An Analysis of the Driving Mechanisms of Digital Service Ecosystems on the Transformation of Traditional Industries

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Abstract: This study aims to explore the mechanisms through which digital service ecosystems drive the transformation of traditional industries. Through a systematic literature review and theoretical analysis, this paper constructs a comprehensive analytical framework that reveals the driving pathways of digital service ecosystems from three dimensions: value creation, capability reconfiguration, and organizational collaboration. The findings show that digital service ecosystems not only reconstruct value chains by improving resource allocation efficiency and breaking through the traditional linear production logic, but also promote continuous business model innovation through data-driven processes, enabling deep integration of products, services, and extended services. At the same time, they foster organizational capability reconstruction by strengthening data management, facilitating cross-boundary collaboration, and reshaping innovation culture. The conclusion of this study suggests that the mechanisms by which digital service ecosystems drive the transformation of traditional industries are characterized by systemicity, gradualness, and deep integration. These mechanisms provide not only external impetus but also gradually internalize as core capabilities, thereby offering sustainable support for industrial transformation. The findings of this study enrich the theoretical understanding of industrial upgrading under the conditions of the digital economy and provide practical guidance for traditional enterprises in formulating strategies for digital transformation.

Keywords: Digital Service Ecosystem; Transformation of Traditional Industries; Value Chain Reconstruction; Business Model Innovation; Organizational Capability

1. Introduction

With the rapid development of the digital economy, data, information, and technology have gradually become the core driving forces of economic growth and industrial upgrading [1]. After a long period of linear development, traditional industries are now facing multiple challenges and opportunities brought about by digital transformation. On the one hand, consumer demand is increasingly characterized by personalization and diversification, pushing firms to continuously seek new growth paths. On the other hand, the widespread adoption of digital technologies has accelerated changes in value creation, forcing traditional industries to reassess their production logic and business models. In this process, the digital service ecosystem—an open system jointly constructed by platforms, data, and multiple stakeholders—has increasingly become an important driving force for industrial transformation [2].

Existing studies have primarily focused on the impact of digital tools or single platforms on enterprise performance, while discussions on the overall mechanisms of digital service ecosystems remain limited. Compared with single-technology applications, digital service ecosystems place greater emphasis on cross-boundary resource integration, value chain optimization, and the dynamic evolution of innovation networks [3]. This characteristic not only helps break the path dependence of traditional industries but also provides enterprises with long-term and sustainable competitive advantages. Meanwhile, digital service ecosystems have gradually expanded on a global scale, demonstrating significant transformative effects in sectors ranging from retail and manufacturing to finance and healthcare, thereby becoming a new engine of industrial transformation and economic growth [4].

However, understanding the underlying mechanisms of digital service ecosystems in the transformation of traditional industries remains a critical issue for both theoretical research and practical exploration. On the one hand, enterprises often lack systematic guidance in their digital transformation processes, leading to fragmented resource allocation or limited effectiveness. On the other hand, academic research on digital service ecosystems has yet to form a comprehensive framework, with insufficient in-depth analysis of their driving logic. Therefore, the purpose of this study is to construct a systematic analytical framework to reveal how digital service ecosystems promote the transformation and upgrading of traditional industries through value chain reconstruction, business model innovation, and capability reconfiguration.

The findings of this study not only enrich the theoretical understanding of the relationship between the digital economy and industrial transformation but also provide strategic references for enterprises in practice. By exploring the driving mechanisms of digital service ecosystems, this study seeks to address the following questions: How do digital service ecosystems reshape value creation in traditional industries? What are the specific mechanisms at the levels of business models and organizational capabilities? And what are the theoretical and practical implications of these mechanisms for industrial transformation? The answers to these questions will provide new perspectives and empirical support for understanding the patterns of industrial development in the digital economy era.

2. Literature Review

2.1 Research Progress on Digital Service Ecosystems

The digital service ecosystem is a complex system jointly constructed by digital technologies, service providers, platform mechanisms, and user demand, and research on it has primarily focused on two aspects: value creation and innovation-driven development [5]. Existing studies point out that the development of digital technologies—particularly the widespread application of big data, artificial intelligence, cloud computing, and the Internet of Things—has laid the foundation for the formation of digital service ecosystems. These technologies not only improve the efficiency of information processing and transmission but also expand the scope of service provision, enabling enterprises to deliver personalized and intelligent services through data-driven processes [6].

At the level of value creation, scholars generally argue that digital service ecosystems have transformed the linear logic of traditional value chains into a new model of multi-stakeholder collaboration and co-creation [7]. Platforms, as central hubs, not only integrate resources from both supply and demand but also foster innovation diffusion and resource optimization through network effects and economies of scale. At the same time, users are no longer passive recipients; instead, they actively participate in value co-creation within the ecosystem through data feedback, content creation, and sharing behaviors. This interactive relationship enhances the resilience and sustainability of the ecosystem.

