ISSN 2616-5902 Vol. 7, Issue 1: 30-36, DOI: 10.25236/AJBM.2025.070104

Data-Driven "Intelligent Manufacturing": The Business Model Reconstruction of Industrial Internet Platforms—A Case Study of Black Lake Technology

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Abstract: *The digital application scenarios and the complex network attributes are creating new turning points for platform business models. Effectively acquiring and integrating data resources to fill the gaps in the resource control limits of platform enterprises is the foundation for constructing the business model of industrial internet platforms. Based on the theory of resource orchestration, this paper takes Shanghai Black Lake Network Technology Co., Ltd. as the research object. It deeply analyzes the network effects and scenario-driven innovation under the fusion and reconstruction of platform business model, aiming to provide theoretical and practical references for the high-quality growth of industrial internet platforms and the efficient implementation of the digital-physical integration strategy in China.*

Keywords: *Industrial Internet Platform, Business Model, Scenario Innovation, Network Effect, Resource Orchestration*

1. Introduction

The Industrial Internet is at the intersection of integrated applications and technological transformation, with the strategic task of "promoting the deep integration of the digital economy and the real economy" becoming a current priority for industrial internet platforms. The combination of data elements and technological innovation generates numerous digital application scenarios, changing the interaction patterns between enterprises and users. Based on an open architecture, systems utilize common digital technologies and network attributes to collect and utilize big data across the industrial chain. The complexity of network effects makes the platform business model face new turning points. Scholars have analyzed the mechanisms of business model innovation from perspectives such as resource-based views, process theory, and systems theory.[2] Resource orchestration theory provides a solid theoretical foundation for studying the transformation of scattered resources into differential capabilities in business ecosystems.[6] The foundation of constructing an industrial internet platform business model is to acquire and integrate effective resources, fill the gaps in platform enterprises' resource control limits, capture new value propositions, and optimize business processes to deliver valuable products and services. This paper focuses on Black Lake Technology, a "disruptor" in the traditional SaaS industry, to explore how the company addresses the common contradiction of "individuality and commonality" in the development of industrial internet platforms. The paper deeply analyzes the network effects and scenario-driven fusion and reconstruction of platform business models, aiming to provide theoretical and practical references for the high-quality growth of China's industrial internet platforms and the efficient implementation of the digital-physical integration strategy.

2. Theoretical Foundation

2.1. Platform Business Model Innovation and Its Applicability to Industrial Internet Platforms

Platform business models facilitate value co-creation through a "core-periphery" structure, enabling service exchanges among various providers and receivers. They emphasize ecosystem dynamics and user co-creation, driving network effects and adapting to market demands through continuous resource reconfiguration and innovation of value activities.[3] Industrial internet platforms, distinct from consumer platforms, feature complex value chains, cross-industry integration, and diverse applications.

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2.2. Network Effects of Industrial Internet Platform

The concept of network effects originated in economics and describes how the value of a product or service increases as the number of users grows. It is divided into direct network effects and cross-side network effects. The business operations of industrial internet platforms do not directly rely on supply-demand matching services;[1] instead, they involve complex interactions between multiple participants, devices, and systems. As an important component of innovative platform ecosystems, the openness and collaboration of industrial internet platforms continuously promote the emergence of new business models. Factors such as differences in service timeliness and highly heterogeneous industry users make the utilization of network effects vary. Achieving complex network effects is essential for value creation in industrial internet platforms.[4]

2.3. Scenario Innovation of Industrial Internet Platforms

Scenario innovation is a new paradigm emerging in the era of digital economy. It represents the integration and diversified application of digital technologies, market demands, and other innovation elements, driven by strategy and focusing on breakthrough innovations. The goal is to overcome existing technological bottlenecks and create new products, channels, and business models. With the digitalization trend, emerging technologies grow in a cluster and integrative fashion, and market demands exhibit personalized and forward-looking development characteristics. Therefore, it is required to establish closer connections and transformations between technology, demand, scenarios, and mission, leading to organic and coordinated integration.

2.4. Resource Orchestration Strategy Based on Platform Business Innovation

Resource actions are the organizational actions that enterprises take to achieve positive interaction between actions and resources at different stages of resource situations.[7] This gives rise to concepts such as resource orchestration and resource coordination, which are defined broadly in different organizational contexts and resource stock backgrounds.[5] Resource orchestration refers to the comprehensive process of structuring, bundling, and utilizing resources. It explains how enterprises manage a series of processes to acquire, configure, and transform resources. The evolution of these resource actions can drive enterprises to effectively integrate resources and innovate processes, thereby reshaping their business models by adjusting value propositions, updating value creation and delivery channels, and changing value acquisition methods.

