Journal of Applied Economics and Policy Studies Vol.18 Issue 11 EWA Publishing
Available Online: 16 December 2025 DOI: 10.54254/2977-5701/2025.30512

Research on cross-industry data asset integration and business strategy synergy

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Abstract. This study investigates the role of cross-industry data asset integration in generating business strategy synergies. It first develops a theoretical framework that outlines the core principles of data assetization, key integration drivers, and a structured architecture. The analysis then delineates the mechanisms through which synergies emerge across operational, managerial, and financial domains. Furthermore, the research examines how data integration informs strategic positioning, competitive dynamics, and organizational adaptation. The study concludes by identifying pivotal technical, managerial, and legal challenges and proposing targeted solutions. The study demonstrates that cross-industry data integration can drive corporate strategic transformation and collaborative development, though overcoming numerous challenges remains essential.

Keywords: cross-industry data integration, business strategy, synergy, challenges

1. Introduction

In the digital economy, cross-industry data asset integration has emerged as a pivotal strategy for enterprises to transcend sectoral boundaries and build sustainable competitive advantages. As a new production factor, data assets not only unleash their multiplier effects through cross-industry flows and collaborations, but also facilitate optimized resource allocation and value co-creation through strategic synergy. Using a theoretical framework, this research analyzes the internal mechanics of cross-industry data integration, explains the generation of synergistic effects, and demonstrates how these effects enhance business strategies. The framework provides a foundation for enterprises seeking to build sustainable competitive advantages in complex and dynamic environments.

2. Theoretical basis and core framework of cross-industry data asset integration

2.1. The essential characteristics and value dimensions of data assetization

Data assetization, the process of converting raw data into valuable economic assets, is characterized by distinct attributes and multiple value dimensions. Its core should meet the three conditions: clear ownership, measurable value and machine readability. Defining data ownership is a prerequisite for cross-industry data integration. Due to the low cost of data replication and the complex propagation path, the ownership can easily become ambiguous. While single-format data products like music and e-books can solidify ownership through copyright registration, cross-industry integration requires a dynamic ownership allocation mechanism. Approaches such as hierarchical authorization and revenue-sharing models for data usage rights can help clarify the rights and responsibilities of all parties. In terms of value measurement, a single data product (e.g., a song or a picture) can be priced accurately using standardized units. In contrast, the multi-source heterogeneous datasets involved in cross-industry integration are more complex, necessitating a multidimensional evaluation model based on data quality, timeliness, and integrity. By providing an accurate value benchmark, the model enables enterprises to better evaluate data assets and optimize resource allocation, thereby facilitating more efficient, orderly, and value-driven cross-industry data integration [1].

2.2. Driving logic and implementation path of cross-industry integration

The driving force behind cross-industry data integration stems from the complementary nature and synergistic potential of data across sectors. Traditional industry data often exhibits "silos" characteristics, such as equipment operation data in manufacturing,

clinical diagnostic data in healthcare, and transaction flow data in finance, where their value density is constrained by the boundaries of single-scenario applications. Through cross-industry integration, data can transcend sectoral barriers to create "data + scenario" composite value (Figure 1). For instance, combining manufacturing equipment data with financial risk control data can establish equipment health assessment models to provide risk pricing references for supply chain finance. Integrating medical data with insurance data enables the development of personalized health management products, achieving dual objectives of risk prevention and cost control. The integration path includes data standardization, interface unification, and platform-based operations. By establishing cross-industry data exchange protocols and security mechanisms, compliance and efficiency in data circulation are ensured.

