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Analysis of the Current Situation and Problems of Digital Transformation of Micro, Small and Medium Enterprises in the Context of Digital Economy

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Abstract

Against the backdrop of the digital economy's rapid evolution, the digital transformation of small and medium-sized enterprises (SMEs)—a pivotal driver of China's economic growth, employment stability, and GDP contribution—has emerged as an imperative agenda. This study employs a questionnaire-based methodology to examine the current landscape and inherent challenges pertaining to the digital transformation of SMEs in China. The survey instrument encompasses 11 items, addressing domains such as operational and managerial bottlenecks, the deployment of digital technologies, assessments of digital transformation efficacy, and the underlying rationales for pursuing such transformation, upon which the research framework is constructed. The empirical findings indicate that Chinese SMEs generally suffer from inadequate cognition of digital transformation, underdeveloped foundational capacities, and multifaceted impediments. Specifically, during the course of digital transformation, SMEs encounter critical challenges including prohibitive costs, ill-defined strategic pathways, and talent scarcity. Moreover, significant heterogeneities across different categories of SMEs exacerbate the complexity of their digital transformation endeavors. In light of these observations, this paper puts forward a set of policy recommendations from a governmental standpoint, aiming to accelerate the digital transformation of SMEs. These recommendations entail the formulation of a suite of enterprise-oriented policies, the development of intelligent platform ecosystems, the sustained advancement of new infrastructure projects, and the establishment of mechanisms to integrate technological resources and talent supply with SME needs.

Subject Areas

Business Management

Keywords

Digital Transformation, Small and Medium-Sized Enterprises, Digital Technology, Current Problems

1. Introduction

In the context of the digital era, empowering small and medium-sized enterprises (SMEs) through emerging technologies to achieve digital transformation—evolving from an "Internet of Everything" paradigm to an "Intelligence of Everything" ecosystem—represents an inevitable trend driven by digital integration. Digital transformation among China's micro, small, and medium-sized enterprises (MSMEs) is currently characterized by imbalances, inadequacies, and non-standardization. These enterprises generally confront a tripartite predicament: inability to transform ("can't turn"), incapacity to transform ("unable to turn"), and reluctance to transform ("dare not turn"). Additionally, three core issues persist: enterprises operating exclusively offline without an online presence, those with an online presence but lacking offline integration, and those with both online and offline channels but failing to achieve seamless integration. Amid the surging tide of digitalization, digital technologies such as big data, cloud computing, artificial intelligence, blockchain, and quantum technology have been continuously advancing in their development, deployment, and mature application. These advancements have spawned the digital economy as a new economic form, driving the growth of the global digital economy, with China being no exception. According to the *China Internet Development Report* 2019, the scale of China's digital economy reached 31.3 trillion yuan in 2019, accounting for 34.8% of GDP, thereby establishing the digital economy as a new engine for China's economic growth [1]. The report of the 19th National Congress of the Communist Party of China (CPC) proposes the construction of a "Digital China" and advocates for the deep integration of the Internet, big data, and artificial intelligence with the real economy. The Central Committee of the CPC, with Comrade Xi Jinping at its core, attaches great importance to the development of the digital economy [2]. The government work reports of 2017 and 2019 repeatedly emphasized the necessity of advancing the development of the digital economy. The 2020 government work report proposed to continue introducing supportive policies, comprehensively promote the "Internet+" initiative, and foster new competitive edges in the digital economy. According to Accenture's 2018 fiscal year report, the net revenue generated from the company's digital business reached $23 billion, representing a year-on-year growth of 25% and accounting for 60% of its total revenue. A study conducted by the Boston Consulting Group on over 100 enterprises that have implemented digital transformation revealed that, between 2002 and 2016, the efficiency of these enterprises' procedural operations—encompassing business processes, decision-making and approval mechanisms, and business communication—improved by