3. Research Design and Analytical Framework

This study adopts a longitudinal single-case research methodology, selecting "Black Lake Technology" as the case study object for the following reasons: First, the case is typical—Black Lake Technology addressed industrial pain points and built its platform from scratch, continuously exploring digital industrial applications and achieving transformation at every key node. Second, the case is valuable—Black Lake Technology provides cloud-based data collaboration and analysis tools for self-reforming manufacturing enterprises, and is the first "phenomenal" startup in the Chinese market to offer full-service SaaS software solutions for various types of manufacturing enterprises. Based on the aforementioned theoretical support and practical observations: digital technologies and cross-domain scenarios are deeply involved in platform value creation. Complex network effects help to promote positive interactions among participants in the industrial manufacturing ecosystem, releasing more powerful value transfer effects. Resource orchestration plays a strategic role in the construction process of industrial internet platforms. The generation of the business model is based on the outcomes of platform resource actions, and the nature of products and services determines business model innovation.

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4. Case Analysis

4.1. Empowerment Mechanism of Scenario Innovation

4.1.1. Scenario Perception

Within innovation ecosystems, Black Lake Technology addresses the digital supply chain gap, especially in manufacturing, by enhancing factory information structures. They collect and integrate machine data, system data, and production process data to form a comprehensive database. This enables real-time data collaboration on mobile and PC devices, facilitating collaborative work. Additionally, they visualize and concretize traditionally intangible scenario elements for scenario analysis, restructuring, and innovation.

4.1.2. Value Insight

Strategic direction is crucial for scenario construction, aligning task design and technological innovation to enhance efficiency and value creation. Black Lake Technology, an entry-level industrial collaboration platform, targets factory digital transformation and operates within the industrial internet ecosystem. Through the "Intelligent Manufacturing Companion Program," it collaborates with stakeholders to develop tools, scale up, and form industry alliances. The platform, centered on data-driven manufacturing, digitalizes production, facilitates industry chain interconnection, and enhances operational efficiency, quality, and flexibility for enterprises.

4.1.3. Interaction Between Technology and Demand Cycles

Clustered growth in emerging tech and personalized market demands drive scenario-driven innovation. Black Lake Technology offers an industrial internet innovation platform, swiftly commercializing enterprise innovations. It heavily invests in natural semantic analysis and appoints a product leader to boost trial efficiency. Using cloud technologies like Kubernetes and Docker, Black Lake achieves a "mobile app + microservices + cloud" setup for rapid, low-maintenance, efficient, and cost-effective service delivery. The platform integrates machine learning and data modeling for real-time, data-driven decision-making.

4.1.4. Flexible Adaptation

In industrial internet platforms, scenario perception, value insight, and the technology-demand cycle are interconnected, driving ecosystem innovation and development. Black Lake Technology deeply analyzes manufacturing to pinpoint technological needs, optimize within scenarios, and identify potential user needs across the industry chain. This approach refines technology, fosters cooperative models, and broadens service scope. IoT and product integration collaborations deepen multi-product scenario integration. The scenario-driven innovation model, led by mission and values, guides through scenario analysis, deconstruction, task design, and targeted solutions for industry and innovation chain challenges, facilitating the integration of technological supply with cutting-edge demand, as depicted in Table1.

Table 1: Empowerment Mechanism of Scenario Innovation with Examples and Coding.

Example	First-Level Concept	Second-Level Theme	Third-Level Category
The existing ERP system cannot handle overages or shortages, causing the procurement and warehouse departments to rely on offline communication to process business workflow	Customer Problem Perception	Scenario Perception	Scenario Innovation
How to implement full-chain traceability of products to cope with the complex and strict factory certification requirements in the automotive parts industry	Application Scenario Perception		
Cross-organizational traceability via barcode, which records entire production and quality inspection history of products. The system platform can track a finished product's steel stamp number to its raw material sources	Functional Extension Perception		
Create a tool platform for the manufacturing industry from a third-party perspective. The goal is to enable other manufacturers to disrupt our	Clear Value Positioning	Value Insight	

