

Research on the Dynamic Adaptation Path and Performance of Digital and Real Economy Integration Empowering "Specialized, Refined, Distinctive and Innovative" Enterprises-Heterogeneity analysis based on the incubation period and the growth period

Mingting Huang, Junlei Jiang, Zifan Zhang, Ziyang Wang and Yaqiong Wang

Anhui University of Finance and Economics, Bengbu, 233030, China

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Abstract

With the development of the digital economy, the integration of digital and real economies has become a key driving force for the high-quality development of enterprises, especially "specialized, refined, distinctive and innovative" ones. However, enterprises at different life cycle stages have significant differences in resource endowment, capability structure and strategic focus, and the path selection and performance impact of their integration of digital and real economies also show heterogeneity. This study focuses on "specialized, refined, distinctive and innovative" enterprises and constructs a theoretical framework covering the heterogeneity analysis of the incubation period and the growth period. Through the method of multi-case comparative study, the dynamic adaptation paths of digital and physical integration in enterprises at different stages and their mechanism of effect on enterprise performance were explored. Research findings show that during the incubation period, enterprises tend to adopt an integrated path of "demand-driven and agile iteration", focusing on optimizing core business processes and reducing trial-and-error costs through digital technologies. Their performance improvement is mainly reflected in operational efficiency and the speed of product market validation. During the growth stage, enterprises tend to adopt a more integrated path of "strategy-driven and system reconstruction", dedicated to achieving large-scale growth and enhancing innovation capabilities through data-driven decision-making, industrial chain collaboration, and value network expansion. The performance impact is more significantly reflected in market share, profitability, and innovation output. This study reveals the phased characteristics and path dependence of the empowerment effect of the integration of digital and real economies, providing theoretical basis and practical guidance for "specialized, refined, distinctive and innovative" enterprises to precisely formulate digital transformation strategies, and enriching the application of enterprise life cycle theory and dynamic capability theory in the context of the integration of digital

and real economies.

Keywords

Specialized; refined; distinctive and innovative enterprises; enabling effects; integration of digital and real economies; enterprise performance; Life cycle

1. Introduction

The integrated development of the digital economy and the real economy is an inevitable trend nowadays. Becoming a "specialized, refined, distinctive and innovative" small and medium-sized enterprise is an inevitable choice for the transformation and upgrading of the manufacturing industry. China's 14th Five-Year Plan proposes to promote digital development, and there are specific supportive policies for the digital transformation of "specialized, refined, distinctive and innovative" enterprises in China. However, at different stages of its development, its resources and capabilities are limited. In its initial stage, it faced problems such as difficult financing and immature technology. There was a problem of balancing business and scale during its rapid development stage. When the traditional form of digital business no longer meets the dynamic development needs of enterprises, how to solve the problems of the integration of digital and physical economies and the mismatch of life cycles? Existing research has focused on exploring the business innovation initiative effect of the integration of digital and physical entities. However, there are deficiencies such as ignoring the differences in the cycles of different enterprises and the adaptability of digital development needs.

Based on the existing literature, this paper focuses on studying two theoretical issues: The first is to explore the intrinsic key differences and corresponding evolutionary matching mechanisms of the digital and real economy integration demands for the incubation and growth of "specialized, refined, distinctive and innovative" enterprises; Second, further explore the role of the phased digital and physical integration matching mechanism of enterprises in fostering and transforming the business performance of incubated and growing enterprises. Scientifically analyze the relationship and mechanism of action between the integration of digital and real economies in enterprises and the growth life cycle of "specialized, refined, distinctive and innovative" enterprises, discontinue targeted guidance opinions, and provide scientific theoretical support and practical guidance for enterprises to more effectively integrate digital and real economies. This research is theoretically innovative, that is, it breaks through the previous research paradigm and, under the premise of following the enterprise life cycle, builds a systematic interactive analysis and research framework of "phased matching performance assessment", thereby enriching the intrinsic theory of the integration of digital and real economies and the growth of the enterprise life cycle. The stage matching, comprehensive toolbox and

policy concretization designed in this article will to a certain extent reduce the cost and time for "specialized, refined, distinctive and innovative" enterprises to go online, improve efficiency, provide effective evidence for the government's precise matching, and promote the high-quality development of the manufacturing real economy.

