From the Perspective of "Small, Quick, Light, Targeted": Barriers and Empowerment System for SMEs' Digital Transformation in Underdeveloped Regions

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Abstract: The digital transformation of SMEs is an important engine for promoting high-quality economic development. However, in underdeveloped regions, the digital transformation of SMEs faces multiple obstacles, presenting a characteristic of "unwillingness to transform, lack of confidence to transform, and inability to transform". Based on the "Small, Quick, Light, Targeted" concept, this paper constructs a theoretical analysis framework of "context - obstacles - empowerment", systematically revealing the deep mechanism of the digital transformation of SMEs in underdeveloped regions. The research shows that the transformation obstacles are not a single-dimensional shortage of resources, but a systematic predicament resulting from the coupling of multiple factors such as infrastructure, funds, talents, systems, and culture. Based on this, this paper proposes a four-in-one empowerment system covering technology, services, policies, and ecology, aiming to reshape the transformation logic of SMEs in underdeveloped regions through lightweight, modular, and precise path design. Moreover, to promote the digital transformation of SMEs in underdeveloped regions, based on system analysis, targeted countermeasures and suggestions are proposed.

Keywords: SMEs; Digital Transformation; Underdeveloped Regions; "Small, Quick, Light, Targeted"; Empowerment System

1. Introduction

In the current era of vigorous development of the digital economy, digital transformation has become an inevitable choice for SMEs (Small and Medium-sized Enterprises) to enhance their competitiveness and achieve sustainable development. However, for SMEs in underdeveloped regions, digital transformation faces more complex and severe challenges. These challenges not only stem from the limitations of the enterprises' own resource endowments, but are also closely related to external environmental factors such as regional economic and social development levels, infrastructure conditions, and talent reserves [1]. Compared with developed regions, SMEs in underdeveloped regions face "threefold dilemmas" during the process of digital transformation. Firstly, the "unwilling to transform" cognitive dilemma, where business owners have insufficient understanding of the value of digital transformation and are worried about the imbalance between investment and output [2]. Secondly, the "unwilling to transform" risk dilemma, where enterprises have weak risk-resistance capabilities and are unable to bear the losses caused by transformation failure [3]. Thirdly, the "unable to transform" capability dilemma, where there is a lack of necessary technologies, talents, and management capabilities to support the practice of digital transformation [4].

Based on the practical needs of the digital transformation of SMEs in underdeveloped areas, this paper systematically discusses the obstacle factors of the digital transformation of SMEs in underdeveloped areas and the solution path from the theoretical perspective of "Small, Quick, Light, Targeted". Through in-depth discussion, it provides practical and feasible digital transformation paths for SMEs in underdeveloped regions, reduces transformation risks, and improves transformation efficiency; provides decision-making basis for government departments to formulate differentiated and precise digital transformation support policies; and provides market insights for digital service providers to develop "Small, Quick, Light, Targeted" solutions that are adapted to the needs of SMEs in underdeveloped regions.

2. Core Concepts and Theoretical Framework

2.1 "Small, Quick, Light, Targeted" and Its Theoretical Basis

The concept of "Small, Quick, Light, Targeted" emphasizes the characteristics of digital transformation, such as small scale, rapid deployment, lightweight nature and precise matching [5]. This concept is particularly suitable for SMEs with limited resources and weak foundations. From the perspective of its conceptual content, the "Small, Quick, Light, Targeted" concept encompasses four core dimensions: First, "Small" refers to the small scale and modular nature of the digital transformation plan, allowing for the combination of functional units as needed; second, "Quick" emphasizes the rapid deployment speed and short payback period, enabling business improvement and efficiency enhancement within a short period; third, "Light" requires the solution to be lightweight and low-cost, reducing the transformation threshold for enterprises; fourth, "Targeted" emphasizes the precise matching of the solution with industry pain points and enterprise needs.

