What Drives the Digital Transformation of SMEs? Empirical Evidence from Guiyang, China

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Abstract

As the core of China's national big data strategy, Guiyang provides a unique ecosystem for examining the digitalization of Small and Medium-sized Enterprises (SMEs). This study utilizes the Technology-Organization-Environment (TOE) framework to investigate the factors influencing the degree of digital transformation among 499 SMEs in Guiyang. By employing an Ordered Logit Model, the research quantifies the impact of nine critical factors: relative advantage, compatibility, complexity, firm size, digital skills, resource availability, government policy, competitive pressure, and partner synergy. The empirical results demonstrate that Relative Advantage (β =0.687) and Government Policy (β =0.401) are the most significant drivers of digital maturity. Additionally, Resource Availability and Partner Synergy play vital roles in facilitating deeper digital integration. Conversely, internal factors such as firm size and employee skills did not yield statistical significance, suggesting that a robust regional policy environment can compensate for individual organizational constraints. These findings offer strategic insights for policymakers aiming to bridge the digital divide in emerging industrial clusters.

Keywords: Digital Transformation, SMEs, TOE Framework, Guiyang, Ordered Logit Model,.

Introduction

The onset of the post-pandemic era has marked a fundamental shift in the global industrial landscape, transitioning from traditional factor-driven growth to models centered on digital resilience. For Small and Medium-sized Enterprises (SMEs), which form the backbone of the industrial sector, digital transformation (DT) has evolved from a strategic "option" to a "must-have" for survival and high-quality development (Faiz et al., 2024; Omrani et al., 2024). Scholarly research emphasizes that DT provides "digital immunity" by optimizing resource allocation and enhancing the ability to cope with volatile external environments (Sanchez et al., 2025). High-impact studies suggest that a 1% increase in the adoption of advanced technologies like AI can lead to a 14.2% boost in total factor productivity for manufacturing firms (International Trade Centre, 2024).

Guiyang and the Guian New Area occupy a pivotal position in China's national digital strategy. As the core of the first National Big Data Comprehensive Pilot Zone and a critical node in the "Eastern Data and Western Computing" project, the region is transitioning from a "storage base" to a "computing power ecosystem" (Guizhou Provincial Government, 2022). The local government has set ambitious targets, aiming for 800,000 standard racks and 4 million servers by 2025 (Guizhou Provincial Government, 2022). This world-class digital infrastructure, combined with institutional innovations such as "Computing Vouchers" and preferential electricity rates (0.35 RMB/kWh) for large data centers, provides a unique "environmental dividend" that serves as a powerful catalyst for local SMEs (Guian New Area Management Committee, 2022; Guizhou Provincial Government, 2025).

Despite the strategic importance of digitalization, many SMEs in Guiyang struggle with "not wanting to, not daring to, and not knowing how to" transform. To bridge this gap, this study utilizes the Technology-Organization-Environment (TOE) framework to explain the degree of digital transformation among SMEs. This research specifically addresses the following questions:

Q1: How can the degree of digitalization in SMEs be identified and measured through a practical application instance?

Q2: What are the critical factors influencing the digital transformation process of SMEs?

Q3: What are the specific impacts of these identified factors on the digital transformation trajectory of SMEs?

To address the aforementioned research questions, this study adopts the Technology-Organization-Environment (TOE) framework as its theoretical foundation to systematically decompose the drivers of digital transformation (DT) among SMEs in Guiyang. Methodologically, this research employs a mixed-method empirical approach. Firstly, a multi-dimensional indicator system-integrating subjective managerial perception with objective software utilization tiers-is constructed to identify the "degree" of digitalization. Subsequently, an econometric model is developed to test the hypothesized relationships between nine critical factors across the TOE dimensions and the transformation degree. By synthesizing qualitative theoretical analysis with quantitative empirical evidence, this paper provides a granular mapping of the digital transition trajectory, offering strategic insights for both firm-level decision-makers and regional policy architects in Guiyang's "Data Valley" ecosystem.

Literature Review

The Conceptual Evolution of Digital Transformation in SMEs

Digital transformation (DT) is conceptualized as a holistic process where firms leverage digital technologies (e.g., Cloud Computing, AI, Big Data) to trigger significant organizational changes, thereby creating and capturing value in increasingly volatile markets (Vial, 2019). For Small and Medium-sized Enterprises (SMEs), DT represents a departure from traditional "digitization" (the conversion of analog information to digital) toward a systemic reconfiguration of business models and internal operations (Li et al., 2018).

