

# Discussion on Digital Transformation of Small and Medium-sized Enterprises in the Post-epidemic Era

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**Abstract:** Driven by digital technology, China's digital economy is developing rapidly, and its position in the economy and society is getting higher and higher. As the main force of China's economy, employment and GDP, SMEs have been greatly impacted by the COVID-19 epidemic. It is of great practical significance to study the digital transformation of SMEs for the relief and development of SMEs after the epidemic and to promote the development of China's digital economy. A questionnaire survey was conducted on the status quo, problems and policy appeals of China's small and medium-sized enterprises' digital transformation. The survey object was the principals of 925 small and medium-sized manufacturing enterprises. The survey questions included 11 issues such as difficulties faced by enterprises in business operation, application of digital technology, effectiveness of digital transformation, and driving factors of digital transformation. On this basis, the study was carried out. The survey results show that SMEs in China generally have problems such as lack of digital transformation thinking, weak digital foundation, and large obstacles to digital transformation. The vulnerability of SMEs themselves and the differences between different types of SMEs increase the difficulty of digital transformation. The classified statistics of SMEs based on different dimensions such as the development stage, location, and scale of enterprises show that there are significant differences between different types of SMEs and the total sample, as well as between different types of SMEs in terms of difficulties faced in operation, effectiveness of digital transformation, status quo of digital transformation, application of digital technology, driving factors of digital transformation, and policy appeals; Meeting market demand, improving production efficiency and significantly reducing costs are the driving factors for SMEs to carry out digital transformation, but there are differences between different types of SMEs. In order to effectively promote the digital transformation of small and medium-sized enterprises in China, it is suggested to give full play to the guidance and policy support of government departments based on the policy demands of small and medium-sized enterprises for digital transformation, accelerate the construction of new infrastructure, and provide more solid digital transformation foundation for small and medium-sized enterprises; Take multiple measures to eliminate the shortage of digital talents, improve and innovate the talent training mechanism, and provide talent support for digital transformation; Build a digital platform and network, build a cross industry and cross link digital collaboration system, open up the digital transformation path of SMEs, and boost their digital transformation and development.

**Keywords:** Small and medium-sized enterprises, Post-epidemic era, Digital economy, Digital transformation, Digital technique.

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## 1. Introduction

By the end of 2021, the national statistical yearbook shows that there are about 48 million small and medium-sized enterprises in China, accounting for about 99% of the total number of enterprises in China, which is the main force of Chinese enterprises [1]. According to the data of the Ministry of Industry and Information Technology of China, SMEs in China contribute more than 50% of taxes, more than 60% of GDP, more than 70% of technological innovation and more than 80% of urban labor employment [2]. It can be seen that small and medium-sized enterprises are the main support for social progress and national economic development, and an important basis for expanding employment capacity and alleviating employment conflicts.

It has been nearly three years since the COVID-19 broke out in December 2019. As of November 30, 2022, the cumulative number of confirmed patients with COVID-19 worldwide has reached about 647.6 million, the number of deaths has exceeded 6.6 million, and there are 69 countries or regions with more than one million confirmed cases of COVID-19 (the population accounts for 77.6% of the world). At the same time, the number of newly diagnosed patients per

day in countries is still rising, and at least 30 countries and regions have more than 1000 new COVID-19 patients per day.

Thanks to scientific and strict prevention and control measures, China was able to quickly control the epidemic and return to work and production earlier, becoming an important force against the trend of growth in the global economic recession caused by the epidemic [3]. At present, the domestic epidemic prevention and control has tended to be normalized, but the epidemic situation is volatile, the virus frequently mutates, and the overseas epidemic situation is still very serious. The overseas import has increased the difficulty of epidemic prevention and control in China, and the epidemic situation has a great negative impact on the survival and development of small and medium-sized enterprises [4].

Digital economy is a new economic form that takes digital knowledge and information as the key production factors, digital technology as the core driving force, and modern information network as the important carrier. Through the deep integration of digital technology and real economy, it constantly improves the level of digitalization, networking and intelligence, and accelerates the reconstruction of economic development and governance mode [5]. In recent years, the "digital economy" has become a hot word in

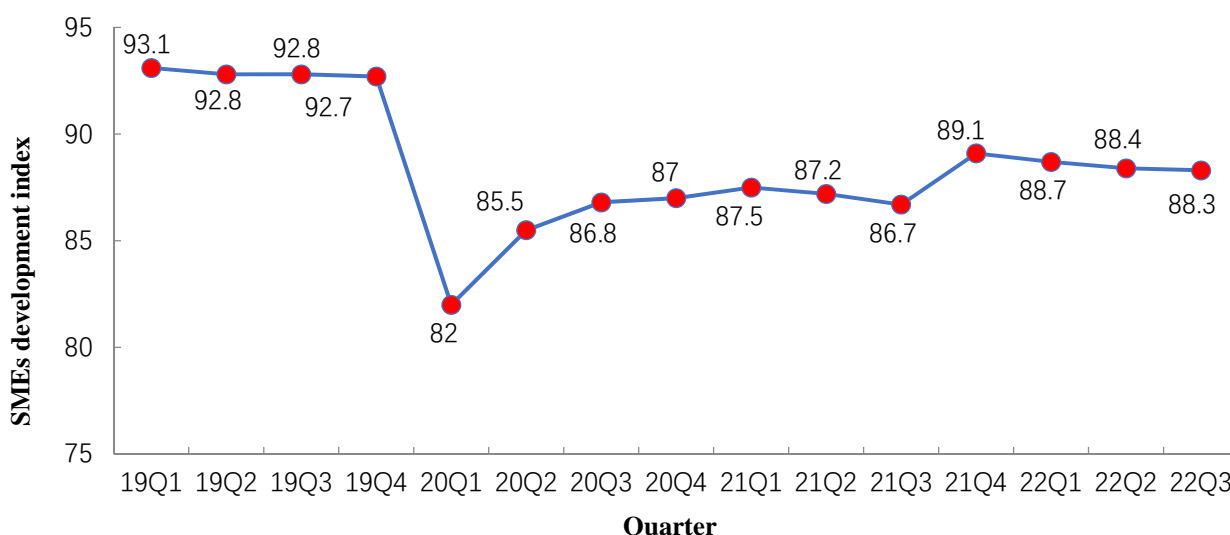
economic activities and social life. The digital economy represented by new technologies such as the Internet, the Internet of Things, big data, artificial intelligence, etc., has burst out huge energy to lead the times in the continuous development, and has highlighted the importance of the digital economy in the process of combating the COVID-19 [6].

Under the pressure of the COVID-19, digital transformation has provided effective support for SMEs to solve the problems of capital shortage, unstable production capacity, personnel shortage, etc., and helped many enterprises overcome difficulties [7]. Digital technology has played a positive role in epidemic prevention and control, and digitalization of the global economy is the trend of the times. As the "fresh force" of the national economy, the digital transformation of SMEs will enter the stage of full implementation, but for most SMEs, the path of digital transformation is not likely to be smooth [8]. In the post epidemic era, the successful completion of digital transformation of SMEs can effectively mitigate the negative impact of the epidemic, which is conducive to the stability of employment, finance, investment, expectations, foreign trade and other aspects, and is conducive to the improvement of long-term economic competitiveness [9]. Studying the digital transformation of SMEs in the context of the current "normalization of epidemic prevention" has important practical significance for the rescue and development of SMEs after the epidemic and promoting the development of China's digital economy.