From a theoretical perspective, the "Small, Quick, Light, Targeted" concept integrates various theoretical ideas such as agile development, lean startup, and user-centered design [6]. The agile development theory emphasizes iterative development, rapid response, and continuous improvement, providing a methodological foundation for "Small, Quick, Light, Targeted" [7]. The lean startup theory advocates for minimum viable products, rapid experimentation, and customer feedback, offering practical guidance for "Small, Quick, Light, Targeted" [8]. The user-centered design theory emphasizes user demand orientation and core scenario application, providing a value orientation for "Small, Quick, Light, Targeted".

2.2 Theoretical Framework

The research on the obstacles of digital transformation for SMEs in underdeveloped regions is an important branch of digital transformation research. Existing studies mainly analyze the special challenges faced by SMEs in underdeveloped regions during their digital transformation from dimensions such as infrastructure [9,10], financial constraints [11], talent shortage [10], institutional environment [12], and cultural adaptation [13]. Based on this, this study has constructed a theoretical analysis framework of "context - obstacles - empowerment" in three parts. This framework aims to systematically reveal the internal logic of digital transformation for SMEs in underdeveloped regions and provide theoretical guidance for subsequent research.

Firstly, the context dimension focuses on the unique environment of digital transformation for SMEs in underdeveloped regions. Secondly, the obstacle dimension analyzes the main challenges faced by SMEs in underdeveloped regions during their digital transformation. Thirdly, the empowerment dimension explores the construction of an empowerment system based on the "Small, Quick, Light, Targeted" concept. The theoretical analysis framework of "context - obstacle - empowerment" emphasizes that the digital transformation of SMEs in underdeveloped regions is a complex system project, which requires starting from the particularity of the context, accurately identifying the obstacle factors, and scientifically designing the empowerment system.

3. Formation Mechanism of Digital Transformation Barriers of SMEs in Underdeveloped Areas

3.1 Resource Endowment Constraints

The dual shortage of infrastructure and funds. The prerequisite for digital transformation lies in resource support. However, SMEs in underdeveloped regions are facing the dual constraints of "infrastructure" and "funds". On one hand, the shortcomings in regional digital infrastructure directly affect the enterprises, resulting in unstable equipment connection, high system operation costs, and poor coordination. This not only raises the initial cost of the transformation but also weakens the enterprises' intuitive perception of the transformation effect [14]. On the other hand, the financial obstacle is not merely a "lack of money", but rather a combination of "insufficient investment capacity" and "weak risk tolerance" [15]. Facing continuous and uncertain investments such as hardware purchase and system integration, SMEs with low profits find it difficult to bear the trial-and-error costs. Once the project is delayed or the feedback fails to meet expectations, it is

very likely to trigger a tight financial situation, thereby reinforcing the behavioral logic of "not daring to transform" of the enterprises.

3.2 Disruption of Core Competence

The interweaving of talent shortage and cognitive bias. The implementation of transformation relies on the modernization of "people", while SMEs in underdeveloped regions have significant capability gaps in terms of both talent and culture. Firstly, there is the talent barrier. Enterprises are extremely lacking in compound talents who are proficient in both technology and business processes. As a result, even if they obtain digital tools, they still have difficulty conducting scenario organization and continuous optimization. Excessive reliance on external service providers further leads to the predicament of "the system can afford it but cannot be used well", causing a disconnection between "technology availability" and "ability usability" [16]. Secondly, there is the cultural barrier. Enterprises that have long been in a familiar market and experience-based operation environment often simply equate digitalization with purchasing software or opening online stores, lacking a global perspective that regards it as a system engineering [17]. This cognitive bias, combined with the resistance of internal employees to the adjustment of power and responsibility, has formed a deep organizational inertia of "not willing to transform".