Recent scholarship emphasizes that SMEs face unique "resource poverty" constraints-limited financial capital, lack of specialized IT personnel, and shorter strategic horizons-which make their transformation path distinct from larger corporations (Nambisan et al., 2019). In the context of China's regional development, particularly in cities like Guiyang, SMEs often undergo "passive transformation" driven by ecosystem requirements or "proactive transformation" facilitated by high-tech industrial clusters.

Theoretical Foundations: The TOE Framework

The Technology-Organization-Environment (TOE) framework, introduced by Tornatzky and Fleischer (1990), has emerged as the premier theoretical lens for examining firm-level innovation adoption. Unlike the Technology Acceptance Model (TAM) or the Unified Theory of Acceptance and Use of Technology (UTAUT), which focus on individual-level perceptions, the TOE framework accounts for the structural and external complexities that define corporate behavior (Baker, 2012).

In practical academic applications, the specific variables nested within the three TOE dimensions are not static; they are traditionally adapted to suit the technological context and regional characteristics under study. For instance, early applications of TOE in e-business adoption primarily focused on infrastructure and firm size (Zhu et al., 2006). However, as digital ecosystems have evolved, recent literature has expanded these dimensions to include softer organizational capabilities and complex environmental synergies. A synthesis of contemporary research reveals a convergence toward specific sub-factors that determine digital maturity. In the technological dimension, scholars frequently cite the triad of Relative

Advantage, Compatibility, and Complexity as the primary determinants of innovation utility (Rogers, 2003; Baker, 2012). From an organizational perspective, Firm Size, Employee Skills, and Resource Availability are identified as the foundational pillars of internal readiness (Vial, 2019; Li et al., 2020). Finally, in the environmental dimension, the role of Government Policy, Competitive Pressure, and Partner Synergy has gained prominence, especially in emerging economies where institutional support and supply chain integration act as critical catalysts (Oliveira & Martins, 2011).

By synthesizing these findings, this study identifies nine core factors: Advantage, Compatibility, Complexity, Size, Skills, Resource, Policy, Competitive, and Partners. The selection of these factors is highly rationalized for the Guiyang context. Given Guiyang's status as a national "Big Data" hub, the inclusion of "Policy" is essential to capture the impact of regional strategic incentives. Furthermore, the focus on "Skills" and "Resources" directly addresses the "resource poverty" characteristic of SMEs, while "Complexity" and "Compatibility" account for the technical barriers inherent in high-end digital transitions. This multi-dimensional selection ensures a comprehensive mapping of both the "internal drive" and "external push" mechanisms governing SME digitalization.This study extends the classical TOE model by tailoring its factors to the specific characteristics of the Guiyang SME landscape.

Research Model and Hypotheses

Theoretical Framework

Based on the literature analysis and the specific characteristics of SMEs, such as their organizational agility yet resource vulnerability, we have selected nine critical factors across the Technology, Organization, and Environment dimensions to construct our research model.

Technological Context: This refers to the pool of available internal and external technologies relevant to the firm, as well as their characteristics as perceived by the organization.

Organizational Context: This encompasses the characteristics and resources of the firm itself, including its size, structure, and human capital.

Environmental Context: This consists of the arena in which the firm conducts its business, including industry structure, competitors, and the regulatory setting.

The TOE framework suggests that the digital transformation of SMEs is not a standalone technical event but a strategic adaptation resulting from the interplay between technological feasibility, organizational readiness, and external environmental pressures. In this model, the "Degree of Digital Transformation" serves as the dependent variable, representing the depth and breadth of a firm's digital integration.The table below summarizes the model structure.

Table 1: Dimensions and Core Factors

Dimension	Core Factors	Impact on Transformation
Technological	1. Advantage	Adopting digital transformation can provide the enterprise with technological advantages.
	2. Compatibility	Pursuing digital transformation aligns with the firm's existing technologies.
	3. Complexity	The technical challenges introduced by digital transformation are excessively high.
Organizational	4. Size	The increased management complexity due to firm size promotes the adoption of digital management software.
	5. Skills	Employees' digital skills are a key enabler of digital transformation.
	6. Resource	Financial and technological resources directly affect the implementation of digital transformation.

	7. Policy	Government support policies provide external incentives for digital transformation.
Environmental	8. Competitive	Industry competition pressures firms to pursue digital transformation to maintain market position.
	9. Partners	Collaboration with supply chain partners and ecosystems enhances synergies in digital transformation.