50% to 350% [3]. Enterprises constitute the cornerstone of economic growth; without their transformation and upgrading, a fundamental shift in the mode of economic development cannot be achieved [4]. Digital transformation represents a pivotal pathway for enterprises to sustain viability and adapt to the evolving times [5]. It follows that, amid the ongoing development of the digital economy, undertaking digital transformation has become an imperative for enterprises. Currently, the proportion of enterprises in China that have embarked on digital transformation stands at approximately 25%, significantly lower than the corresponding figures of 46% in Europe and 54% in the United States [6]. According to the Ministry of Industry and Information Technology, by the end of 2019, the number of small and medium-sized enterprises (SMEs) in China had exceeded 30 million, with individual industrial and commercial households surpassing 70 million. Collectively, these entities contribute over 50% of the nation's tax revenue, more than 60% of GDP, in excess of 70% of technological innovation achievements, and over 80% of employment opportunities. As such, China's SMEs have emerged as a core driver of the contemporary economy and a dominant form of industrial organization that epitomizes the trajectory of socio-economic development [7]. Small and medium-sized enterprises (SMEs) possess distinctive advantages and play an irreplaceable role in multiple dimensions: they contribute significantly to employment expansion, enhance market competition intensity, boost overall economic vitality, and facilitate the construction of a more efficient production system through complementary collaboration with large enterprises [8]. In particular, the global pandemic has exerted a profound impact on numerous industries across most countries [9]. Specifically, over 80% of SMEs have been unable to maintain sufficient liquidity to sustain operations for more than three months [10]. The pandemic has not only directly affected enterprises' revenue in 2020 but also threatened their very survival [11]; notably, the negative impact on SMEs' income has been significantly more severe than that on large enterprises. It can be seen that studying the digital transformation of SMEs has a high marginal contribution to both the production and development of SMEs in the post-epidemic era and the promotion of the development of China's digital economy, which is also a topic worth exploring.

2. Literature Review

While existing literature on digital transformation is extensive, research specifically focusing on the enterprise-level remains relatively scarce. Such studies primarily concentrate on the following dimensions:

1) Advantages of digital transformation: Hu Qing's research indicates that enterprises engaging in digital transformation can positively drive improvements in corporate performance, with internal learning orientation and external network embedding acting as positive moderators in the relationship between digital transformation and performance [12]. Ghosh *et al.* argue that digital transformation facilitates enhancements in operational efficiency, which in turn strengthens mar-

ket position and influence by improving product or service quality and boosting consumer satisfaction [13]. Li Haichuan, Tan Songtao, and their colleagues suggest that enterprises can effectively reduce costs through the implementation of digital transformation initiatives [14] [15]. He Fan and Liu Hongxia contend that physical enterprises undertaking digital transformation can achieve performance improvement objectives through pathways such as cost reduction, efficiency enhancement, and innovation [16].

2) Digital technology as a key enabler of digital transformation Huang Qunhui *et al.* argue that information technology, and digital technology in particular, constitutes a pivotal factor in enterprises' digital transformation [17]. Pagani and Pardo propose that the application of next-generation digital technologies facilitates the transformation of information structures toward timeliness, continuity, and fine-tuning, thereby enabling enterprises to truly transition into the digital era [18].

Furthermore, Qi Yudong and Xiao Xu argue that the digital economy has precipitated shifts in corporate management. Within the context of the digital economy, they identify two fundamental drivers of such managerial changes: the primacy of user value and competitive substitution [19]. Ying Qiu and Zhouming Guo note that the digital economy enables SMEs to move up the value chain; however, due to their inability to bear the high fixed costs associated with value chain participation and their lack of core technologies, SMEs are prone to becoming trapped in the low end of digitization-driven production networks as their integration into the value chain deepens [20]. Wang Shubai and Zhang Yong argue that the digital transformation of foreign trade enterprises should not be reduced to merely establishing a digital technology department to boost profitability. Instead, it entails leveraging digital technologies to realize intelligent manufacturing, enhance brand communication, facilitate intra-industry data integration and sharing, and achieve in-depth integration with extra-industry resources. Ultimately, this process aims to accomplish an enterprise transformation characterized by digital technology as its foundation, innovation as its driver, and customers as its center [21].