3.3 Mismatch of External Environment

The mismatch between institutional supply and real demand. Digital transformation of SMEs is a systematic project that cannot be achieved without the collaboration of the external ecosystem. However, in underdeveloped regions, there is a widespread problem of mismatch between institutional supply and the actual demands of enterprises. On one hand, the existing support policies often present a fragmented nature and overly focus on equipment subsidies and project applications, paying insufficient attention to key links such as digital diagnosis, scenario development, and subsequent services, resulting in a significant reduction in the effectiveness of the policies [18]. On the other hand, the data governance rules, standard systems, and cross-departmental coordination mechanisms are not yet complete, increasing the uncertainty of the transformation process [19]. SMEs generally worry about data leakage, platform lock-in, and unclear liability determination during the transformation process. If these concerns cannot be effectively addressed at the institutional level, it will seriously undermine the confidence of enterprises in participating in the transformation, highlighting that the core of the institutional obstacle lies in "whether it is precisely adapted" and "whether it is stable and predictable".

3.4 Systematic Dilemma

The coupling effect of multiple obstacles. The hindrance to the digital transformation of SMEs in underdeveloped regions is not caused by a single factor, but rather a systematic predicament formed by the interweaving and coupling of multiple obstacles [20]. Insufficient infrastructure directly raises the transformation costs and intensifies the financial pressure; the lack of funds restricts the recruitment of talents and the purchase of services, weakening the execution ability; the shortage of talents makes it difficult for enterprises to scientifically choose solutions, increasing the cost of trial and error, and thereby strengthening the risk-averse mentality of the managers; the imprecise supply of institutional support reduces the efficiency of resource utilization, making it difficult for enterprises to obtain effective external support; and cultural cognitive biases amplify the subjective perception of risks and costs by enterprises, leading to the indefinite postponement of the transformation actions. This "combined effect of regional environmental constraints, enterprise resource shortages, mismatched institutional support, and conservative organizational culture" constitutes the deep mechanism that hinders the digital transformation of SMEs in underdeveloped regions.

4. Building an Empowerment System under the "Small, Quick, Light, Targeted" Concept

4.1 Basic Principles for the Construction of Empowerment System

The construction of the digital transformation empowerment system for SMEs in underdeveloped regions requires adhering to four unifications. First, there should be a unity of demand orientation and scenario-driven approach, focusing on real pain points to drive overall improvement through small-scale initiatives, avoiding formalistic transformation.

Second, there should be a unity of phased implementation and rapid effectiveness, achieving local quantitative results through "small steps and rapid iterations", thereby enhancing the confidence of enterprises in transformation. Third, there should be a unity of precise supply and classified policy implementation, providing differentiated support based on industry categories and development stages, to improve the efficiency of resource allocation. Fourth, integrating multi-stakeholder coordination with continuous evolution, it brings together governments, financial institutions, enterprises and other participants to form a closed-loop mechanism, thereby driving the dynamic optimization and upgrading of the empowerment system.

4.2 The Construction of a Multi-dimensional Coordinated Empowerment System

Based on the "Small, Quick, Light, Targeted" transformation concept, the digital transformation of SMEs in underdeveloped regions is a systematic project involving multiple elements' collaboration. In response to the actual problems such as weak regional resources, scarce services, insufficient enterprise transformation capabilities, and lagging industrial ecosystem, it is urgent to establish a four-in-one collaborative empowerment system integrating technology, services, policies, and ecosystem, precisely matching the transformation needs of enterprises, resolving difficulties such as high transformation costs, inability to transform, and reluctance to transform, and promoting the large-scale, standardized, and sustainable development of digital transformation of regional SMEs.

Technology empowerment serves as a direct support for the digital transformation of SMEs in underdeveloped regions [21]. Based on the concept of "Small, Quick, Light, Targeted", it promotes the transformation of digital products into lightweight, modular and subscription-based forms, encourages service providers to develop standardized scenario tools that are compatible with specific industries and support flexible combinations, in order to reduce enterprise costs. At the same time, it emphasizes the adaptability and iterability of technology, popularizes low-threshold cloud services and mobile applications, and adopts a gradual approach of "pilot - feedback - expansion" to avoid the burden of one-time high-intensity transformation. Ensure that the technical solutions are "accessible, usable and scalable", truly enhancing the enterprises' ability to absorb technology and transforming technology empowerment into real productive capacity.