Figure 1. Model of driving logic and implementation path for cross-industry data integration

2.3. The construction of theoretical framework: from data integration to value co-creation

A robust theoretical framework is essential for achieving value co-creation in cross-industry data integration. This framework should span three layers: data, technology, and strategy. The data layer forms the foundation, focusing on accurate identification, efficient cleaning and standardized annotation of data resources. These processes address problems of uneven data quality and poor availability, providing high-quality data support for subsequent integration and utilization. The technology layer offers the key support. This layer leverages key technologies—such as cloud computing for storage and computation, blockchain for tamper-proof security, and artificial intelligence for analysis—to enable secure data storage, efficient processing, and trusted sharing. The strategic layer provides the core guidance, focusing on how data integration drives business model innovation and generates synergy. For example, data integration can reduce information asymmetry in supply chains and enhance overall efficiency; similarly, data-driven precision marketing can accurately reach target customers and expand market boundaries. This theoretical framework highlights that data integration is not a simple technical operation, but a strategic choice closely related to enterprise resource endowment, industry characteristics and competitive environment [2]. Only by establishing dynamic alignment among these three layers can the goal of value co-creation in cross-industry data integration be realized.

3. The generation mechanism of synergistic effect of cross-industry data integration

3.1. Business synergy: resource complementarity and efficiency improvement

Business collaboration is one of the important synergies brought by cross-industry data integration, and its root lies in the reconstruction and optimization of operational processes. In the process of cross-industry data integration, enterprises can achieve the resource allocation and significant cost reduction by sharing data from key links such as production, sales and logistics. Consider the integration of manufacturing and logistics data: demand can be accurately forecast based on sales data, enabling optimized inventory management, reducing capital tied up in overstock, and minimizing lost sales due to shortages. Data sharing between the retail and financial industries has also yielded notable results by facilitating the development of comprehensive consumer credit evaluation systems. These systems allow financial institutions to assess customer credit more accurately, thereby reducing transaction costs and bad debt risks. The full generation of business synergy is highly dependent on the depth and breadth of data integration. However, there are differences in data formats, standards and interfaces among industries, which has become an obstacle to data integration. Therefore, it is necessary to establish a unified data governance system and formulate cross-industry data dictionaries and exchange protocols. This ensures the consistency and traceability of data in the circulation between different industries, so that enterprises can fully benefit from the operation synergy, improve the overall operation efficiency and enhance market competitiveness [3].

3.2. Management coordination: organizational capability transfer and knowledge sharing

As the key synergy effect of cross-industry data integration, management collaboration highlights its positive role in promoting organizational learning and knowledge transfer. Such integration enables the horizontal flow of essential management practices, technical expertise, and market insights accumulated across different sectors. For example, technology companies carry out data integration with the traditional manufacturing industry, and the advanced digital technology capabilities of technology companies can be transferred to the manufacturing sector, supporting the traditional manufacturing industry in transforming and upgrading to intelligent manufacturing; When the medical industry and education industry share data, rich clinical diagnosis and treatment experience can be transformed into educational content, thereby enhancing the quality of medical personnel training. However, the full generation of management synergy faces many challenges, and organizational culture conflict and knowledge absorption barriers are the main obstacles. In order to solve these problems, it is necessary to establish a collaboration mechanism and develop a knowledge management platform [4]. Through this series of measures, tacit knowledge that is difficult to express can be transformed into explicit knowledge that can be clearly expressed, and promote its sharing and dissemination among different industries, so that enterprises in various industries can better absorb and use the advantageous resources of other industries and improve their overall management ability.

The following table 1 shows the transformation of enterprise competitive strategy: from cost leadership to value innovation, emphasizing data and technology innovation.

Table 1. Key points of management collaboration under cross-industry data integration

Point types	concrete content
Core aspects of management collaboration	Cross-industry data integration facilitates organizational learning and knowledge transfer, enabling horizontal flow of management practices, technical experience, and market insights across industries, and improving the overall management capability of enterprises
Typical case example	Data integration between technology companies and traditional manufacturing: Digital technology capabilities are being transferred to the manufacturing process, driving the transformation of smart manufacturing
	Data sharing between the medical and education industries: transforming clinical experience into medical education content to improve the quality of talent training
Facing critical issues	Organizational culture conflict, knowledge absorption barriers
Problem-solving measures	Establish cross-industry collaboration mechanisms
	Create a knowledge management platform
	Promote the explicit and shared tacit knowledge

