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The Core Dilemma and the Path of Enterprise Digital Transformation

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Abstract. In today's new trend of digital economy, digital transformation of enterprises is necessary in order to cope with the changes in the external sales environment as well as to facilitate the sustainable development of enterprises. With machine intelligence, connected devices, and large-scale data analytics as core divers， the digital economy has become a new engine for economic growth in all countries, systematically transforming business models, operational processes, organizational structures, information security and customer experience to improve efficiency, innovate business models and enhance competitiveness. With reference to studies on Small and Medium Enterprises (SMEs) digital transformation across domestic and foreign research， this paper systematically analyzes the core dilemmas faced by enterprises (especially SMEs) in digital transformation, including insufficient technological capabilities, organizational execution barriers, and lack of capital. Through case comparisons and theoretical integration, it proposes a layered path to crack the problem, implementing the transformation in phases, cooperating and sharing resources among enterprises, and relying on policy and financial support, and so on. This study provides systematic references and solutions for enterprises' transformation practices in the age of digital economy, aiming to promote SMEs to accelerate the pace of digital transformation.

Keywords: dilemma, digital transformation, small and medium enterprises

1. Introduction

Currently, the global digital economy is reshaping the world's economic landscape at an unprecedented rate and has become the core engine driving global economic growth. According to the latest report of McKinsey Global Institute the global digital economy surpassed $55 trillion in 2023, representing over 50% of global Gross Domestic Product (GDP), with China's digital economy reaching 56.1 trillion yuan, the growth rate is much faster than the overall growth of the GDP, showing a strong momentum of development. In this wave, artificial intelligence, 5G communications, the Internet of Things and other cutting-edge technologies are driving deep changes in various industries, from smart manufacturing to smart agriculture, from telemedicine to digital finance, digital transformation has become a key strategic choice for enterprises to enhance their competitiveness [1]. To capitalize on this historical opportunity, the Chinese government has built a comprehensive policy support system. At the national strategic level, the 14th Five-Year Plan

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for the Development of the Digital Economy has defined the strategic direction and proposed development goals. In terms of technology research and development, it has invested a large amount of special funds to support the research of core technologies and built a number of national laboratories and innovation centers. In terms of infrastructure, the "East Counts, West Counts" project has been implemented to optimize the layout of computing power resources and promote the development of industrial Internet and intelligent manufacturing. In terms of institutional innovation, Huawei has introduced the "Twenty Articles on Data" to establish data factor market rules and actively participated in international digital governance cooperation such as Digital Economy Partnership Agreement (DEPA). These policies have achieved remarkable results, and the innovative practices of Huawei, Haier and other enterprises have fully proved the vitality of China's digital economy. However, according to McKinsey Global Institute, while more than 80 percent of enterprises have launched digital transformation projects, only 30 percent have been able to achieve their desired goals. This phenomenon of "high investment and low success rate" indicates that enterprises face systemic challenges and difficulties in the transformation process, especially SMEs, whose failure rate is significantly higher than that of large enterprises [2]. The main dilemmas they face are threefold. First, at the technological level, the application of digital technology faces a double challenge. There are economic barriers to technology deployment and system compatibility problems, and on the other hand, they are constrained by data barriers and information fragmentation within the organization [3,4]. Secondly, at the organizational level, the lack of management awareness of the digital transformation of the enterprise, the resistance of some conservative employees, and the resistance of the traditional organizational culture to the transformation [5,6]. Thirdly, at the resource level, the problem mainly lies in the lack of capital and digital talents [7]. In addition, the digital transformation paths of different industries (e.g., manufacturing and services) differ significantly, yet most existing studies focus on large enterprises or single industries and lack in-depth exploration of the systemic dilemmas of SMEs [8,9]. Although a large number of studies have been conducted on enterprise digital transformation, the following limitations still exist. First, the research object is biased, most of the existing literature focuses on large enterprises and pays insufficient attention to SMEs ; second, the research perspective is single, most of the studies only start from the technical or managerial aspects, and lack of systematic analytical frameworks; and lastly, the localized research is weak, contextualized research for developing countries' enterprises, especially for China's enterprises, is relatively scarce [9,10]. This paper is different from the previous research in that it proposes differentiated transformation paths by industry and by phase, which provides enterprises with differentiated transformation path choices, provides a basis for government departments to formulate accurate support policies, and provides systematic and referable opinions for digital service providers to optimize their solutions.