Exploring the nexus between the digital economy and enterprises constitutes a research topic of profound contemporary significance. Nevertheless, dedicated scholarly attention to the digital transformation of small and medium-sized enterprises (SMEs) remains limited—particularly in terms of empirical investigation and analysis of the current state of digital technology application among SMEs. Given that SMEs serve as a cornerstone of China's economic development, and their need for digital transformation has become even more pressing amid the ongoing pandemic, investigating the digital transformation of SMEs holds substantial practical relevance and academic merit.

3. Research Instrumentation

This study employs a web-based survey method to analyze the challenges confronting small and medium-sized enterprises (SMEs) in China during their digital

transformation. The analysis leverages government datasets and findings from domain experts. Based on the current landscape, the research proposes targeted solutions. Empirical data reveal the multidimensional barriers hindering SME digitalization. The proposed solutions integrate policy innovations with practical technology implementation strategies. This research provides a decision-making reference for government bodies formulating targeted support policies.

3.1. The Current Situation of Digital Transformation of Small and Medium-Sized Enterprises

In the current market landscape, shrinking order volumes, rising operational costs, diminishing customer acquisition capabilities, and declining operational efficiency have emerged as the "four critical constraints" impeding the high-quality development of small and medium-sized enterprises (SMEs). Survey data reveals that 89% of SMEs remain in the exploratory phase of digital transformation, 8% are in the practical implementation phase, and a mere 3% have advanced to the stage of deep digital application.

3.1.1. Digital Transformation Stage

China's digital transformation of small and medium-sized enterprises (SMEs) remains in its nascent stage. Data indicate that in 2020, fewer than one-third (approximately 32.9%) of SMEs had implemented digital transformation strategies, while 40.0% lacked any such plans at that stage, and 18.6% were merely in the planning phase of initiating digital transformation. Further data reveal that by 2021, the proportion of SMEs with implemented digital transformation strategies had risen to 44.8%, representing an 11.9 percentage point increase from 2020, yet still remaining below 50%. Drawing on the aforementioned data, it is evident that China's SMEs have made positive strides in digital transformation: a growing number of enterprises have developed transformation awareness and commenced substantive investments and actionable explorations in this domain. However, overall, the digital transformation of China's SMEs is still in its early stages.

The proportion of digital transformation of small and medium-sized enterprises in the information industry and industry is at the forefront of the sub-industry, different industries due to the development of different foundations, technical requirements, the process of digital transformation of their enterprises and the development trend is different, and the degree of digital transformation between the industries is more pronounced imbalance phenomenon. Specifically, the digital transformation level of the information transmission, software and information technology services industry and the industry is in the forefront, and the proportion of digital transformation of small and medium-sized enterprises in the above industries is over 40%. The proportion of digital transformation of SMEs in agriculture, forestry, animal husbandry and fisheries is in the middle, and the proportion of digital transformation of SMEs in accommodation, public utilities and real estate is at a lower level (see **Figure 1**) (the data were sourced from the official government website).

