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Digital Transformation-Digital Economy and Business Innovation

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Abstract: The digital intelligence economy, driven by the dual wheels of digital industrialization and industrial digitalization, reconfigures the industrial ecosystem through intelligent technologies and data resources. Business innovation specifically relies on four types of practices: product intelligence, service wisdom, model ecology, and management intelligence, to revolutionize the value creation model. The two form a virtuous cycle of technology supply and innovative application, driving enterprises to complete digital transformation through the integration of intelligent technologies, process reengineering, precise marketing, and the construction of ecological platforms. However, they also face challenges such as data security, traffic barriers, and talent shortages, requiring the establishment of governance systems and training mechanisms to achieve sustainable development.

Keywords: Digital intelligence economy; Business innovation; Digital transformation

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1. Introduction

Recently, the "Digital China Development Report (2024)" was released at the 8th Digital China Summit, revealing the trend of coordinated advancement of digital industrialization and industrial digitalization [1]. The report indicates that in 2024, the added value of China's core digital economy industries will account for about 10% of the GDP, marking the digital economy as a significant pillar of the national economy. Against this backdrop, exploring the intrinsic connection and transformation paths between the digital intelligence economy and business innovation is of great significance for understanding the reconstruction of business models driven by technology.

2. Theoretical connotations and connections between digital intelligence economy and business innovation

2.1. The concept and characteristics of digital intelligence economy

The digital intelligence economy is an advanced form of the digital economy. On the basis of the digital economy,

which takes data as the core element, it emphasizes the deep integration of intelligent technologies such as artificial intelligence with the economic system. The digital economy framework consists of two core components (**Table 1**), which form a deeply integrated situation in the national economic system, demonstrating the internal driving logic of the penetration of technological elements into the industrial system-digital industrialization provides technical tools and infrastructure, while industrial digitalization realizes the application and value transformation of technology, jointly building a new economic form with data as the key production element and intelligent technology as the core driving force [2].

Table 1. Two core components of the digital economy framework

Core sector	Definition	Specific fields/ Manifestations	Role
Digital industrialization	Focuses on the development of the information industry itself	Basic telecommunications services, electronic manufacturing industry, software research and development and information technology services, internet economy, etc.	Constitutes the technical foundation and innovation source of the digital economy
Industrial digitalization	Uses information and communication technology (ICT) to empower and transform agriculture, industry, and service industries	Efficiency improvement and value creation generated by information and communication technology investment in various industrial fields (such as intelligent agriculture, industrial internet, smart service industry, etc.)	Realizes technology application and value transformation

2.2. The essence and types of business innovation

In the context of the digital intelligence economy, the core of business innovation lies in enterprises' systematic reconstruction of value creation mechanisms, value transmission paths, and value acquisition methods through the integration of intelligent technology systems and data resources, thereby building a differentiated competitive advantage. From a practical perspective, it can be divided into four types of innovation:

2.2.1. Intelligent product innovation

This is specifically manifested in the technological empowerment and functional iteration of physical products. For instance, Apple's Apple Watch, by integrating biosensors, wireless communication modules, and self-developed chips, has expanded the traditional watch's timekeeping function to health monitoring, sports management, mobile payment, and other diverse scenarios. Through real-time analysis of user physiological data by algorithm models, it achieves functional value addition, reconstructing the product definition and user experience paradigm of consumer electronics [3].

2.2.2. Intelligent service innovation

This is reflected in the transformation of service supply towards precision and personalization. For example, the online education platform Coursera uses machine learning technology to build a user learning behavior model, generating personalized learning paths based on data such as course browsing history and assignment completion status. Through an intelligent Q&A system and adaptive question banks, it realizes the dynamic matching of "teaching" and "learning", breaking the limitations of traditional standardized courses and forming a service innovation model oriented towards user needs.

2.2.3. Ecological innovation of business models

A typical representative of ecological innovation in business models is the construction of value networks by sharing economy platforms. Take Uber as an example. By integrating global driver and passenger resources and using location data and real-time supply and demand algorithms to build a two-sided market platform, it not only meets users' convenient travel needs but also provides income channels for idle transportation capacity. By integrating third-party resources such as map services, payment systems, and car rental, it forms a cross-domain collaborative business ecosystem, achieving value co-creation and co-evolution among multiple participants.