This paper aims to study the dynamic adaptation path and performance research of the integration of digital and real economies in empowering "specialized, refined, distinctive and innovative" enterprises based on the incubation and growth stages. It focuses on elaborating that incubation-stage enterprises tend to adopt the integration path of "demand-driven and agile iteration", emphasizing the use of digital technologies to optimize core business processes and reduce trial-and-error costs. Its performance improvement is mainly reflected in operational efficiency and the speed of product market validation. Growth-stage enterprises tend to adopt an integrated path of "strategic-driven and system reconstruction", dedicated to achieving large-scale growth and enhancing innovation capabilities through data-driven decision-making, industrial chain collaboration, and value network expansion. The performance impact is more significantly reflected in market share, profitability, and innovation output, and research conclusions are formed through data presentation. Put forward suggestions for "specialized, refined, distinctive and innovative" enterprises to gradually promote digital transformation and for the government to optimize policy-making.

2. Literature Review

2.1. Relevant theories and overviews

2.1.1. The theory of digital and real economy integration

The integration of digital and real economies refers to the convergence of the digital economy and the real economy, using digital technology as a means to enhance production efficiency, optimize the allocation of factors and resources, and develop and expand emerging industries. The deep integration of the digital economy and the real economy is an important engine for promoting economic and social development and the digital transformation of traditional enterprises, and plays a significant role in promoting the dual circulation at home and abroad. The integration of digital and physical economies is conducive to the digital and physical integration reconstruction of key links by specialized, refined, distinctive and innovative enterprises. On this basis, new development capabilities and synergy effects can be generated. The integration of digital and physical economies is a comprehensive and systematic driving force for the transformation and change of enterprise strategies, business processes, business models, and even the entire value chain[1].

2.1.2. The theory of "Specialized, refined, distinctive and innovative" enterprises

As a key carrier for implementing China's innovation-driven development strategy, "specialized, refined, distinctive and innovative" enterprises are characterized by advantages such as specialization, refinement, distinctiveness and innovation[2]. They are a key force in enhancing the resilience of industrial and supply chains and play a positive role in the high-quality development of the manufacturing industry. The "specialization" and "refinement" of "specialized, refined, distinctive and innovative" enterprises reflect the formation and enhancement of their core professional capabilities. The "uniqueness" and "novelty" reflect the continuous innovation of its dynamic advantages.

2.1.3. The theory of "Specialized, refined, distinctive and innovative" enterprises

Dynamic adaptation is another research perspective of this study, which involves dynamic adaptation and selection of the best in the research system. Dynamic adaptation research[3] explores the dynamic co-evolution mechanism and phased adaptation model of new quality productivity and specialized, refined, distinctive and innovative development, clarifying the different focus allocation directions in technology, talent and management at each stage of enterprise development, providing theoretical and practical guidance for the specialized, refined, distinctive and innovative development of enterprises. This is also the direct theoretical basis for this study to focus on the "heterogeneity" in the enterprise life cycle. "Dynamic adaptation" refers to the dynamic adaptation of "specialized, refined, distinctive and innovative" enterprises to the direction and path of digital and real economy integration based on their own life cycle characteristics, achieving the best performance

2.2. Summary and analysis of existing research

2.2.1. Research on the Mechanism and Enabling Effect of Digital and Real Economy Integration

A large number of documents have confirmed the dividends that the integration of digital and real economies brings to the growth of enterprises. Taking "specialized, refined, distinctive and innovative" enterprises as research samples, empirical evidence has confirmed that the integration of digital and real economies has a significant positive impact on enterprise productivity. The empowerment mechanism is manifested in aspects such as reducing agency costs, R&D and innovation investment, and a decline in investment levels[4]. These documents basically expound the macro empowerment path of the integration of digital and real economies.

2.2.2. Research on the Growth Path and Performance of "Specialized, Refined, Unique and Innovative" Enterprises

In addition, there are also many literatures focusing on "specialized, refined, distinctive and innovative" enterprises. For instance, they explore the element mechanisms

of digital intelligence empowering "specialized, refined, distinctive and innovative" manufacturing enterprises from three dimensions: digital technology, digital platforms, and data elements[5]

2.2.3. Research on the Correlation between Digital and Real Economy Integration and "Specialized, Refined, Unique and Innovative" Enterprises

The correlation mechanism between the integration of digital and real economies and the development of "specialized, refined, distinctive and innovative" enterprises has gradually become a hot topic in academic research. Some of them conducted empirical analyses on the manufacturing data of A-shares. The research found that the integration of digital and real economies has a positive impact on the improvement of new quality productivity of new physical enterprises[6], providing relevant evidence for such studies. These studies have to some extent revealed the promoting effect of the integration of digital and real economies on the development of "specialized, refined, distinctive and innovative" enterprises. However, most of the research focuses on verifying the macro effect of the integration of digital and real economies or merely describes a certain path of the integration of digital and real economies. Few literatures explain the integration of digital and real economies from the perspective that enterprises adjust their paths according to different growth stages.