Service empowerment is the key approach to addressing the shortcomings in the digital transformation capabilities of SMEs in underdeveloped regions [22]. A service empowerment system featuring "diagnosis first, plan follow-up, accompaniment implementation, and continuous optimization" should be established. On one hand, a digital diagnosis mechanism should be established to clarify requirements, avoid blind construction, and encourage service providers to transform into comprehensive solution providers. On the other hand, to address the issue of scarce service resources, it is necessary to build regional platforms, cultivate local institutions, and introduce various forces such as universities and industry associations, to create a multi-level service network, promote resource precise matching, thereby effectively alleviating the problem of enterprises "not being able to transform".

Policy empowerment serves as the institutional foundation for the orderly advancement of digital transformation among SMEs in underdeveloped regions [23]. Policy empowerment should leverage its leverage based on the "Small, Quick, Light, Targeted" concept. On one hand, it is necessary to go beyond general subsidies and design differentiated policy tool combinations around key links such as diagnosis, renovation, subscription, training, and demonstration, achieving precise deployment and outcome-oriented guidance. On the other hand, it is necessary to improve supporting rules such as data security and strengthen cross-departmental collaboration, shifting from merely financial investment to establishing a support mechanism that caters to the real needs of enterprises, is sustainable, and can be evaluated.

Ecological empowerment is a crucial support for activating the internal driving force of digital transformation for SMEs in underdeveloped regions [24]. Digital transformation is a collaborative evolutionary process embedded within the industrial chain. On one hand, through the digital transformation of the upstream and downstream links based on parks, clusters, and leading enterprises, core enterprises can drive

supporting enterprises to reduce transformation costs and risks. On the other hand, it promotes the joint efforts of the government, finance, industry, academia, and research to form a collaborative pattern of "technology + capital + talent + policy". Integrating individual transformation into the reshaping of the regional industrial ecosystem, achieving the transformation from scattered pilot projects to scale diffusion.

4.3 The Implementation Path of the Empowerment System

The empowerment system based on the "Small, Quick, Light, Targeted" concept is designed to reshape the digital transformation logic of SMEs in underdeveloped regions, emphasizing the use of small-scale approaches, fast rhythms, light models, and precise matching to solve high-barrier problems. Its implementation path should follow a closed loop of "pilot demonstration - evaluation feedback - diffusion and promotion - long-term mechanism guarantee", that is, select basic enterprises to conduct scenario pilot projects, establish a multi-dimensional dynamic assessment mechanism to track the results, and then promote the standardization and regional replication of mature solutions, and ensure the sustainability of the mechanism by improving the service catalogue, policy tools, and collaborative platform. Build a systematic mechanism of mutual support among technology, services, policies and ecosystem, thereby effectively breaking through structural transformation obstacles and accumulating digital capabilities of enterprises and regions.

5. Suggestions

First, strengthening digital infrastructure is a prerequisite for addressing the issue of "whether it can be transformed". Infrastructure such as networks, computing power, and platforms should be incorporated into the overall regional development plan. In industrial clusters, shared digital bases should be prioritized for construction to reduce enterprise investment. At the same time, emphasis should be placed on improving public service capabilities. Public technology service platforms should be accelerated in construction, and the infrastructure should be deeply integrated with actual enterprise application scenarios to ensure that resources are truly utilized in production and operation processes, avoiding facility idleness and disconnection between supply and demand.

Second, strengthening element support is the core approach to resolving the issues of "not daring to transform" and "not knowing how to transform". At the financial level, a diversified investment mechanism involving fiscal guidance, financial follow-up, and participation from social capital should be established. Special funds should be set up to precisely support "Small, Quick, Light, Targeted" solutions, and innovative digital special loans and risk-sharing mechanisms should be introduced to alleviate financing difficulties. At the talent level, efforts should be made simultaneously at the levels of managers, staff, and front-line workers to enhance digital literacy. Through collaborative efforts between the government, enterprises, and schools, order-based training and flexible talent recruitment should be carried out to comprehensively strengthen the talent support system for transformation.