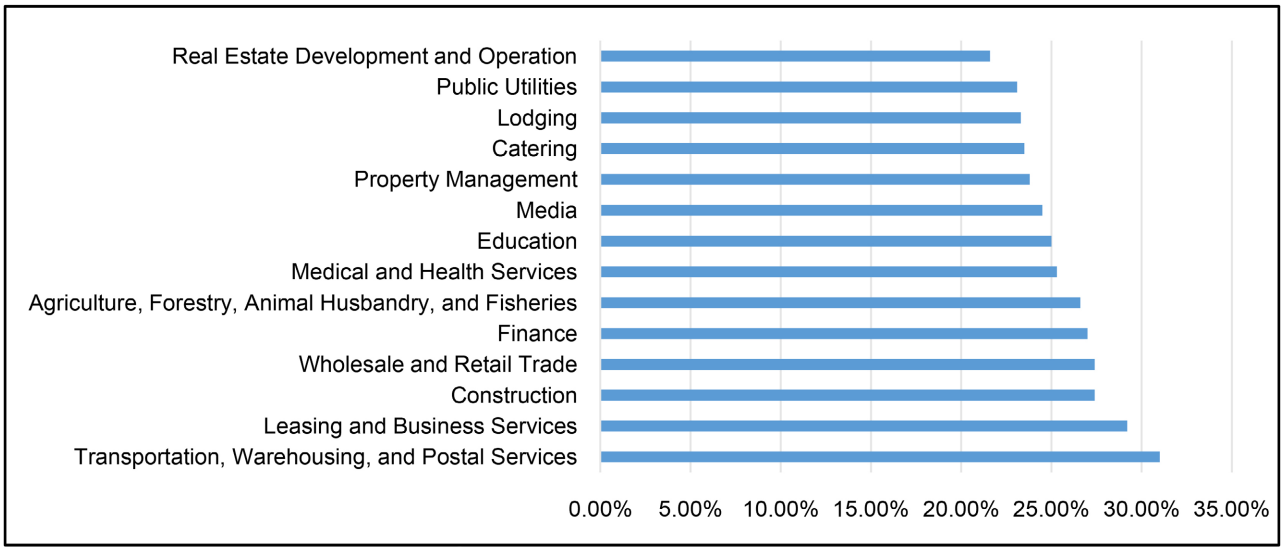

Figure 1. Industry breakdown of digital adoption.

3.1.2. First-Tier Cities and Urban Agglomerations such as the Yangtze River Delta and the Pearl River Delta Stand as Pioneering Regions in Driving the Digital Transformation of SMEs

1) Digital transformation of SMEs in different regions

Sub-regionally, the digital transformation of China's small and medium-sized enterprises (SMEs) exhibits a gradient of diminishing advancement from east to west. Specifically, the eastern region boasts the highest proportion of SMEs engaged in digital transformation, followed by the central region, then the northeastern region, with the western region ranking the lowest, at 37.2%, 33.7%, 29.6%, and 28.3% respectively.

The significant disparity in the proportion of digitally transforming SMEs between the eastern and western regions stems from a confluence of factors. For the western region, underdeveloped digital infrastructure and an inadequate system for cultivating digital skills are key constraints impeding its digital development. For instance, data indicate that rural broadband subscribers in the western region account for 25.9% of the national total, compared to 45.9% in the eastern region. Additionally, information asymmetry, a depleted talent pool, and technological backwardness have placed the western region at a disadvantage in harnessing the digital dividend.

2) Digital transformation of SMEs in five major city clusters

Data indicate that the proportion of small and medium-sized enterprises (SMEs) undergoing digital transformation in the three major urban agglomerations—the Yangtze River Delta, Pearl River Delta, and Beijing-Tianjin-Hebei—exceeds the national average. Specifically, the Yangtze River Delta leads with the highest proportion (43.0%), followed by the Pearl River Delta (40.1%), while the Beijing-Tianjin-Hebei region ranks the lowest among the three at 37.4%. In contrast, the proportions of digitally transforming SMEs in the Chengdu-Chongqing urban agglomeration and the urban cluster in the middle reaches of the Yangtze River are

below the national average, standing at 34.6% and 31.0% respectively.

The remarkable performance of SMEs' digital transformation in the Yangtze River Delta, Pearl River Delta, and Beijing-Tianjin-Hebei urban agglomerations can be attributed to several factors: these regions boast mature and efficient markets, well-developed and comprehensive infrastructure, and abundant reserves of digital talent. Additionally, their robust local manufacturing, trade, and Internet industries provide inherent advantages for digital transformation, collectively contributing to the high level of digitalization among SMEs in these areas.

