

Research on Digital Transformation Path of Small and Medium-sized Enterprises from the Perspective of Internet of Things

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Abstract: Against the backdrop of the rapid growth of the digital economy, the digital economy is gradually transforming into a central theme of global industrial innovation and economic expansion. Modern digital information technologies, such as 5G, the Internet and the Internet of Things (IoT), have facilitated the rise of digital consumption methods and contributed to a large digital consumer market. As a result, digital transformation has become a strategic choice for companies to update their management style, improve their operations and gain competitive advantage in the future. The thesis combs the development status of digital transformation of small and medium-sized enterprises. Based on the theoretical perspective of the Internet of Things, it analyses the influencing factors of digital transformation of small and medium-sized enterprises. Accordingly, it proposes the path planning to promote the digital transformation of small and medium-sized enterprises. Combining the digital transformation of small and medium-sized enterprises (SMEs) with the theoretical perspective of the Internet of Things (IoT), it provides a new reference for SMEs to achieve digital transformation.

1. Introduction

At present, with the advent of a new generation of technological revolution and the impact of the epidemic of the century, digital transformation has become a key means for enterprises to build up momentum for development, catch up and enhance their resilience, including enterprises of different sizes in different industries, such as agriculture, forestry, animal husbandry, fishery, industrial manufacturing and service industries, as well as enterprises of different sizes. As a vital force in the overall development of China's national economy, SMEs play a pivotal role in unclogging the domestic cycle, providing employment security and enhancing development vitality. The digital transformation of SMEs is no longer an optional choice, but a mandatory course for the survival and long-term development of enterprises, and even determines the success or failure of the digital transformation of China's economy [1]. The implementation of digital transformation in small and medium-sized enterprises can not only promote the reform and growth of small and

medium-sized enterprises, improve their ability to adapt to the market-oriented economic situation, but also help to enhance their competitiveness and lay the foundation for them to achieve the goal of high-quality development.

2. Analysis of the Development Status of Digital Transformation in Small and Medium-sized Enterprises

2.1 Digital Transformation of SMEs is Still in Its Infancy

On the whole, the digital transformation of China's SMEs is still in its infancy. In the long-term market competition, most of the enterprises have formed a mature and solidified business model, business management concepts and have a certain market share, etc., compared with the success of digital transformation to improve the overall capacity of the enterprise, more afraid of the uncertainty risk brought by the failure of digital transformation.

2.1.1 Overall Level of Digital Transformation in SMEs

Most SMEs are in the state of "not wanting to transform" or "not knowing how to transform" due to strong technical challenges, large capital investment, low short-term benefits, high conversion costs, difficult business reengineering, high risk of trial and error, lack of short-term benefits, as well as the lack of advanced experience and few applicable programs.

30% of large enterprises are at the stage of in-depth application, 22% are at the stage of practicing transformation, and 48% are at the stage of exploring digital transformation.

2.1.2 The Level of Digital Development of SMEs Varies Across Industries

The digitization level of medium-sized enterprises is much higher than that of small and micro enterprises. According to the regional ranking of the comprehensive index of digitization of small and medium-sized enterprises, the digitization level of small and medium-sized enterprises in China is characterized by a high level in the east, a low level in the west and a strong level in the south and a weak level in the north. The regional ranking of the SME composite digitization index is shown in Table 1.

Table 1: Echelons of the SME Composite Digitization Index

Term	Province/city
First Echelon	Guangdong Province, Beijing Municipality, Shanghai Municipality, Jiangsu Province, Zhejiang Province, Shandong Province
second Echelon	Fujian Province, Sichuan Province, Henan Province, Hubei Province, Hebei Province, Hunan Province, Anhui Province, Chongqing Municipality Shaanxi Province, Tianjin Province, Jiangxi Province, Guizhou Province, Liaoning Province
Third Echelon	Yunnan Province, Shanxi Province, Jilin Province, Heilongjiang Province, Gansu Province, Hainan Province, Qinghai Province

2.2 Level of SME Digitization Index

After exploring and practicing in recent years, the digital transformation of small and medium-sized enterprises (SMEs) has also achieved some results. The China Industrial Internet Research Institute has built an industrial APP store and a solution store, providing free general SaaS suite services for SMEs, such as lightweight ERP, equipment management, work order management,

and so on, which have significantly lowered the threshold of SMEs' informatization and digitalization.