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collaborative products, thus turning us into a more universal interface.			
It facilitates data exchange between factories in a networked scenario and may enable the data flow throughout the entire supply chain.	Value Chain Extension		
Orders are shifting from large-volume, standardized orders to small-batch, customized orders, increasing the demand for factories' rapid responsiveness. These factories need to transition from design-driven to demand-driven manufacturing.	Production Process Adaptation	Technology-Demand Interaction	
By aggregating and distributing real-time data, empowering frontline workers across different departments, the goal is to facilitate seamless collaboration between workers.	Business Innovation Response		
The product-focused approach aims for extreme simplicity, with ease of use. The data from small work order management is timely, accurate, and standardized, something many competing foreign factories have not achieved in terms of fine control.	Ease of Operation	Flexible Adaptation	
Spiral development involves creating a few core microservices and gradually enriching these services over time as they accumulate through different scenarios, driving iterative innovation through accumulation.	Iterative Innovation		
Companies along the supply chain accumulate industry data, and the data from different departments and organizations are connected, enabling structured analysis.	Cross-Border Integration		

4.2. Strengthening Mechanism of Network Effects

4.2.1. Building Network Effects

Network effects require a minimum user threshold to attract new users. Black Lake Technology, lacking an established user base, focused on building reputation and user loyalty. It offered free services to factories for a year to understand production realities and find a market entry. Using modular deployment, its R&D team adapted quickly, providing training in a week and deployment in four to six weeks. Within two years, the company served over 200 validation clients and nearly 2,000 manufacturing enterprises across nearly 20 sub-industries, helping them accumulate data.

4.2.2. Layered Reinforcement

The minimum viable product, "Black Lake Small Work Order," is a lightweight enterprise management software on "public cloud + IM system," penetrating the small and micro-enterprise market with no hardware, apps, or operational thresholds. "Black Lake Intelligent Manufacturing" integrates internal value chains, enabling data sharing and circulation, and analyzes production stages. "Black Lake Supply Chain" targets enterprises with complex supply chains, facilitating real-time collaboration. These products are mutually coupled and operate in a coordinated manner within the ecosystem.

4.2.3. Intelligent Manufacturing Cooperation Alliance

Black Lake Technology expands ecological cooperation, empowering the upstream supply chain through technology co-creation and connecting data for digital collaboration across the Yangtze River Delta's manufacturing industry. It integrates with Huawei's IoT and Microsoft's Azure, and collaborates with vertical industries. It launched "Black Lake Factory Ding," integrating manufacturing SaaS with scenarios. Client services are segmented by industry, exploring models while fine-tuning processes, leading to integrated product-service cooperation, as depicted in Table 2.

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Table 2: Strengthening Mechanism of Network Effects with Examples and Coding

Example	First-Level Concept	Second-Level Theme	Third-Level Category
A strategy of cultivating user reputation and building user stickiness. Initially offering free usage to factories for one year, and clarifying the realities and logic of the production process.	Building Key Nodes	Network Effect Construction	Network Effect
Black Lake excels at having strong user reputation, leveraging word-of-mouth to drive user acquisition.	Successful Case Feedback		
After two years online, Black Lake helped accumulate over 200 verified clients, serving nearly 2,000 manufacturing enterprises and their supply chains, covering full production scenarios across nearly 20 sub-industries.	Industry Focused		
A platform network state differentiated into multiple service modules, using differentiated products to meet the diverse needs of heterogeneous users based on demand matching.	Clear Value Positioning	Layered Reinforcement	
In specific industrial sectors, the platform's capabilities need to be further refined, such as in discrete manufacturing versus process manufacturing industries, where processes differ, requiring more granular layers.	Value Chain Extension		
Leveraging Huawei Cloud Container Engine (CCE) for high elasticity scaling; integrating vertical industrial applications from Microsoft to promote Azure.	Production Process Adaptation	Smart Manufacturing Cooperation Alliance	
Black Lake Technology collaborates with Alibaba Group to join Link IoT, realizing cooperation in IoT technology and product integration, and jointly launching "Black Lake Factory Ding".	Business Innovation Response		

4.3. Resource Orchestration Process

4.3.1. Resource Structuring

In the resource structuring phase, Black Lake Technology uses advanced technologies to democratize data by perceiving, collecting, and managing it. They ensure interoperability within departments, deconstruct manufacturing processes, standardize data, and create a unified format for cloud uploading. They build a complete industry chain network, enabling seamless data flow across all stages.

4.3.2. Resource Capability Building

In the resource capability building phase, Black Lake focuses on extracting common needs to guide R&D resource allocation. Through spiral development, they enrich services for different scenarios, building a modular matrix to adapt to various business models. The platform enhances smart manufacturing services, optimizes processes, supports cloud collaboration, and creates a digital manufacturing model. By linking enterprises, it enables automatic decision-making, driving demand-based manufacturing and building a flexible supply chain.

