital Organization

Digital business growth refers to the significant increase in business scale and revenue achieved by enterprises through the optimization of business processes, the improvement of operational efficiency, and the expansion of market scope using digital means. WM-1 integrates social resources through a digital platform, breaks the bottlenecks of physical operations, and establishes a complete rescue service ecosystem, significantly enhancing customer experience. WM-12 achieves resource sharing and business collaboration through a data middle platform, establishes data models to optimize credit systems, and promotes business model innovation.

Multi-service business parallel refers to enterprises expanding into multiple business areas, integrating the ecosystem, achieving business diversification and comprehensive competitive advantage through resource sharing and collaborative development in the process of digital innovation. WM-1 not only expands the service scope but also introduces AI technology to enhance the level of system intelligence. WM-2 covers multiple regions with digital systems to improve customer management and service efficiency, further expanding the business scope and building a complete customer relationship management ecosystem. WM-12 not only expands the business scale in the expansion phase but also focuses on the extension of the industrial chain. By sharing resources and business collaboration through the data middle platform, downstream industrial park procurement data is gathered on the platform, attracting fund management institutions to visit the platform to analyze the upstream demand for finished products, thereby expanding new cooperation opportunities.

Digital orchestrating and integration refers to the ability to use digital technology and tools to improve communication and collaboration in the workplace, as well as to access resources, and to build and maintain good social networking relationships

through digital technology. WM-9 requires coordinating cooperation between different departments, breaking down information silos, promoting team collaboration, and data sharing. Companies form interdisciplinary teams to leverage their respective professional strengths to solve complex problems in projects. WM-1 needs to communicate and coordinate with external parties, schedule resources, and achieve online and offline integration.

In this period, digital executive capability refers to the leader actively learning and mastering key work resources such as digital knowledge, skills, and tools, and transforming them into effective actions that ultimately are implemented in daily practice. WM-1 enhances team collaboration efficiency, improves information transparency, and enhances customer experience through digital platforms. WM-12 achieves resource sharing and business collaboration through the data midstation.

5.7 Chapter Conclusion

This study develops a process framework of intrapreneurship (see Figure 5.2), revealing how frontline managers' digital leadership and business function development jointly advance intrapreneurship through three stages: Digital Resource Utilization, Digital Logic Formation, and Effective Digital Organization. The findings show that at each stage--Startup, Growth, and Expansion--business function development and the emergence of digital leadership are mutually reinforcing.

Specifically, in the Startup Stage, frontline managers, drawing on digital strategic thinking and digital executive capability, achieve Digital Resource Utilization through the internal coordination of digital resources and the external acquisition of digital resources. In the Growth Stage, frontline managers, leveraging digital operative management and digital executive capability, foster Digital Logic Formation by driving business through digital technologies and innovating digital services. Finally, in the Expansion Stage, frontline managers, relying on digital orchestrating and integration and digital executive capability, realize Effective Digital Organization through digital business growth and the parallel advancement of diversified business initiatives.

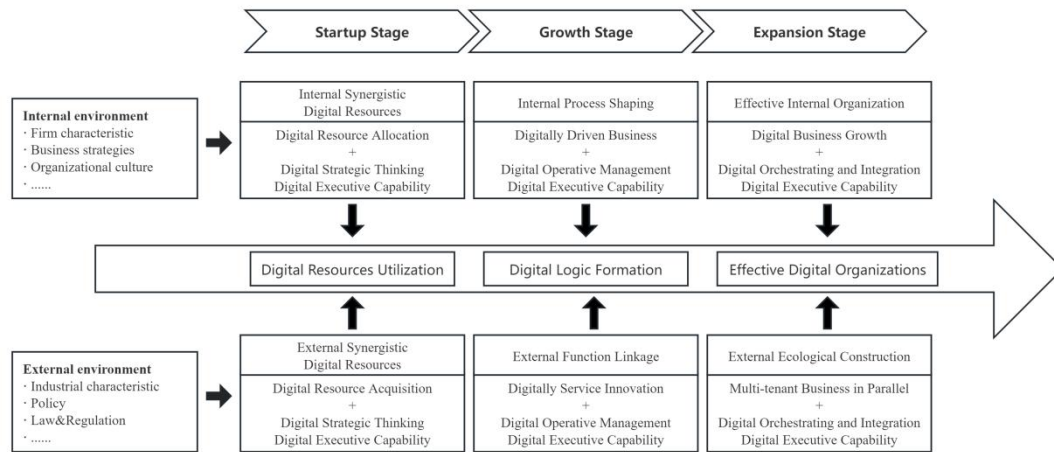


Figure 5.2 Process Framework of Intrapreneurial Digital Innovation

6 Conclusion

6.1 General Discussion of Findings

At present, the digital economy has become the frontier of global economic development and industrial transformation, and human society has entered a new era characterized by digitalization (Chen et al., 2020). With the rapid advancement of big data, cloud computing, the Internet of Things, and artificial intelligence, the basic forms of existing products, the production processes of new products, business models, and organizational structures have all undergone unprecedented changes. Environmental change and technological progress are the key drivers of digital transformation, while digital technologies serve as the essential tools for implementation. Enterprise digital transformation involves the combined application of information, computing, communication, and connectivity technologies, which, through deep integration with corporate strategy, trigger fundamental changes in organizational characteristics and reconstruct structures, behaviors, and operating systems (Huang et al., 2021). Although digitalization has become a critical pathway to competitive advantage, digital transformation, as a disruptive organizational change, often entails long payback periods, high risks, and significant uncertainty. It may even face resistance from organizational inertia, resulting in internal conflict or performance decline (Nambisan et al., 2019). For many firms, how to respond to the changes brought about by digital development remains a new challenge. In particular, enterprise leaders often react slowly to the managerial implications of digital transformation (Li and Miao, 2020), making it difficult for enterprises that are rapidly implementing digital transformation to respond swiftly. As a result, managerial practices frequently lag behind environmental changes, digital technologies fail to integrate fully with business development, and the outcomes of industrial digitalization remain below expectations (Ma and Wang, 2023). Indeed, post-transformation performance gains are often limited (Qi and Cai, 2020).

Digital leadership must therefore be positioned as a core driver of digital transformation. The digital era challenges leaders' authority, credibility, and influence, while reshaping leadership styles, organizational relationships, and cohesion (Han and Cheng, 2021). People remain the ultimate decision-makers in business strategy and organizational change, even in firms heavily empowered by artificial intelligence and advanced technologies (Xiao et al., 2022). Both research and practice now widely

acknowledge that managerial elements such as leadership are central to the success of digital transformation. Analyses of failed initiatives show that many firms lack top-level design and coherent transformation strategies, with leaders failing to provide strong direction (Bresciani et al., 2021). Without a clear digital leadership framework, many organizations lack systematic understanding of internal and external environments, as well as the opportunities offered by digital technologies (Cai et al., 2019). To achieve high-level digital transformation, leaders must cultivate a digital mindset and foster a digital culture that enables organizations to manage technological shocks and disruptions effectively (Vial, 2019). Digital leadership exerts a strong driving force on the improvement of organizational performance and plays a significant role in the process of corporate digital transformation.

Therefore, the primary purpose of this study is to build on the theoretical foundations of digital transformation and leadership change, and to conduct an in-depth exploration of leadership transformation among frontline managers in the process of intrapreneurship within large enterprises. Through in-depth interviews, data collection, and empirical analysis, the study aims to enrich existing leadership theories and provide a basis for enterprises to select, train, and enhance the leadership capabilities of frontline managers. The core objective of this research is to examine, within the practical context of intrapreneurship in large enterprises, how frontline managers' digital leadership is constructed and how it functions. In doing so, the study seeks to uncover the significance of leadership transformation among frontline managers in the digital era. To achieve this goal, and based on the literature review, the study addresses two key research questions: (1) what constitutes frontline managers' digital leadership in the process of intrapreneurship? (2) how does frontline managers' digital leadership function in the process of intrapreneurship?

6.2 Structural Dimensions and Formation Mechanism of Digital Leadership

Traditional leadership research has mainly focused on leaders' abilities and influence (Bouchard and Basso, 2011; Williamson et al., 2013). Although leadership has long been a classical topic in academic research, leadership in digital contexts still offers considerable room for theoretical expansion. Under the impact of digitalization, innovation, and organizational transformation, the concept of digital leadership has

emerged.