## 2. The Value of Digital Transformation of SMEs in the Post-epidemic Era

### 2.1. The Epidemic Situation Forces the Digital Transformation of SMEs

The SMEs Development Index (SMEDI) reflects the economic operation of SMEs in China [10]. Taking the SME development index as the analysis object, in order to compare the development of SMEs before and after the epidemic, the time span is set from the first quarter of 2019 to the third quarter of 2022, through the official website of "China Association of SMEs" ( <http://www.ca-sme.org/> ) Acquire the public data, manually collect and further analyze the data, and finally make the data into Figure 1. As shown in Figure 1, the development index of SMEs in China was relatively high and stable in 2019 before the epidemic occurred. Since the outbreak of the epidemic in 2020, China's SME development index has declined precipitously. Although it is slowly recovering, it has not recovered to the level of 2019 by 2022. It can be seen that the epidemic situation has brought great challenges to the survival and development of small and medium-sized enterprises. With the victory of the battle for epidemic prevention and control, under the normalization of epidemic prevention and control, and with the orderly progress of the resumption of work and production, the society is moving towards stable operation, the economy is gradually recovering [11], and the survival crisis of small and medium-sized enterprises has eased, but it has still not recovered to the normal state before the outbreak of the epidemic, and there is still a large gap with the positive state. It can be seen that the epidemic has seriously affected the healthy development of small and medium-sized enterprises in China.



**Figure 1.** Operation Chart of China's SMEs Development Index  
Data source: China Association of Small and Medium Enterprises.

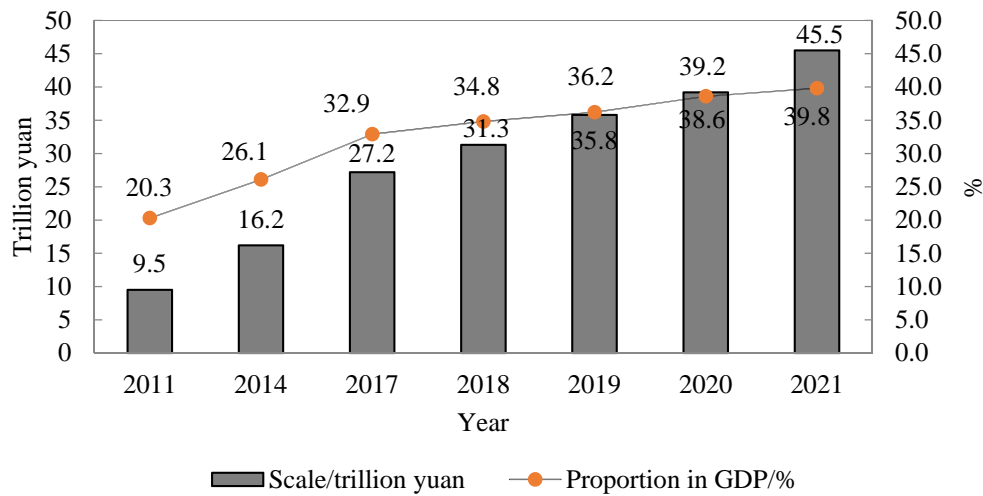
### 2.2. High Speed Development of Digital Economy Promotes Small and Medium-sized Enterprises to Accelerate Digital Transformation

China's digital economy is booming, the scale of industrial digitalization and digital industrialization is expanding, and the total scale and growth rate of the digital economy rank

among the world's top [12]. It can be seen from Figure 2 that the total scale of China's digital economy has expanded from 9.5 trillion yuan in 2011 to 45.5 trillion yuan in 2021, an increase of nearly 4.8 times in 10 years; The proportion of digital economy in GDP will increase from 20.3% in 2011 to 39.8% in 2021. The scale of the digital economy has grown steadily and its proportion in GDP has increased year by year. The digital economy is becoming a new driving force for China's high-quality economic development. At the same

time, the proportion of digital economy in GDP tends to be stable, indicating that the current digital economy has encountered a bottleneck. It is urgent for small and medium-

sized enterprises to accelerate digital transformation to promote the development of digital economy.



**Figure 2.** Overall scale of China's digital economy and its proportion in GDP from 2011 to 2021

**Data source:** China Academy of Information and Communications released the White Paper on China's Digital Economy Development.

Digital transformation is the key for SMEs to get rid of the survival crisis caused by the epidemic and help their long-term development. The "Fourteenth Five Year Plan" has put forward the goal of "accelerating digital development and building a digital China" [13]. To promote the digital transformation of SMEs in the post epidemic era, first, it is conducive to reducing costs and improving performance of SMEs [14]. In the context of the epidemic, some enterprises took the opportunity of fighting against the epidemic to promote digital transformation and development. They helped enterprises resume production with the help of AI, big data, cloud computing and other digital technologies [15], which reduced the burden of layoffs, accurately adjusted inventory, guaranteed production and life, significantly improved management efficiency and operational efficiency, and effectively reduced the operating costs of the organization [16]. Second, it is conducive for SMEs to cope with the complex and volatile external environment [17]. When the epidemic broke out, the vulnerability of SMEs was exposed before the epidemic [18]. As far as the current situation is concerned, epidemic prevention and control has become normal, and the external economic environment is still in an extremely unstable state. Digital transformation can improve enterprise resilience [19] and help enterprises survive and develop better in an uncertain external environment. Third, it is conducive for SMEs to follow the pace of social development. The digital era has come, and enterprises must adapt to the progress of the times to survive and meet the needs of social development. In the context of the digital economy, it is a general trend for enterprises to carry out digital transformation [20]. In order not to be eliminated by the society, enterprises must carry out digital transformation. To sum up, it is important and necessary to promote the digital transformation of SMEs in the post epidemic era.

### 3. Literature Review

There are many researches on digital transformation, but there are few literatures focusing on the enterprise level, mainly focusing on the following aspects.

#### 3.1. Advantages of Digital Transformation

Ghosh K et al. [21] believed that digital transformation can help enterprises improve their operational efficiency, and ultimately enhance their market position and influence by improving product or service quality and consumer satisfaction. Hu Qing [22] believed that the digital transformation of enterprises can positively promote the improvement of enterprise performance, and play a positive role in regulating the relationship between the digital transformation of enterprises and enterprise performance through internal learning orientation and external network relationship embedding. He Fan et al. [23] believed that real enterprises should carry out digital transformation to achieve the goal of performance improvement through cost reduction, efficiency improvement and innovation. Tan Songtao et al. [24] believed that enterprises can effectively reduce their costs through digital transformation and development.

#### 3.2. Digital Technology Is the Key to Digital Transformation

Pagani M et al. [25] proposed to promote the characteristics of information structure to be timely, continuous, detailed and complete through the application of a new generation of digital technology, so that enterprises can truly enter the digital era. Huang Qunhui et al. [26] believed that information technology, especially digital technology, is the key to enterprise digital transformation. Qi Yudong et al. [27] believed that the digital economy has triggered enterprise management reform. In the context of the digital economy, user value orientation and alternative competition are two fundamental forces driving enterprise management reform. Wang Shubai et al. [28] proposed that the digital transformation of foreign trade enterprises is not simply through the creation of digital technology departments to improve their profitability, but through the application of digital technology to achieve intelligent manufacturing, brand communication, data integration and sharing within the industry, and deep integration of external resources of the industry, ultimately achieving the goal of enterprise

transformation based on digital technology, driven by innovation, and centered on customers. Qiu Ying et al. [29] mentioned that the digital economy promotes the rise of SMEs' value chain, but because SMEs can hardly afford to participate in the high fixed costs of the value chain and lack of core technology, small enterprises are easy to be locked in the low-end of the production network based on digitalization as their participation in the value chain deepens.

The existing literature notes the impact of digital economy and digital technology on enterprises, and these research results provide reference value for this study. Especially under the background of vigorously promoting the development of digital economy in China, it is of great significance to explore the topics related to digital economy and enterprises. However, few of them are dedicated to the topic of digital transformation of small and medium-sized enterprises, especially the lack of investigation and analysis of the status quo of digital applications of small and medium-sized enterprises. Because small and medium-sized enterprises are crucial to China's economic development, especially under the impact of this epidemic, small and medium-sized enterprises face more urgent needs for digital transformation. Therefore, it is of great practical significance and research value to explore the topic of SMEs' digital transformation.