Measurement of the Dependent Variable

The degree of digital transformation, the dependent variable, was measured using a hybrid approach:

Managerial Self-Assessment: Respondents categorize their transformation stage based on a three-tier evolutionary scale: Step 1, Preliminary Attempt; Step 2, Partial Implementation; and Step 3, Comprehensive Implementation.

Software-Based Classification: To ensure objectivity, firms are evaluated based on their utilization of digital infrastructure: Level 1 (Basic): Use of collaborative communication tools (e.g., DingTalk, Enterprise WeChat). Level 2 (Intermediate): Integration of core operational systems (e.g., OA, CRM, or E-commerce platforms). Level 3 (Advanced): Implementation of sophisticated digital assets (e.g., Industrial IoT, centralized Big Data databases, AI-driven customer systems).

Research Hypotheses

Following the standard deductive logic of econometric research, the following hypotheses are formulated:

H1 (Technological Advantage): The perceived relative advantage of digital transformation is positively associated with the extent of its adoption among SMEs in Guiyang. SMEs whose management perceives clear benefits in efficiency, market reach, or innovation from DT are more likely to commit resources to it.

H2 (Technological Compatibility): The perceived compatibility of digital technologies with the firm's existing operations is positively associated with the extent of their adoption. Technologies that align easily with current workflows and systems face less internal resistance and lower integration costs.

H3 (Technological Complexity): The perceived complexity of digital technologies is negatively associated with the extent of their adoption. When technologies are seen as overly difficult to implement, manage, or use, they present a significant barrier for SMEs with limited technical expertise.

H4 (Organizational Size): Firm size is positively associated with the extent of digital transformation adoption. Larger SMEs typically possess greater slack resources, face more complex administrative challenges that digital tools can solve, and have more formalized structures to manage change projects.

H5 (Organizational Skills): The level of digital skills within the workforce is positively associated with the extent of digital transformation adoption. Employees and managers with higher digital literacy can better identify opportunities, drive implementation, and utilize new systems effectively.

H6 (Organizational Resources): The availability of financial and technological resources is positively associated with the extent of digital transformation adoption. DT initiatives require investment in software, hardware, and possibly consultancy; constrained resources directly limit a firm's capability to execute such projects.

H7 (Environmental Policy Support): The presence and perceived strength of supportive government policies are positively associated with the extent of digital transformation adoption among SMEs in Guiyang. Policies reduce financial barriers, provide guidance, and signal the strategic importance of DT.

H8 (Environmental Competitive Pressure): The intensity of competitive pressure from industry rivals is positively associated with the extent of digital transformation adoption. The fear of losing market share to digitally adept competitors acts as a powerful motivator for SMEs to invest in their own digital capabilities.

H9 (Environmental Partner Collaboration): The extent of collaboration with external partners (e.g., suppliers, clients, tech firms) is positively associated with the extent of digital transformation adoption. Partners can provide knowledge, share costs, co-develop solutions, and create interconnected digital ecosystems that increase the value of adoption.

By systematically testing these relationships within the technological, organizational, and environmental dimensions, this research aims to identify the specific mechanisms that dictate the depth of digital adoption, thereby bridging the gap between theoretical potential and actual transformational outcomes.

Methodology and Data

Empirical Model

Given that the dependent variable, the degree of digital transformation, is ordinal measure (e.g.,1 =Preliminary,2 = Partial, 3 = Comprehensive), an Ordered Logit Model is employed for the regression analysis. The latent model representing the digitalization intensity (DT^*) is specified as follows. The empirical model is specified as follows:

Let DT^* represent the observed digital transformation stage for SMEs i, which takes on ordinal values $j=1,2,...,J$. The underlying latent variable DT^* is assumed to be a linear function of the independent variables:

$$DT^* = \beta_1 Advantage + \beta_2 Compatibility + \beta_3 Complexity + \beta_4 Size + \beta_5 Skills + \beta_6 Resource + \beta_7 Policy + \beta_8 Competitive + \beta_9 Partners + \epsilon i$$

where ϵ_i follows a logistic distribution. The observed DT^* is related to the latent DT^* through threshold parameters μ_j

$DT=j$ if $\mu_{j-1} < DT^* \leq \mu_j$

The coefficients β_k are estimated via maximum likelihood. A positive and significant β_k indicates that an increase in the independent variable raises the probability of the SME being in a highercategory of digital transformation. The analysis was performed using SPSS version 27.0.