4.3.3. Resource Leveraging

In the resource leveraging phase, Black Lake Technology integrates lean production and digital manufacturing, amplifying resource utility for higher efficiency and value. Through collaboration, it creates a new data ecosystem, accumulates industry experience, and optimizes user experience. Leveraging Changning Business District, the platform invites ecosystem partners to join, aiming to lead digital collaboration in the Yangtze River Delta's manufacturing industry chain, as depicted in Table3.

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Table 3: Resource Orchestration Process with Examples and Coding

Example	First-Level Concept	Second-Level Theme	Third-Level Category
Changing the original data storage model, implementing real-time data cleaning and storage, and achieving minimal data management.	Resource Deconstruction	Resource Structuring	Resource Orchestration
Black Lake hopes to become the "WeChat" of the production site, transmitting digital information through structured modules and microservices.	Resource Accumulation		
The organization's strategic goals and priorities are aligned to ensure adequate support for key areas and projects.	Resource Sequencing		
Unlike traditional ERP systems, Black Lake's software structure is similar to building Lego blocks, with very fine-grained microservices that are assembled and tailored based on application scenarios.	Packaging Capability Modules	Resource Capability	
Adapting to the production requirements of different industries, Black Lake has developed a rich service foundation in automotive parts, food, chemicals, and home appliances, which can be reused to expand product effectiveness.	Adaptive Models		
Achieving efficient collaboration through the free flow of data, resulting in a perfect combination of personalized customization and digital production.	Resource Deployment	Resource Leveraging	
Black Lake throws a "digital stone" into a calm lake, making invisible but valuable data surge with ripples, driving data flow and collaboration in the manufacturing industry.	Resource Coordination		

5. Conclusions

5.1. Innovation Mechanism of Industrial Internet Platform Business Model

Industrial internet platforms focus on user-driven scenario innovation in manufacturing, integrating resources to enable information flow and digital collaboration. They leverage network effects to foster innovation and resource integration, creating a feedback loop that enhances platform services. By transforming industrial resources into accessible data and employing cutting-edge technologies, these platforms establish bilateral network effects, with digital twins expanding scenario diversity. The platform's approach involves restructuring resources, activating their value, and aligning with strategic goals to innovate product combinations. It caters to varying enterprise stages with a flexible technical product matrix, from single-operation digital tools for small businesses to comprehensive applications for medium-sized enterprises and ecosystem support for supply chain leaders. Value transmission is facilitated through microservices and modular assembly, adapting to deployment scenarios and forming partnerships. Value acquisition moves to a subscription model, starting with serving a wide client base to build user loyalty and upgrading services, thus expanding value and completing a commercial cycle.

5.2. Practice Implications

The practical implication of this research is that platforms should drive mutual empowerment and linkage between scenarios to enhance the collaborative effect of the entire empowerment system and market competitiveness. Platforms should allocate resources reasonably based on the forces exerted by the supply and demand sides in different network effects, facilitating the smooth operation of linkage mechanisms more swiftly and efficiently. Platforms should further strengthen comprehensive resource management, enhance resource reconfiguration, and maximize resource utilization.

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References

[1] Yong Du., Lei Cao, and Siqi Ren. The Evolution Mechanism of Empowerment Models of Industrial Internet Platforms from the Perspective of Network Effects: A Case Study of Humi Network. Management Case Studies and Reviews, 2022, 15(06): 673-684.
[2] Panpan Li, Han Qian, and Tao Guo. The Cross-level Effects of Digitalization on Business Model Innovation of Manufacturing Enterprises. Scientific Research Management, 2022, 43(11): 11-20.
[3] Zhangming Shi, Lin Du. Empirical Study on the Impact of Industrial Internet Platforms on Industrial Integration. Science and Technology Progress and Countermeasures, 2022, 39(19): 59-68.
[4] Shuilian Wang, Chenghao Yu, and Jiayue Zhang. Research on the Value Creation Process of Industrial Internet Platforms. China Science and Technology Forum, 2022, (04): 78-88.
[5] Hongjun Hong, Zhe Zhang, and Yang Zhen. Sustainable Business Model Innovation of Platform Enterprises: Adequacy and Formation Mechanism. Shandong University Journal (Philosophy and Social Science Edition), 2021, (06): 62-75.
[6] Weihong Xie, Jianbin Luo, and Haizhen Guo, et al. Research on the Knowledge Structure and Expansion Directions of Industrial Internet Platform Studies. Science and Technology Progress and Countermeasures, 2021, 38(22): 151-160.
[7] Jingqin Su, Jingjing Lin, and Yanming Zhang. Evolution Path and Mechanism of Resource Action in Entrepreneurial Enterprises: From Patchwork to Orchestration. Science of Science and Management of S&T, 2017, 35(11): 1659-1672.