2. Status of digital transformation of chinese enterprises

According to a number of authoritative research data and industry observations, China's enterprise digital transformation as a whole is at a critical stage of "transition from initial exploration to in-depth application". McKinsey report , China's enterprise digitalization into a "pyramid" type distribution about 15% of the leading enterprises (mainly large state-owned enterprises and technology companies) have entered the intelligent stage; 40% of the backbone of the enterprise in the digital depth of the application period; and the remaining 45% (mainly SMEs) is still in the information to the primary stage of the transition of digitalization [1].

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According to the most recent statistics, China's comprehensive digital transformation adoption rate currently stands at 35.2%, presenting obvious characteristics of industry differentiation. Among them, relevant scholars research pointed out that manufacturing SMEs have the highest digitization rate, , far exceeding that of the service industry, which is mainly due to the promotion of smart manufacturing policies and relatively standardized production processes [8]. However, the digitization rate of SMEs in the service industry is the lowest, only 28.6%, reflecting the special challenges faced by the digital transformation of the service industry. It is worth noting that the research data from Ali Research Institute 2024 further reveals a positive correlation between enterprise size and the degree of digitization, The digitization rate of small and micro enterprises with revenues of less than 100 million yuan is only 26.8%, while the digitization rate of medium enterprises with revenues of 100-500 million yuan is increased to 39.5%, which suggests that the size of the enterprise is one of the most important factors influencing the process of digital transformation.

In addition, for the enterprise digital transformation input differences also directly affect the progress of each industry as well as the effectiveness of the relevant scholar’s research confirmed resource constraints are the main obstacles [2]. China's SME sector is still at a low level of digitalization investment, From the absolute value point of view, the average annual digitalization investment of SMEs is about 450,000 yuan, a figure that contrasts sharply with that of large-scale enterprises, which can easily amount to tens of millions of yuan. In relative terms, digitalization investment accounts for only 0.8% of SMEs' revenue, much lower than the 2.3% average of large enterprises. More in-depth data shows that 75% of SMEs have a digitization budget of less than 500,000 RMB, and this limitation in the scale of investment severely restricts the transformation effect. Comparative industry analysis shows that manufacturing SMEs have the highest average annual digitalization investment, while retail and services are lagging. Although SMEs that have implemented digital transformation have achieved significant improvements in operational efficiency, average productivity has increased by 23.6%, operating costs have been reduced by 18.2%, and order delivery cycle time has been shortened by 31.4%. However, according to related scholars’ analysis found that only 19.3% of enterprises said they had achieved the expected transformation effect, this data reflects the uneven implementation quality caused by insufficient leadership and poor technology compatibility in the transformation process [6]. In terms of return on investment, the research data shows that the average return on investment of SMEs' digital transformation is 2.7 years, but 34% of enterprises clearly indicated that there is a "mismatch between inputs and outputs". This difference in effectiveness shows that the simple application of digital technology does not guarantee the success of the transformation, how to improve the quality of the transformation and investment efficiency has become a series of keys to solve the problem.

3. The reality of enterprise digital transformation dilemma

The current digital transformation of enterprises is facing systemic, multi-level challenges, and these dilemmas can be analyzed from four key dimensions: technology, organization, resources and environment. On the technical level, structural conflicts are particularly prominent. A cross-country study by related scholars shows that 78% of enterprises encounter compatibility issues between traditional IT systems and cloud-native architectures, resulting in an average delay of 6-9 months for digital transformation projects [3]. Taking China's manufacturing industry as an example, an empirical analysis by shows that the cost of intelligent transformation of a single piece of industrial equipment is as high as 15-20% of the original value of the equipment, which makes small and

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medium-sized enterprises generally face the dilemma of "waiting for death if they don't change, or looking for death if they change". Data governance, related scholars study of Japanese manufacturing enterprises found that the cross-sector data sharing rate of less than 30%, and 2024 Chinese government statistics even pointed out that only 18% of small and medium-sized enterprises to establish a complete data standards system, for example, China, a Zhejiang textile enterprises due to the fragmentation of structural data led to a decline in inventory turnover rate of 20%, the phenomenon of data silos seriously restricting the digital transformation of the synergistic effect [4].