Thirdly, improving the professional service supply system is the key support for enhancing the quality and efficiency of transformation. Efforts should be made to cultivate professional service providers with both industry and digital expertise, develop highly adaptable lightweight solutions, and establish a selection, evaluation and dynamic management mechanism by the government to guide enterprises to precisely match resources. At the same time, regional service centers should be established based on parks and associations to provide one-stop inclusive support, strengthen process supervision to prevent conceptual packaging, and enhance the professionalism, transparency and evaluability of services to effectively increase the trust and usage rate of enterprises.

Fourth, improve the classification-based policy implementation and collaborative governance mechanism to shape a sustainable digital ecosystem. Develop differentiated transformation plans for enterprises of different types and with different foundations to avoid policy supply not aligning with enterprise demands. Also, establish a cross-departmental collaborative governance mechanism to enhance policy coordination and resource integration capabilities. On this basis, break through the limitations of individual enterprises and encourage leading enterprises and platform companies to play a leading role, driving the upstream and downstream to simultaneously carry out "chain-like" transformations. Introduce

external high-quality resources through deepening cross-regional cooperation and park collaboration, and ultimately build an open, shared, and collaboratively linked digital ecosystem.

6. Conclusion

This study adopts the theoretical perspective of "Small, Quick, Light, Targeted" and systematically explores the formation mechanism of obstacles to the digital transformation of SMEs in underdeveloped regions and the construction of enabling systems. The main conclusions are as follows.

Firstly, the obstacles to the digital transformation of SMEs in underdeveloped regions are not the result of a single factor, but a systemic predicament formed by the coupling of multiple factors such as weak infrastructure, severe capital constraints, insufficient talent supply, mismatched institutional support, and conservative cultural cognition. There are complex transmission and reinforcement mechanisms among these obstacles, and insufficient infrastructure will increase the transformation cost, capital pressure will limit talent recruitment, talent shortage will increase the risk of trial and error, institutional mismatch will reduce policy effectiveness, and cultural conservatism will amplify the transformation resistance. Eventually, a vicious cycle of "not willing to transform, not daring to transform, and not knowing how to transform" is formed.

Secondly, the concept of "Small, Quick, Light, Targeted" provides a new methodology for solving the predicament of digital transformation of SMEs in underdeveloped regions. Different from the traditional pursuit of "large and comprehensive" in digital transformation, "Small, Quick, Light, Targeted" emphasizes starting from the most urgent business pain points of enterprises, and achieving low-cost entry, rapid deployment, precise matching, and continuous iteration through modular, subscription-based, combinable, and low-code lightweight solutions. This concept not only lowers the transformation threshold but also enhances the transformation confidence and continuous investment willingness of enterprises.

Again, the construction of the empowerment system based on the "Small, Quick, Light, Targeted" concept requires coordinated advancement along four dimensions: technological empowerment, service empowerment, policy empowerment, and ecological empowerment. Technological empowerment should promote the transformation of digital products into "light and user-friendly" ones; service empowerment should establish a professional chain of "diagnosis first, follow-up with solutions, and implementation with companionship"; policy empowerment should highlight precise irrigation and process support; ecological empowerment should rely on the industrial chain and regional collaborative networks. Only by forming an empowerment pattern featuring multi-stakeholder participation, multi-level support and multi-link coordination can digital transformation be translated from conceptual ideas into real productive forces.

Finally, to promote the digital transformation of SMEs in underdeveloped regions, it is necessary to adhere to the implementation path of classified measures, step-by-step advancement, and dynamic optimization. Policy design should be in line with the actual needs of enterprises, and support methods should shift from "large project subsidies" to "small scenario empowerment", and the implementation process should establish a progressive mechanism from pilot demonstrations to chain expansion and then to ecological improvement. Only by integrating the logic of "Small, Quick, Light, Targeted" throughout the entire process of policy formulation, service provision, and enterprise practice can the sustainable advancement of digital transformation be truly achieved.

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