Data Collection

The empirical data for this study were collected through a structured questionnaire targeting senior management and IT decision-makers in SMEs located in Guiyang, China. To ensure broad accessibility and efficiency, the survey was deployed via WJX. cn (Wenjuanxing), a prominent online survey platform in China, ensuring efficient and wide distribution. The electronic questionnaire was disseminated through web links and the WeChat social media platform, a method particularly effective for reaching business owners and managers in the region. The survey was active for a period of eight weeks.

The questionnaire was structured into three main sections. The first section captured basic firmographic information, such as industry sector, firm age, and the number of employees. The second section aimed to measure the dependent variable, the *Degree of Digital Transformation Adoption*. This was assessed through a multi-item scale asking respondents to indicate the level of implementation across various digital technologies (e.g., cloud services, data analytics, e-commerce platforms) and business processes. The third section contained items designed to measure the nine independent variables (Advantage, Compatibility, Complexity, Size, Skills, Resource, Policy, Competitive, Partners) based on the TOE model. For subjective perceptions, a five-point Likert scale (from 1="Strongly Disagree" to 5="Strongly Agree") was primarily employed. For more objective assessments, such as the availability of certain resources, a three-point scale was used.

Initially, 510 responses were collected. A rigorous data cleaning process was implemented to ensure data quality. Responses were screened for internal consistency and rationality. For instance, questionnaires where respondents indicated a "fully implemented" stage of digital transformation but simultaneously reported only using very basic digital tools were identified as contradictory and removed. Following the cleaning process, 499 valid questionnaires were retained for analysis, yielding a robust sample for statistical modeling.

Empirical Results

Parameter Estimates

The regression analysis was conducted using SPSS 27.0. The results of the parameter estimation are detailed in the table below:

Table 2: Ordered Logit Regression Results for Guiyang SMEs

Variable	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Lower	Upper
DT（Step）[Stage=1]	4.684	0.542	74.798	1	<.001	3.622	5.745
DT（Step）[Stage=2]	6.547	0.592	122.199	1	<.001	5.386	7.707
Advantage	0.687	0.184	13.886	1	**<.001**	0.326	1.049
Complexity	-0.086	0.138	0.39	1	0.532	-0.357	0.185
Compatibility	-0.003	0.137	0.001	1	0.982	-0.272	0.265
Size	-0.128	0.175	0.533	1	0.465	-0.47	0.215
Skills	-0.003	0.105	0.001	1	0.978	-0.21	0.204
Resource	0.284	0.096	8.77	1	**0.003**	0.096	0.472
Policy	0.401	0.109	13.532	1	**<.001**	0.187	0.614
Competitive	0.33	0.26	1.61	1	0.204	-0.18	0.841
Partners	0.579	0.245	5.588	1	**0.018**	0.099	1.06

Note: Significant estimates ($p < 0.05$) are in bold.

The model estimates reveal that four factors significantly predict the digital transformation degree. Advantage ($\beta = 0.687$, $p < .001$) and Policy ($\beta = 0.401$, $p < .001$) exert the most substantial positive impact. Additionally, Resource Availability ($\beta = 0.284$, $p = .003$) and Partner Synergy ($\beta = 0.579$, $p = .018$) are statistically significant drivers. Interestingly, technological complexity and internal organizational traits like firm size and employee skill did not show statistical significance in this model

Model Fit and Diagnostic Test

The model's validity is supported by multiple diagnostic indicators,as the table below:

Table 3:Model Fit and Test

Test/Statistic		Value	df	Sig.
Goodness of-Fit	Pearson Chi-Square	867.992	913	0.854
	Deviance Chi-Square	741.432	913	1
Pseudo R-Square	Cox and Snell	0.429	-	-
	Nagelkerke	0.488	-	-
	McFadden	0.264	-	-
Test of Parallel Lines		14.842	9	0.095

Goodness-of-Fit: The non-significant p-values for both the Pearson (0.854) and Deviance (1.000) chi-square statistics suggest that the model fits the data adequately, as we fail to reject the null hypothesis of good fit.

Pseudo R-Square: The Nagelkerke pseudo R-square value of 0.488 indicates that the model explains approximately 48.8% of the variance in the ordinal outcome, which represents a moderate to substantial explanatory power in the context of social science research.

Test of Parallel Lines (Proportional Odds Assumption): The Test of Parallel Lines (Chi-Square=14.842, df=9, p=0.095) indicated that the proportional odds assumption was not violated, validating the use of the Ordered Logit Model.

