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Research on the Influencing Factors of DT of SMEs from TOE Perspective

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ABSTRACT

Purpose: This paper is to examine how the DT of SMEs is affected and driven, and provide theoretical and practical implications for the DT of SMEs.

Design/methodology/approach: Starting from the TOE framework, combined with the resource-based view and contingency theory, this study identifies the antecedents that affect the DT of SMEs from the three dimensions of technology, organization, and environment. Under the framework of TOE, digital technology infrastructure, employee skills, management support and environment uncertainty will be fully discussed. With the data from 221 SMEs from China analyzed by the fs_QCA 3.0, the driving paths for high DT are divided into different conditions configurations.

Findings: The DT of SMEs is not the result of a single factor driven, but rather the result of the synergistic effect of the enterprise. There are multiple resource allocation configurations that drive the DT of SMEs, indicating the complexity and synergy of the factors affecting the DT of SMEs, which can prove the DT of SMEs has the characteristic of "multiple concurrency".

Research limitations/implications: DT is a very complex phenomenon, and there are many factors that affect the DT of SMEs. Based on the TOE framework, this paper selects four factors, and many possible factors are not included in the model. Besides, for QCA, a case-based research method with a quantitative approach, structured questionnaire surveys often result in a lack of detailed understanding of the research subjects and the inability to delve into all case enterprises.

Originality/value: The findings will enrich the research in the DT field, and deepen the rational understanding of the complex interaction nature of multiple factors behind the successful DT of SMEs and provide path guidance for SMEs to realize DT. The research conclusions of this study provide valuable insights for SMEs to promote DT by combining possible antecedent configurations.

Keywords: Small and medium-sized enterprises (SMEs), Digital transformation (DT), Qualitative comparative analysis, Technology-organization-environment (TOE), Configuration factors, fsQCA

I. Introduction

As the largest enterprise group, small and medium-sized enterprises (SMEs) are the main force of technological innovation and digital economy

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development in China. Since the past two decades, SMEs go through change and development with digital transformation as a result of technology, deregulation, globalization, and intense competitive pressure (Prasad et al., 2022). However, SMEs are facing many challenges, such as the lack of talents, capital, technology and innovation resources, which impede the competitiveness of SMEs significantly.

In recent years, with the rapid development and wide application of digital technology, the enabling role of the digital economy in China's various industries has become increasingly prominent. The deep integration of the digital economy and the real economy has entered the fast lane, further enhancing the resilience and vitality of China's economy. Digital technology, digital innovation, and digitization are fundamentally changing business processes, products, services, and relationships, driving businesses to change their business practices and employee mindset, forcing them to restructure for survival (Karimi & Walter, 2015) and keep SMEs competitiveness in this fast changing environment.

At present, it is a critical period for the digital transformation of SMEs. However, when it comes to digital transformation (DT), there are still a large number of SMEs that have the problems of "not wanting to transform", "not daring to transform", and "not being able to transform". As the world's factory, 90% of China's manufacturing industry is composed of SMEs. The DT of SMEs is closely related to the promotion of the digital economy. Once SMEs basically complete their DT and achieve data-driven collaborative production, huge economic benefits will erupt. It can be seen that SMEs are the core issue and micro foundation of manufacturing transformation and upgrading. Therefore, helping SMEs transform and upgrade has become an important issue.

However, the current research in academia on DT is mostly focused on large enterprises, and there is insufficient research on the DT of SMEs. There is even less research on the factors affecting the digital transformation of SMEs. Meanwhile, research on the factors influencing DT of SMEs often uses qualitative analysis methods such as case studies, and the

conclusions drawn are not universally applicable. Some scholars have also used regression analysis methods to study the net effects of factors affecting the DT of SMEs, but have overlooked the causal complexity behind DT, which makes it difficult for existing research to analyze the mechanism of DT of SMEs from a holistic perspective. Therefore, this study introduces the fsQCA method into the study of the influencing factors of DT attempting to investigate how different factors collaborate and affect the DT of SMEs, and clarify the antecedent configuration that leads to high-degree or not high-degree of DT. This has important guiding significance for the DT practice of SMEs.