3.3. Financial coordination: risk diversification and value appreciation

For risk diversification, enterprises can develop more comprehensive and accurate risk assessment models by integrating multi-industry data. Previously, a single industry was highly susceptible to fluctuations due to market, policy, and other factors, which could easily impact a company's financial performance. For instance, the development of carbon emissions trading products through the integration of energy and financial industry data, and the establishment of disaster early warning systems via data sharing between agriculture and insurance, can effectively mitigate risks associated with climate policies and natural disasters, thereby reducing the negative impact of uncertainty on corporate finances. Cross-industry data integration also contributes significantly to value appreciation, helping enterprises explore new growth points and create new value streams. However, smooth implementation faces obstacles, with data privacy and security being key challenges. To address this, enterprises can employ encryption and anonymization techniques to protect data subject information, and conduct compliance audits to ensure data processing meets regulatory requirements [5]. Federated learning technology, which enables model training without sharing raw data, not only fully utilizes data value but also effectively protects data privacy, providing a solid foundation for financial coordination in the context of cross-industry data integration.

The following table 2 shows that cross-industry data integration brings risk dispersion (average risk reduction of 23.25%) and value-added effect (10,000 yuan income), and improves data utilization.

Table 2. Financial synergy effect and data security technology application effect of cross-industry data integration cases

Industry integration cases	Risk dispersion effect (percentage of risk reduction)	Value added effect (new business income/10,000 yuan)	Technology application effect (percentage increase in data utilization)
Energy industry+financial industry (carbon emission trading products)	25%	1,200	15%
Agriculture+insurance (disaster early warning system)	30%	800	10%
Manufacturing+logistics (supply chain optimization)	20%	1,500	20%
Medical industry+technology companies (health management platform)	18%	950	25%
Total/average	23.25%	1,112.5	17.5%

4. The empowerment path of cross-industry data integration to business strategy

4.1. Strategic positioning: from industry competition to ecological construction

Amid the trend of cross-industry data integration, corporate strategic positioning is shifting from a focus on single-industry competition to participation in ecosystem co-construction. E-commerce platforms integrate merchant business data, consumer preference data, and logistics distribution data to build comprehensive retail ecosystems where all parties are interdependent and co-evolve. Similarly, smart cities leverage traffic flow, energy usage, and healthcare data to create efficient urban governance platforms [6]. To effect this strategic shift, enterprises must possess strong data integration capabilities to aggregate and process diverse data; ecosystem-building capabilities to attract participants; and the ability to coordinate and balance the interests of all stakeholders.

4.2. Competitive strategy: from cost leadership to value innovation

Amid the wave of cross-industry data integration, corporate competition strategies are undergoing a profound transformation from cost leadership to value innovation [7]. Traditional cost leadership strategies, which relied on expanding production scale and improving operational efficiency to reduce costs and gain market dominance, are increasingly revealing their limitations in today's competitive landscape. Data-driven value innovation strategies harness the power of data to explore new frontiers. Automotive manufacturers integrating driver behavior and road environment data to develop autonomous driving systems have transitioned from mere vehicle manufacturing to providing mobility services. Financial institutions combining social and transactional data to build user credit profiles and launch customized financial products have successfully established a differentiated advantage.. However, achieving this strategic transformation is challenging. Enterprises must possess data insight capabilities to extract valuable information from massive datasets, technological innovation capabilities to convert data into tangible products and services, and agile responsiveness to adapt quickly to market changes. To this end, companies need to establish data-driven decision-making mechanisms that prioritize data as the core basis for decisions, while building rapid iterative product development processes. By continuously optimizing products based on user feedback and consistently creating new value for users, enterprises can secure competitive initiative in the cross-industry data integration era.

The following table 3 shows the key points of enterprise competitive strategy transformation: from cost leadership to data-driven value innovation, emphasizing data insight, technological innovation and rapid response to the market.