2.3. Research gaps and the entry point of this study

Based on the summary of existing research, this study has identified the research gaps that need to be filled urgently, which is also the entry point of this study. All existing literature has expounded on the empowerment path of digital and real economy integration, but none of them has considered dynamic response. We believe that enterprises in the incubation period need niche digital tools for rapid testing and iteration to respond quickly to uncertainties. Growth-stage enterprises need to smooth out business processes and build an efficient operation model to respond stably and efficiently to uncertainties, mentioning the dynamic response to the heterogeneity of the life cycle and the differences in response paths. The quantitative correlation analysis between dynamic adaptation and performance is insufficient.

In conclusion, this study holds that at the current stage, it is necessary to build an integrated framework to explore not only the integrated digital and real economy integration and adaptation path for "specialized, refined, distinctive and innovative" enterprises from incubation to growth, but also to test the performance-driven path of enterprises in the dimensions of "specialized, refined, distinctive and innovative" through data. While constructing theoretical research models, it is also necessary to explore the mechanism of "path selection - performance output". The relevant research results have provided certain research basis and inspiration for this study,

but there are also certain deficiencies. This study will make up for this deficiency and construct a performance-driven mechanism for the differentiated paths of "specialized, refined, distinctive and innovative" enterprises empowered by the integration of digital and real economy through a three-dimensional dynamic adaptation framework of "life cycle - capability structure - digital empowerment", providing policy suggestions for the government to implement targeted policies.

3. Research Methods

3.1. Case Selection

Following the principle of theoretical sampling, four enterprises in the typical incubation period and four in the typical growth period were respectively selected from the national list of "specialized, refined, distinctive and innovative" enterprises as research samples to ensure their comparability in terms of industry, field and other aspects

3.2. Data sources and collection methods

Conduct in-depth interviews with key personnel such as enterprise founders and ceos, each lasting 60 to 120 minutes. Collect enterprise annual reports, business plans, internal process documents, digital transformation project reports, etc. Collect information from enterprise official websites, industry analysis reports, etc. For a broader sample of "specialized, refined, distinctive and innovative" enterprises, questionnaires were distributed to measure variables such as the degree of integration of digital and real economies, the characteristics of the paths adopted, dynamic capabilities, and enterprise performance.

3.3. Data analysis

Transcribe and encode the interview recordings and text materials, and apply techniques such as pattern matching and cross-case comparison to identify and summarize the characteristics of the fusion paths at different stages and their correlations with performance.

4. Research Results

4.1. Data presentation

Table 1. Data presentation table

Characteristic dimensions	Incubation stage enterprises	Growth stage enterprises
Path-oriented	Survival orientation, problem-driven	Development orientation, strategy-driven
core focus	optimizing single-poin links	coordinating entire the business process Integrate the value chain

The proportion of enterprises focusing on digital marketing	59.8%	73.8%
The proportion of enterprises promoting intelligent production	25.3%	51.7%
The main areas for performance improvement	operational efficiency Market validation speed	market share, profitability, innovation output
The proportion of enterprises reporting a significant improvement in operational efficiency	40%	56.9%
The proportion of enterprises with significantly enhance innovation capabilities	Less than 40%	Exceeds 70%

4.2. Result Analysis

The characteristics of the digital and physical integration path for enterprises in the incubation period: The path is mainly a demand-driven and agile iterative "type path. The core activities focus on leveraging low-cost SaaS tools to achieve digital marketing (such as social media marketing), digital R&D (such as simulation design and rapid collection of user feedback), and internal management collaboration (such as cloud-based OA). The integration process presents the characteristics of "point-like breakthroughs and small, rapid steps". Both interviews and data show that this path has significantly enhanced operational efficiency (such as shortening the product iteration cycle), reduced initial costs, and accelerated the matching verification between products and the market. However, its direct impact on financial performance (such as profits) may not be significant in the short term.

The characteristics of the digital and physical integration path for growth-stage enterprises: The path is mainly of the "strategic-driven and system reconfiguration" type. Its core activities are to start building an integrated data middle platform or business system, promote the intelligent transformation of the production and manufacturing process, optimize the supply chain through data analysis, and attempt to carry out collaborative innovation with upstream and downstream enterprises through the industrial Internet platform. The integration process is more systematic and strategic. This path has a more comprehensive and profound impact on enterprise performance, significantly promoting the expansion of market share, the improvement of profitability (through cost reduction and efficiency enhancement as well as premium pricing power), and substantive innovation output (such as the increase in patent applications and the proportion of new product sales revenue).