## 4. Research Methods

This study uses the questionnaire survey method to conduct

data research on SMEs nationwide, aiming to understand the status quo of SMEs' digital transformation, effectiveness, policy appeals and other information. The questionnaire investigates the digital transformation of SMEs from different dimensions by setting enterprise type options, and excavates the representation and differences of different types of SMEs in digital transformation. Based on the survey data, this study uses the statistical analysis method to analyze the current situation of China's SMEs' digital transformation, explore its driving factors, and then put forward targeted suggestions.

### 4.1. Data Source

The survey questionnaire includes 11 questions, including enterprise background, digital technology application, digital transformation effectiveness, policy appeals, etc. See Table 1 for details. Based on the questionnaire star platform, the targeted questionnaire distribution and recovery method is adopted to conduct a questionnaire survey on the principals of small and medium-sized enterprises relying on government departments, industry associations and social network resources such as industrial and information departments, small and medium-sized enterprise management departments and statistical departments in many places.

From October 10, 2022 to November 20, 2022, 925 persons in charge of small and medium-sized manufacturing enterprises were investigated to ensure that the data can objectively and truly reflect the digital transformation of small and medium-sized enterprises.

**Table 1.** Questionnaire on Digital Transformation of SMEs

Research project	Questionnaire items
Enterprise background information	1. Enterprise scale
	2. Enterprise location
	3. Enterprise type
	4. Development stage of the enterprise
	5. Industries of enterprise
Enterprise digital cognition and appeal content	1. Difficulties in enterprise operation
	2. The effectiveness of digital transformation in solving business difficulties
	3. Present situation of enterprise digital transformation
	4. What digital technologies have enterprises applied
	5. Drivers of enterprises' digital transformation
	6. Enterprises' policy demands for digital transformation

### 4.2. Sample Composition

See Table 2 for the composition of 925 SMEs in this survey. In this survey, small and medium-sized enterprises are divided into eastern, central and western regions; It is divided into three categories by scale: medium, small and micro (defined according to the Standard for the Classification of Small and Medium sized Enterprises issued in June 2011 and the Regulations on the Standard for the Classification of Small and Medium sized Enterprises (Revised Draft for

Comments) issued by the Ministry of Industry and Information Technology on April 23, 2021); According to the development stage, it can be divided into four categories: start-up stage, growth stage, mature stage and transition stage to explore the differential performance of different types of SMEs. From the perspective of sample structure, the SMEs surveyed are highly representative, which also verifies that the survey data has a high coverage and representativeness, and can effectively reflect the application of SMEs in digital transformation in China.

**Table 2.** Composition of sample enterprises

Enterprise types		Quantity (piece)	Proportion (%)
Enterprise location	Eastern region	450	48.65
	Central region	170	18.38
	Western region	305	32.98
Enterprise scale	Medium-sized enterprise	280	30.27
	small enterprise	375	40.54
	Microenterprise	270	29.19
Enterprise development stage	Initial period	210	22.70
	Growth period	265	28.65
	Mature period	255	27.57
	Transformation period	195	21.08

Data source: according to the survey data, the same below.

## 5. Digital Transformation of SMEs

### 5.1. Difficulties Faced by Small and Medium-sized Enterprises in Operation

#### 5.1.1. Analysis Based on Total Samples

As can be seen from Table 3, 58.23% of small and medium-sized enterprises believe that market competition pressure is

the biggest difficulty they face in business operation; 38.26% of small and medium-sized enterprises think that the transformation pressure of enterprises in operation is great; 28.18% and 26.45% of small and medium-sized enterprises believe that there are difficulties in employment and technological innovation in their business. These situations are the main types of problems faced by SMEs in their operation.

**Table 3.** Difficulties Faced by SMEs in Operation

Facing difficulties	Total sample	Enterprise development stage				Enterprise location			Enterprise scale		
		Initial period	Growth period	Mature period	Transformation period	Eastern region	Central region	Western region	Medium-sized enterprise	small enterprise	Microenterprise
No difficulty	4.92	1.25	5.24	12.72	2.13	4.06	7.65	8.12	3.17	9.34	5.78
Financing difficulties	14.32	19.36	16.94	3.89	5.25	15.22	20.15	10.17	5.18	20.15	16.23
Supply chain pressure	19.58	20.54	26.15	12.53	8.84	17.24	28.75	13.25	13.21	24.32	18.55
High cost of raw materials and equipment	15.73	25.32	14.81	7.32	10.15	9.18	25.91	15.38	8.56	19.73	15.22
Labor shortage	28.18	22.18	38.32	20.24	15.15	27.53	22.44	24.05	15.58	33.36	38.15
Difficulty in technological innovation	26.45	13.55	32.28	22.35	30.56	22.39	38.85	25.42	27.54	32.43	15.28
Enterprise transformation pressure	38.26	14.42	28.54	48.42	57.95	45.29	20.32	41.48	42.26	39.65	29.14
Market competition pressure	58.23	40.31	58.46	62.46	65.42	60.45	55.24	64.08	65.36	52.34	63.38

#### 5.1.2. Analysis Based on Enterprise Development Stage

From the perspective of enterprise development stage, SMEs in different development stages have obvious differences in their evaluation of business difficulties. The main difficulties faced by small and medium-sized enterprises at the start-up stage are market competition pressure, labor difficulty and the cost of raw materials and equipment; The main difficulties faced by the growing SMEs are market competition pressure, employment difficulties and technological innovation difficulties; The main difficulties faced by SMEs in the mature period are market competition pressure, enterprise transformation pressure and technological innovation difficulty; The main difficulties faced by SMEs in the transition period are market competition pressure, enterprise transformation pressure and technological innovation difficulty.

From the perspective of sub items, the performance of

SMEs at different stages of development is quite different. In terms of financing difficulties, the proportion of SMEs in start-up period (19.36%) and growth period (16.94%) was significantly higher than that in mature period (3.89%) and transition period (5.25%); In terms of supply chain pressure, the proportion of SMEs in the transition period (8.84%) was significantly lower than that in other development stages; In terms of raw materials, equipment and other costs, the proportion of SMEs in the start-up period (25.32%) was significantly higher than that in the mature period (7.32%) and transition period (10.15%); In terms of employment, the proportion of SMEs in the growth period (38.32%) was significantly higher than that in the transition period (15.15%); In terms of technological innovation, SMEs in the growth period (32.28%) and transition period (30.56%) accounted for a high proportion; In terms of enterprise transformation pressure, SMEs in the mature period (48.42%) and transition

period (57.95%) accounted for a high proportion; In terms of market competitiveness pressure, SMEs in all stages are under great pressure. The proportion of SMEs in the transition period (65.42%) is the highest and significantly higher than the total sample (58.23%), while the proportion of SMEs in the start-up period (40.31%) is the lowest and the pressure is relatively minimum.

### 5.1.3. Analysis Based on the Region Where the Enterprise Is Located

From the perspective of the regions where the enterprises are located, the difficulties faced by SMEs in different regions tend to converge with the total sample, but there are also some differences, and there are also some differences between SMEs in different regions. In terms of supply chain, cost of raw materials, equipment, technological innovation, etc., the proportion of SMEs in the central region is significantly higher than that in the eastern and western regions, but in terms of enterprise transformation pressure, the proportion of SMEs in the central region (20.32%) is significantly lower than that in the eastern region (45.29%) and western region (41.48%). In addition, SMEs in the western region are also significantly lower than those in the eastern and central regions in terms of financing difficulties and supply chain pressure.

### 5.1.4. Analysis Based on Enterprise Scale

From the perspective of enterprise scale, the difficulties

faced by SMEs of different scales in operation are similar to the total sample, but there are also some differences, and there are also some differences between SMEs of different scales. In addition to the pressure of market competition, small enterprises face slightly more difficulties than micro and medium-sized enterprises. The pressure of micro enterprises on employment and financing is significantly higher than that of medium-sized enterprises, but the pressure on technological innovation and enterprise transformation is significantly lower than that of medium-sized enterprises.