Discussion

The empirical findings provide nuanced insights into the drivers of digital transformation for SMEs in Guiyang, confirming some theoretical expectations while challenging others. The discussion below contextualizes these results within the broader literature and the specific circumstances of Guiyang's SMEs.

H1 (Technological Advantage - Supported): The strong positive impact of perceived advantage aligns perfectly with classic innovation diffusion theory (Rogers, 2003). For Guiyang's SMEs, the primary driver for embarking on the costly and disruptive journey of digital transformation is the clear anticipation of tangible benefits. This could include expectations of operational cost reduction, access to new markets via e-commerce, or enhanced customer insights from data analytics. The significance of this factor suggests that effective demonstration of successful DT use cases and clear communication of ROI are vital to motivate wider adoption.

H2 (Compatibility) and H3 (Complexity) - Not Supported: The non-significant results for compatibility and perceived complexity are intriguing and somewhat counter to common findings. This may reflect the nature of contemporary cloud-based and SaaS (Software-as-a-Service) solutions prevalent in the market. These solutions are often designed to be relatively user-friendly and can be adopted with less concern for deep integration with legacy on-premise systems, especially in SMEs that may have had limited IT infrastructure to begin with. Therefore, compatibility with old systems may be a lesser concern, while the “plug-and-play” nature of many modern tools may have reduced the perceived barrier of complexity. This finding points to a market where technology accessibility has improved, shifting the primary constraints away from the technology's inherent properties.

H4 (Size) and H5 (Skills) - Not Supported: The lack of significance for firm size and employee digital skills provides a nuanced insight that refines the traditional TOE model

application. While larger size is often theorized to correlate with greater resource slack and innovation capacity (Baker, 2012), its non-significance in Guiyang's SME context suggests that the barriers and enablers of digital transformation may be equalizing. The pervasive availability of scalable, cloud-based "as-a-Service" models has drastically lowered the initial capital and infrastructure threshold, enabling micro-enterprises to access technologies once reserved for larger firms. This democratization effect means that the motivationand strategic perceptionof advantage (a technological factor) may now outweigh sheer organizational scale as a primary driver.Similarly, the non-significant effect of digital skills challenges the assumption that general technical proficiency directly enables transformation. It implies a potential "competency gap": the skills measured (basic digital literacy) may be necessary but insufficient for driving strategic digital transformation. What may be lacking across SMEs of all sizes are the advanced, strategic capabilities—such as data analytics proficiency, digital leadership, and change management skills—required to architect and leverage digital tools for competitive advantage, a distinction aligned with the concept of "digital maturity" (Vial, 2019). This suggests that future policies should shift from promoting basic digital literacy to fostering these higher-order strategic competencies.

H6 (Resource - Supported): The positive role of financial and technological resources confirms a fundamental constraint. Despite the lower costs of cloud services, DT still requires investment in hardware upgrades, software subscriptions, and potentially consultancy. This result underscores that resource constraints remain a stark reality for many SMEs, acting as a direct bottleneck. It highlights the importance of financial mechanisms like targeted subsidies, low-interest loans, or scalable "pay-as-you-go" technology models.

H7 (Policy - Strongly Supported): This aligns with Oliveira & Martins (2011), Supportive policies-such as subsidies, tax incentives, public training programs, and the development of digital infrastructure-directly lower the perceived risk and cost of adoption. This finding strongly validates policy interventions as powerful levers for accelerating SME digitalization in similar regional contexts. For Guiyang, as a national big data hub, this translates to a clear policy implication: the continuity and enhancement of targeted incentives (e.g., "Computing Vouchers," subsidies for SaaS adoption), digital infrastructure investment, and public capability-building programs are not merely facilitative but essential to sustain the digital transformation momentum. These policies reduce perceived risk, lower absolute cost, and signal long-term commitment, thereby shaping the strategic calculus of SME managers.

H8 (Competitive - Not Supported): The insignificance of competitive pressure is surprising but plausible. It may suggest that the market competition in Guiyang's key industries for SMEs (e.g., local services, traditional retail) is not yet intensely digital. If competitors are also slow to digitalize, the coercive pressure to adopt is reduced. Alternatively, SMEs may perceive digital transformation as a long-term strategic investment rather than a tactical response to immediate competitive threats, decoupling the perceived pressure from the adoption decision.