This study builds a research model on the influencing factors of DT in SMEs based on the TOE framework, which fills the gap in existing research on the mechanism of multiple factors affecting DT in SMEs. At the same time, a configuration perspective is adopted, and the fuzzy set qualitative comparative analysis method (fsQCA) is used to focus on how technological factors, organizational factors, and environmental factors interact to affect the DT of SMEs. To a certain extent, it overcomes the shortcomings of case studies and regression analysis, and enriches the research on the influencing factors of DT in SMEs. For SMEs, if there are clear configurations that can drive DT, it can provide methods and path references for their DT practice. SMEs can evaluate their own resources, combine with the external environment they face, utilize their resource endowments, and accelerate the process of DT by continuously adapting to the external environment.

II. Literature Review

A. DT and SMEs' Performance

SME's DT is a multi-dimensional concept. From a technical perspective, DT consists of the application of new generation digital technologies in enterprises, such as, big data, artificial intelligence, cloud computing

and the Internet of things, etc. For example, Ebert & Duarte (2018) believes that DT refers to the transformation process in which enterprises apply digital technology to reduce repetitive labor or replace traditional digital technology with advanced digital technology in the production, operation, and service processes (Ebert & Duarte, 2018). From the perspective of organizational change, enterprise DT is a process that triggers organizational change through the application of digital technology (Hanelt et al., 2021; Vial, 2019), including organizational structure, business processes, business models, etc (Yu, 2021). This study adopts the perspective of organizational change and thus defines DT as a process in which enterprises use various digital technologies to drive the change of management modes, business processes, products and services, etc.

B. The Influencing Factors of DT

Current research generally believes that factors such as funding, technology, talent, and data, as well as business philosophy and external support such as government policies, digital platforms, and service institutions, are important factors affecting the DT of SMEs. Some scholars have conducted research from the perspective of multiple influencing factors, believing that the success of DT of SMEs is not driven by a single factor, but rather the result of the joint interaction of multiple internal and external factors (Chen & Tian, 2022a). Weak foundation, competitive pressure, technological barriers, low quality of digital applications, and weak digital collaboration among enterprises are multiple factors that affect the DT of SMEs. Other scholars have conducted research on a specific factor that affects the DT of SMEs, and found that factors such as the "digital divide" caused by the lack of data elements, the willingness of government participation, the use of digital technologies such as cloud computing, and digital platform support have played a significant role in influencing the digital transformation process of small and medium-sized enterprises (Chatterjee et

al., 2022). Kozanoglu & Abedin, (2021) believe that big data, artificial intelligence, cloud computing, and other technologies are the first driving force for DT. In addition, scholars also mentioned that management support, leader knowledge quality, and other important factors affecting the DT of SMEs.

C. The TOE Framework

Tornatzky et al. (1990) proposed the TOE theoretical framework, which provides a theoretical explanation for research on technological innovation, application, and promotion from the perspective of internal and external enterprises, based on the three perspectives of technology, organization, and environment. The TOE framework emphasizes the impact of multi-level technological application conditions on the effectiveness of technological application. Among them, technological factors refer to the technical conditions, characteristics, and applications of an enterprise, such as professional knowledge and infrastructure of enterprise technology (Chau et al., 1997; Wu et al., 2020); Organizational factors refer to organizational characteristics related to technology adoption and utilization, covering enterprise size, support from senior management, previous technical experience, executive tenure, executive background, organizational atmosphere, organizational redundancy, etc (Walker, 2013); Environmental factors refer to the specific environment in which an enterprise is located, including government regulatory policies, market competition, policy changes, environmental pressure, etc (Abed, 2020; Oliveira et al., 2011). The connotation and subdivision dimensions of the TOE framework in the process of continuous application. The degree and application scenarios are constantly adjusted and improved.

III. The Model Construction

For the model construction, based on the TOE theoretical framework, combined with literature review and the current situation of digital transformation in SMEs, four influencing factors of digital infrastructure, employee skills, environmental uncertainty, and management support for digital transformation in SMEs were identified.

Based on the above analysis, the research model of this paper is shown in Figure 1.

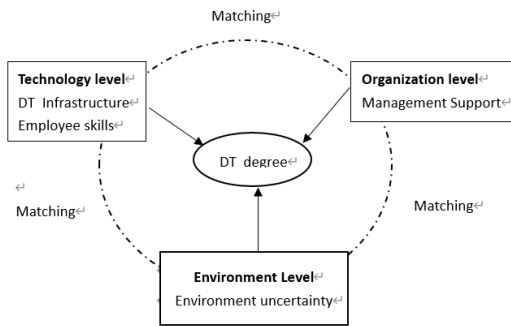


Figure 1. Theoretical model

IV. Research Methodology and Data Collection

A. fsQCA Method

The QCA method is an innovative research method based on the configuration perspective (Ragin & Rihoux, 2017) is particularly suitable for studying complex causality and multiple interactions (Fiss et al., 2011). fsQCA (Fuzzy set Qualitative Comparative Analysis) is a fuzzy set theory method used to quantitatively analyze the influencing factors in complex systems which can effectively analyze the ordered and unordered relationships between multiple variables, making it a very useful quantitative analysis method. Using the set concept and Boolean algebra