3) Digital transformation of SMEs in first-tier cities

The author further examined the digital transformation of SMEs in 16 first-tier cities, including Beijing, Shanghai, and Guangzhou. Data reveal that seven of these cities—Hangzhou, Shenzhen, Guangzhou, Ningbo, Shanghai, Beijing, and Suzhou—have seen over 40% of their SMEs undergoing digital transformation. Among them, Hangzhou, Shenzhen, and Guangzhou lead with the highest proportions, at 47.2%, 46.0%, and 44.0% respectively. In contrast, Hefei, Changsha, and Tianjin exhibit relatively lower proportions, standing at 29.7%, 28.6%, and 25.7% respectively (see Figure 2) (the data were sourced from the official government website).

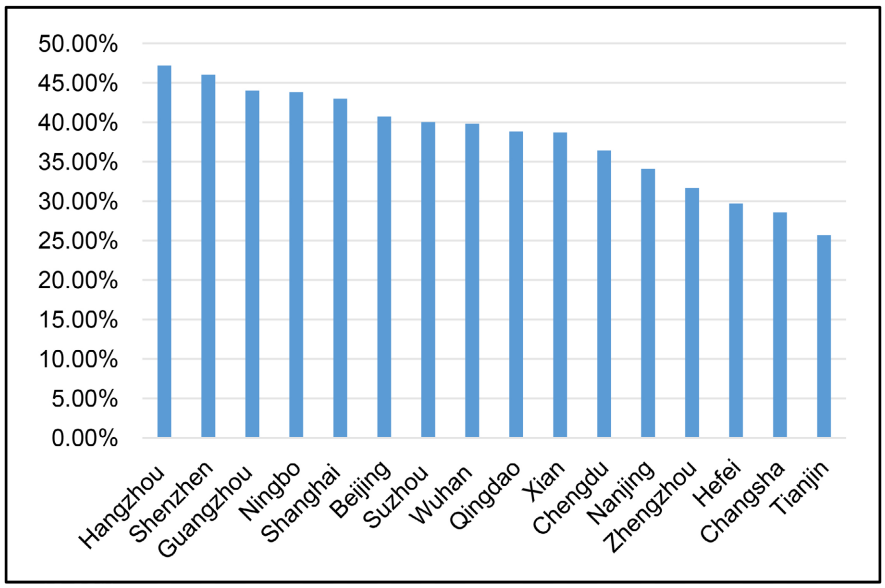

Figure 2. SME digital maturity levels in major Chinese cities (Tier-1).

Overall, first-tier cities in the eastern coastal region demonstrate distinct advantages in their digital economy foundations and high potential for digital transformation, emerging as pivotal leaders in driving SMEs' digital development. With the continuous optimization of the digital economy ecosystem, the increasingly refined digital talent cultivation systems, and the growing support for digital technologies, the digital transformation of SMEs in these first-tier cities has entered a "fast lane".

4) Business status

55.12% of SMEs perceive intense market competition pressure as their most significant challenge. Secondly, 33.17% of SMEs face pressures related to enterprise transformation and upgrading. Additionally, 27.81% encounter issues with technological innovation, while 27.32% grapple with human capital pressures such as difficulties in recruitment and employment. These factors collectively represent the primary types of pressures prevalent in the current management of SMEs.

3.2. Analysis of Digital Transformation Problems of SMEs

3.2.1. Insufficient Cognition of Digital Transformation in SMEs

Constrained by limitations in their own strategic awareness, knowledge reserves, and management capabilities, SMEs exhibit a lack of awareness regarding digital transformation. Beyond a superficial understanding of the concept itself, they possess even weaker awareness of its advantages and necessity, and remain unfamiliar with specific measures and implementation pathways for digital transformation. As noted earlier, over half of SMEs—both in the total sample and across various sub-samples—perceive digital transformation as ineffective in alleviating operational pressures. This underscores a significant lack of motivation among SMEs to pursue digital transformation.

In terms of current progress, more than half of enterprises have yet to embark on digital transformation, reflecting their inadequate understanding and weak willingness to engage in such efforts. Whether stemming from cognitive gaps or flawed conceptualization of digital transformation, these issues have become the primary obstacles to SMEs' digital transformation. Failure to address these cognitive and conceptual barriers will make it even harder for SMEs to proactively initiate or successfully complete their digital transformation journeys.