5. Research conclusions and policy recommendations

5.1. Research Conclusion

The dynamic matching between the integration of digital and real economies and the growth of "specialized, refined, distinctive and innovative" enterprises is a dy-

namic change process of the enterprise's capability structure within the enterprise's development cycle. This article takes "life cycle - capability structure - digital empowerment" as the theoretical logic. Based on theoretical deduction and cross-case analysis, it further reveals the differentiated empowerment paths and internal mechanisms of the integration of digital and real economies for "specialized, refined, distinctive and innovative" enterprises at different life cycle stages. It constructs a mutually supportive logical chain from three aspects: changes in stage demands, changes in empowerment methods, and changes in empowerment approaches.

The enterprise is in the incubation stage. The contradiction between the scarcity of innovation resources and the realization of innovation value is the key contradiction for the enterprise. In the era of digital economy, the contradiction between the scarcity of innovation resources and the realization of innovation value for enterprises is complex. Besides the lack of funds and personnel, there is also a shortage of data management, digital technology support and scenario adaptation. This contradiction further intensifies the survival crisis of enterprises in the incubation stage. Therefore, enterprises tend to adopt an integrated path of "demand-driven and agile iteration", focusing on optimizing core business processes and reducing trial-and-error costs through digital technologies. Their performance improvement is mainly reflected in operational efficiency and the speed of product market validation. Lightweight digital technologies such as big data precision marketing and SaaS platforms can help enterprises save on R&D trial-and-error and customer search costs, etc. Resolve the survival crisis of enterprises and enhance the quality of innovation.

After a growth-oriented enterprise has gone through the expansion period, it seeks economies of scale and balanced development. As a result, the enterprise scale increases, market share rises, but management difficulty and communication costs also rise. During the business cycle, systematic digital integration solutions are needed. Industrial Internet platforms, intelligent supply chains, and digital integration of industry, academia, and research need to address management issues brought about by the expansion of economies of scale, achieving a transformation from zero-sum innovation to systematic innovation. Enterprises, on the other hand, tend to adopt an integrated path of "strategy-driven and system reconstruction", dedicated to achieving large-scale growth and enhancing innovation capabilities through data-driven decision-making, industrial chain collaboration, and value network expansion. The performance impact is more significantly reflected in market share, profitability, and innovation output.

In conclusion, digital technology empowerment has differentiated impacts on "specialized, refined, distinctive and innovative" enterprises at different life cycles. It not only enhances the production efficiency and competitive edge of enterprises, but also provides a brand-new perspective for enterprise innovation and expands the research on enterprise collaborative innovation in organizational theory. In addition, there are obvious life cycle differences in the performance transmission mechanism

based on digital and real economies. The digital and real economy technology empowerment transmission mechanism in the incubation period is: technological innovation efficiency → market experiment effect → improvement of survival ability. The digital and real economy technology empowerment transmission mechanism in the growth period is: Production efficiency → enhancement of competitive advantage → improvement of sustainable development capacity. This also conforms to the life-stage capability view, which requires enterprises to choose appropriate technologies.

5.2. Policy recommendations

At the enterprise level, for incubation-stage enterprises, it is advisable to choose digital tools that are low-cost and easy to implement, avoid blind use and technological mismatch, and take advantage of government policy support to reduce their own resource constraints. The focus should be on enhancing their own survival capabilities and basic innovation to improve their digital transformation capabilities. For growth-stage enterprises, it is necessary to increase the investment in systematic digital integration. Pay attention to the internal industrial chain collaboration of enterprises, focus on enhancing the digital team and organizational transformation capabilities of enterprises, improve the adaptability of enterprises to digital transformation, and increase the probability of successful transformation of enterprises. Through case analysis, enterprises can avoid transformation costs and increase the success rate of their digital transformation.

At the government level, during the incubation period, measures such as strengthening public technology platforms, pre-financing, and digital technology training should be taken to enhance the pertinence and timeliness of policies. During the growth stage, through the improvement of the industrial digital ecosystem, the introduction and cultivation of talents, and the pilot projects of data assetization, the transformation from "flooding" to "drip irrigation" is achieved. Establish a dynamic tracking and evaluation mechanism, and adjust the focus and methods of policy assistance in a timely manner based on the enterprise life cycle and the evolution of digital technology to enhance the effectiveness of assistance.

At the industry and regional development level, this study supports the high-end, intelligent and green development of the manufacturing industry, and empowers the upgrading of the industrial chain. Support the digitalization of the entire industrial chain with digital empowerment of "specialized, refined, distinctive and innovative" enterprises, optimize resource allocation, and enhance the resilience of the industrial chain.

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