2.2.4. Intelligent management innovation

This innovation focuses on enhancing the operational efficiency of enterprises and organizational transformation. For instance, the intelligent management system developed by SAP integrates enterprise resource planning, supply chain management, and human resource management modules. It uses blockchain technology to achieve data traceability and process automation, and employs natural language processing technology to analyze business documents and generate decision-making suggestions. This promotes the transformation of enterprises from experience-driven hierarchical management to data-driven flat operation, demonstrating significant efficiency improvement effects in areas such as inventory optimization and supply chain collaboration [4].

2.3. The intrinsic link between digital intelligence economy and business innovation

The digital intelligence economy provides a multi-dimensional support system for business innovation: intelligent technologies such as cloud computing and the Internet of Things form the technological foundation for innovation, enabling enterprises to break through physical space limitations and achieve resource integration and real-time interaction; big data analysis technology endows enterprises with the ability to deeply understand user needs, market trends, and competitive landscapes, converting data assets into the basis for innovative decision-making; an open and collaborative digital ecosystem reduces innovation costs and trial-and-error risks, promoting the efficient flow of technology, capital, and talent. Meanwhile, business innovation practices serve as a significant driving force for the development of the digital intelligence economy: the demand for sensor accuracy and computing efficiency in the process of product intelligence drives research and development in areas such as chip manufacturing and edge computing; the massive application data generated in the process of service intelligence innovation provides training materials for the optimization of artificial intelligence algorithms, promoting the iterative upgrade of technologies such as natural language processing and computer vision; the demand for industrial integration brought about by the ecological innovation of business models prompts the improvement of infrastructure such as 5G and digital twins and the formulation of cross-industry standards.

3. The path and challenges of driving business innovation through digitalization and intelligence transformation

3.1. The core path of digitalization and intelligence transformation

3.1.1. Deep integration and application of intelligent technologies

Artificial intelligence, big data, the Internet of Things, and other technologies are deeply integrated into various operational links of enterprises, presenting multi-dimensional collaborative characteristics. In the manufacturing field, IoT sensors collect real-time equipment operation parameters, which are pre-processed through edge computing and then transmitted to the cloud data center via 5G networks. Combined with digital twin technology,

a virtual mirror of the production line is constructed to support dynamic optimization of process parameters and predictive maintenance of equipment. The big data analysis engine models historical production data to identify quality defect correlation factors, driving the upgrade of intelligent quality inspection systems. In supply chain management, blockchain technology is used to record logistics node data, and smart contracts automatically execute order settlements. Combined with demand forecasting models, safety stock levels are dynamically adjusted to shorten order fulfillment cycles. In customer service scenarios, natural language processing technology parses customer service dialogue texts, builds a knowledge base of customer intentions, and optimizes the multi-round dialogue logic of the intelligent customer service system. At the same time, service process data is fed back to the product design stage to form a closed loop of demand insight [5].

3.1.2. Intelligent redesign of business processes

Enterprises rely on intelligent technologies to deconstruct and reconstruct business processes, breaking down information silos in traditional hierarchical organizations. In the R&D and design stage, the collaborative platform integrates CAD design data, bill of materials, and process routes, and uses knowledge graph technology to establish parameter correlation models, enabling the automatic generation and compliance verification of design schemes. The production planning module accesses real-time production capacity data, order priority rules, and material inventory status, and uses heuristic algorithms to generate multi-objective optimization schedules, dynamically adjusting task allocation for each production line. The supply chain collaboration system synchronizes supplier production capacity, in-transit logistics information, and customer order changes in real time through API interfaces, triggering intelligent replenishment strategies and logistics route re-planning. In the financial settlement process, RPA robots automatically capture invoice images, and after key information is recognized by OCR technology, it is matched with purchase orders. Abnormal data is pushed to financial personnel for manual verification, forming an automated process system that is mainly handled by machines with human intervention as a supplement.

3.2. Implementation methods of business innovation in digital and intelligent transformation

3.2.1. Precise marketing and service based on intelligent data

The data-driven demand insight system realizes value transformation through a multi-level technical architecture. The bottom-level data collection layer integrates online mall browsing logs, offline store traffic sensor data, customer service work order texts, and third-party industry reports. After being cleaned by ETL tools, the data is stored in a data lake. The middle-level analysis layer uses machine learning algorithms to build user segmentation models, calculates customer lifetime value by combining implicit feedback (such as clickstream data) and explicit feedback (such as product ratings), and identifies high-potential market segments. The application layer develops a personalized recommendation engine based on collaborative filtering algorithms and content matching models, dynamically generating product combinations on user touchpoints. At the same time, a predictive maintenance system is used to push component replacement suggestions to equipment users, transforming passive services into active value output. The marketing activity management platform connects to real-time public opinion data, uses sentiment analysis technology to monitor the popularity of social media topics, and automatically adjusts advertising placement strategies and content creativity, achieving precise allocation of marketing resources [6].