This study explores the structural dimension of frontline managers' digital leadership. Existing literature offers limited exploration of digital leadership dimensions and mechanisms at this level. To address this gap, the study conducted qualitative text analysis research on interview data from 18 corporate leaders, deconstructing the structural dimensions of frontline managers' digital leadership. In contrast to Roman et al.'s (2019) six-dimension SEC model for digital leadership in government (digital communication, digital socializing, digital transformation, digital team, digital technology, and digital trust) and Larjovuori et al.'s (2018) four-dimension model for the service industry (strategic vision and execution, leading corporate cultural change, empowering and leading social network developments), this study finds that frontline managers' digital leadership comprises four dimensions: digital strategic thinking, digital operative management, digital orchestrating and integration, and digital executive capability. Among these, the relatively macro-level digital strategic thinking is identified as the key to enabling organizational "digital initiation," playing a particularly critical role. Digital executive capability runs through the entire three-stage process of corporate intrapreneurship and serves as the top priority for the implementation of digital innovation projects. Based on coding analysis, this study further develops a Digital Leadership Scale.

This study also deconstructs the process of how frontline managers drive intrapreneurship. While prior research has begun to acknowledge the importance of digital leadership in intrapreneurship, the mechanisms through which it functions have not been systematically revealed. Findings from WM Group's intrapreneurship cases show that digital leadership varies across stages, with mutual reinforcement between business function development and digital leadership formation. The study identifies a three-stage process in which frontline managers' digital leadership and business development co-evolve: (1) Startup Stage: Frontline managers draw on digital strategic thinking and digital executive capability to realize Digital Resource Utilization through both internal and external resource coordination. (2) Growth Stage: Frontline managers apply digital operative management and digital executive capability to advance Digital Logic Formation via digitally driven business and digital service innovation. (3) Expansion Stage: Frontline managers leverage digital orchestrating and integration and digital executive capability to achieve Effective Digital Organization through digital business growth and multi-business parallel

development. In the context of intrapreneurship, this study further emphasizes the dynamic nature of digital leadership--a co-evolutionary process in which multidimensional digital leadership interacts with business function development (Figure 6.1). The findings also show that digitally driven business and service innovation enhance recognition among corporate headquarters, internal employees, and external stakeholders regarding the success potential of intrapreneurship projects.

This study also identifies the important role of frontline managers in the process of intrapreneurship. Existing research on corporate intrapreneurship has primarily focused on the human capital of frontline employees and internal intrapreneurs, while also recognizing the role of management in promoting intrapreneurial activities. For example, prior studies on digital leadership have mainly examined the relationship between leadership and intrapreneurial behavior (Promsri, 2019; Damayanti & Mirfani, 2021; Larjovuori et al., 2018). Kuratko et al. (2005) further emphasize the distinctive role of middle managers. These studies highlight how middle managers identify, refine, and guide intrapreneurial opportunities, as well as how they acquire and coordinate the resources needed to pursue them. However, existing research tends to focus more on how managerial hierarchy and categorization influence the intrapreneurial process, while to some extent overlooking the role of frontline managers. Based on interview analyses from the case studies, this research finds that in the context of digital technology that drives organizational transformation, frontline managers possess a certain degree of decision-making authority in operational activities and play a crucial role in the intrapreneurial process.

6.3 Theoretical Exploration and Contributions

Based on the research findings obtained, it can be analyzed that this study's research conclusions have mainly made the following contributions, specifically:

First, analyzing the structural dimensions of digital leadership helps to conduct a systematic examination within the Chinese context. A review of existing research on digitalization and corporate leadership shows that most studies focus on the new requirements digital technologies place on leaders' competencies and behaviors, such as mastering digital technologies, proactively driving organizational change, leading virtual teams, and developing communication and social interaction skills. But the overall researches remain fragmented and scattered. Scholars have conducted more

systematic research on digital leadership in the public sector in Western cultural contexts, constructing a SEC model of digital communication, digital socialization, digital transformation, digital teams, digital technology, and digital trust, which share some similarities with the structural dimensions of digital leadership abilities in the Chinese context of this study. However, in the digital era, a key aspect of business leadership is the ability to strategically use digital thinking to consider long-term development issues for the enterprise (Westerman et al., 2014; Cortellazzo et al., 2019; Peng, 2019). There is a lack of systematic analysis of digital leadership in existing research, this study, based on qualitative text analysis, constructs the structural dimensions of digital leadership, addresses the shortcomings of research on digital leadership abilities, and lays the foundation for future empirical research on digital leadership. Furthermore, currently, based on the existing literature, domestic research on the structural dimensions of digital leadership lacks in-depth exploration grounded in actual corporate cases and featuring frontline managers as representative subjects. This study fills this gap and broadens the theoretical boundaries of digital leadership.

Second, the development of digital leadership scale with good reliability and validity provides powerful technical support for empirical research on digital leadership and the development of digital leadership in management practice. The structural dimensions of corporate digital leadership have not been clearly defined in existing literature. Although some scholars have made initial explorations of the dimensions of digital leadership in the public sector, there are significant differences between enterprise organizations and public sector organizations. Enterprises, as profit-oriented organizations, place more emphasis on continuously adjusting strategies in dynamic and complex environments to achieve survival and development. Therefore, under the impact of emerging digital technologies, enterprise leaders may need different behaviors and capabilities than leaders in the public sector. This study responds to the academic call for developing context-specific digital leadership scales (Li Yanping & Miao Li, 2020). Based on the four-dimensional framework of digital leadership, a 20-item measurement scale was developed. A series of reliability and validity tests confirm that the scale demonstrates strong internal consistency. Compared with existing international digital leadership measurement tools, this study's scale shows several key distinctions: First, the scale development process is more rigorous. Many existing international scales are derived from literature reviews and researchers' subjective judgments, without strictly following standardized scale

development procedures. As a result, some items suffer from overlap in meaning or lack clarity. In contrast, this study follows the principles of theoretical sampling and strictly adheres to coding procedures, while also reporting a range of validation indicators to ensure the reliability and validity of the scale. Second, the scale provides more comprehensive item coverage. Existing measures often focus primarily on how leaders adopt and use digital technologies to enhance leadership effectiveness. However, this study finds that digital leadership is not limited to technical usage; rather, it represents a dynamic combination of digital mindset, behaviors, and capabilities. It also involves enhancing organizational transparency and increasing employee engagement through digital technologies. In particular, leaders need to possess “digital strategic thinking” to guide digital business development and even encourage employees to actively participate in digital transformation. Third, the scale demonstrates stronger cross-cultural applicability. Most existing digital leadership scales are based on observations of Western leadership contexts, creating a mismatch between the origin of the scale and the context in which it is applied. This limits cross-cultural comparison and dialogue. By developing the scale based on Chinese samples, this study provides a more contextually relevant measurement tool for future empirical research on digital leadership in China, and offers greater practical value for organizations seeking to develop digital leadership capabilities.

Third, examining the co-evolution of digital leadership and business development helps to deconstruct the process model of intrapreneurship. During the startup stage, frontline managers leverage their digital strategic thinking and digital executive capability to achieve effective digital resource utilization through the integration of both internal and external digital assets. This foundational stage focuses on establishing the groundwork for digital innovation through strategic planning and operational execution. As the organization transitions into the growth stage, leaders harness digital operative management and digital executive capability to drive digitally driven business and implement digital services innovation. During this phase, digital logic takes precedence, guiding the optimization of operational processes and enhancement of innovation capacity to propel comprehensive digital transformation. At the expansion stage, leaders employ digital orchestrating and integration and executive capability to drive the growth of digital business and the parallel expansion of multi-platform business. This culminates in establishing an efficient digital organization through dynamic resource orchestration and precise execution, enabling

both operational excellence and business ecosystem diversification.

6.4 Practical Applications and Implications

6.4.1 Practical Significance

The rapid development of the digital economy is profoundly reshaping the cognition, thinking patterns, and management models of traditional enterprise leaders. At present, in order to adapt to the new demands of digital transformation poses unprecedented challenges for traditional leaders. Against this backdrop, conventional single-strategy approaches and leadership methods are no longer sufficient to address the complex and dynamic requirements of digital change. The emergence of digital leadership reflects the adaptation to the new demands of the digital economy era. Based on the above analysis, this study proposes several recommendations for cultivating, developing, and enhancing digital leadership in enterprises:

First, enterprises should prioritize digital leadership development for their survival and development in the digital era. Digital leadership development is a systematic and comprehensive endeavor involving organizational process reengineering, business model transformation, and more. During intrapreneurship within large enterprises, they should pay close attention to critical areas such as digital strategic thinking, digital capability building, and digital culture development, thereby advancing the building and development of digital leadership. Furthermore, enterprise leaders must reassess core issues such as industry positioning, corporate orientation, reconstruction of organizational procedure and values reshaping, to ensure that the development of digital leadership moves forward in synergy with the overall corporate strategy, thereby laying a solid foundation for successful digital transformation.