## 5.2. The Effectiveness of Digital Transformation in Solving Business Difficulties

### 5.2.1. Analysis Based on Total Samples

As shown in Table 4, it is found in the survey that most SMEs believe that digital transformation has not played a significant role in solving the above-mentioned business difficulties. 40.42% of SMEs believe that digital transformation can solve business difficulties occasionally, 38.16% of SMEs believe that digital transformation can solve business problems to a large extent, and few believe that it can solve business difficulties to a large extent or completely.

**Table 4.** Effectiveness of Digital Transformation in Solving Business Difficulties

Effectiveness	Total sample	Enterprise development stage				Enterprise location			Enterprise scale		
		Initial period	Growth period	Mature period	Transformation period	Eastern region	Central region	Western region	Medium-sized enterprise	small enterprise	Microenterprise
Can not solve	15.25	25.42	10.26	5.76	16.79	9.61	11.43	22.56	3.68	8.57	25.93
Occasionally solve	40.42	30.75	40.63	34.15	55.64	39.26	42.72	36.76	32.65	46.18	40.36
Solve to some extent	38.16	44.68	26.72	55.63	10.28	42.90	29.26	32.05	45.46	42.08	21.26
Solve to a large extent	12.52	5.67	15.95	7.29	20.38	10.26	17.82	12.06	21.28	6.87	3.07
Completely solved	3.15	1.25	7.25	2.24	3.06	1.53	5.13	1.26	1.89	2.06	4.45

### 5.2.2. Analysis Based on Enterprise Development Stage

From the perspective of enterprise development stage, the evaluation of SMEs in different development stages on the effectiveness of digital transformation is generally similar to the total sample, but there are also significant differences, and there are also differences between SMEs in different development stages. SMEs in different development stages tend to think that they can solve business difficulties occasionally, but for the view that they can solve business difficulties to a greater extent, SMEs in the transition period (10.28%) account for the lowest proportion and are significantly lower than other development stages. During the transition period (20.38%), SMEs believed that digital transformation could solve the business difficulties of enterprises to a large extent, and the data was significantly higher than that in other development stages. It shows that SMEs in the transition period prefer to carry out enterprise innovation, development, reform and upgrading through digital transformation.

### 5.2.3. Analysis Based on the Region Where the Enterprise Is Located

From the perspective of the region where the enterprises are located, small and medium-sized enterprises in the eastern

region (42.90%) believe that digital transformation can greatly solve business difficulties, which is significantly higher than that in the central and western regions. Small and medium-sized enterprises in the western region are the most pessimistic about the effectiveness of digital transformation. 22.56% of small and medium-sized enterprises believe that digitalization cannot solve business difficulties, which is significantly higher than that in the eastern and central regions.

### 5.2.4. Analysis Based on Enterprise Scale

From the perspective of enterprise size, the performance of SMEs of different sizes differs greatly from that of the total sample on the option of "unable to solve", and the differences between SMEs of different sizes are also significant. 25.93% of microenterprises believe that digital transformation cannot solve their business difficulties, which is significantly higher than the proportion of enterprises in the total sample who choose "can not solve", and the proportion gradually decreases with the increase of enterprise size. 21.28% of medium-sized enterprises believe that digital transformation can solve business difficulties to a large extent. With the increase of enterprise scale, the evaluation of the effectiveness of digital transformation is gradually improved.

### 5.3. Status Quo of Digital Transformation of Small and Medium-sized Enterprises

#### 5.3.1. Analysis Based on Total Samples

As shown in Table 5, 32.85% of SMEs began to explore digital transformation in some businesses and achieved some

results. This type of enterprises accounted for the highest proportion, 18.05% of SMEs did not understand digital transformation at all, and 26.36% of SMEs did. It shows that a large proportion of SMEs have not yet undergone digital transformation, and the digital transformation has made slow progress and the application of digital technology is not high.

Table 5. Status Quo of Digital Transformation of SMEs

Degree of digital transformation	Total sample	Enterprise development stage				Enterprise location			Enterprise scale		
		Initial period	Growth period	Mature period	Transformation period	Eastern region	Central region	Western region	Medium-sized enterprise	small enterprise	Microenterprise
Completely ignorant of digital transformation	18.05	25.75	22.86	5.38	22.57	20.45	16.15	22.82	4.87	28.43	30.24
A little understanding of digital transformation and willingness to transform, but not yet implemented	26.36	35.35	38.53	19.03	15.26	25.35	46.25	20.52	15.31	30.21	32.56
Started to explore digital transformation in some businesses and achieved some results	32.85	26.18	22.89	40.28	36.17	32.34	15.27	41.78	40.76	25.17	18.38
Digital transformation has been completed in a large range	11.35	6.25	7.82	18.36	13.34	12.42	13.06	9.47	18.44	6.72	5.36
The degree of digital transformation of various businesses is high, and the digital transformation has been basically completed	8.64	5.52	4.03	8.86	12.28	10.12	9.25	5.27	20.76	4.86	6.71
Digital innovation has become the norm of enterprises	6.62	1.28	5.26	10.35	2.86	8.52	5.25	3.54	8.92	2.06	0.00

#### 5.3.2. Analysis Based on Enterprise Development Stage

From the perspective of enterprise development stage, small and medium-sized enterprises in the start-up and growth stages do not apply much digital technology, or even have little or no knowledge of digital transformation. 35.35% of small and medium-sized enterprises in the start-up stage have a slight understanding of digital transformation, accounting for the highest proportion of their corresponding digital transformation degrees; The performance of SMEs in the growth period is similar, with 38.53% slightly understanding the digital transformation, which also accounts for the highest proportion in the corresponding digital transformation degree. The mature and transitional SMEs performed slightly better in digital transformation than those in the start-up and growth periods. 40.28% of mature SMEs and 36.17% of transitional SMEs began to explore digital transformation in some businesses and achieved some results, and accounted for the highest proportion in their corresponding digital

transformation degrees. However, SMEs in the transition period know less about digital transformation than those in the mature period, and 22.57% of SMEs in the transition period do not know about digital transformation at all. It can be seen that with the promotion of enterprise development cycle, the degree of digital transformation will be improved.

#### 5.3.3. Analysis Based on the Region Where the Enterprise Is Located

From the perspective of the regions where the enterprises are located, SMEs in different regions have great differences in digital transformation. The proportion of SMEs in the central region (46.25%) who have a little knowledge of digital transformation and are willing to transform is significantly higher than that in the eastern region (25.35%) and western region (20.52%). However, the proportion of SMEs in the central region (15.27%) who began to explore digital transformation in some businesses was significantly lower than that in the eastern region (32.34%) and western region (41.78%), while the western region was significantly higher

than the eastern region.

### 5.3.4. Analysis Based on Enterprise Scale

From the perspective of enterprise scale, the performance of micro and small enterprises in digital transformation is obviously inferior to that of medium-sized enterprises. 28.43% of small enterprises and 30.24% of micro enterprises do not understand digital transformation at all, and their proportion is significantly higher than that of medium enterprises (4.87%); 30.21% of small enterprises and 32.56% of micro enterprises slightly understand digital transformation, and their proportion is also significantly higher than that of medium enterprises (15.31%). This shows that most small and micro enterprises do not perform well in digital transformation.

## 5.4. Application of Digital Technology in Small and Medium-sized Enterprises

### 5.4.1. Analysis Based on Total Samples

As shown in Table 6, the largest number of SMEs currently use big data and e-commerce. 45.88% of SMEs use big data technology and 41.16% of SMEs use e-commerce technology. In addition, cloud computing, artificial intelligence and the Internet of Things also have a certain degree of use in SMEs, and the proportion of SMEs applying these technologies exceeds 20%. On the whole, the application level of digital technology in SMEs is not high. The proportion of enterprises that do not use any digital technology is not low, with 20.41% of SMEs saying that they do not use digital technology. The use of other digital technologies is low, such as 5G (10.29%), blockchain (6.35%), 3D printing (2.42%), and quantum technology (2.06%).