In addition, scholars emphasize the dynamic and open nature of digital service ecosystems. Unlike traditional industrial boundaries, digital ecosystems exhibit a trend of cross-boundary integration, where sectors such as finance, retail, manufacturing, and healthcare achieve interconnectedness and cross-sector collaboration under the traction of platforms [8]. This characteristic not only drives industry-level innovation but also provides new transformation pathways for traditional industries.

2.2 Research Progress on the Transformation of Traditional Industries

Regarding the transformation of traditional industries, academic research has generally focused on three dimensions: digital-driven change, organizational transformation, and business model innovation.

First, in terms of digital-driven change, studies indicate that traditional industries can break efficiency bottlenecks in production and service processes by adopting digital technologies, achieving a shift from scale effects to intelligent effects [9]. For example, big data applications can help firms accurately identify consumer preferences, while artificial intelligence can optimize supply chains and customer management processes, thereby improving overall competitiveness.

Second, in terms of organizational

transformation, existing studies emphasize the importance of culture and management models [10]. Digital transformation is not merely a technological issue; it also involves restructuring organizational systems and updating managerial philosophies. Enterprises need to adjust information sharing, teamwork, and decision-making mechanisms in order to adapt to a more flexible and responsive market environment. Meanwhile, an organization's internal acceptance of digitalization and its learning capacity are considered key factors for successful transformation.

Third, in terms of business model innovation, studies show that traditional industries are shifting from product-oriented to service-oriented approaches [11]. For instance, manufacturing firms extend into after-sales and value-added services through digital platforms, while the retail sector achieves omnichannel operations by integrating online and offline channels. These transformation practices indicate that digital service ecosystems are not only the result of technological empowerment but also reflect strategic choices and shifts in business logic.

Overall, while existing literature has achieved substantial progress in studying both digital service ecosystems and the transformation of traditional industries, research on the driving mechanisms that link the two remains insufficient. Most studies focus on a single dimension and lack systematic explanations of how ecosystems jointly influence industrial transformation through multiple mechanisms. Therefore, this study further clarifies the internal logic of digital service ecosystems driving the transformation of traditional industries through theoretical analysis, with the aim of filling this gap.

The formation and evolution of digital service ecosystems not only drive the renewal of business models in traditional industries but also bring profound changes in technological applications, industry chain integration, and value creation logics [12]. Current research often explains their mechanisms from perspectives such as technology adoption, platform governance, and ecosystem interaction. However, systematic theoretical analysis is still lacking regarding how they drive transformation at a deeper level, reshaping industrial value chains and organizational boundaries. Therefore, the next section (Part 3) will take a theoretical perspective to construct an analytical framework that reveals the mechanisms by which digital service ecosystems drive the transformation of traditional industries.

3. Theoretical Analysis

3.1 Value Creation Mechanism

In the context of the digital economy, the value creation model of traditional industries has undergone profound transformation. In the past, value chains largely relied on linear production logic, emphasizing large-scale and standardized material output. However, digital service ecosystems, through the aggregation and flow of data elements, have established a user-centered value creation mechanism. Data has become a new factor of production, breaking down the information barriers between supply and demand, enabling firms to accurately capture consumer needs and market dynamics, and rapidly transform these insights into product or service innovations using digital tools.

This shift has gradually driven traditional industries from being "production-driven" to "service-driven." For example, in the manufacturing sector, firms not only provide products but also deliver predictive maintenance, remote monitoring, and customized solutions through platform-based service systems, thereby realizing dual value creation of "manufacturing + services." In this process, value is no longer generated solely from the product itself but rather co-created through the interactions between products and services, platforms and users. This mechanism also strengthens the long-tail effect of industries, allowing small and medium-sized enterprises as well as individual operators to find opportunities for survival and growth on platforms, thereby enhancing the vitality and diversity of entire industries.

Therefore, the value creation mechanism of digital service ecosystems not only improves resource utilization efficiency but also promotes the expansion of industry boundaries. Traditional industries have gradually evolved from closed, single value chains into multi-sided, interactive value networks, forming a new industrial value logic characterized by openness, interactivity, and dynamism.

3.2 Capability Reconfiguration Mechanism

Capability reconfiguration is one of the key mechanisms through which digital service ecosystems influence the transformation of traditional industries. Traditional enterprises often rely on physical capital, fixed assets, and established processes in competition, with limited innovation capability and responsiveness. Digital service ecosystems, however, provide opportunities for firms to reorganize resources and capabilities, enabling agile and intelligent transformation in dynamic environments.

First, data analytics and artificial intelligence endow firms with new cognitive capabilities. Through algorithmic models, firms can extract valuable insights from massive, multi-source, and heterogeneous data, helping managers make more scientific and forward-looking decisions. Second, operational capabilities are also reconfigured under digital empowerment. For instance, retail enterprises adopting intelligent supply chain management systems achieve real-time inventory monitoring and logistics optimization, which significantly reduces costs while enhancing responsiveness. Third, innovation capabilities are considerably stimulated. Traditional R&D cycles are lengthy, but with the support of digital service platforms, firms can accelerate product development and iteration through user participation, open innovation, and crowdsourcing models.