Second, advancing digital transformation requires prioritizing the cultivation and development of digital leadership.. In the wave of digital transformation, enterprises must maintain an open mindset, embrace the digital era, and seek to become industry frontrunners through sound planning and steady implementation. To this end, firms should design systematic digital leadership learning and training programs that enhance managers' digital literacy and strategic capacity through diverse means. For example, by organizing industry forums, executive training sessions, and cross-sector exchanges, firms can foster digital thinking, broaden digital horizons, and build clear

digital enterprise strategies. Seminars, workshops, and blended online and offline training formats can provide leaders with methodological guidance for formulating digital strategies, enabling them to participate directly in the strategic decision-making process and ensuring the effective implementation of digital initiatives. In addition, firms should conduct systematic communication and education campaigns to help employees thoroughly understand the significance, strategies, and pathways of digital transformation, clarify their roles and responsibilities, and foster a collective effort for digital transformation through broad participation and coordinated advancement.

6.4.2 Analysis of Leadership-Related Concepts

In the course of the literature review, this study also identified the conceptual distinctions between leader development and leadership development, as well as between digital leadership and digital management, highlighting the need for enterprises to distinguish these differences in the practice of digital leadership development and cultivation.

First, the distinction concerns leader development versus leadership development. The Center for Creative Leadership in the United States defines leadership development for leaders differently. The former refers to leadership training for individual learners, which helps them clarify development directions, establish good collaboration relationships, and maintain commitments with other members within the organization. In comparison, the latter has a broader coverage than the former, which refers to leadership training for organizational members. Through training, it guides organizational members to learn the leadership skills needed in collective work situations, including clarifying development directions, establishing collaboration relationships, and maintaining commitments with other members within the organization.

Second, the similarities and differences between digital leadership and digital management. Research shows that the core of digital management is to enhance the ability to complete work tasks, while digital leadership development focuses more on cultivating the ability of leaders to foresee and respond to unknown challenges in the digital economy era (Wen, 2008). The scope of digital leadership development not only includes enhancing the abilities of leaders, but also involves how to better fulfill responsibilities, lead teams, and achieve team goals with the help of digital

technology in the digital economy era. Therefore, digital leadership development has incorporated the development of digital management into it. In the current iteration and updating of digitalization levels, the ways of leadership development have become more diverse in terms of time and space, with more possibilities. From the perspective of digital leadership development, its scope is not only limited to the improvement of individual leadership, but also covers the enhancement of overall organizational capabilities and the optimization development of relationships among members within the organization. The development of digital leadership has a phased characteristic: initially focusing on corporate leaders, then expanding to other members of the organization and their relationships with each other, and finally involving the shaping and building of organizational culture.

It is worth noting that the construction and development of digital leadership require the planned design and implementation of targeted initiatives in order to enhance digital leadership at both the individual and organizational levels. Typically, common development methods include education and training, mentoring, 360-degree feedback, and observational learning in various forms (Day, 2000). However, the improvement of leadership not only relies on theoretical learning but also requires the accumulation of rich practical experience in actual work situations. Therefore, the approach to developing digital leadership should not be limited to traditional methods but should also highlight the four key areas proposed in this study: digital strategic thinking, digital operative management, digital orchestrating and integration, and digital executive capability. By learning, evaluating, and providing feedback in these areas, digital leadership can be more comprehensively enhanced to better adapt to the demands of the digital economy era.

The development of digital leadership should focus on the entire organization, with the core goal of enhancing the collective competency of the organization to address uncertainty and change in the digital economy era. During the development process, it is necessary to use digital social tools to promote internal dialogue and communication within the organization, build consensus, achieve unity, and effectively implement enterprise transformation driven by performance. At the same time, continuously precipitate management experience through digital means, extract excellent management practices, and establish a “training-practice combination” digital learning mechanism and system to achieve the organic combination of experience inheritance and capability enhancement.

The success of a company largely depends on the leaders' attitude and conception towards training activities. The leaders' conception not only determines the training methods they choose, but also has a profound impact on the overall organization. In digital leadership training, leaders need to first clearly present the teaching philosophy related to digital leadership. Based on this, leaders should create a positive environment and atmosphere during the training process and daily work, and promote the improvement of learning effects through continuous interaction with students.

6.5 Limitations and Future Research Directions

The conclusions of this study offer significant implications for the supply chain industry in which the case enterprise operates, as well as for its upstream and downstream partners, while also demonstrating broad applicability across other industrial sectors. By selecting a representative enterprise from China's supply chain industry as the case company, this study distilled generalizable insights on the structural dimensions, measurement scale, and function process of digital leadership from concrete empirical observations, thereby explaining the behavioral logic through which frontline managers' digital leadership drives intrapreneurship. These findings provide strong guidance for cultivating and developing digital leadership in relevant detaler enterprises within the same industry. To avoid over-reliance on a specific enterprise context and to ensure the broader applicability of the conclusions, the study primarily adopted the following measures:

First, in terms of the selection of the research field, the integrative characteristics of supply chain management are conducive to enhancing the inclusiveness of the research conclusions. This study takes the management practice of a representative enterprise in China's supply chain as the research object. Supply chain management is the integration of business processes from end user through original suppliers, in order to provide products, services, and information that create value for customers. Supply chain management, as a business philosophy oriented toward value co-creation and collaboration, achieves synergistic effects across the entire chain by managing interdependencies among supply chain members, thereby improving overall competitiveness and efficiency. In other words, starting from the network structure of supply chain member enterprises and focusing on key value-creating activities that

run through the supply chain structure and cut across functions and enterprises, supply chain management establishes the core mechanism of the strategic integration philosophy of the entire enterprise and its partners. From the perspective of enterprise practice, modern supply chain management has gone beyond the limitations of single-point, single-dimension, and single-enterprise operations, incorporating overall value creation across upstream and downstream firms. This gives it distinct cross-contextual and cross-boundary characteristics. Therefore, compared with research on enterprises in specific industries, the integrative characteristics of supply chain management as a research object make its research conclusions more transferable.

Second, in terms of the selection of research samples, the diversity among projects helps to improve the robustness of the research conclusions. Researchers generally believe that the conclusions of multiple-case studies are more generalizable than those of single-case studies. In order to ensure that the research conclusions are more reliable and more generalizable, this study adopted 18 successful intrapreneurship projects promoted by WM Group during its digital transformation as the subjects of observation and analysis. These projects cover multiple fields, including trade industries such as warp-knitted supply chains and automobile sales, manufacturing enterprises such as cables and thermal power, as well as business forms such as supply chain finance. They also include digital transformation projects aimed at improving the internal efficiency of existing businesses, as well as platform-based enterprises positioned to build regional ecosystem-type businesses. That is to say, this study ensured that the conclusions drawn are more reliable through multiple repeated “quasi-experimental” judgments. At the same time, by comparing the subtle differences among these project details, it increased understanding of the diversity of the empirical world.

Therefore, in terms of research field and methodological choices, this study has sought to ensure the transferability and robustness of its conclusions as much as possible. We also have reason to believe that the findings of this study have a certain degree of general applicability to related industries. However, through a comprehensive reflection on the entire text, and considering the importance of enterprise digital transformation and digital leadership for sustainable development in China, the limitations of this study are mainly as follows:

First, theoretical applicability is subject to contextual constraints. From the perspective of case selection, the specific context of WM Group exerts a certain

influence on the research conclusions. At the level of technological adaptation, the embedding of digital tools required alignment with the delegation of decision-making autonomy to the frontline. In promoting digital reform, WM Group proactively adapted to the trend of organizational flattening and carried out a series of empowerment reforms, granting substantial autonomy to the business frontline and creating favorable conditions for the successful advancement of intrapreneurship. At the level of institutional design, WM Group emphasized a fault-tolerant mechanism and an inclusive culture. As a large enterprise operating in a fully competitive field, WM Group established a market-oriented system and performance evaluation philosophy relatively early, demonstrating strong inclusiveness and receptiveness toward emerging matters. Therefore, factors such as digital maturity and organizational culture do have some influence on the research conclusions. Yet, due to research time and conditions, it has not been possible to fully eliminate these implicit variables. In addition, the role of digital leadership in the process of intrapreneurship illustrates the dynamic co-evolution of digital leadership and business function development, but this longitudinal case study still faces constraints of timeliness. Furthermore, this study relies heavily on Western leadership frameworks and insufficiently integrates Chinese contextual factors, such as institutional characteristics and relationship, thereby failing to fully capture the uniqueness of digital leadership within Chinese enterprises.