**Table 6.** Application of Digital Technology in SMEs

Digital technique	Total sample	Enterprise development stage				Enterprise location			Enterprise scale		
		Initial period	Growth period	Mature period	Transformation period	Eastern region	Central region	Western region	Medium-sized enterprise	small enterprise	Microenterprise
No digital technology applied	20.41	28.21	25.82	18.95	12.53	15.38	30.22	12.09	5.62	16.14	38.67
Big data	45.88	20.51	51.62	57.86	62.26	48.03	41.87	57.81	74.16	45.17	25.21
Cloud computing	21.52	17.05	19.63	26.52	28.75	22.58	17.26	23.62	30.82	15.92	12.45
5G	10.29	11.56	8.42	10.73	13.09	8.61	2.18	15.29	16.89	7.78	5.18
Artificial intelligence	26.35	15.92	20.86	34.67	40.87	28.75	25.46	22.72	42.32	24.84	10.65
Internet of Things	23.46	26.75	10.83	37.92	28.42	20.74	31.92	25.38	40.16	13.34	21.58
Blockchain	6.35	4.68	3.15	8.41	8.06	5.38	7.86	6.53	3.98	8.56	5.03
3D printing	2.42	0.00	2.24	4.06	1.86	3.56	1.89	1.56	1.84	4.06	0.00
Quantum technology	2.06	0.00	4.48	2.12	0.00	1.12	2.16	2.52	1.56	3.42	1.28
Electronic commerce	41.16	46.62	30.65	51.75	36.17	52.04	26.12	34.27	44.82	48.25	28.24

### 5.4.2. Analysis Based on Enterprise Development Stage

From the perspective of enterprise development stage, small and medium-sized enterprises in different stages differ greatly in the application of digital technology. In the option of "no digital technology is applied", the proportion of SMEs in the mature period is the lowest; In terms of big data, the application level of SMEs in the start-up stage is significantly lower than that in other development stages; In terms of artificial intelligence, SMEs in the mature and transition periods are significantly higher than those in the start-up and growth periods; In terms of the Internet of Things, small and medium-sized enterprises in the growth period have the lowest degree of use; In terms of e-commerce, SMEs in the growth period are the lowest, and the application level of SMEs in the start-up and mature periods is significantly higher than that in the growth and transition periods. On the whole, the application level of most digital technologies in mature SMEs is higher than that in other development stages.

### 5.4.3. Analysis Based on the Region Where the Enterprise Is Located

From the perspective of the region where the enterprises are located, the proportion of SMEs in the central region is the highest in the option of "no digital technology is applied", which is significantly higher than that in the eastern and western regions; In terms of big data, the proportion of SMEs in the western region is significantly higher than that in the

eastern and central regions; In terms of artificial intelligence, the performance of SMEs in the eastern and central regions is better than that in the western regions; In terms of e-commerce, the proportion of SMEs in the eastern region is the highest, and is significantly higher than that in the central and western regions. This is also consistent with our current performance in these digital technologies. For example, the dominant regions of e-commerce are concentrated in the eastern coastal provinces, while the western provinces represented by Guizhou are better represented by big data.

### 5.4.4. Analysis Based on Enterprise Scale

From the perspective of enterprise scale, in the option of "no digital technology is applied", micro enterprises account for the highest proportion, and are significantly higher than small and medium-sized enterprises; In terms of big data, medium-sized enterprises account for the highest proportion, and are significantly higher than small enterprises, while small enterprises are significantly higher than micro enterprises; In terms of cloud computing, 5G, artificial intelligence and the Internet of Things, the proportion of medium-sized enterprises is significantly higher than that of micro and small enterprises; In e-commerce, the proportion of micro enterprises is the lowest, and is significantly lower than that of small and medium-sized enterprises. On the whole, micro enterprises account for the lowest proportion of most digital technology applications, and are significantly



lower than small and medium-sized enterprises.

## 5.5. Drivers of Small and Medium-sized Enterprises' Digital Transformation

### 5.5.1. Analysis Based on Total Samples

As shown in Table 7, meeting market demand is the primary driving factor for SMEs to carry out digital

transformation. 65.23% of SMEs carry out digital transformation based on this consideration; Improving production efficiency and significantly reducing costs are the other two important driving factors for SMEs to carry out digital transformation, and nearly half of enterprises prefer these two factors; In addition, getting more policy support and reducing the risks faced by enterprises do not significantly drive the digital transformation of SMEs.

**Table 7.** Drivers of SMEs' digital transformation

Driving factors	Total sample	Enterprise development stage				Enterprise location			Enterprise scale		
		Initial period	Growth period	Mature period	Transformation period	Eastern region	Central region	Western region	Medium-sized enterprise	small enterprise	Microenterprise
Significant reducing cost	48.24	48.26	44.66	52.04	56.41	45.29	44.22	55.69	50.65	44.71	51.38
Effective increase in operating income	39.59	58.14	35.85	32.41	30.57	39.65	59.56	28.37	36.82	40.23	42.79
Improve productivity	50.74	52.84	44.15	54.75	49.28	58.14	20.74	55.39	60.26	41.49	45.38
Meet market demand	65.23	40.88	75.13	68.24	70.35	67.39	58.24	66.52	70.24	68.92	53.84
Get more policy support	22.06	25.87	22.41	18.68	15.29	15.35	30.28	21.87	15.89	25.17	22.87
Reduce risks faced by enterprises	27.24	15.29	34.39	30.24	26.94	27.74	41.36	22.83	32.16	24.26	28.47

### 5.5.2. Analysis Based on Enterprise Development Stage

From the perspective of enterprise development stage, the driving factors of SMEs' digital transformation in different development stages are quite different. In terms of significantly reducing costs, SMEs in different development stages are similar to the total sample, except that SMEs in the mature and transition periods prefer to carry out digital transformation for the purpose of significantly reducing costs, and the proportion of SMEs in the transition period is the highest; In terms of effectively increasing operating income, the proportion of SMEs in the start-up stage is significantly higher than that in other development stages; In terms of meeting market demand and reducing various risks faced by enterprises, the proportion of SMEs in the start-up stage is significantly lower than that in other development stages.

### 5.5.3. Analysis Based on the Region Where the Enterprise Is Located

From the perspective of the regions where the enterprises are located, SMEs in different regions have significant differences in the driving factors of digital transformation. SMEs in eastern and western regions are similar, while SMEs in central regions are significantly different from those in eastern and western regions. In terms of substantial cost reduction, the proportion of SMEs in the western region is higher than that in the eastern and central regions. In terms of effectively increasing operating income, the proportion of SMEs in the central region is significantly higher than that in the eastern and western regions. This trend also applies to the other two drivers, namely, obtaining more policy support and reducing various risks faced by enterprises. In terms of

improving production efficiency, the proportion of SMEs in the central region is significantly lower than that in the eastern and western regions.

### 5.5.4. Analysis Based on Enterprise Scale

From the perspective of enterprise size, there is little difference in the choice of drivers for digital transformation among enterprises of different sizes. In terms of improving production efficiency, the proportion of medium-sized enterprises is significantly higher than that of micro and small enterprises; In terms of obtaining more policy support, the proportion of medium-sized enterprises is significantly lower than that of micro and small enterprises; In terms of meeting market demand, the proportion of micro enterprises is significantly lower than that of small and medium-sized enterprises.

## 5.6. Policy Demands for Digital Transformation of Small and Medium-sized Enterprises

### 5.6.1. Analysis Based on Total Samples

It can be seen from Table 8 that more than 40% of SMEs have demands for policy interpretation, digital related training, digital transformation planning and information system construction, among which the demand for digital related training is the largest. This shows that SMEs' policy demands for digital transformation are multifaceted. They do not understand digital transformation and lack the system construction and planning that digital transformation relies on.