3.2.2. Business model innovation of ecological platform

Enterprises build value co-creation networks by establishing intelligent digital platforms. A typical example is

the difference in the traffic ecosystem operation logic between WeChat and Douyin (**Table 2**). WeChat takes the social relationship chain as the core, integrating multiple carriers to form a closed ecosystem of private and public domain traffic interaction. Douyin, on the other hand, relies on its algorithmic advantages to create a content-driven commercial monetization system. Both attract third-party developers by opening data capabilities and expanding the boundaries of ecological services.

Table 2. Comparison of traffic ecosystem operation logics between WeChat and Douyin

Comparison dimension	WeChat	Douyin
Core logic	Centered on social relationship chains to build a private domain traffic precipitation system	Relying on algorithmic advantages to achieve precise content distribution and efficient traffic conversion
Ecological closed-loop path	Social drainage → content reach → transaction conversion → user retention	Content production → traffic distribution → commercial realization
Key functions/ Platforms	Open platform interfaces integrate Official Accounts, Video Accounts, and Mini Programs; Search function realizes public domain traffic diversion; Data permission management supports precision marketing	ByteDance Marketing Services integrates advertising, live streaming, and influencer resources; Douyin Shop connects with supply chains; Data-driven content recommendation model optimization
Third-party cooperation models	Open data capabilities through API interfaces to attract developers to access	Open data capabilities to encourage developers to enrich platform functions and services

3.3. Challenges and countermeasures in the process of digital and intelligent transformation

3.3.1. Challenges faced

Data security and privacy protection issues present new dimensions as the value of data assets rises. In the heterogeneous network environment created by distributed architectures, the complexity of compliance reviews for cross-domain data flows increases. Traditional security architectures face dual pressures of technical iteration costs and business adaptability when implementing zero-trust systems. New data leakage risks impose higher requirements on the dynamic and precise nature of protection mechanisms, while traditional boundary defense methods show capability gaps in dealing with distributed attacks and API vulnerabilities. At the same time, the supply and demand contradiction of digital and intelligent composite talents is manifested as a connection gap between technology application and business scenarios. There is a shortage of talents who understand industry business logic and master complex algorithm engineering capabilities. The existing professional training system in universities is restricted by disciplinary divisions, leading to a knowledge structure biased towards a single technical field or theoretical research, which is difficult to meet the actual needs of cross-domain problem-solving capabilities required by the integration and innovation of multiple technology stacks in enterprises.

3.3.2. Countermeasures

The construction of a data security governance system needs to break through the traditional protection framework and form a three-dimensional architecture of technical protection, institutional norms, and process control. By adopting technologies such as federated learning and privacy computing, distributed collaboration can be achieved where data is “usable but not visible”. Through the establishment of a data classification and grading standard system, the boundaries of data access, flow, and storage permissions in different business scenarios can be clearly defined. A data security risk assessment mechanism and multi-level emergency response plans should be implemented to enhance the full life cycle management capabilities of data. At the same time, the talent cultivation

and introduction mechanism for digital intelligence needs to be restructured to transform knowledge. At the level of industry-education integration, it is necessary to promote the in-depth connection between enterprise business scenarios and university research resources, develop customized course systems that include core technology modules, industry application scenarios, and engineering practice cases, and build a knowledge sharing platform through cross-departmental joint projects to improve the efficiency of converting technical theories into commercial solutions. In the talent introduction process, focus on the dual ability matrix of "technology commercialization" and "commercial technologization", design a competitive salary incentive system, and attract compound talents with industry experience and technological foresight through high-end talent plans. For internal talent cultivation, a mechanism combining job rotation and mentorship should be established to accelerate the integration of technical capabilities and business insights in real business scenarios, and build a hierarchical and sustainable talent team.

4. Conclusion

In summary, the deep integration of digital intelligence and business innovation is manifested in the empowerment of industrial efficiency by intelligent technologies and the reconstruction of value creation models by data resources. Through technology integration, process optimization, and ecosystem construction, enterprises can achieve innovative breakthroughs in digital transformation, while data governance and talent cultivation become key supports for sustainable development. This collaborative process will continue to promote the deep integration of the digital economy and the real economy, injecting new impetus into high-quality development.

Disclosure statement

The author declares no conflict of interest.

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