Second, the possibility of interpretive bias remains. The conclusions of this study are drawn from extensive interviews with respondents, and the use of qualitative text analysis ensures methodological rigor and procedural soundness. However, respondents' evaluations of digital leadership inevitably carry individual subjectivity. Moreover, subjectivity in the grounded coding process may lead to the neglect of certain core categories. The interpretation of textual coding could also be influenced by the researcher's own academic background, leading to potential biases in explanation. Therefore, it is necessary to conduct both reflexive examination of the research process and reflective consideration of interactions with the research subjects. For reflexivity in the research process, the study should clearly document the basis for key decisions, methodological choices, as well as the processes of data collection and analysis. It also requires reflecting on how the researcher's own assumptions, value orientations, and subjective biases may have influenced the findings. For example, this includes considering whether there was any sampling bias in case selection, or

whether the researcher's own experiences and perspectives may have shaped or guided participants' responses during interviews. In terms of interactional reflexivity, it is important to analyze the relationship between the researcher and frontline managers, and to examine how this interaction may have affected the objectivity and authenticity of the results. For instance, one should reflect on whether the researcher's presence during participant observation may have influenced the behaviors and decisions of frontline managers, and how methodological adjustments could be made to minimize such effects.

Third, there is potential bias in sample selection. The case studies are limited to a single supply chain group, lacking cross-industry and cross-organization validation, which may restrict the generalizability of the findings. Among the 18 cases, most of the participants are male frontline managers, indicating insufficient gender diversity and possible sample bias. In addition, the validation sample for the scale is geographically concentrated in Zhejiang Province, which does not fully capture regional differences in digital development and may affect the broader applicability of the scale.

In summary, this study could further benefit from incorporating diverse theoretical perspectives to analyze the formation mechanisms of frontline managers' digital leadership from multiple angles. For example, from a postmodernist perspective, one could question the universality and objectivity of digital leadership, emphasizing its diversity and socially constructed nature across different contexts. From a feminist perspective, attention could be given to the gender discrimination and challenges faced by female frontline managers in developing digital leadership. Based on such critical analysis, more innovative and challenging research conclusions can be proposed to reflect on and extend existing theories and practices. For instance, the formation of digital leadership is not only a matter of individual capability development, but also the result of the interplay of organizational power structures, cultural values, and other contextual factors. Accordingly, enterprises undergoing digital transformation should place greater emphasis on cultivating frontline managers' critical thinking and innovation capabilities to better respond to a rapidly changing market environment.

Future research directions mainly include:

First, in order to further validate the effectiveness of the enterprise digital leadership scale, more empirical studies are needed to test its reliability and validity.

The validity of the scale is gradually verified through a large number of empirical studies, while this study has only completed preliminary empirical tests. Therefore, future research should further verify the effectiveness of the digital leadership scale developed in this study through more extensive empirical investigations, providing a more solid tool foundation for measuring digital leadership. For example, researchers could select three to five representative companies across different industries, such as manufacturing, internet, and service sectors, and conduct participant observation and in-depth interviews with frontline managers. This would allow for capturing their decision-making processes in real scenarios, such as the use of digital tools (e.g., ERP systems and data analytics platforms), cross-department collaboration, and customer responsiveness. For instance, in manufacturing, one could examine how frontline managers use digital twin technologies to optimize production processes, while in platform-based firms, how user data is leveraged to drive product iteration.

Second, in order to better guide the development and cultivation of digital leadership, future research can further explore the relevant variables of digital leadership. This includes improving the impact mechanism of organizational, team, and individual factors on digital leadership, which is also one of the frontier issues in current leadership theory research and management practice. By deeply researching these antecedents, more targeted digital leadership development strategies can be provided to enterprises. In addition, longitudinal studies could be conducted by tracking frontline managers over a period of six to twelve months. Through regular interviews and psychometric assessments, researchers can analyze how their cognition of digital technologies evolves in practice, including aspects such as technology acceptance and the formation of digital mindsets.

Finally, regarding the impact of digital leadership, future research can further explore the impact mechanism of digital leadership on aspects such as organizational performance, innovation performance, employee job performance. This includes exploring the mediating variables and moderating variables in the impact mechanism, and determining their boundary conditions. Through these studies, the impact pathways and boundaries of digital leadership on organizations, teams, and individuals can be more comprehensively and detailedly explained, providing deeper theoretical support and practical guidance for the digital transformation of enterprises.

References

- [1] Adeyeye, J. O., Falola, H. O., Waribo, J. Y., and Akinbode, J. O. (2015) The effects of apprenticeship system on skill development of employees in the printing industry in Lagos State, Nigeria. *British Journal of Economics*, (10), p. 2.
- [2] Albannai NA, Raziq MM, Malik M, Scott-Kennel J, Igoe J (2025). Unraveling the role of digital leadership in developing digital dynamic capabilities for the digital transformation of firms. *Benchmarking: An International Journal*, Vol. 32 No. 6 pp. 2250-2275.
- [3] Alireza Feyzbakhsh, S., Sadeghi, R., and Shoraka, S. (2008) A case study of intrapreneurship obstacles: The RAJA passenger train company. *Journal of Small Business and Entrepreneurship*, 21(2), pp. 171-180.
- [4] Åmo, B. W. (2010) Corporate entrepreneurship and intrapreneurship related to innovation behaviour among employees. *International Journal of Entrepreneurial Venturing*, 2(2), pp. 144-158.
- [5] Åmo, B. W., and Kolvereid, L. (2005) Organizational strategy, individual personality and innovation behavior. *Journal of Enterprising Culture*, 13(01), pp. 7-19.
- [6] Amit S. Mukherjee. *Leadership in the Digital Age: The Transformation of Leadership Under the Influence of Technology* [M]. Trans. Ma Xufei & Li Changxia. Hangzhou: Zhejiang University Press, 2023.
- [7] André Hanelt, René Bohnsack, Marz, D., and Antunes, C. (2021) A systematic review of the literature on digital transformation: insights and implications for strategy and organizational change. *Journal of Management Studies*.
- [8] Antoncic, B., and Hisrich, R. D. (2001) Intrapreneurship: Construct refinement and cross-cultural validation. *Journal of Business Venturing*, 16(5), pp. 495-527.
- [9] Antoncic, B., and Hisrich, R. D. (2003) Clarifying the intrapreneurship concept. *Journal of Small Business and Enterprise Development*, 10(1), pp. 7-24.

- [10] Antoncic, B., and Hisrich, R. D. (2004) Corporate entrepreneurship contingencies and organizational wealth creation. *Journal of Management Development*, 23(6), pp. 518-550.
- [11] April, K., and Dalwai, A. (2019) Leadership styles required to lead digital transformation. *Effective Executive*, 22(2), pp. 14-45.
- [12] Ardi, Djati, S.P., Bernarto, I., Sudibjo, N., Yulianeu, A., A. Nanda, H., and A. Nanda, K. (2020) The Relationship Between Digital Transformational Leadership Styles and Knowledge-Based Empowering Interaction for Increasing Organisational Innovativeness.
- [13] Avolio B J, Kahai S, and Dodge G E. (2000) E-leadership: Implications for theory, research, and practice, *The Leadership Quarterly*, (4), pp. 615-668.
- [14] Avolio, B. J., and Kahai, S. S. (2003) Adding the “E” to E-Leadership: How it may impact your leadership. *Organizational Dynamics*, 31(4), pp. 325–338.
- [15] Avolio, B. J., and Kahai, S. S. (2003) Adding the “E” to E-leadership: How it may impact your leadership. *Organizational dynamics*, 31(4), pp. 325-338.
- [16] Avolio, B. J., Sosik, J. J., Kahai, S. S., and Baker, B. (2014) E-leadership: Re-examining transformations in leadership source and transmission. *The Leadership Quarterly*, 25(1), pp. 105-131.
- [17] Badguerahanian, L., and Abetti, P. A. (1995) The rise and fall of the Merlin-Gerin Foundry Business: A case study in French corporate entrepreneurship. *Journal of Business Venturing*, 10(6), pp. 477-493.
- [18] Baruah, B., and Ward, A. (2015) Metamorphosis of intrapreneurship as an effective organizational strategy. *International entrepreneurship and management journal*, (11), pp. 811-822.
- [19] Basuki, Y. T., Arief, M., and Propheto, A. (2015) The role of leadership, dynamic capabilities, and organization culture, in company performance of manufacturing industries in indonesia (study in food and beverages industries). *Advanced Science Letters*, 21(5), pp. 1141-1145.