**Table 8.** Policy Appeal for Digital Transformation of SMEs

%

Policy appeal	Total sample	Enterprise development stage				Enterprise location			Enterprise scale		
		Initial period	Growth period	Mature period	Transformation period	Eastern region	Central region	Western region	Medium-sized enterprise	small enterprise	Microenterprise
Policy interpretation	44.15	39.16	52.36	32.41	65.38	45.06	42.77	47.39	40.67	44.07	49.22
Digital related training	52.48	60.92	53.27	54.49	42.67	50.06	56.38	57.04	45.42	58.14	61.89
Digital transformation planning	50.74	35.28	53.95	52.56	50.24	60.22	27.03	44.36	56.65	45.17	46.09
Information system construction	50.89	42.68	51.28	62.29	36.96	58.18	32.27	46.28	58.29	49.06	42.67
Digital transformation consultant	35.78	36.78	29.31	38.17	36.25	35.29	38.28	30.89	36.22	38.15	26.39
Digital equipment transformation	26.24	25.21	27.89	26.73	22.43	18.27	44.22	24.03	30.92	20.87	21.09
Application guidance of R&D software	23.61	15.28	30.25	25.04	14.36	16.37	42.74	23.98	22.04	23.86	25.15

**5.6.2. Analysis Based on Enterprise Development Stage**

From the perspective of enterprise development stage, SMEs' policy demands for digital transformation are similar to the total sample, but there are some differences between the performance of SMEs in different development stages and the total sample, and the differences between SMEs in different development stages are also large, which is not only reflected in the type of policies, but also reflected in the degree of demand for policies.

First of all, from the number of policy appeals that SMEs accounted for more than 40% in different development stages, the proportion of SMEs in the start-up stage only exceeded 40% in the two policy appeals of digital related training and information system construction; The proportion of SMEs in the first four policy appeals in the growth period exceeded 50%; The proportion of SMEs in the mature period exceeded 50% in the three policy appeals of digital related training, digital transformation planning and information system construction; During the transition period, the proportion of SMEs in the first three policy appeals exceeded 40%.

Secondly, the proportion of enterprises in different development stages in individual policy appeals exceeds 60%, indicating that the demand for this policy is higher. For example, 60.92% of start-up SMEs need digital related training, 62.29% of mature SMEs need information system construction, and 65.38% of transition SMEs need policy interpretation.

Finally, the proportion of small and medium-sized enterprises in different development stages differs greatly in the performance of the same policy appeal. For example, in terms of policy interpretation, the proportion of SMEs in the transition period is significantly higher than that in the growth period, and the proportion of SMEs in the growth period is significantly higher than that in the start-up and mature periods; In terms of digital related training, the proportion of small and medium-sized enterprises in the start-up period is significantly higher than that in the growth and maturity period, and the proportion of small and medium-sized enterprises in the transition period is the lowest; In terms of digital transformation planning, the proportion of small and medium-sized enterprises in the start-up stage is the lowest, and is significantly lower than that in the growth stage, mature

stage and transformation stage; In terms of information system construction, the proportion of SMEs in different development stages decreases significantly in the order of maturity, growth, start-up and transition; In terms of application guidance of R&D software, the proportion of SMEs in the growth period is significantly higher than that in the mature period, and the proportion of SMEs in the mature period is significantly higher than that in the start-up period and the transition period.

**5.6.3. Analysis Based on the Region Where the Enterprise Is Located**

From the perspective of the regions where the enterprises are located, in terms of policy appeals, there are differences not only between SMEs in different regions and the total sample, but also between SMEs in different regions.

First of all, from the number of policy appeals that SMEs in different regions account for more than 40%, four policy appeals each account for more than 40% in the eastern, central and western regions, but there are differences in policy appeals. Among them, the policy appeal projects of SMEs in eastern and western regions are the same as the total sample, but the proportion is different; There are significant differences in policy appeal projects among SMEs in the central region, especially in digital equipment transformation and R&D software application guidance, accounting for more than 40%, which is significantly different from the total sample and the eastern and western regions.

Secondly, the first policy needed by SMEs in the eastern region is digital transformation planning. The central and western regions are digital related training, and the demand for digital transformation planning of SMEs in the eastern region is significantly higher than that in the central and western regions.

Finally, for different policies, the demand degree of SMEs in different regions varies greatly. For example, in terms of digital transformation planning and information system construction, the proportion of SMEs in the eastern region is significantly higher than that in the western region, and the proportion of SMEs in the western region is significantly higher than that in the central region; In terms of digital equipment transformation and R&D software application guidance, the proportion of SMEs in the central region is

significantly higher than that in the western region, and the proportion of SMEs in the western region is slightly higher than that in the eastern region.

#### **5.6.4. Analysis Based on Enterprise Scale**

From the perspective of enterprise size, SMEs of different sizes tend to converge with the total sample demand in terms of policy demands, and there is little difference between SMEs of different sizes. First of all, the number of policy appeals of SMEs of different sizes accounting for more than 40% is four, only slightly different in policy ranking. Secondly, there are some differences in the demand of SMEs of different sizes for policies. In terms of policy interpretation, the proportion of microenterprises is higher than that of small and medium-sized enterprises; In terms of digital related training, the proportion of micro enterprises is slightly higher than that of small enterprises, while the proportion of micro and small enterprises is significantly higher than that of medium-sized enterprises; In terms of digital transformation consultants, the proportion of small and medium-sized enterprises is significantly higher than that of micro enterprises.

## **6. Problems Faced by Digital Transformation of SMEs**

### **6.1. Obvious Obstacles to Digital Transformation of SMEs**

Small and medium-sized enterprises in China face great market competition pressure and great difficulties in enterprise transformation and technological innovation. From the survey data, the driving factors for SMEs to carry out digital transformation are mainly focused on meeting market demand, improving production efficiency, significantly reducing costs, and the proportion of SMEs committed to meeting market demand is higher. It can be seen that digital transformation can effectively alleviate the pressure of enterprise market competition, whether by accurately matching supply and demand, or by improving production efficiency or reducing costs, it can effectively alleviate the difficulties faced by SMEs in market competition, transformation and development and technological innovation. This fully shows that digital transformation is in line with the business objectives of SMEs. However, according to the survey results, the degree of digital transformation of SMEs in China is not high, and there are many difficulties in digital transformation, which further increases the difficulty of digital transformation of SMEs.

First of all, SMEs do not have a deep understanding of digital transformation. They generally believe that digital transformation has little effect on solving the difficulties faced by business, and they have not fully realized the benefits of digital transformation; Secondly, at present, the application of digital technology in SMEs in China is not high, and more than 70% of SMEs have not yet conducted large-scale digital transformation; Finally, the application level of digital technology is not high, which is not only reflected in the depth of application of digital technology, but also in the breadth of application of digital technology.

### **6.2. SMEs Lack Digital Transformation Thinking**

At present, SMEs in China are obviously lack of digital transformation thinking, resulting in slow digital transformation and few digital technology applications. Small

and medium-sized enterprises are limited to their own strategic awareness, knowledge reserves, management capabilities and other reasons, and have insufficient awareness of digital transformation. In addition to not knowing the concept of digital transformation, SMEs do not know the advantages and necessity of digital transformation, and are not familiar with the measures and implementation path of digital transformation.

The survey data fully shows that the small and medium-sized enterprises in China are not willing to make digital transformation. Nearly half of the small and medium-sized enterprises have not yet made digital transformation, and the proportion of small and medium-sized enterprises that take the initiative to make digital transformation is relatively low, which highlights that the small and medium-sized enterprises are not motivated enough to make digital transformation. The development of enterprises is greatly affected by the thinking of business operators. Because business operators have not yet a clear understanding of digitalization, especially the understanding of digitalization transformation is not sufficient, leading to significant deficiencies in digitalization transformation and digital technology application of SMEs in China, which increases the difficulty of digitalization transformation of SMEs.