3. Analysis of Influencing Factors on Digital Transformation of Small and Medium-sized Enterprises under the Perspective of Internet of Things

Researching and analyzing the factors affecting the digital transformation of SMEs is the key to providing relevant countermeasures and suggestions for SMEs to help them realize digital transformation and development. Recommendations to help SMEs realize digital transformation and development.

3.1 Hierarchical Modeling

According to the requirements of hierarchical analysis, this paper constructs a hierarchical structure model with 14 factors and 3 levels, including target layer, criterion layer and indicator layer. Among them, the target layer is the factors affecting the digital transformation of SMEs, the criterion layer is the four layers of the IoT architecture, including the perception layer, the network layer, and the platform layer, and the indicator layer is the nine specific indicators including digital thinking, data phone and accessibility. The hierarchical model of this paper is shown in Fig. The factors in the criterion layer influence the factors in the target layer, and at the same time, they are related to the factors in the indicator layer. The hierarchical model of factors influencing digital transformation is shown in Figure 1.

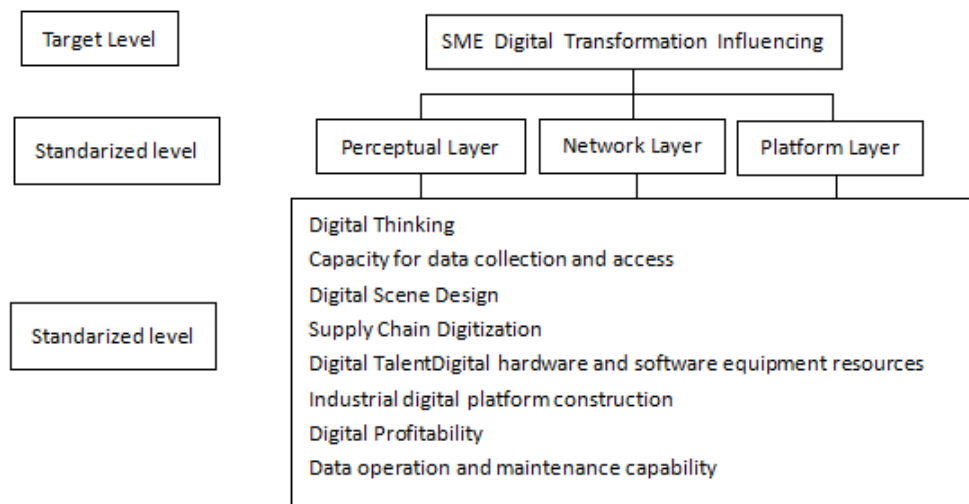


Figure 1: A Hierarchical Model of Factors Influencing Digital Transformation

3.2 Perception Layer: Data Sensing and Recognition

The perception layer is also known as the perception recognition layer. The perception layer is the foundation of the overall architecture of the IoT and is an important part of the integration of the physical and information worlds. The perception layer is responsible for collecting and acquiring information for IoT. It is crucial for quickly understanding the external environment of digital transformation.

3.2.1 Digital Thinking

Digital thinking helps to unearth the deeper value of an organization and gives it an edge over

the competition. The cultivation and development of a digital mindset involves learning digital knowledge and skills, developing a data-driven mindset, fostering innovative thinking, cultivating the ability to learn and think, as well as cultivating teamwork and communication skills. The construction of a digital mindset will help avoid disruptive threats, such as the "digital war" of new talent, and promote a deeper and more comprehensive development of enterprise digital transformation.

3.2.2 Capacity for Data Collection and Access

Data collection and acquisition capabilities. The core of digital transformation is data, so an enterprise's data collection and acquisition capabilities are the key to successful digital transformation. Enterprises need to establish a comprehensive data collection, analysis and application system, make data-based business decisions, and continuously make data optimization and iterative adjustments to drive business process optimization [2]. Enterprises need to collect and analyze large amounts of data and use it for decision-making and strategy formulation. Data-driven decision-making can help companies better understand customer needs and market trends, optimize business processes, and improve efficiency.