- [20] Belitski, M., and Liversage, B. (2019) E-Leadership in Small and Medium-Sized Enterprises in the Developing World. *Technology Innovation Management Review*, 9(1), pp. 64-74.
- [21] Benitez, J., Arenas, A., Castillo, A., and Esteves, J. (2022) Impact of digital leadership capability on innovation performance: the role of platform digitization capability. *Information and management* (2), p. 59.
- [22] Berman, S., and Korsten, P. (2014) Leading in the connected era. *Strategy and Leadership*, 42(1), pp. 37-46.
- [23] Bicknell, A., Francis-Smythe, J., and Arthur, J. (2010) Knowledge transfer: de-constructing the entrepreneurial academic. *International Journal of Entrepreneurial Behavior and Research*, 16(6), pp. 485-501.
- [24] Bjornali, E. S., and Anne Støren, L. (2012) Examining competence factors that encourage innovative behaviour by European higher education graduate professionals. *Journal of Small Business and Enterprise Development*, 19(3), pp. 402-423.
- [25] Blanka, C. (2019) An individual-level perspective on intrapreneurship: a review and ways forward. *Review of Managerial Science*, 13(5), pp. 919-961.
- [26] Bongiorno, G., Rizzo, D., and Vaia, G. (2018) CIOs and the digital transformation: a new leadership role. In *CIOs and the Digital Transformation* pp. 1-9. Springer, Cham.
- [27] Bouchard, V., and Basso, O. (2011) Exploring the links between entrepreneurial orientation and intrapreneurship in SMEs. *Journal of Small Business and Enterprise Development*, 18(2), pp. 219-231.
- [28] Braf E, Melin U. (2020) Leadership in a digital era—Is “digital leadership” a buzzword or a significant phenomenon? Association for Information Systems. 11th Scandinavian Conference on Information Systems. Sundsvall, Sweden, pp. 1-15.
- [29] Bryman, A. and Bell, E. (2015) *Business Research Methods*. Oxford: Oxford University.

- [30] Burgelman, R. A. (1983) A process model of internal corporate venturing in the diversified major firm. *Administrative science quarterly*, pp. 223-244.
- [31] Camelo-Ordaz, C., Fernández-Alles, M., Ruiz-Navarro, J., and Sousa-Ginel, E. (2012) The intrapreneur and innovation in creative firms. *International Small Business Journal*, 30(5), pp. 513-535.
- [32] Carrier, C. (1996) Intrapreneurship in small businesses: an exploratory study. *Entrepreneurship Theory and Practice*, 21(1), pp. 5-20.
- [33] Charlton, R. (2019) Person-Group Fit Moderating the Transformational Leadership Contextual Performance Relationship. *Academy of Management Proceedings*.
- [34] Chen, D., Wang, L., and Chen, A. (2020) Digitization and Strategic Management Theory: Retrospect, Challenges, and Prospects. *Management World*, 36(5), p. 17.
- [35] Choi, Y.G.; Cho, K.T. (2020) Analysis of Safety Management Characteristics Using Network Analysis of CEO Messages in the Construction Industry. *Sustainability*, (12), p. 5771.
- [36] Corbett, A., Covin, J. G., O'Connor, G. C., and Tucci, C. L. (2013) Corporate entrepreneurship: State-of-the-art research and a future research agenda. *Journal of Product Innovation Management*, 30(5), pp. 812-820.
- [37] Cortellazzo, L., Bruni, E., and Zampieri, R. (2019) The Role of Leadership in a Digitalized World: A Review. *Frontiers in psychology*, (10), p. 1938.
- [38] Covin, J. G., and Miles, M. P. (1999) Corporate entrepreneurship and the pursuit of competitive advantage. *Entrepreneurship theory and practice*, 23(3), pp. 47-63.
- [39] Damayanti, F.P. and Mirfani, A.M. (2020) An analysis of digital leadership in the pandemic Covid-19 era. The 4th International Conference on Research of Educational Administration and Management.
- [40] Day, C. (2000) Effective Leadership and Reflective Practice. *Reflective Practice*, 1(1), pp. 113–127.
- [41] Dewi, R.K., and Sjabadhyni, B. (2021) Digital Leadership as a Resource to

Enhance Managers' Psychological Well-Being in COVID-19 Pandemic Situation in Indonesia. *The South East Asian Journal of Management*, (2), pp. 154-168.

[42] Douglas, E. J., and Fitzsimmons, J. R. (2013) Intrapreneurial intentions versus entrepreneurial intentions: distinct constructs with different antecedents. *Small business economics*, 41, pp. 115-132.

[43] Drucker, P. F., and Noel, J. L. (1986) Innovation and Entrepreneurship: Practices and Principles. *The Journal of Continuing Higher Education*, 34(1), pp. 22-23.

[44] Duan, K. (2020) Dimension characteristics and improvement path of leadership in the digital age. *Leadership Science*, (16), pp. 60-62.

[45] Duan, K. (2020) Dimensions, characteristics, and enhancement paths of leadership in the digital age. *Leadership Science*, (16), pp. 60-62.

[46] Eberl, J. K., and Drews, P. (2021) Digital Leadership-Mountain or Molehill? *A Literature Review*, pp. 223-237.

[47] Edú Valsania, S., Moriano, J. A., and Molero, F. (2016) Authentic leadership and intrapreneurial behavior: cross-level analysis of the mediator effect of organizational identification and empowerment. *International Entrepreneurship and Management Journal*, 12(1), pp. 131-152.

[48] Erhan, T., Uzunbacak, H.H. and Aydin, E. (2022) From conventional to digital leadership: exploring digitalization of leadership and innovative work behavior. *Management Research Review*, 45(11), pp. 1524-1543.

[49] Fan, S., Yu, Z. and Qiu, D. (2022) University teachers' digital leadership model construction and its validation. *Heilongjiang Researches on Higher Education*, .40(6), pp. 91-100.

[50] Fang, Y. (2019) Digital leadership. Shanghai: Orient Publishing Center.

[51] Fang, Y. (2019) Digital Leadership. Shanghai: Orient Publishing Center.

[52] Farrukh, M., Chong, W. Y., Mansori, S., and Ramzani, S. R. (2017) Intrapreneurial behaviour: the role of organizational commitment. *World Journal of Entrepreneurship, Management and Sustainable Development*, 13(3), pp. 243-256.

- [53] Frank, A.G., Mendes, G.H.S., Ayala, N.F., and Ghezzi, A. (2019) Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technol. Forecast. Soc. Chang*, 141, pp. 341-351.
- [54] Gardner, W. L., Lowe, K. B., Moss, T. W., Mahoney, K. T., and Coglisier, C. C. (2010) Scholarly leadership of the study of leadership: A review of *The Leadership Quarterly's* second decade, 2000–2009. *The Leadership Quarterly*, 21(6), pp. 922-958.
- [55] Gartner, W. B. (1988) “Who is an entrepreneur?” is the wrong question. *American journal of small business*, 12(4), pp. 11-32.
- [56] Gawke, J. C., Gorgievski, M. J., and Bakker, A. B. (2017) Employee intrapreneurship and work engagement: A latent change score approach. *Journal of Vocational Behavior*, 100, pp. 88-100.
- [57] Gioia, D. A., Corley, K. G., and Hamilton, A. L. (2013) Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational research methods*, 16(1), pp. 15-31.
- [58] Globocnik, D., and Salomo, S. (2015) Do formal management practices impact the emergence of bootlegging behavior?. *Journal of Product Innovation Management*, 32(4), pp. 505-521.
- [59] Grant, A. M. (2012) Leading with Meaning: Beneficiary Contact, Prosocial Impact, and the Performance Effects of Transformational Leadership. *Academy of Management journal*, 55(2), pp. 458-476.
- [60] Guerrero, M., and Peña-Legazkue, I. (2013) The effect of intrapreneurial experience on corporate venturing: Evidence from developed economies. *International Entrepreneurship and Management Journal*, 9(3), pp. 397-416.
- [61] Guth, W. D., and Ginsberg, A. (1990) Guest editors' introduction: Corporate entrepreneurship. *Strategic management journal*, pp. 5-15.
- [62] Gwynne, P., and Wolff, M. F. (2005) Introducing women to intrapreneurial thinking. *Research Technology Management*, 48(4).

- [63] Hagedorn, R. A., and Jamieson, D. W. (2014) Intrapreneurial sensemaking: the case of a reenvisioned school of professional studies. *International Journal of Entrepreneurship and Innovation Management*, 18(5-6), pp. 425-437.
- [64] Hamzah, N.H., Nasir, M.K.M. and Wahab, J.A. (2021) The effects of principals' digital leadership on teachers' digital teaching during the Covid-19 pandemic in Malaysia. *Journal of Education and E-Learning Research*, 8(2), pp.216-221.
- [65] Havermans, L. A., Den Hartog, D. N., Keegan, A., and Uhl-Bien, M. (2015) Exploring the role of leadership in enabling contextual ambidexterity. *Human Resource Management*, 54(1), pp. 179-200.
- [66] He A. (2022) The digital Silk Road and China's influence on standard setting. Waterloo: *CIGI Papers*, pp. 1-20.
- [67] Hornsby, J. S., Kuratko, D. F., Holt, D. T., and Wales, W. J. (2013) Assessing a measurement of organizational preparedness for corporate entrepreneurship. *Journal of Product Innovation Management*, 30(5), pp. 937-955.
- [68] Huang, R., and Hu, H. (2012) Informational Leadership and School Informatization Construction. *Open Education Research*, 18(05), pp. 11-17.
- [69] Huo, G., Meng, J., and Liu, S. (2008) A Review of Research on Informatized Leadership. *Management Review*, (04), pp. 31-38+24+64.
- [70] Imran, F., Shahzad, K., Butt, A. and Kantola, J. (2020) Leadership competencies for digital transformation: evidence from multiple cases. International Conference on Applied Human Factors and Ergonomics, pp. 81-87.
- [71] Ireland, R. D., Hitt, M. A., and Sirmon, D. G. (2003) A model of strategic entrepreneurship: The construct and its dimensions. *Journal of management*, 29(6), pp. 963-989.
- [72] Jäckli, U., and Meier, C. (2020) Leadership in the digital age: its dimensions and actual state in Swiss companies. *International Journal of Management and Enterprise Development*, (4), pp. 293-312.
- [73] Jagadisen, M.S., Salamzadeh, Y., Farzad, F.S., Salamzadeh, A. and Palalic, R.