Due to limited digital thinking, the digital transformation maturity of SMEs in China is not enough, which will drag SMEs' resilience in the face of crisis and the resilience of enterprise reconstruction after the COVID-19. In particular, the direct impact and long-term impact of the COVID-19 further highlight the defects and deficiencies of SMEs' digital deployment, and the impact of the supply chain management, omni channel operation Intelligent decision-making and other important digital technology application scenarios are particularly reflected.

### **6.3. Weak Foundation of Small and Medium-sized Enterprises' Digital Transformation**

The basic level of digital transformation of SMEs in China is generally low. The digital transformation of small and medium-sized enterprises needs the support of big data, cloud computing, artificial intelligence, blockchain and other emerging digital technologies. The application of these digital technologies should be used to promote the digital transformation of enterprises. However, the survey data shows that SMEs in China do not perform well in the application of digital technology, which seriously affects the process of digital transformation of SMEs in China. According to the survey data, about one fifth of SMEs have not applied any digital technology, even higher in some types of SMEs. For example, 30.22% of SMEs in central China and 38.67% of micro enterprises have not applied any digital technology. From the perspective of digital technology, cloud computing, 5G, blockchain, 3D printing and quantum technology are not widely used in SMEs. As the core technology of digital economy development, 5G technology has not been widely used by SMEs, even in some types of SMEs.

The digitalization level of the vast majority of SMEs in China, most of which show that the informatization level stays in the stage of office system automation and human resource management such as word processing and financial management, while the popularity of enterprise cloud, digital conference, data resource collection, etc. in SMEs is still low. Due to the lack of necessary infrastructure for digital

transformation, small and medium-sized enterprises in China lack the necessary information application foundation, which further restricts the supply of core digital technology, increases the difficulty of data collection for small and medium-sized enterprises, and even more cannot promote the digital transformation of small and medium-sized enterprises through the cooperation of industrial chains and cross industrial chains.

#### **6.4. The Vulnerability of SMEs Increases the Difficulty of Digital Transformation**

SMEs have significant vulnerability. Due to small scale, low anti risk ability, single business model and poor financing ability of SMEs, their digital transformation costs are high. According to the survey, most SMEs in China are under the pressure of market competition, technological innovation and enterprise transformation. They have invested heavily in market development, raw material procurement and other aspects, while they have not invested enough in the allocation of digital resources such as networks, equipment and information systems. These will affect their capital investment in digital transformation, further increase the vulnerability of SMEs in China, and increase the difficulties faced by SMEs in digital transformation.

The outbreak of global epidemic since 2020 is a severe test for SMEs. The constant outbreak of the COVID-19 has led to unstable market expectations, weak demand, and declining orders. SMEs are the first to bear the brunt, which has seriously affected the production and development of SMEs. A large number of SMEs have gone bankrupt or fallen into operational difficulties. In order to cope with the production crisis, SMEs' primary task is to ensure the normal operation of enterprises, and may feel that digital transformation is less important and urgent, This will delay the progress of enterprise digital transformation. In addition, small and medium-sized enterprises adopting traditional business models are not strong in management ability and attract little talents, which will lead to the lack of talents needed for digital transformation. The combined effect of the above factors has increased the difficulty of SMEs' digital transformation.

#### **6.5. The Difference Between Different Types of SMEs Increases the Difficulty of Digital Transformation**

From the survey data, different types of SMEs, including SMEs in different development stages, regions and scales, have significantly different performances in digital transformation. This difference exists not only between different types of SMEs and the total sample, but also between different types of SMEs; It is reflected not only in the cognition of digital transformation, but also in the level of digital transformation and digital technology application. It can be seen that digital transformation is a systematic and complex project, which needs to be differentiated according to different types of enterprises.

Different types of SMEs have significant differences in digital transformation cognition, digital transformation status, and digital technology application, leading to significant differences in their policy demands for digital transformation (different types and degrees). Similarly, this difference exists not only between different types of SMEs and the total sample, but also between different types of SMEs. In terms of digital thinking, digital transformation and digital technology application, China's SMEs have significant differences, and

the differences between different types of SMEs are more significant. In particular, there are significant differences in the difficulties faced by SMEs at different development stages, in different regions, and in different scales in business operation, in the effectiveness of digital transformation, in the application of digital technology, in the driving factors of digital transformation, and in policy appeals. This significant difference will not only increase the difficulty of SMEs' digital transformation, but also affect the effect of implementation of measures and policies related to digital transformation. It is impossible to use a unified caliber or scale standard to measure or promote SMEs' digital transformation. The formulation of digital transformation measures should vary with the types of SMEs, which will undoubtedly increase the difficulty of SMEs' digital transformation.

### **7. Digital Transformation Path of Small and Medium-sized Enterprises**

#### **7.1. Give Full Play to the Guiding Role of Government Departments and Improve the Digital Transformation Thinking of SMEs**

##### **7.1.1. Set Up a Special Digital Project Class to Give Full Play to the Guiding Role of Government Departments**

The establishment of national, provincial and municipal level SME digital transformation special classes can be led by leaders directly under the leadership of the development and reform departments, business departments, tax departments, science and technology departments and other functional departments related to SME business, giving full play to the guiding role of the government in the process of SME digital transformation. The special work class should establish a long-term communication mechanism, improve SMEs' awareness and acceptance of digital transformation and digital technology application through policy formulation, professional services, business training and other ways, and open up the thinking path of SMEs' digital transformation from the perspective of thinking and concepts.

##### **7.1.2. Build Digital Platforms and Networks to Play a Leading Role**

On February 9, 2020, the Ministry of Industry and Information Technology issued the Notice on the Work Related to Responding to the novel coronavirus Pneumonia Epidemic and Helping Small and Medium sized Enterprises to Return to Work and Overcome Difficulties, which clearly proposed that we should integrate decentralized manufacturing capabilities through collaborative manufacturing platforms, achieve technology, capacity and order sharing, and promote small and medium-sized enterprises to resist the impact of the epidemic, which laid the foundation for the digital platform needed for the digital transformation of small and medium-sized enterprises.

Small and medium-sized enterprises have small scale, scattered orders, weak competitiveness, and individual enterprises have insufficient resources and capabilities. In order to promote the digital transformation of SMEs, it is necessary to build a government led digital platform and data sharing platform, especially to accelerate the construction of cross sectoral, cross hierarchical and cross regional platforms. Based on the convergence and integration of data information resources in different regions, at different levels, and among

different departments, and the integration of social data resources required for the digital transformation of SMEs, improve the collection capacity and efficiency of key data resources, and accelerate the construction of a centralized sharing and comprehensive intelligent analysis platform for enterprise digital data resources. Integrate the internal resources of the industrial chain and industrial cluster through the digital platform and data sharing platform, optimize each link of the industrial chain from production to consumer terminals by relying on digital technology, improve the efficiency of supply and demand matching, achieve inventory optimization in procurement, quality control in production, tracking and tracing in distribution, precision marketing in retail and experience upgrading in service, and finally achieve the core purpose of improving value, increasing efficiency and reducing cost. Taking the government as the leader can not only ensure the neutrality and impartiality of the digital platform, but also avoid the self-interest behavior led by leading enterprises.

## **7.2. Focus On New Breakthroughs in Digital Core Technology and Consolidate the Technical Foundation of Digital Transformation**

We should not only seize the opportunity of continuous iterative innovation of digital technology, consolidate digital technologies such as big data, artificial intelligence, mobile Internet, cloud computing, blockchain, but also achieve new breakthroughs in quantum technology, biotechnology and other digital technologies. We should not only promote the efficient operation of the digital technology supply system, but also actively encourage multiple entities and platforms to participate in digital technology research and development, so as to achieve the synergy between government, enterprise, industry, university and research. Actively respond to the national call for new infrastructure construction, and improve the new infrastructure construction of digital society required for the digital transformation of SMEs in China.