3.2.3 Digital Scenario Design

The integration of digital scene design and business model as well as the integration of digital technology application and industry promotes the emergence of new products, services and industries, and provides a new direction and impetus for the development of small and medium-sized enterprises (SMEs). Generally speaking, the higher the level of digital scenario design and the more flexible the mode of digital technology application of SMEs, the higher the technological content of the products and services they provide, and the higher the operational efficiency, which is conducive to the expansion of business in emerging fields and accelerates the process of digital transformation and integration of enterprises into the development of the digital economy.

3.3 Network Layer: Digital Technology and Equipment

The network layer is mainly responsible for the transmission of massive information, information transmission is a complex and long process, the realization of its various aspects of the digitalization, not only can provide more digital information solutions for the enterprise, but also to improve the efficiency of information transmission within the enterprise.

3.3.1 Supply Chain Digitization

Supply chain is a logistic, financial and value-added chain that centers around a core enterprise and connects manufacturing, distribution and end-use. The use of digital information technology such as cloud computing, the Internet of Things and big data further strengthens the synergistic relationship between the various subjects in the supply chain, prompting the transformation and upgrading of the chain-type supply system into a network structure supply system. This digitized supply chain is conducive to reducing the procurement and supply costs of enterprises and increasing their revenues. Therefore, supply chain digitization is an important factor that induces SMEs to carry out digital transformation.

3.3.2 Digital Talent

Data talent has a direct impact on an organization's data processing capabilities. On the one hand,

digital transformation not only does not eliminate companies' reliance on human capital, but also places higher demands on the skills of their employees, requiring them to rely more on their analytical skills to solve increasingly complex business problems. On the other hand, the improvement of employee skills can promote the adaptation of employees to the digital work environment, but also promote the understanding of the company's digital transformation concept, recognize the benefits of digital technology and reduce resistance [3]. Therefore, the construction of enterprise digital transformation service platform requires a group of first-class data employees with data mindset and data skills to create economic benefits for enterprises by solving complex data science problems encountered in enterprise digital transformation.

3.3.3 Digital Hardware and Software Equipment Resources

Digital software and hardware equipment resources are important basic resources for the digital development of SMEs. They include hardware facilities such as computers, servers, storage and projectors, and software operating systems such as OA office collaboration systems, BI business intelligence systems, inbound and outbound inventory control systems and financial data analysis systems. These digital equipment resources can be used in the production, marketing, organization and management of small and medium-sized enterprises in all aspects, can improve the operational efficiency of enterprises, and promote the digital operation and development of enterprises.

Generally speaking, the more digital hardware and software equipment resources SMEs have, the wider the application scenarios and the higher the frequency of use, the stronger their ability and potential for digital transformation.

3.4 Platform Layer: Data Management and Services

The industrial digital platform is based on digital information technology to converge data flow, and as a guide to promote cross-border integration between upstream and downstream industrial chains or different industries, thus forming a symbiotic and win-win digital ecosystem. This industrial digital platform helps to share factor resources and improve the efficiency of resource allocation; it is also conducive to strengthening collaboration and joint innovation among different enterprises and improving the efficiency of interconnection and integration. Generally speaking, the construction of industrial digital platforms can further promote the digital transformation of small and medium-sized enterprises and improve their digital competitiveness by integrating into the digital ecosystem.

3.4.1 Industrial Digital Platform Construction

Industrial digital platforms help to share factor resources and improve the efficiency of resource allocation; they are also conducive to strengthening collaboration and joint innovation among different enterprises and improving the efficiency of interconnection and integration. Generally speaking, the construction of industrial digital platforms can further promote the digital transformation of small and medium-sized enterprises and improve their digital competitiveness by integrating into the digital ecosystem.

3.4.2 Digital Profitability

Digital profitability is the current and future ability of the enterprise to digitally operate to obtain profits, is the production. It is the comprehensive performance of the integration and synergy of production, marketing and management [4]. SMEs with poor digital profitability urgently need to leverage external advantages to carry out relevant digital transformation to improve their

unfavorable business conditions. SMEs with poor digital profitability urgently need to take advantage of external advantages to carry out relevant digital transformation to improve their unfavorable business conditions; SMEs with strong digital SMEs with strong digital profitability have already shared the dividends of adapting to the development of the digital economy, laying a material foundation for further promoting the digital transformation of enterprises.