- (2022) Digital leadership and organizational capabilities in manufacturing industry: a study in Malaysian context. *Periodicals of Engineering and Natural Sciences*, 10(1), pp. 195-211.
- [74] Jameson, J., Rumyantseva, N., Cai, M., Markowski, M., Essex, R. and McNay, I. (2022) A systematic review and framework for digital leadership research maturity in higher education. *Computers and Education Open*, (3), p. 100115.
- [75] Jiang, L. (2011) A Review of Research on Female Leadership. *Journal of China Women's University*, 23(02), pp. 66-72.
- [76] Johnson, K. L., and Wu, C. (2012) Creating entrepreneurial opportunities as a means to maintain entrepreneurial talent in corporations. *Journal of Small Business and Entrepreneurship*, 25(3), pp. 327-348.
- [77] Ju, Y. (2021) Digital leadership matrix and its improvement path in the digital era. *Leadership Science*, (8), pp. 47-50.
- [78] Kahai, S. S., Sosik, J. J., and Avolio, B. J. (2004) Effects of participative and directive leadership in electronic groups. *Group and Organization Management*, 29(1), pp. 67-105.
- [79] Kahai, S., Avolio, B. J., and Sosik, J. J. (2017) E-leadership. In G. Hertel, D. L. Stone, R. D. Johnson, and J. Passmore (Eds.). *The Wiley Blackwell handbook of the psychology of the Internet at work*. Wiley Blackwell, pp. 285–314.
- [80] Kane, G. C., Palmer, D., Philips Nguyen, A., Kiron, D., and Buckley, N. (2015) Strategy, Not Technology, Drives Digital Transformation.
- [81] Kane, G.C., Phillips, A.N., Copulsky, J.R., and Andrus, G.R. (2019) How digital leadership is(n't) different. *MIT Sloan Management Review*, 60, pp. 34-39.
- [82] Karakose, T., Polat, H., Papadakis, S. (2021) Examining Teachers' Perspectives on School Principals' Digital Leadership Roles and Technology Capabilities during the COVID-19 Pandemic. *Sustainability*, 13, p. 13448.
- [83] Karippur, N. K., and Balaramachandran, P. R. (2022) Antecedents of Effective Digital Leadership of Enterprises in Asia Pacific. *Australasian Journal of Information*

Systems, 26.

[84] Kearney, C., and Meynhardt, T. (2016) Directing corporate entrepreneurship strategy in the public sector to public value: Antecedents, components, and outcomes. *International Public Management Journal*, 19(4), pp. 543-572.

[85] Kirby, D. A. (2006) Creating entrepreneurial universities in the UK: Applying entrepreneurship theory to practice. *The Journal of Technology Transfer*, 31, pp. 599-603.

[86] Kraft, M.H. (2019) How to lead with digital media effectively? A literature-based analysis of media in a E-leadership context. *Journal of Economic Development, Environment and People*, 8, pp. 42-53.

[87] Kreutzer, R. T., Neugebauer, T., and Pattloch, A. (2018) Digital Business Leadership: Digital Transformation, Business Model Innovation, Agile Organization, Change Management. Berlin: Springer, p. 263.

[88] Kulshreshtha, K., and Sharma, G. (2021) Understanding e-leadership: please mind the gap. *Technological Forecasting and Social Change*, 168(6), p. 120750.

[89] Kuratko, D. F., Ireland, R. D., Covin, J. G., and Hornsby, J. S. (2005) A model of middle-level managers' entrepreneurial behavior. *Entrepreneurship theory and practice*, 29(6), pp. 699-716.

[90] Kuratko, D. F., Montagno, R. V., and Hornsby, J. S. (1990) Developing an intrapreneurial assessment instrument for an effective corporate entrepreneurial environment. *Strategic management journal*, pp. 49-58.

[91] Larjovuori, R. L., Bordi, L., and Heikkilä-Tammi, K. (2018) Leadership in the digital business transformation. In Proceedings of the 22nd International Academic Mindtrek Conference, pp. 212-221.

[92] Larjovuori, R. L., Bordi, L., Mäkinen, J. P., and Heikkilä-Tammi, K. (2016) The role of leadership and employee well-being in organizational digitalization. *Tiziana Russo Spena and Cristina Mele*, p. 1159.

- [93] Larson, L., and DeChurch, L. A. (2020) Leading teams in the digital age: Four perspectives on technology and what they mean for leading teams. *The leadership quarterly*, 31(1), p. 101377.
- [94] Li F. (2023) The future of the Digital Silk Road is promising. *Economic Daily*, (05).
- [95] Li, W., Liu, K., Belitski, M., Ghobadian, A., and O'Regan, N. (2016) E-leadership through strategic alignment: an empirical study of small-and medium-sized enterprises in the digital age. *Journal of Information Technology*, 31(2), pp. 185-206.
- [96] Li, Y. and Miao, L. (2020) The structural dimensions of enterprise digital leadership and its impact-a study of grounded theory in the Chinese context. *Wuhan University Journal (Philosophy and Social Sciences)*.
- [97] Li, Y., and Miao, L. (2020) Structural dimensions and impacts of enterprise digital leadership: A grounded theory study based on the Chinese context. *Wuhan University Journal(Philosophy and Social Sciences)*, 73(6), pp. 125-136.
- [98] Li, Z., Yang C., and Cheng, Y. (2024) The mechanism of the effect of digital leadership on employees' proactive change behavior: A chain mediating model]. *Soft Science*, 39(02), pp. 131-137.
- [99] Liu, C., Ready, D., Roman, A., Van Wart, M., Wang, X., McCarthy, A. and Kim, S. (2018) E-leadership: an empirical study of organizational leaders' virtual communication adoption. *Leadership and Organization Development Journal*, 39(7), pp. 826-843.
- [100] Liu, X., and Yang, D. (2015) The construction and functioning mechanism of corporate values management system: A case study of A.O. Smith Company. *Chinese Journal of Management*, 12(09), pp. 1273-1285.
- [101] Liu, X., Sun, J., and Zhou, Y. (2011) The contingency effect mechanism of transformational/transactional leadership on team innovation performance: The moderating role of team emotional atmosphere. *Chinese Journal of Management*, 8(06), pp. 857-864.

- [102] Liu, Z., and Yan, S. (2015) The development, challenges, and countermeasures of enterprise electronic leadership. *Leadership Science*, (26), pp. 44-47.
- [103] Liu, Z., Yan, S., and Jiang, H.(2018) The influence of electronic leadership on employee engagement: The mediating role of organizational support. *Soft Science*, 32(07), pp. 65-69.
- [104] Lynn Pulley, M. and Sessa, V.I. (2001) E-leadership: tackling complex challenges. *Industrial and Commercial Training*, 33(6), pp. 225-230.
- [105] Ma, L. (2022) Structure and dimensions of digital leadership. *Seeker*, (06), pp. 100-110.
- [106] Magesa, M.M., and Jonathan, J. (2021) Conceptualizing digital leadership characteristics for successful digital transformation: the case of Tanzania. *Information Technology for Development*, 28, pp. 777-796.
- [107] Mao, J. (2020) Using structured data analysis methods for rigorous qualitative research - A summary of the China Enterprise Management Case and Qualitative Research Forum. *Management World*, 36(03), pp. 221-227.
- [108] Martiarena, A. (2013) What's so entrepreneurial about intrapreneurs?. *Small Business Economics*, 40, pp. 27-39.
- [109] Meng, L. (2020) Public Sector Digital Leadership: Literature Review and Research Prospects. *E-government*, (02), pp. 100-110.
- [110] Menzel, H. C., Aaltio, I., and Ulijn, J. M. (2007) On the way to creativity: Engineers as intrapreneurs in organizations. *Technovation*, 27(12), pp. 732-743.
- [111] Mihardjo, D. L. W. W. (2019) The influence of digital leadership on innovation management based on dynamic capability: Market orientation as a moderator. *Management Science Letters*, (7), pp. 1059-1070.
- [112] Mihardjo, L.W., and Rukmana, R.A. (2018) Does Digital Leadership Impact Directly or Indirectly on Dynamic Capability: Case on Indonesia Telecommunication Industry in Digital Transformation? *The Journal of Social Sciences Research*, 2, pp. 832-841.