3.2.2. Weak Foundation of Digital Transformation of SMEs

Based on the above data, the overall baseline level of digital transformation among China's SMEs remains relatively low. Approximately a quarter of SMEs do not utilize any digital technologies, and this proportion is even higher across certain enterprise categories. SMEs rarely adopt advanced digital technologies such as 5G, blockchain, 3D printing, and cloud computing—with 5G technology, in particular, failing to achieve widespread adoption despite being a core driver of the digital economy.

The digitalization level of most Chinese SMEs is often confined to basic informatization, such as the automation of office systems for word processing, financial management, and human resource management. In contrast, the penetration rates of enterprise cloud services, digital meetings, and data resource collection remain low among SMEs.

General Secretary Xi Jinping has emphasized, "*We must build a digital economy with data as a key factor of production*"—a vision that also underpinned China's 2020 "New Infrastructure" strategy. However, due to insufficient infra-

structure for digital transformation, Chinese SMEs lack the necessary foundation for informatization applications. This not only restricts the supply of core digital technologies but also exacerbates difficulties in data collection for SMEs, making it impossible to advance their digital transformation through industrial chain integration or cross-industry collaboration.

The obstacles to the digital transformation of small and medium-sized enterprises are large.

As previously noted, SMEs are more prone to perceiving pressures such as market competition, technological innovation challenges, and the need for enterprise transformation and upgrading. Due to their inherent disadvantages and vulnerabilities, SMEs face significant drawbacks in pursuing digital transformation; hasty digitalization efforts will inevitably increase their costs, exacerbating their predicaments. To sustain survival and development, most SMEs allocate the majority of their funds to market development and raw material procurement, which constrains their investment in digital transformation. These factors collectively constitute obstacles to SMEs' digital transformation.

The sudden outbreak of the global pandemic in 2020 posed a severe test for SMEs. The epidemic triggered a sharp decline in orders and a bleak market outlook for SMEs, severely disrupting their production and development. Even after the epidemic was effectively contained, the primary goal of SMEs remained to emerge from distress and secure survival, making digital transformation appear less critical and urgent.

3.2.3. Differences in the Types of SMEs Increase the Difficulty of Transformation

Heterogeneity in digital transformation needs across SME types. As noted earlier, significant disparities exist among different types of SMEs—categorised by region, industry, development stage, and sector type—in their performance across key dimensions: operational and management challenges, understanding of digital transformation, application of digital technologies, and drivers of transformation. In other words, diverse SME types exhibit distinct needs and perceptions regarding digital transformation.

This heterogeneity inherently precludes a one-size-fits-all approach to digital transformation for SMEs. When advancing transformation efforts or formulating relevant measures, strategies must be tailored to specific SME types, which invariably amplifies the complexity of driving digital transformation among SMEs.

3.2.4. Internal Problems of Enterprises

1) Insufficient digital knowledge reserves among management and employees

Enterprise digital transformation is a systematic project that requires full commitment from management, and its success depends, to some extent, on managers' digital knowledge reserves. Survey data indicate that 58% of transforming enterprises recognize the irreplaceable role of enterprise managers in driving digital transformation [1]. However, in the process of SMEs advancing digital transfor-

mation in depth, issues such as inadequate digital knowledge among top management and employees often arise, which hinder the smooth progress of transformation.

Firstly, the lack of digital knowledge among SME managers makes it difficult for them to effectively select digital products and services and apply digital tools, leading to a tendency to blindly follow trends. With the iterative innovation of emerging digital technologies such as "cloud computing, IoT, big data, AI, and blockchain", a constant stream of digital tools and solutions has emerged. Some SMEs follow trends by purchasing these new digital tools while ignoring their practical application value to the enterprise, ultimately damaging corporate profits.

Secondly, although some SMEs have integrated digital technologies into their business operations, management's lack of awareness regarding data-driven decision-making has resulted in insufficient in-depth application of digital tools, interdepartmental information barriers, "data silos", and weak capabilities in leveraging digital insights to drive business decisions.