SMEs with strong digital profitability have already shared the dividends of adapting to the development of the digital economy, which lays a material foundation for further promoting digital transformation. Therefore, digital profitability is a key factor in measuring the ease or difficulty of SMEs' digital Therefore; digital profitability is a comprehensive factor to measure the difficulty of SMEs' digital transformation and to ensure the smooth progress of their digital transformation.

3.4.3 Data Operation and Maintenance Capability

Data operation and maintenance is an important manifestation of an enterprise's data processing capability. Enterprises use emerging technologies to carry out data value creation and realize business innovation to highlight enterprise data capabilities, which to a large extent plays a decisive role in the success of enterprise digital transformation. With the development of big data, the Internet and other new forms of business, data has gradually become a key production factor in the development of the digital economy [5].

First, small and medium-sized enterprises should strengthen their digital perception capabilities, including strengthening enterprise digital thinking; improving data collection capabilities; and improving the level of digital scenario design. Second, small and medium-sized enterprises should improve the level of digital foundation, including building the industry chain synergistic development mode; cultivating digital technology talents; and strengthening the research and development and use of core technologies. Finally, they should promote the construction of digital platforms, improve the ability of data operation and maintenance; and explore the innovative digital marketing business.

4. Digital Transformation Development Path Planning for Small and Medium-sized Enterprises under the Perspective of Internet of Things

4.1 Needs Identification: Strengthening Data-Awareness Capabilities

First, strengthen the enterprise digital thinking. In the current era, in order to better adapt to the development of the times and meet the needs of the enterprise's own development, digital transformation and upgrading must be carried out. In order to better provide conditions for digital transformation, enterprise managers must strengthen the understanding of the concept of digital transformation.

Second, improve the data collection ability. Digital transformation, the key is to deal with the massive data of the enterprise, through the relevant technical support, build a perfect digital model system, unified management and operation, to ensure that data collection, storage, processing and management can be carried out in an orderly manner.

Third, improve the level of digital scene design. SMEs should identify the key business scenarios and digital technology should be the point of fit, and then focus on the core business scenarios for transformation and upgrading. The key for SMEs to improve the level of digital scenario design is to take user experience as a reference.

4.2 Transformative Practices: Improving the Digital Infrastructure

First, the construction of industry chain synergistic development mode in the context of digitalization can use digital technology to supplement the industry chain, strengthen the weak links, so that enterprises can cooperate with other enterprises with larger development scale, and re-stimulate the internal vitality of the industry chain.

Second, cultivate digital technology talents. Professionals need to have a good sense of digitalization, can recognize the background of the development of small and medium-sized enterprises in the digital era, can combine the characteristics of the background and their own work content, the work mode innovation.

Third, strengthen the research and development and use of core technologies. In order to ensure the safety of technology, enterprises need to carry out independent research and development and digital technology improvement, so that the application of advanced technology can truly become a tool and power for the digital transformation of enterprises [6]. Through this, enterprises can also explore to obtain more advanced productivity and production tools, expand the scope of application of advanced data technology within the enterprise, and accelerate the process of enterprise digital transformation.

4.3 Deep Application: Strengthening Digital Application Capabilities

First, promote the construction of digital platforms. For small and medium-sized enterprises actively promoting digital transformation, it is very critical to build an excellent information sharing platform, only when it becomes a powerful medium to promote enterprises to carry out research on digital transformation, enterprises can realize the sharing of application cases, information exchange and mastery of core technology algorithms.

Second, improve data operation and maintenance capabilities. Digital transformation is usually faced with high costs and uncertainty. Based on this, enterprises should also use internal efficiency improvement and external government subsidies to enhance the level of revenue from their own digital transformation.

Third, explore innovative digital marketing business. Enterprises in the process of digital transformation, one of the most important transformation tasks is to promote the digital innovation of business projects, only to explore innovative digital marketing businesses can faster integration into the digital era, access to the development of digital technology to bring a variety of dividends.

5. Conclusions

SMEs should change their original business management mode, realize the digital transformation of their development mode and strategy, seek production relations that match the new productivity, improve the quality of the supply of digital products and services, and provide more diversified digital products and services, in order to maximize the micro-foundational role of SMEs in contributing to the process of high-quality development in the new era, and make the development of SMEs meet the requirements of the new era.

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