The key of digital transformation lies in the construction of digital infrastructure, and the perfect digital infrastructure also determines the functional level and application prospects of SMEs' digitalization. The new infrastructure should not only lay out new information infrastructures such as industrial Internet, 5G network, urban and rural Internet of Things, and data exchange center in multiple places, but also continuously improve the communication connection speed and computing storage service capacity, and improve the infrastructure support capabilities such as timely information transmission and digital real-time processing, but also pay attention to the construction of a high standard market system and improve the soft new infrastructure. Through the layout and improvement of "hard" infrastructure and "soft" infrastructure, we will promote the digital technology infrastructure required for the digital transformation of SMEs, especially focus on the infrastructure construction of 5G based industrial Internet, industrial Internet and consumer Internet, build a new generation of mobile, safe and high-speed information infrastructure, and provide basic security for the digital transformation of enterprises.[30]

## **7.3. Get Through the Digital Bottleneck of the Industrial Chain and Improve the Digital Capability of SMEs**

From the industrial dimension, many enterprises are involved in a long industrial chain with many links. The application of digital technology provides a set of new ideas and flexible solutions for SMEs, which can leverage relatively large profits with relatively small investment. At the initial stage of digital transformation, SMEs in China can combine their own characteristics, start with the relatively easy and less investment links, and realize the digitalization of a single industrial link through the introduction of digital technology.

The conventional industrial chain can be divided into procurement, production, distribution, retail, service and other links. The digitalization of the industrial link is not only to improve the operating efficiency of a single link, but also to achieve data connectivity and circulation between different links to form new value, and then to achieve the efficiency improvement and cost compression of each link in a digital way. In the fields of the industrial chain, production line, management model, etc., in the fields of procurement, production, quality inspection Inventory management, marketing and other links can effectively improve the data analysis and governance by building the whole chain digitalization. Not only that, new production methods such as digital design, personalized customization and open innovation should break through the pyramid like organizational structure in the past and break the shackles and boundaries of innovation, which requires the flexibility of enterprise organizational methods. It requires the digital transformation of SME governance to form a more efficient and flexible organizational form.

## **7.4. Support Small and Medium-sized Enterprises to Speed up Digital Transformation under the Guidance of Preferential Enterprise Policies**

SMEs are in urgent need of policy support, which fully reflects the research results of SMEs' demands for digital transformation policies. In the context of the epidemic, SMEs in China need more support from preferential policies. In order to speed up the rescue and recovery of small and medium-sized enterprises, a number of preferential policies have been introduced to support and speed up the digital transformation of small and medium-sized enterprises. For example, on August 15, 2022, the Ministry of Industry and Information Technology and the Ministry of Finance issued the Notice on Carrying out the Pilot Work of Financial Support for Digital Transformation of Small and Medium sized Enterprises, which aims to support local small and medium-sized enterprises to carry out the pilot work of digital transformation through the central financial funds, Accelerate the growth of a number of small and medium-sized enterprises into specialized and new enterprises, and promote the upgrading of the industrial base and the modernization of the industrial chain; On November 3, 2022, the Ministry of Industry and Information Technology issued the Guidelines for Digital Transformation of Small and Medium sized Enterprises to help small and medium-sized enterprises scientifically and efficiently promote digital transformation, improve their ability to provide digital products and services for small and medium-sized enterprises, and provide guidance

for relevant responsible departments to promote the digital transformation of small and medium-sized enterprises.

These favorable policies at the national level not only provide policy dividends for SMEs' digital transformation, but also provide them with top-level design for digital transformation. Different types of SMEs have large differences in digital transformation and policy appeals, which requires that each region, under the guidance of national policies, combine the characteristics of local enterprises and resource advantages, issue targeted support policies and measures for digital transformation of SMEs in line with their own reality, and pay special attention to specific implementation, so that preferential policies can effectively help SMEs to achieve digital transformation.

### **7.5. Take Multiple Measures to Eliminate the Shortage of Digital Talents and Strengthen the Cultivation of Digital Talents**

From the perspective of the policy content required by SMEs for digital transformation, it reflects that SMEs are very short of talents for digital transformation. Talents are the first resource for the development of enterprises. For the digital transformation of SMEs, digital talents are particularly important. According to the report *The Digital Talent Gap Are Companies Doing Enough* released by Capgemini, the surveyed enterprises all said that the digital talent gap is growing. Up to 54% of the enterprises believed that the shortage of digital talents is an important factor for enterprises to achieve digital transformation. 50% of the enterprises said that they are always paying attention to the digital talent gap and will make up for the competitiveness problems caused by the shortage of talents. In a sense, digital transformation is the competition and integration of digital talents. The shortage of funds of small and medium-sized enterprises makes them at a clear disadvantage when competing for digital talents with large enterprises. At the same time, it remains to be seen whether the digital talents introduced from outside can match the enterprise transformation as "the right people". The White Paper on Methodology of Digital Transformation in the 2019 Industry released by Huawei clearly pointed out that digital talents not only refer to technical talents or business talents, but also refer to compound talents who can effectively integrate digital technology and business innovation. Cultivating a high-level digital talent team is a problem that must be faced in the transformation. In 2021, the Research Report on the Employment Impact of the Digital Economy issued by the China Academy of Information and Communication Research pointed out that China's digital talent gap is close to 11 million.

On the premise of the shortage of digital talents, SMEs are far less attractive to digital talents than large enterprises. Large enterprises focus on talent training, which can provide a larger platform and better working environment for talents. In the "battle" for digital talents, SMEs have no advantage. Most of the digital talents choose to work in large enterprises, which makes SMEs unable to solve the dilemma of digital talent shortage. The problem of small and medium-sized enterprises' digital transformation is even worse. Without the guidance and help of digital talents, the transformation cannot be carried out smoothly and efficiently, and the process of digital transformation of SMEs can only stop.

The cultivation of digital talents needs to clarify the quality standards and broaden the training channels. Digital talents can be divided into digital technology application talents,

digital management talents, and digital innovation talents. It is necessary to implement precise policies, classify training, and actively promote the integration and development of digital talents with traditional industries.

We need to deepen school enterprise cooperation and integration of production and education, cultivate application-oriented digital talents, solve the problem of scarcity of digital talents in small and medium-sized enterprises, and assist small and medium-sized enterprises in their digital transformation. We should also actively explore the talent training model in which the government, scientific research institutes, universities and enterprises participate, such as targeted training, part-time work model, weekend and holiday work model, and competition instead of education model. It can give full play to the coordinating role of industry associations in digital talent training and application, give play to the information advantages and intermediary role of industry associations, effectively link the three parties of "government, enterprise and school", promote school enterprise cooperation, improve and innovate the talent training mechanism, and provide talent support for digital transformation and digital economic development.

The combination of online and offline methods can be used to strengthen the digital skills training of SME managers and improve their digital cognition. Set up supporting fund projects for small and medium-sized enterprises, guide digital talents to sink into small and medium-sized enterprises, and help small and medium-sized enterprises accelerate the digital process. We will strengthen vocational education in the field of digitalization and actively cultivate application-oriented talents. Promote digital universal education and improve the "digital" literacy of the whole people.

Small and medium-sized enterprises should make full use of the knowledge spillover effect of entrepreneurship, establish a cooperative innovation mechanism between industry, university and research, improve the conversion rate of scientific research achievements, and make scientific research achievements become real productive forces. SMEs themselves should also increase investment in talent attraction, build a good work platform, attract complex digital talents to sink into SMEs, and help enterprises transform and upgrade.

## **8. Concluding Remarks**

The digital transformation of enterprises is a profound change brought about by the great progress of contemporary information and communication technology. In this transformation, no enterprise can stay out of the way, especially for traditional SMEs that lack core competitiveness. Only by accelerating the digital transformation, actively adapting to this change, and daring to embrace this change, can we win the first opportunity and win the competitive advantage. The digital transformation of SMEs is a complex and long-term strategy, and it is also a process of continuous promotion. It cannot be achieved overnight. However, the most important thing is that every traditional enterprise needs to join the queue of digital transformation as soon as possible, otherwise, it will be eliminated by the times.

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