Thirdly, the success of enterprise digital transformation is closely linked to employees' level of digital knowledge. Digital transformation involves all aspects of operations and entails the transformation of all elements and links in enterprise activities—from formulating digital strategies to implementing them on the ground. Every link may involve the reorganization of relationships between "people", and between "people and machines", requiring all employees to possess appropriate digital knowledge to better respond to the challenges of digital.

2) Unclear transformation path and lack of long-term strategic planning

Lack of clear strategic planning for digital transformation. The absence of clear strategic planning for digital transformation constitutes a key obstacle hindering SMEs' digital transformation efforts. Data reveal that approximately 60% of enterprises plan to increase digital investments and pursue transformation; however, over 80% have not yet clarified how to effectively integrate digital technologies into their business operations to expand revenue streams and enhance productivity.

In reality, formulating a clear transformation strategy is a critical step for SMEs embarking on digital transformation. Enterprises need to address questions such as: What practical problems can be solved through digital transformation? Which aspects of digital transformation should be prioritized? What are the specific implementation steps? Unfortunately, SMEs often face vague and complex demands for digital transformation, while there are relatively few successful, replicable, and scalable cases of SME digital transformation to reference. This predicament leaves some SMEs struggling to define their positioning in digital transformation, let alone clarify the direction or implementation pathways, resulting in stagnation—a phenomenon referred to as SMEs' "inability to transform".

Additionally, SMEs may encounter a "reluctance to transform". Specifically, digital transformation typically requires substantial initial investment, with high risks and uncertainties inherent in the implementation process. If SMEs lack a thorough understanding of the importance and necessity of digital transfor-

mation, or lack the experience and knowledge to plan and execute transformation strategies, they will hesitate and stall in their digital transformation efforts.

3.3. Suggestions for Countermeasures for SMEs' Digital Transformation

SMEs inherently face multiple disadvantages, including challenges such as difficulties in implementing digital transformation and an inability to achieve transformation. If SMEs take the initiative to pursue digital transformation on their own, they will encounter issues such as elevated transformation risks and a sharp increase in transformation pressures. As research data indicate, the government can introduce a series of policies and measures across various dimensions to encourage and facilitate SMEs in accelerating their digital transformation.

3.3.1. Supporting SMEs in Accelerating Digital Transformation through Business-Friendly Policies

Against the backdrop of the pandemic, to expedite the relief and recovery of small and medium-sized enterprises (SMEs), the state has introduced a series of business-friendly policies to support and accelerate their digital transformation. For instance, on April 10, 2020, the National Development and Reform Commission (NDRC) and the Cyberspace Administration of China (CAC) jointly issued the *Implementation Plan for Promoting the "Cloud-Enabled and Smart-Empowered" Initiative to Foster the Development of the New Economy*. On July 24, 2020, seventeen government departments jointly released the *Opinions on Improving the Support System for the Development of Small and Medium-Sized Enterprises*. These national-level preferential policies not only provide policy dividends for SMEs' digital transformation but also lay out a top-level design for their digital transformation efforts.

Furthermore, relevant central and local government ministries and commissions should promptly formulate support measures for digital transformation that align with the needs of SMEs across different sectors, with distinct characteristics, industries, and regions. Attention should be paid not only to policy formulation but also to the effective implementation of these support measures.

3.3.2. Improve SME Digital Infrastructure by Promoting New Infrastructure

The cornerstone of digital transformation lies in the development of digital infrastructure, as a robust digital infrastructure directly shapes the functional capabilities and application prospects of SMEs' digitalization efforts. General Secretary Xi Jinping has emphasized the need to accelerate the construction of new infrastructure, such as 5G networks and data centers. This initiative presents significant opportunities for the growth of China's digital economy and the advancement of SMEs' digital transformation. The development of new infrastructure should encompass not only "hard" infrastructure like 5G networks and data centers but also the establishment of a high-standard market system to strengthen the "soft" foundation of new infrastructure. By strategically deploying and enhancing

both "hard" and "soft" infrastructure, we can advance the digital technology infrastructure required for SMEs' digital transformation. Special attention should be paid to 5G-enabled industrial internet, as well as infrastructure for industrial internet and consumer internet, thereby providing a fundamental guarantee for enterprises' digital transformation.