method in mathematics, each case is regarded as a whole, which integrates the dual advantages of qualitative analysis and quantitative analysis. The advantage of the QCA method (Ragin & Rihoux, 2017) is that it overcomes the defect that the traditional regression analysis method based on net effect only studies the influence of independent variables on dependent variables and cannot study the influence of multi-factor synergy on dependent variables. At the same time, the QCA method also makes up for the weak universality of single case study conclusions to a certain extent. At present, the QCA method has been widely used in many fields of social science field (Greckhamer et al., 2008).

Qualitative comparative analysis (QCA) is a case-based research method suitable for SMEs. Du et al., (2021) and Zhang & Du (2019) believe that the QCA method has a moderate sample size and meets the requirements for a moderate sample size. By adopting a holistic perspective and focusing on the comprehensive explanatory power of different combinations of conditional variables on outcome variables, it is possible to identify different conditional configurations that lead to the same result. Therefore, the QCA method is very suitable for identifying complex antecedents leading to DT research. At present, the QCA method is increasingly being applied in the fields of digitalization and information systems, such as the research of Park et al. (2020) and Pappas et al. (2018).

B. Variable Measurement

In order to ensure the reliability and validity of the questionnaire, the research scale mainly adopted the mature scale existing in the literature. The independent variables and dependent variables were all anchored on five-point Likert scale.

1. Digital transformation

DT evaluates the current situation of enterprise DT, Schumacher et al., (2016) built a manufacturing

enterprise DT maturity model including evaluation elements such as products, operations, customers, and technology, and Leyh et al., (2016) established an enterprise digital level maturity measurement model, which divided the maturity into five levels: basic digitization, cross-departmental digitization, horizontal and vertical digitization, complete digitization and optimized digitization to measure the stage of manufacturing enterprise DT (Yoruk, 2004). By measuring the maturity of DT, we can grasp the current DT degree of manufacturing enterprises and promote the organization to adapt to the development requirements of the digital market, which is of positive significance for mastering the DT of manufacturing enterprises. Referring to the research of Schumacher et al. (2016), this study measures the DT of SMEs from the aspects of the enterprise's use of digital technology is measured from four aspects: product, management, business process and operation, including four items.

2. Digital technology infrastructure

Digital technology infrastructure evaluates the digital technology resources owned by enterprises. The measurement of digital technology infrastructure is based on the research of Eller et al. (2020) to integrate and revise the scale and measure the richness, complexity, upgrading, and optimization of enterprise digital technology and its comparison with peers, including four items.

3. Employee skills

Employee skills measure the ability of employees in SMEs to operate digital technology and adapt to the digital environment. Based on the research of Eller et al. (2020) and Nasiri et al., (2020), the scale was integrated and revised to measure employees' learning of digital technology, training, and other aspects, including four items.

4. Environmental uncertainty

Environmental uncertainty mainly measures the

changes in the external environment faced by enterprises. The measurement scale of environmental uncertainty is relatively mature. Many scholars divide environmental turbulence into two dimensions: technology and market, and some scholars measure environmental uncertainty as a whole (V. Lee et al., 2022). Combined with the scenario of the DT of SMEs, this study regards the environmental uncertainty as a whole and measures the speed of technology elimination and market change concerning the research of Jaworski & Kohli (1993).

5. Management support

Management support measures the cognitive and behavioral support of senior managers of SMEs for DT. Senior managers in enterprises are the "bridge" connecting internal and external contexts and strategic changes, and the initiation of DT strategies depends on the management's understanding and actions towards digital strategies (S. Lee et al., 2023). There are many mature measurement scales of management support, mainly focusing on the research fields related to informatization, but the connotation of management support changes with the change in research scenarios. In the context of the application of digital technology, some scholars also regard management support as a whole. This study refers to the research of Jarvenpaa & Ives (1991), and measures executive support as a whole.