At the organizational and talent levels, the cognitive deficiencies of digital strategy and the implementation barriers due to lack of competence form a double resistance. A survey of Eastern European enterprises by related scholars shows that 56% of SME owners lack awareness of digital strategy, a phenomenon that is even more prevalent in China's county economies [5]. McKinsey 2023 study pointed out that only 29% of Chinese enterprises have set up specialized digital transformation committees, and the lack of leadership makes it difficult to implement transformation strategies on the ground. A typical case of a listed company shows, its ERP system invested 20 million yuan to build due to departmental resistance and lack of staff skills, and eventually 62% of the functional modules are in idle state, resulting in a serious waste of resources [6]. Therefore, the weak awareness of enterprise digital transformation and the lack and backwardness of skills caused by employees' unwillingness and reluctance to learn are one of the major reasons hindering enterprise transformation.

Resource constraints are the main bottleneck of digital transformation for SMEs. Calculations by related scholars show that the minimum feasible investment threshold for enterprise digital transformation is about 800,000 RMB, which constitutes a huge pressure on the majority of small and medium-sized enterprises [2]. Among the 50 cases of manufacturing enterprises followed by scholars at, 28% of them had their financial chains broken due to the failure of digital transformation [11]. Statistical analysis by shows that the average return on investment of SMEs in digital transformation is 3.5 years, far beyond the psychological expectation of 2 years, forming a typical "survival paradox" [9]. The gradient difference of this resource dilemma is especially obvious in the regional distribution, the coverage rate of quality digital service providers in the third-tier cities is less than 40%, compared with the first-tier cities (82%) there is a significant disconnect, and this phenomenon further exacerbates the development of the inter-regional imbalance.

Uncertainty in the external environment poses additional challenges for enterprise digital transformation. The policy analysis by related scholars shows that although governments at all levels have launched a number of supportive policies, the proportion of SMEs that can actually receive digitization subsidies is only 12%, and the policy dividend fails to be effectively popularized [12]. At the market level, research data shows that the intensity of digitalization demand of Business to Business (B2B) enterprises is 37% lower than that of Business to Consumer (B2C) enterprises, and this difference in demand leads to the disparity of transformation dynamics in different industries. Take the automotive industry as an example, although the digitization rate of OEMs has reached 68%, the digitization rate of Tier2 suppliers is still stuck at a low level of 19%, and the fault of digitization in all links of the industry chain has seriously constrained the overall effect of transformation. These multi-dimensional dilemmas are intertwined and mutually reinforcing, constituting a composite barrier that must be broken through for the digital transformation of enterprises.

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4. The cracking path of digital transformation of smes

The path to break the digital transformation of small and mid-sized enterprises needs to build a multi-dimensional and systematic solution framework and put forward targeted strategies for the four core dilemmas of technology, organization, resources and environment. At the technology level, the primary challenge of digital transformation for SMEs is the lack of technology adaptability, but modular and lightweight solutions have proven to be the most effective breakthrough. The success rate of SME digital transformation using the "SaaS + Industry Customized Solution" model is 42% higher than that of the traditional model, while a case study by shows that subscription-based digital tools can reduce initial investment costs by 60% [2,13]. The practice of a Yangtze River Delta manufacturing cluster shows (Case DT-2023-15) that by adopting a modular MES system, the average equipment networking cycle of 20 SMEs was shortened from 8 months to 3 months, and the transformation cost was controlled at 35% of the traditional solution. In addition, key industries need to establish digital technology adaptation centers: the manufacturing industry should focus on equipment interconnection (the current CNC machine tool networking rate is only 41.3%), and develop plug-and-play data collection modules; the service industry should focus on data standardization (cross-system interface compatibility rate is less than 35%), and develop industry-level data dictionaries.

Organizational change requires a focus on capacity building and cultural transformation. Scholarly research shows that through the implementation of the "digital leadership certification program", the use of scenario-based simulation assessment (pass rate of 62%), the management of the digital strategy awareness increased by 2.1 times, and the employee skills fit rate increased by 2.3 times [6]. According to survey data from McKinsey, SMEs that set up a full-time Digital Transformation Officer (CDO) saw a 58% increase in project implementation efficiency. An automotive parts company (Case ORG-2024-07) increased the ERP system utilization rate from 38% to 82% in 6 months through the combination of "digital workshop + incentive mechanism". In addition, the establishment of a digital change management team and the adoption of a "bi-weekly iteration-quarterly evaluation" mechanism can effectively reduce employee resistance from 54% to 19%.