Table 3. Key points of enterprise competition strategy transformation under cross-industry data integration

Class	detailed information
Traditional competitive strategy	Cost leadership: relying on expanding production scale and improving operational efficiency to reduce costs and occupy advantages in the market, which gradually shows limitations
New competitive strategy	Value innovation: Using the power of data integration to open up new tracks, such as automobile manufacturers integrating data to develop autonomous driving systems, financial institutions integrating data to launch customized financial products, creating differentiated advantages
Transformational competencies	Data insight capability: Mining valuable information from massive data
	Technological innovation capability: transforming data into actual products and services
	Agile responsiveness: Quick adaptation to market changes
Specific measures for transformation	Establish a data-driven decision-making mechanism: Let data become the core basis for decision-making
	Build a fast iterative product development process: optimize based on user feedback and continuously create new value

4.3. Organizational change: from hierarchical structure to networked collaboration

Amid the wave of cross-industry data integration, corporate organizational structures are undergoing a profound transformation from hierarchical frameworks to networked collaboration. Traditional pyramid-like hierarchies, with their multiple layers of information transmission and slow speed, struggle to meet the complex, dynamic challenges posed by cross-industry data integration. To address this, organizations need to adopt flat, flexible, and decentralized designs. A flattened structure reduces management layers, enabling information to reach decision-makers and executors swiftly, thereby enhancing responsiveness. Flexible designs empower organizations to adapt agilely to data integration needs. Decentralization breaks down centralized power structures, unleashing innovation across all nodes. Building cross-industry data teams that integrate technical, business, and data experts drives rapid implementation of data integration projects through diverse perspectives and professional expertise. Agile development methodologies are employed, with continuous optimization of solutions through short-cycle iterations and user feedback. However, organizational transformation is not without challenges, with cultural conflicts and power restructuring being major hurdles. Differences in industry cultures often lead to conceptual clashes. Establishing an open and inclusive organizational culture that promotes mutual understanding and respect is essential [8]. Creating a shared benefit distribution mechanism with clearly defined rights, responsibilities, and interests ensures participants reap tangible benefits from collaboration, thereby stimulating intrinsic motivation and creativity in cross-industry cooperation.

5. Challenges and countermeasures for cross-industry data integration

5.1. Technical challenges: data standards and interface compatibility

Different industries have developed unique data formats, coding rules, and exchange protocols based on their specific business characteristics and development needs. The healthcare industry uses specialized medical codes to record disease information, while the financial industry employs distinct data standards to process transactions. These differences create significant barriers to direct data understanding and sharing during cross-industry circulation—much like communication in different languages. To overcome these challenges, a multi-faceted approach is required. First, establishing cross-industry data standards is fundamental. Frameworks such as the ISO/IEC data element and metadata standards provide unified data descriptions and definitions, enabling disparate industries to share a common "language." Second, developing generalized data interfaces is crucial. Technologies like RESTful APIs and GraphQL serve as flexible channels, allowing data to be seamlessly accessed across different systems. Finally, employing ETL and other data conversion tools enables the extraction, transformation, and loading of incompatible data formats to meet integration requirements. Together, these measures break down barriers posed by divergent standards and interfaces, thereby promoting efficient cross-industry data integration.

The following table 4 shows that the data integration in the medical industry is the most difficult, while the retail industry is relatively easy. There are differences and cost challenges in data standards, interfaces and other aspects in various industries.