C. Data Collection

The research samples of this study are the SMEs carrying out DT. The research time was from July to October, 2021. The research objects were mainly CEOs, business executives and relevant middle and senior managers, including 101 business executives, accounting for 45.7%, 72 senior managers such as general managers or CEOs, accounting for 32.6%, and 48 IT-related departments middle managers, accounting for 21.7%; The research sample SMEs are located in typical regions such as Beijing-Tianjin-

Table 1. Descriptive statistical information of surveyed SMEs

No. of employees	No.	Percentages	Year of establishment	Frequency	Percentage
Under 50	115	52.0	Below 2	16	7.2
51-100	40	18.1	3-5	64	29.0
101-200	24	10.9	6-10	69	31.2
201-500	24	10.9	More than 11	72	32.6
501 -1000	6	2.7	Industry Sectors	Frequency	Percentage
Above 1001	12	5.4	Manufacturing	55	24.9%
Stages	No.	Percentages	Wholesale and retail	61	27.6%
Initial stage	26	11.8	Business services	27	12.2%
Growing stage	106	48.0	Scientific research and technical services	17	7.7%
Mature stage	81	36.7	Information services	17	7.7%
Recession stage	8	3.6	Others	44	19.9%

Hebei, Yangtze River Delta and Pearl River Delta. A total of 263 questionnaires were distributed in this survey, and 221 valid ones were obtained after eliminating questionnaires with incomplete answers or obvious problems. The descriptive statistics of the sample SMEs are shown in Table 1.

that the variable has good convergent validity. Thirdly, by comparing the square root of AVE value with the size of correlation coefficient, as reported in Table 3, the square root of AVE value of all variables is greater than the correlation coefficient with other variables, indicating that the scale in this study has good discriminant validity.

V. Data Analysis and Findings

A. Reliability and Validity test

In this paper, Cronbach coefficient was used to test the internal consistency reliability, and factor load was used to test the index reliability. The results are reported in Table 2. It can be seen from Table 2 that the Cronbach coefficients of all constructs are greater than 0.7, indicating that the scale has good internal consistency reliability, and the factor loads of all latent variables are greater than 0.7, indicating that the measurement indicators of the constructs have relatively good reliability.

In terms of validity, firstly, the commonly used scales at home and abroad were selected and revised on the basis of pilot-study, which ensures the content validity of the questionnaire to a certain extent. Secondly, the average variance extraction factor (AVE) of each variable is greater than 0.5, indicating

B. Data Calibration

This essay refers to the calibrate (X, n1, n2, n3) function in fsQCA3.0 software to calibrate each variable to fuzzy set data. During the calibration process, three anchor points need to be set, namely the full membership point (0.95), the completely non-full membership (0.05), and the cross point (0.5). The cross point refers to the intermediate point between complete membership and complete non membership. the three anchor points for calibration are shown in Table 4 below.

C. Necessary Condition Analysis

Referring to the research by (Greckhamer & Aguilera, 2018), a necessary condition analysis was conducted before conducting configuration analysis. When the consistency of the conditional variable with

the result variable reaches 0.9 or more, it can be considered that this factor is a necessary condition for the generation of the result. Through consistency analysis using fsQCA3.0 software, the consistency scores of each single variable on the outcome variable were obtained (see Table 5). The consistency scores of each conditional variable on the outcome variable of transformation and upgrading did not exceed 0.9, indicating that there is no necessary condition for

Table 3. Variable correlation coefficient and discriminant validity

	DT	DTI	ES	MS	EU
DT	0.704				
DTI	0.637	0.710			
ES	0.588	0.579	0.771		
MS	0.549	0.488	0.538	0.716	
EU	0.377	0.447	0.387	0.507	0.724