- [113] Miller, D. (1983) The correlates of entrepreneurship in three types of firms. *Management science*, 29(7), pp. 770-791.
- [114] Moriano, J. A., Molero, F., Topa, G., and Lévy Mangin, J. P. (2014) The influence of transformational leadership and organizational identification on intrapreneurship. *International entrepreneurship and management journal*, 10, pp. 103-119.
- [115] Morris, M. H., Webb, J. W., and Franklin, R. J. (2011) Understanding the manifestation of entrepreneurial orientation in the nonprofit context. *Entrepreneurship theory and practice*, 35(5), pp. 947-971.
- [116] Mustajab, D., Bauw, A., Irawan, A., Rasyid, A., Akbar, M.A., and Hamid, M.A. (2020) Covid-19 Pandemic: What are the Challenges and Opportunities for e-Leadership? *Fiscaoeconomia*, 4(2), pp. 483-497.
- [117] Neessen, P. C., Caniëls, M. C., Vos, B., and De Jong, J. P. (2019) The intrapreneurial employee: toward an integrated model of intrapreneurship and research agenda. *International Entrepreneurship and Management Journal*, 15, pp. 545-571.
- [118] O'reilly, C. A., and Tushman, M. L. (2013) Organizational ambidexterity: Past, Present, and future. *Academy of Management Perspectives*, 27(4), pp. 324-338.
- [119] Oberer, B. and Erkollar, A. (2018) Leadership 4.0: digital leaders in the age of industry 4.0. *International Journal of Organizational Leadership*, (4), pp. 404-412.
- [120] Parker, S. C. (2011) Intrapreneurship or entrepreneurship?. *Journal of business venturing*, 26(1), pp. 19-34.
- [121] Peng, J. (2019) Digitization: Not only a technological transformation but also a revolution in thinking. *Chinese and Foreign Corporate Culture*, (01), pp. 12-21.
- [122] Peterson, R. A., and Berger, D. G. (1971) Entrepreneurship in organizations: Evidence from the popular music industry. *Administrative science quarterly*, pp. 97-106.
- [123] Philip, J., Gilli, K., and Knappstein, M. (2023) Identifying key leadership

competencies for digital transformation: Evidence from a cross-sectoral Delphi study of global managers. *Leadership and Organization Development Journal*, 44(3), pp. 392-406.

[124] Philippart, M. H. (2021) Success factors to deliver organizational digital transformation: A framework for transformation leadership. *Journal of Global Information Management (JGIM)*, 30(8), pp. 1-17.

[125] Pinchot, G., and Pellman, R. (1999) *Intrapreneuring in action: A handbook for business innovation*. Berrett-Koehler Publishers.

[126] Pinocht III, G. (1985) Intrapreneuring-why you don't have to leave the corporation to become an entrepreneur. *New York*.

[127] Promsri, D.C. (2019) Developing model of digital leadership for a successful digital transformation. *International Journal of Business Management*, 2(8), pp. 1-8.

[128] Pulley, M. L., Sessa, V., and Malloy, M. (2002) E-Leadership: A Two-Pronged Idea. *T+ D*, 56(3), pp. 34-44.

[129] Qihai C., Wu, J., Wu, T., Chang, P., and Mardani, A. (2024) The impact of digital leadership on hidden champions' competitive advantage: A moderated mediation model of ambidextrous innovation and value co-creation. *Journal of Business Research*.

[130] Reference News. (2019) Foreign media commentary: "Digital Silk Road" brings new development opportunities to Asia. *Reference News*, 2019-05-02(10).

[131] Rigtering, J. C., and Weitzel, U. (2013) Work context and employee behavior as antecedents for intrapreneurship. *International Entrepreneurship and Management Journal*, 9, pp. 337-360.

[132] Roman, A. V., Wart, M. V., Wang, X. H., Liu, C., Kim, S., and McCarthy, A. (2019) Defining e-leadership as competence in ICT-mediated communications: an exploratory assessment. *Public Administration Review*, 79(6), pp. 853-866.

[133] Rudito, P. and Sinaga, M.F.N. (2017) *Digital Mastery: Membangun Kepemimpinan Digital Untuk Memenangkan Era Disrupsi*. Jakarta: Gramedia Pustaka Utama.

- [134] Ryan McManus. (2021) The rise of digital leadership. *Dialogue Review*, 12(2), pp. 34-38.
- [135] SAHYAJA C, RAO K. (2018) New leadership in the digital era-A conceptual study on emotional dimensions in relation with intellectual dimensions, *International Journal of Civil Engineering and Technology*, (1), pp. 738-747.
- [136] Santos, F.M. and Eisenhardt, K.M. (2009) Constructing Markets and Shaping Boundaries: Entrepreneurial Power in Nascent Fields. *Academy of Management Journal*, 52, pp. 643-671.
- [137] SAPUTRA N, SAPUTRA A M. (2020) Transforming into digital organization by orchestrating culture, leadership, and competence in digital context. *GATR Global Journal of Business Social Sciences Review*, (4), pp. 208-216.
- [138] Saputra, F. (2021) Leadership, Communication, and Work Motivation in Determining the Success of Professional Organizations, *Journal Law Politic Humanit*, 1, pp. 59-70.
- [139] Saputra, N., Nugroho, R., Aisyah, H. and Karneli, O. (2021) Digital skill during COVID-19: effects of digital leadership and digital collaboration. *Journal Aplikasi Management*, 19(2), pp. 272-281.
- [140] Sasmoko, S., Mihardjo, L.W., Alamsjah, F., and Elidjen, E. (2019) Dynamic capability: The effect of digital leadership on fostering innovation capability based on market orientation. *Management Science Letters*, 9, pp. 1633-1644.
- [141] Schwarzmüller, T., Brosi, P., Duman, D., and Welp, I. M. (2018) How Does the Digital Transformation Affect Organizations? Key Themes of Change in Work Design and Leadership. *Management Review*, 29(2), pp. 114-138.
- [142] Shan Zhiguang, Ma Chaojiang, Xu Qingyuan. Deeply Promote the High-Quality Development of Industry Digitalization and Digital Industrialization[J]. *Economy*, 2025, (09): 26-29.

- [143] Sharma, P., and Chrisman, J. J. (1999) Toward a reconciliation of the definitional issues in the field of corporate entrepreneurship. *Entrepreneurship theory and practice*, 23(3), pp. 11-28.
- [144] Sheshadri C., Ranjan C., Demetris V., and Guido G. (2023) Digital workplace and organization performance: Moderating role of digital leadership capability, *Journal of Innovation and Knowledge*, 8(1), p. 100334
- [145] Shuang Ren, Justin A. DeSimone, Xue Zhang, Wei He, & Xinxin Ma. (2022). Leadership in the digital era: A review of who, what, when, where, and why. *The Leadership Quarterly*.
- [146] Siggelkow, N. (2007) Persuasion with case studies. *Academy of management journal*, 50(1), pp. 20-24.
- [147] Siggelkow, N., (2007) Persuasion with Case Studies. *Academy of Management Journal*, 50(1), pp.20-24.
- [148] Sinha, N., and Srivastava, K. B. (2013) Association of personality, work values and socio-cultural factors with intrapreneurial orientation. *The Journal of Entrepreneurship*, 22(1), pp. 97-113.
- [149] Solymossy, E., and Gross, A. (2015) Taking the engineering path to business leadership and entrepreneurial success in Canada and USA. *International Entrepreneurship and Management Journal*, 11, pp. 393-408.
- [150] Somerville, M.M. (2013) Digital Age Discoverability: A Collaborative Organizational Approach. *Serials Review*, 39, pp. 234-239.
- [151] Strauss, A., and Corbin, J. (1998) Basics of qualitative research techniques.
- [152] Su, F., Cheng, D., and Wen, S. (2019) Multilevel Impacts of Transformational Leadership on Service Quality: Evidence From China. *Frontiers in psychology*, 10, p. 1252.
- [153] Sutton, R. (2010) What every new generation of bosses has to learn. *HBR Blog Network*, 9.