Table 4. Technical challenges and cost-benefit analysis of cross-industry data integration in various industries

Industry	Difference degree of data standard (virtual score 1-10, 10 is the largest difference)	Interface compatibility barrier level (virtual score 1-5, 5 being the highest barrier)	Time required for formulating cross-industry data standards (months)	General data interface development cost (10,000 yuan)	Percentage improvement of ETL data conversion tool efficiency
Medical industry	8	4	12	80	35%
Financial industry	7	4	10	75	30%
Manufacturing industry	6	3	8	60	25%
Retail trade	5	3	6	50	20%
Average value	6.5	3.5	9	66.25	27.5%

6. Management challenges: data governance and interest coordination

In the context of cross-industry data integration, data governance and interest coordination have become pressing management challenges [9, 10]. Data governance is a systematic project encompassing multiple critical dimensions such as data ownership definition, quality control, security assurance, and privacy protection. Given the diverse sources and formats of cross-industry data, issues of ownership ambiguity, inconsistent data quality, and more complex security and privacy concerns have emerged. Therefore, establishing a scientific and rational cross-industry data governance framework is imperative. Such a framework requires clearly defining data ownership, usage rights, and revenue rights to ensure all parties have well-defined responsibilities during data circulation (Figure 2). Regarding interest coordination, data providers and users often have conflicting interests. Designing a reasonable profit-sharing mechanism is key to harmonizing these relationships. A data contribution-based revenue-sharing model serves as a viable solution, allocating benefits according to each party's input and contribution level to ensure fairness and equity. Leveraging blockchain technology's decentralized, tamper-proof, and transparent traceability features, precise records of data usage—including who accessed the data, the volume used, and the outcomes generated—can be maintained. This provides reliable technical support for fair profit distribution, ensuring smooth and efficient progress in cross-industry data integration.

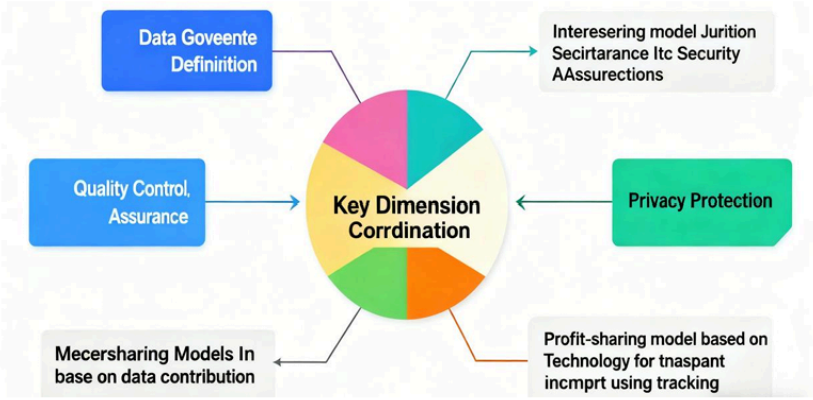

Figure 2. Cross-industry data integration management challenge model

6.1. Legal challenges: data compliance and privacy protection

Navigating the complex legal landscape of cross-industry data integration requires careful attention to compliance and privacy protection. Frameworks such as the GDPR and China's Data Security Law establish rigorous requirements for data handling [11]. A formidable obstacle lies in cross-border data transfers, which are governed by divergent international regulations, increasing the risk of non-compliance. As entities obligated under these laws, enterprises must safeguard user privacy. Data breaches thus carry consequences beyond infringing user rights, extending to substantial fines and lasting reputational harm. A proactive approach is essential; this entails establishing comprehensive compliance management systems, performing periodic audits, and adopting technical safeguards like differential privacy and homomorphic encryption. Furthermore, ongoing collaboration with

legal institutions is imperative to interpret regulatory shifts and adapt data strategies accordingly, ensuring all integration activities operate within legal boundaries.

7. Conclusion

Cross-industry data asset integration carries profound strategic significance for businesses, generating synergies across operations, management, and finance to drive corporate strategic positioning, competitive strategy optimization, and organizational transformation. However, this integration process faces multifaceted challenges including technological hurdles, governance complexities, and legal compliance issues. Enterprises must establish cross-industry data standards, develop governance frameworks, and refine compliance systems while leveraging technological solutions and professional partnerships to overcome these obstacles. Only through such comprehensive efforts can organizations fully harness the benefits of data integration, achieve strategic upgrades, secure competitive advantages in dynamic market environments, and ultimately realize sustainable development.

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