Table 2. Variable measurement, reliability and validity analysis

Constructs	Measures	Factor loading	Cr.Alpha	AVE
Digital Transformation (DT)	Adopting digital technology to transform and upgrade the existing products, services and processes	0.765	0.741	0.505
	Willing to put effort into promoting and publicizing digital skills and management knowledge	0.720		
	Our company is operating business processes based on digital technology	0.722		
	Our business operations are shifting towards leveraging digital technology	0.731		
Digital Transformation Infrastructure (DTI)	Compared with its major competitors, the company invests more in the construction of digital technology infrastructure	0.736	0.705	0.504
	The company's digital technology is more complex than its main competitors	0.788		
	The company's digital technology can be upgraded and optimized	0.791		
	The company is well equipped with various digital technology equipment development	0.711		
Employee Skills (ES)	We promote continuous learning of the unique properties of digital technologies	0.830	0.780	0.603
	My organization provides the employees with the resources or opportunities to obtain the right skills to take advantage of digital trends	0.785		
	Enterprises support and promote employees to improve their digital skills	0.761		
	Employees can easily accept the digital working environment to improve organizational effectiveness	0.728		
Management Support (MS)	The management actively attends to the company's transformation process	0.755	0.758	0.513
	The management knows the implementation situation of rival company's DT	0.786		
	The management frequently has casual contact with the company's DT manager	0.730		
	The management understands the opportunities brought by the company's DT	0.725		
	The management is willing to provide enough capital for the company's DT	0.767		
Environment Uncertainty (EU)	The technology of the industry changes rapidly	0.719	0.847	0.524
	The changing trend of the market is difficult to predict	0.747		
	The update and iteration of technology in the industry is very fast	0.809		
	Customer preferences change rapidly	0.738		
	Customers always tend to look for new products	0.721		
	The product life cycle of the industry is short	0.709		
	The changing trend of the market is difficult to predict	0.806		

Table 4. Variable standard deviation and calibration anchor point

Variables	full membership	Crosspoint	Non-full membership
Digital Transformation Infrastructure	4.161	3.590	3.019
Employee Skills	4.406	3.838	3.270
Executive Support	4.406	3.886	3.366
Environmental Uncertainty	4.355	3.680	3.005
Digital Transformation	4.438	3.919	3.400

Table 5. Test of the necessary conditions for the high-degree DT

Variables	Consistency	Coverage
DTI	0.771256	0.849595
~DTI	0.561728	0.640784
ES	0.890271	0.764526
~ES	0.409931	0.661240
MR	0.791118	0.835152
~MR	0.531611	0.635031
EU	0.721115	0.803147
~EU	0.571013	0.644080

transformation and upgrading, and the explanatory power of a single antecedent variable on digital transformation is not strong (Schneider & Wagmann, 2017; Ragin & Rihoux, 2017).

D. Configuration Path Analysis

Referring to Fiss et al. (2011), set the consistency threshold to 0.8 and the case frequency threshold to 1. The specific results are shown in Table 6. Under the synergistic influence of enterprise digital strategy and resources, the following two configuration paths have been found to promote the high degree of DT of SMEs:

(1)Resource allocation plan for mature SMEs: Combination path H1 displays that high-degree DT can happen with high employee skills play as the core conditions and executive support and environment uncertainty as the auxiliary conditions. The path consistency is as high as 0.865. Most typical enterprises in this configuration are mature SMEs, indicating that for mature SMEs with not so good

Table 6. Configurations of High-Degree DT

Antecedents	Configurations	
	H1	H2
DTI	⊗	●
ES	●	⊗
MR	•	•
EU	⊗	•
Raw Coverage	0.890271	0.351635
Unique Coverage	0.555592	0.016956
Consistency	0.864526	0.847771
Solution Coverage	0.907227	
Solution Consistency	0.759857	

Note: 1) ● indicates that the core condition exists ; 2) indicates the core condition doesn't exist 3) • indicates the auxiliary condition doesn't exist; 4) ⊗ indicates the auxiliary condition does not exist.

DTIs, the collaboration of employ skills, executive support and environment uncertainty can promote the DT significantly.

This phenomenon often occurs in SMEs with a certain scale and a relatively long establishment time. This is because large and established SMEs often have established themselves firmly in the industry, and environmental uncertainty have a relatively small impact on the development of SMEs. At the same time, due to the years of development in the industry and the accumulation of relevant experience and knowledge, managers have a better understanding of the DT situation in the industry, and employees have relatively high skills. In such a situation, endogenous forces play a leading role, and managers attach great importance to the DT of enterprises, vigorously cultivate employee skills, and ultimately promote the realization of a high-degree of DT in SMEs.

(2)Resource allocation plan for newly started SMEs: Combination path H2 displays that high-degree DT can happen with good digital transformation infrastructures play as the core conditions even though executive support and environment uncertainty is clearly missing. The path consistency is as high as 0.848. Most typical enterprises in this configuration are mature SMEs, indicating that for newly started SMEs with not so employee skills, the collaboration of digital transformation infrastructure, low executive support and low environment uncertainty can promote the DT significantly.

According to relevant research on environmental volatility, it can have a synergistic effect with corporate resources (Chen & Tian, 2022b). Due to the uncertainty of the environment, changes in industry digital technology, and customer preferences, market changes are driving companies to accelerate organizational change and drive DT.