- [154] Teng, B. S. (2007) Corporate entrepreneurship activities through strategic alliances: A resource-based approach toward competitive advantage. *Journal of Management studies*, 44(1), pp. 119-142.
- [155] The People's Republic of China. (2020) Global Initiative on Data Security. *China Information Security*, (9), pp. 8-9.
- [156] The State Council of the People's Republic of China. (2016) The 13th Five-year Plan of the People's Republic of China on National Economic and Social Development. Beijing: *People's Publishing House*, pp. 15-18.
- [157] Tian, H., Sun, M., and Wang, L. (2023) How does digital leadership promote green innovation in enterprises? A SEM and fsQCA study. *Science and Technology Progress and Countermeasures*, (8), pp. 54-65.
- [158] Torre, T., and Sarti, D. (2020) The "Way" Toward E-leadership: Some Evidence From the Field. *Frontiers in psychology*, (11), pp. 33-89, 554253.
- [159] Urbano, D., and Turró, A. (2013) Conditioning factors for corporate entrepreneurship: an in (ex) ternal approach. *International entrepreneurship and management journal*, 9, pp. 379-396.
- [160] van Knippenberg, D., Dahlander, L., Haas, M. R., and George, G. (2015) Information, attention, and decision-making [Editorial]. *Academy of Management Journal*, 58(3), pp. 649–657.
- [161] Van Wart, M., Roman, A., Wang, X. and Liu, C. (2019) Operationalizing the definition of e-leadership: identifying the elements of e-leadership. *International Review of Administrative Sciences*, 85(1), pp. 80-97.
- [162] Vesper, K. H. (1984) Three faces of corporate entrepreneurship: A pilot study. Seattle: University of Washington, Graduate School of Business.
- [163] Von Hippel, E. (1977) Successful and failing internal corporate ventures: An empirical analysis. *Industrial Marketing Management*, 6(3), pp. 163-174.

- [164] Wakkee, I., Elfring, T., and Monaghan, S. (2010) Creating entrepreneurial employees in traditional service sectors: The role of coaching and self-efficacy. *International Entrepreneurship and Management Journal*, 6, pp. 1-21.
- [165] Wang, X. (2016) China's Internet has entered the "second half". *China Economic Information*, (15), pp. 56-57.
- [166] Warner, K.S. and Waeger, M. (2019) Building dynamic capabilities for digital transformation: an ongoing process of strategic renewal. *Long Range Planning*, 52(3), pp. 326-349.
- [167] Wart, M. V., Roman, A., Wang, X. H., Liu, C., Klenk, T., and Reiter, R. (2019) Operationalizing the definition of e-leadership: identifying the elements of e-leadership: *International Review of Administrative Sciences*, 85(1), pp. 80-97.
- [168] Wart, M.V., Roman, A., Wang, X., and Liu, C. (2017). Integrating ICT adoption issues into (e-)leadership theory. *Telematics Informatics*, 34, pp. 527-537.
- [169] Wasono, L.W., and Furinto, A. (2018) The effect of digital leadership and innovation management for incumbent telecommunication company in the digital disruptive era. *International journal of engineering and technology*, 7, pp. 125-130.
- [170] Weber, E., Buettgen, M., and Bartsch, S. (2022) How to take employees on the digital transformation journey: an experimental study on complementary leadership behaviors in managing organizational change. *Journal of business research*, 143(4), pp. 225-238.
- [171] Wen, H. (2021) The urgent need for digital leadership in the era of the digital economy. *Chinese Leadership Science*, (01), pp. 106-111.
- [172] Wen, M., and Ruan, P. (2008) Selection of Leadership Development Program Content: An Analysis Based on the Application of Leadership Competencies Model by Global Leading Organizations. *Journal of Pudong Cadre Institute of Administration*, 2(06), pp. 86-92.
- [173] Westerman G, Bonnet D, and McAfee A. (2014) Leading Digital: Turning Technology into Business Transformation.

- [174] Westerman, G., Tannou, M., Bonnet, D., Ferraris, P., and McAfee, A. (2012) The digital advantage: How digital leaders outperform their peers in every industry. MIT Sloan Management and Capgemini Consulting.
- [175] Widodo, W., and YUSUF, F. A. (2021) The Effect of Organizational Citizenship and Visionary Leadership on Contextual Performance: A Case Study in Indonesia. *The Journal of Asian Finance, Economics and Business*, 8(6), pp. 377-386.
- [176] Williamson, J. M., Lounsbury, J. W., and Han, L. D. (2013) Key personality traits of engineers for innovation and technology development. *Journal of Engineering and Technology Management*, 30(2), pp. 157-168.
- [177] Xie, P., Ma, L., and Wei, Y., et al. (2023) Digitized Leadership and Organizational Innovation: The Roles of Digital Platform Capability and Environmental Competitiveness. *Research on Economics and Management*, 44(01), pp. 129-144.
- [178] Xie, X., Zuo, Y., and Hu, Q. (2021) Human Resource Management in the Digital Era: A Perspective of Human-Technology Interaction. *Management World*, 37(1), pp. 200-216.
- [179] Xu, A. (2010) A Study on Enterprise Transformation Based on Entrepreneurial Capabilities: A Case of Zhejiang Merchants. *Management World*, (6), p. 2.
- [180] Xu, J., and Zeng, Z. (2013) Digital Commerce Revolution. *IT Manager World*, (11), pp. 98-99.
- [181] Xu Mingxia, Yan Xiangzhe. Research on Digital Leadership of Leading Enterprises in the Industrial Chain[J]. *Enterprise Management*, 2026, (02): 111-114.
- [182] Xue, H., and Zhang Y. (2003) A Review of Company Entrepreneurship Research: New Developments in Foreign Entrepreneurship Research. *Foreign Economics and Management*, 25(11), pp. 7-11.
- [183] Yao Meifang, Liu Guannan. A Study on the Influence Mechanism of Digital Leadership on Entrepreneurial Performance[J]. *Social Science Front*, 2026, (02): 250-257.
- [184] Yao, Q., Tang, H., Liu, Y. and Boadu, F. (2023) The penetration effect of digital leadership on digital transformation: the role of digital strategy consensus and

- diversity types. *Journal of Enterprise Information Management*, 37(3), pp. 903-927.
- [185] Yin, R. K. (2013) Case Study Research: Design and Methods. Thousand Oaks: Sage Publications.
- [186] Yiu, D. W., and Lau, C. M. (2008) Corporate entrepreneurship as resource capital configuration in emerging market firms. *Entrepreneurship Theory and practice*, 32(1), pp. 37-57.
- [187] Zahra, S. A. (1991) Predictors and financial outcomes of corporate entrepreneurship: An exploratory study. *Journal of business venturing*, 6(4), pp. 259-285.
- [188] Zahra, S. A. (1993) A conceptual model of entrepreneurship as firm behavior: A critique and extension. *Entrepreneurship theory and practice*, 17(4), pp. 5-21.
- [189] Zahra, S. A. (1993) Environment, corporate entrepreneurship, and financial performance: A taxonomic approach. *Journal of business venturing*, 8(4), pp. 319-340.
- [190] Zahra, S. A., Filatotchev, I., and Wright, M. (2009) How do threshold firms sustain corporate entrepreneurship? The role of boards and absorptive capacity. *Journal of business venturing*, 24(3), pp. 248-260.
- [191] Zeike, S., Bradbury, K., Lindert, L., and Pfaff, H. (2019) Digital Leadership Skills and Associations with Psychological Well-Being. *International journal of environmental research and public health*, 16(14), p. 2628.
- [192] Zhang B. Driving factors for digital transformation of leadership in the AI era: research based on technology acceptance model[J]. *Information and Communications Technology and Policy*, 2026, 52(1): 59-67.
- [193] Zhang Y. (2020) China Unicom and Huawei launch joint innovation of 5G indoor distributed Massive MIMO solution. *Global Times*, (07).
- [194] Zhang, L. (2018) From the Information Technology Era to the Data Technology Era. *Informatization Construction*, (4), pp. 60-60.
- [195] Zhao, Y., Cheng, S., and Liu, D., et al. (2024) Cognitive Flexibility, Digital Leadership, and Enterprise Digital Transformation. *Studies in Science of Science*,

42(11), pp. 2387-2396.

[196] Zheng, X., and Liu, C. (2020) Empathetic Leadership-A New Challenge for Intelligent Organizational Management in the Digital Era. *Tsinghua Business Review*, (06), pp. 12-19.

[197] Zhou, H., Li, Z., and Li, Z. (2024) Configuration effect research on innovation performance of state-owned platform-type enterprises under the digital background. *Science and Technology Progress and Policy*, pp. 1-10.

[198] Zhu, H., Djurjagina, K., and Leker, J. (2014) Innovative behavior types and their influence on individual crowdsourcing performances. *International Journal of Innovation Management*, 18(06), p. 1440015.

[199] Zhu, J., Zhang, B., Xie, M., and Cao, Q. (2022) Digital Leadership and Employee Creativity: The Role of Employee Job Crafting and Person-Organization Fit. *Frontiers in psychology*, 13, p. 827057.