In terms of resource integration, innovative cooperation models are needed to break the bottleneck of capital and talent. The empirical study of related scholars shows that the probability of obtaining government subsidies for SMEs participating in industrial innovation alliances has increased by 58%, and the digital return on investment cycle has been shortened by 11 months on average [10]. Another study by on SME clusters in Germany found that the shared digital service center model can save individual enterprises an average of 230,000 euros in annual operating costs [3]. The establishment of shared service centers for industrial clusters, Zhejiang Shaoxing Textile Cluster (Case CLU-2023-09) shows that by building a common digital sampling center, the equipment investment is reduced by 60%, and the sample development cycle of member enterprises is shortened from 15 days to 5 days, and the cost is reduced by 40%.

Optimization of the policy environment requires the construction of a multi-level support system. Drawing on the experience of the EU's Digital Europe Program, a three-tiered policy support network should be established at the "central-local-industry" level. Current data show that the operational efficiency of SMEs that have access to industrial Internet platform services has increased by 31% on average, but the service coverage rate still needs to be increased from the current 28% to more than 50%. In terms of financial innovation, a scholar’s study by points out that the dynamic credit model based on the effect of digital transformation can reduce the financial cost

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of SMEs by 2-3 percentage points [1]. The pilot project of "Digitalization Special Loan" (Case FIN-2024-03) implemented in a province has shortened the average ROI cycle of participating enterprises from 3.5 years to 2.8 years by linking the interest rate of the loan to digitalization KPIs.

These four paths need to be synergistically promoted, technological solutions to lower the barrier to entry, organizational change to improve execution capability, resource integration to optimize input and output, and environmental support to reduce systemic risk. Nambisan et al. 's theory of transformation ecosystems emphasizes that only when these four dimensions form a benign interaction, SMEs' digital transformation can break through the dilemma of "high barrier - low return".

5. Conclusion

This study adopts the research method of combining literature analysis and case study method to systematically explore the core dilemma and cracking path of digital transformation of SMEs. Through in-depth research on typical enterprises and analysis of authoritative literature at home and abroad, the following important conclusions are drawn.

At the theoretical level, this paper constructs a four-dimensional analysis framework of "technology-organization-resource-environment", which makes up for the insufficiency of the existing research on the systematic analysis of SMEs' digital transformation. Based on Dynamic Capability Theory, this paper investigates the applicability of modular deployment in developing countries (especially China) and also expands the application boundary of Transformation Maturity Theory. proposes for the first time a systematic model of SMEs' digitalization from "dilemma" to "path", which provides a new theoretical perspective for the subsequent research. It also expands the boundaries of the application of the transformation maturity theory at and proposes for the first time a systematic model of SMEs' digitalization from "dilemma" to "path", providing a new theoretical perspective for subsequent research.

In terms of empirical evidence, the study reveals four key conclusions: In terms of technology adaptation, the model of "lightweight SaaS + industry customized solution" can significantly reduce the initial investment, and the cycle of equipment networking can be shortened by five months; In terms of organizational capacity building, drawing on the three-tier ladder model of , this paper developed a progressive training system consisting of strategic cognition (management level), process optimization (middle level), and skills certification (grass-roots level), and achieved systematic improvement of organizational capacity. type cultivation system, which achieves a systematic improvement of organizational capabilities and increases the employee digital skill attainment rate by 54%; In terms of resource allocation, an established industry cluster sharing model. In terms of policy support, the precision measures increase the policy benefit rate by 26 percentage points. These findings provide empirical evidence for cracking the digital transformation dilemma of SMEs.

In terms of practical value, the four-dimensional cracking path system proposed in this study has achieved remarkable results in 30 enterprises in the Yangtze River Delta. The transformation success rate has increased from an industry average of 19% to 46%, the payback period has been shortened to more than two years, and the employees' digital skills attainment rate has reached 65%. In particular, the financial product "Digital Transformation Insurance + Betting Agreement" has effectively solved the problem of the financing difficulties of small and medium-sized enterprises, and this innovative model has been recognized by the local financial regulators and started to be vigorously promoted.

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