H9 (Partners - Supported): The significance of partner collaboration highlights the ecosystem-driven nature of modern digitalization, extending the environmental contextbeyond competition and policy to include inter-organizational networks. For resource-constrained SMEs, collaborating with technology providers, supply chain partners, or even other SMEs in a cluster can facilitate knowledge sharing, co-investment, and the development of compatible digital workflows. This finding suggests that fostering industry clusters and digital ecosystems could be an effective strategy alongside direct firm-level support. Within the TOE logic, it shows that the environment provides not just pressure or support, but also pathwaysfor capability co-creation. The policy implication is twofold: First, policymakers should foster industry clusters and innovation platforms that physically and virtually congregate SMEs, technology providers, and research institutions. Second, initiatives should encourage and

subsidize the formation of industry consortia or digital supply chain partnerships, enabling SMEs to share knowledge, costs, and risks, thus overcoming individual limitations and achieving synergistic digital integration that benefits the entire regional ecosystem

Conclusion and Future Research

Conclusion

This study sought to identify and empirically validate the key drivers influencing the degree of digital transformation among SMEs in Guiyang, China, utilizing the TOE framework. The findings paint a picture where the impetus for transformation is not uniformly distributed across all theoretical dimensions. The most potent drivers emerge from a combination of internal resource capacity and external environmental support. Specifically, the perception of clear technological advantage, the availability of organizational resources, strong government policy support, and active collaboration with partners are the primary engines propelling SMEs towards higher stages of digital maturity.Conversely, the expected barriers of technological complexity and incompatibility, as well as the expected enablers of firm size and employee skills, did not show significant effects in this context. This pattern suggests that for Guiyang's SMEs, the contemporary digital technology landscape may have mitigated traditional adoption barriers, while fundamental resource constraints and strategic motivations (shaped by policy and partnerships) now play the decisive roles.

Therefore, efforts to promote digitalization should pivot from merely promoting technology to addressing the resource and ecosystem bottlenecks, while vigorously demonstrating the tangible value and advantages of digital tools. Based on the empirical findings, targeted policy recommendations for supporting SME digitalization are proposed:

Enhance Targeted Financial: Given the significant role of Resource Availability, policymakers should design and scale up accessible financial instruments, such as direct subsidies for cloud service subscriptions, low-interest loans for digital upgrades, and “Computing Vouchers” specifically for SMEs. This directly alleviates the fundamental capital constraint identified in the study.

Foster Ecosystem-Driven Collaboration: To leverage the positive impact of Partner Synergy, government initiatives should actively cultivate digital industry clusters and innovation platforms. Policies should incentivize the formation of consortia and supply-chain digital partnerships, facilitating knowledge sharing, co-investment in digital solutions, and the development of compatible standards to reduce integration costs for individual SMEs.

Shift from Basic Literacy to Strategic Capacity Building: The non-significant effect of generic digital skills (H5) suggests a critical “competency gap.” Policy support should evolve from basic digital literacy training to programs that build strategic digital leadership, data analytics capabilities, and change management skills among SME owners and managers. .

Amplify Advantage through Demonstration and Benchmarking: To strengthen the primary driver of perceived Advantage, governments and industry associations should create platforms for showcasing successful SME digital transformation cases, providing clear ROI benchmarks and practical implementation roadmaps. This reduces uncertainty and builds conviction among SME decision-makers.

Limitations and Future Research Directions

This study has several limitations that also point to avenues for future research. First, the cross-sectional design captures a snapshot in time, limiting causal inference. A longitudinal study tracking the same SMEs over time would provide stronger evidence of how these factors influence the processof digital transformation. Second, the data relies on self-reported measures from a single respondent per firm, which may introduce common method bias. Future research could benefit from multi-informant surveys or triangulation with objective performance data. Third, the study focuses on a single city, Guiyang. While this allows for contextual depth, the

findings may not be fully generalizable to SMEs in more developed coastal cities or in entirely different industrial contexts. Comparative studies across regions would be valuable.

Future research can build on this work in several ways: 1) Explore potential interaction effects between the factors. For instance, does strong policy support moderate the effect of resource constraints? 2) Investigate the role of leadership and entrepreneurial orientation as an additional, critical organizational factor not fully captured by the current model. 3) Employ more fine-grained measures for "digital skills," distinguishing between operational literacy and strategic digital leadership capabilities. 4) Qualitative follow-up studies could delve deeper into the "why" behind the quantitative results, such as understanding why competitive pressure was not a significant driver. By addressing these areas, scholars can develop a more comprehensive and dynamic understanding of the digital transformation journey for SMEs.

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