It is noteworthy that capability reconfiguration is reflected not only at the level of individual firms but also across industry clusters. Upstream and downstream enterprises in the value chain achieve data sharing and resource integration via platforms, enabling industry clusters to form collaborative advantages. For example, the automotive industry integrates component suppliers, manufacturers, and service providers through intelligent manufacturing platforms, building cross-enterprise dynamic capability networks that allow the sector to rapidly seize opportunities in emerging areas such as new energy and autonomous driving.

In essence, capability reconfiguration driven by digital service ecosystems represents a shift from the traditional resource-dependence logic to a new competitive logic centered on knowledge capital, data elements, and dynamic capabilities. This transformation not only enhances the adaptability of individual firms but also strengthens the resilience of the entire industrial system in coping with external uncertainties.

3.3 Organizational Collaboration Mechanism

Another core mechanism of digital service ecosystems lies in fostering cross-organizational collaboration and value co-creation. In traditional industries, inter-firm relationships are mostly based on contractual cooperation, with low information transmission efficiency and restricted resource flows. By contrast, supported by digital platforms, firms, users, and other partners can achieve cross-boundary integration and deep interaction through instant communication, intelligent matching, and data-driven collaboration models.

First, platform-based structures enhance the connectivity of multi-sided markets. Different stakeholders on the platform are not only participants in transactional relationships but also partners in value co-creation. For example, in the healthcare industry, digital platforms connect doctors, patients, pharmaceutical companies, and insurers to form a multi-party collaborative network, optimizing healthcare services, accelerating drug development, and improving risk-sharing mechanisms.

Second, digital service ecosystems emphasize ecological co-win rather than zero-sum competition. Firms sharing data and resources on platforms can jointly develop new products or services, thereby reducing risks and costs associated with R&D. For instance, in the energy sector, digital collaboration mechanisms enable power generation firms, equipment manufacturers, and end-users to share data and manage energy on the same platform, thus improving energy efficiency and promoting green transformation.

Finally, organizational collaboration is reflected not only in horizontal cooperation among firms but also in vertical interactions between firms and users. Users are no longer passive recipients but active participants and co-creators of value within platforms. Through user feedback and community interactions, firms can achieve rapid product iterations and service improvements, further enhancing market adaptability and customer stickiness.

In summary, the organizational collaboration mechanism of digital service ecosystems breaks the boundary constraints of traditional

industries, shifting industrial logic from unilateral competition to multi-stakeholder collaboration. The deepening of such collaborative relationships not only enhances overall industry competitiveness but also provides theoretical support for building open, shared, and sustainable industrial ecosystems.

4. Conclusion

This paper, situated in the context of the digital economy, systematically analyzes the driving mechanisms of digital service ecosystems on the transformation of traditional industries. The study theoretically explores three dimensions: value creation, capability reconfiguration, and organizational collaboration.

The findings reveal that, first, digital service ecosystems, through the value creation mechanism, break the limitations of traditional industries that rely on linear production, driving the value chain from a closed to an open model. This shift enables firms to transition from "production-driven" to "service-driven" models, enhancing the diversity and flexibility of industries. Second, digital service ecosystems, through the capability reconfiguration mechanism, inject data-driven cognitive, operational, and innovation capabilities into firms, enabling them to achieve agility and intelligence in dynamic environments. This strengthens not only the adaptability of individual firms but also the collective resilience of industry clusters. Finally, digital service ecosystems, through the organizational collaboration mechanism, foster cross-boundary cooperation and multi-stakeholder value co-creation, breaking the boundaries of traditional industries and facilitating a shift from a logic of unilateral competition to one of collaborative co-win.

In summary, the mechanisms by which digital service ecosystems drive the transformation of traditional industries are characterized by systemicity, gradualness, and deep integration. They not only provide external impetus but also gradually internalize as the core capabilities of enterprises, thus offering sustainable support for industrial transformation. Theoretically, this study contributes a systematic analytical framework for understanding industrial transformation under the influence of digital service ecosystems, addressing the fragmented nature of prior research. Practically, it provides strategic references for traditional enterprises in the process of digital transformation: firms should actively integrate into digital service ecosystems and achieve upgrading and sustainable competitiveness through value chain reconstruction, capability enhancement, and cross-boundary collaboration.

Moreover, the implications of this study extend beyond individual enterprises to broader industry and policy levels. Digital service ecosystems not only reshape micro-level organizational behavior but also accelerate the restructuring of industrial structures, leading to more open, resilient, and innovation-driven economies. For enterprises, embracing ecosystem thinking means not only adopting digital technologies but also cultivating dynamic learning abilities, collaborative mindsets, and adaptive governance mechanisms that ensure long-term sustainability. For researchers, the framework presented here provides a foundation for future empirical studies and comparative analyses across sectors and regions, thereby deepening the theoretical discourse on digital transformation and broadening its interdisciplinary significance.

Future research could further combine specific industry or regional cases to explore the heterogeneity of digital service ecosystem mechanisms and identify best practice paths. This would provide more targeted guidance for both academic research and enterprise strategy.

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