By comparing the two combination paths mentioned above, it was found that based on the TOE framework, the variables of the technology perspective are quite important, with either the good digital transformation infrastructures or the good employee skills, the high-degree DT can happen with or without executive support and market uncertainty.

VI. Conclusions

A. Research Conclusions

This study analyzes the impact of the mechanism among digital transformation infrastructure, employee skills, management support, and environment uncertainty from the perspective of TOE framework. The main conclusions are as follows:

(1)The DT of SMEs is not the result of a single factor driven, but rather the result of the synergistic effect of the enterprise. There are multiple resource allocation configurations that drive the DT of SMEs, indicating the complexity and synergy of the factors affecting the DT of SMEs, which can prove the DT

of SMEs has the characteristic of "multiple concurrency". The research conclusion is in consistent with the findings of Chen & Tian (2022).

(2)The different combinations of antecedent conditions have formed two equivalent paths to achieve high-level DT. According to the different core conditions, it can be summarized into two types of scenarios: the first type is applicable to technology-based SMEs. Regardless of the size and development potential of the enterprise, good employee skills matching with management support can effectively promote the DT of the enterprise, even when the environment is stable; The second type is applicable to traditional small and medium-sized manufacturing enterprises. In a highly uncertain environment, companies with a large amount of digital technology infrastructure and management support can generate high levels of digital transformation, even though their employees are not skilled.

(3) The configurations for achieving digital transformation are diverse, and there is no single best path for SMEs to achieve DT. Multiple configurations are equivalent and can lead to a high degree of DT(Hanelt et al., 2021).

B. Management Inspiration

On the one hand, SMEs must pay attention to the construction and investment of DT infrastructure when carrying out DT. New digital technologies such as artificial intelligence, big data and the Internet of Things are essential assets for the success of SMEs' DT. SMEs must invest a lot of money in digital technology infrastructure, establish technology advantages, and thus lay the foundation for DT.

On the other hand, we should pay attention to the driving effect of the configuration effect of multi factor synergy on the DT of SMEs. The configuration conditions obtained in this study can provide theoretical guidance for DT of SMEs. SMEs can choose different schemes for DT while strengthening the construction of digital technology infrastructure and employee skills. The first option is to strengthen the training

of employees' skills and improve the support of executives to promote Digital transformation. The second solution is that when SMEs are faced with an uncertain environment, they should make full use of the digital transformation infrastructure and management support, fully seize the new opportunities in the digital era. Both paths indicates that the management support is necessary for high-degree DT of SME. Thus it might be better to enhance the support of executives for DT, promote substantive efforts in both cognitive and behavioural aspects, and even establish positions such as Chief Digital Officer to better promote DT of SMEs from a strategic perspective.

C. Implications

Managers of SMEs must shift their thinking from "partial optimization" to "configuration coordination", abandon "single factor thinking", focus on multi factor linkage driving, and choose transformation strategies that are in line with their actual situation. The configuration results obtained from this study can provide theoretical guidance for the DT of SMEs. Specifically, SMEs can choose different solutions for DT based on continuous introduction of digital technology and equipment for local optimization, strengthening exchange of experience in DT management among peers. Possible solutions are as follows: one approach is to enhance digital skills training for employees, create an atmosphere and culture for learning and using digital technology, and accelerate the DT of various aspects of enterprise production and operation. Another solution is to enhance the support and promotion of DT among executives, urging managers to make substantial efforts in cognitive and behavioral aspects, and even considering the establishment of positions such as Chief Digital Officer to better promote DT of SMEs from a strategic perspective.

D. Limitations of the Study

There are also some shortcomings in this study that require further in-depth research in the future. Firstly, the limitations of the selection of antecedent factors. DT is a very complex phenomenon, and there are many factors that affect the DT of SMEs. Based on the TOE framework, this paper selects four factors, and many possible factors are not included in the model.

Secondly, for QCA, a case-based research method with a quantitative approach, structured questionnaire surveys often result in a lack of detailed understanding of the research subjects and the inability to delve into all case enterprises. Future relevant research can draw on and use the online database of SMEs' DT cases, adopt qualitative research methods, such as using Grounded theory to collect data, reduce the sample size as much as possible, conduct in-depth research on each sample case, and then improve the explanation of configuration results on the phenomenon of DT.

Third, the research object of this paper is SMEs. SMEs are involved in a wide range of industries, and the DT situation of different industries is different. Future research can focus on a specific industry, such as manufacturing or service industry, and further improve the universality of the research conclusions.

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