3.3.3. Build Bridges between Technology and Talent, and Take Multiple Measures to Supplement the Short Board of Technology and Talent

The policy demands of SMEs regarding digital transformation reflect a critical shortage of digital transformation talent. Such talent not only includes computer-related professionals but also those proficient in enterprise management. Additionally, SMEs face a scarcity of talent at all levels of digital transformation. Policy demands also highlight SMEs' needs for digital technologies. It is a common reality for Chinese SMEs to be disadvantaged in attracting and cultivating digital transformation talent, coupled with insufficient investment in technological R&D.

To address these issues, a technology-sharing mechanism can be established. Research institutions can realize technology sharing through various forms such as co-founding new R&D institutions with enterprises, establishing joint laboratories, and undertaking contracted R&D projects. Meanwhile, research institutions should be encouraged to commercialize their technological achievements through diverse channels.

In terms of talent attraction and cultivation, beyond strengthening industry-academia-research collaboration between research institutions and enterprises to foster talent, efforts should be made to actively explore multi-stakeholder talent development models involving the government, research institutions, universities, and enterprises. Examples include targeted training, zero-hour work arrangements, weekend/holiday work schemes, and project-based learning (learning through practice rather than mere instruction).

3.3.4. Relying on the Platform Capability of Leading Enterprises to Realize Digital Empowerment

Industry leaders and leading enterprises should take the initiative to build digital industrial platforms, establish mechanisms for promoting and sharing digital transformation experiences, and develop a set of replicable and scalable digital transformation solutions. They should also be encouraged to lead industrial clusters in conducting networked collaboration, create new models for data interoperability, equipment sharing, and capacity collaboration, effectively synergize with and deeply empower small and medium-sized enterprises (SMEs), and compensate for SMEs' shortcomings in resources and capabilities.

Once digital industrial platforms led by leading enterprises are established, SMEs can, on one hand, leverage these platforms to integrate into the ecosystem of core enterprises, strengthen interconnection and collaboration, and achieve collaborative transformation among large, medium, and small enterprises. On the other hand, they can adopt the digital transformation solutions provided by in-

dustry leaders to access SaaS products or PaaS services that feature low costs and low demands on internal resources, thereby accelerating the improvement of their own digitalization levels.

3.3.5. Improve Supporting Measures and Strengthen the Digital Talent Team

Enhance the talent cultivation system and refine talent training programs, with a focus on developing interdisciplinary talents who possess both digital technology capabilities and industry-specific expertise, thereby providing talent guarantees for the digital transformation of SMEs.

Firstly, advance talent recruitment to an earlier stage by promoting in-depth school-enterprise collaboration. Implement targeted talent training partnerships between schools and enterprises, and jointly establish industry-academia-research bases. Enterprises can deepen such collaboration through initiatives like building training bases and organizing campus talent recruitment competitions, forming a "talent reservoir" mechanism for digital transformation. This will solidify the foundation of interdisciplinary digital talent teams and meet the needs of SMEs.

Secondly, optimize talent allocation by reasonably matching job competency requirements with talent capabilities. Adjust the allocation of digital talents within enterprises to fully tap into the potential of existing talent and enhance efficiency. Conduct in-depth analyses of the pain points and challenges in enterprise development, define position-specific competency requirements based on digital transformation strategies, and optimize the alignment between these requirements and talent capabilities.

Finally, strive to improve the talent service system by creating "green channels" for digital talents. Focus on addressing the needs of digital talents—particularly high-level digital talents—in areas such as household registration, social security, spousal employment, and children's education. By resolving these concerns, enterprises can fully unlock the value of their talent pool.

Conflicts of Interest

The authors declare no conflicts of interest.

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