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Valuation Dilemmas and Optimization Pathways for Capitalizing Data Assets in Manufacturing: Evidence from Zhongan Technology Group in Guiyang

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Abstract

Against the deepening digital economy, data assets have become a new engine for value creation in manufacturing. But structural barriers—including strong contextual stickiness, sensitivity to industry fluctuations, and fragmented ownership- mean manufacturing data assets still struggle in valuation. This paper focuses on Guizhou Zhongan Technology Group's pioneering practice, systematically examining the data asset valuation challenges during financial recognition. It clarifies two key aspects: the formation mechanism behind the triple dilemma of scene dependence, value fluctuation, and ownership compliance. And a three-in-one optimization framework of "scenario-based partition pricing, fluctuation risk mitigation, and ownership chain verification. The study provides both a replicable operational model for manufacturing data assets to be recorded in financial statements and a theoretically grounded, practically relevant decision-making reference for the industry's digital transformation[3].

Keywords: financial recognition, data asset valuation, Zhongan technology, manufacturing

1. Introduction

In the industrial economy era, land, labor, capital, and technology were the "four pillars" that drove manufacturing growth.As we've shifted to the digital economy, data has emerged as a "fifth essential factor"-going beyond traditional production inputs. It's now a key variable in reshaping global value chains and unlocking new economic value. March 2024 brought two important moments. For the first time big data was explicitly included in *China's Government Work Report*. In the same month the 14th Five-Year Plan noted that China's data factor circulation market is entering a phase of faster institutional breakthroughs. On the institutional front, a major step came on January 1, 2024: the Ministry of Finance put into effect the *Interim Provisions on Accounting Treatment for Corporate Data Resources* (hereafter called the "Provisions"). These rules marked a milestone by formally adding data assets to corporate balance sheets.They also set up systematic standards for recognition, measurement, recording, and reporting,laying out a practical institutional framework for turning data assets into capital.

The accounting recognition of data assets doesn't just expand the asset base for manufacturers-it actually acts as a "structural catalyst" for their digital transformation. Traditional production inputs like labor and machinery are hitting diminishing returns, while data as a production factor shows an ever-growing multiplier effect. And data-driven decision systems are helping companies operate with surgical precision and lightning-fast agility[1].But Manufacturing's unique characteristics make plugging data assets into financial statements way more complicated than a simple "copy-paste" job. We're facing three main roadblocks-fuzzy property rights definitions, misaligned rights-liability frameworks, and a complete lack of standardized valuation methods. These hurdles create bottlenecks that prevent data assets from moving beyond just being "reportable on balance sheets" to actually unlocking their true value potential. Among these challenges, valuation stands out as the biggest headache. It's the critical foundation that makes data assets "measurable" in accounting terms, while also setting the baseline price for all subsequent value-unlocking activities—think financing deals, trading platforms.

Valuation challenges with manufacturing data assets stand out in four main areas. Data is so closely tied to its application scenarios that dividing up revenue gets complicated; swings in industry cycles make its value even more uncertain; overlapping ownership and compliance gaps raise legal risks; and unclear cost allocation makes the cost-based valuation method less workable[2]. To address these issues this paper uses Guizhou Zhongan

Technology Group as a real-world case. It breaks down the company's full-cycle efforts to turn data assets into capital, spots key roadblocks in putting valuation into practice, and lays out a four-part optimization strategy. This strategy combines scenario-based segmentation, dynamic risk mitigation, ownership chain authentication, and activity-based cost resetting. The goal is to build a valuation model for manufacturing data assets that's both theoretically solid and easy to put into action, one that can help speed up how the industry unlocks value in the digital economy.

2. Corporate Practices in Recognition of Data Assets in Balance Sheets

This paper uses Guizhou Zhongan Technology Group as a case study to examine practical challenges in valuing manufacturing data assets for financial reporting.

2.1 Enterprise and Data Asset Overview

2.1.1 From "Manufacturing" to "Intelligent Manufacturing": A Benchmarking Case of Industrial Transformation in Guizhou

Founded in March 2018 and headquartered in the 530,000 m² Intelligent Manufacturing Park in Guanshanhu District of Guiyang, Guizhou Zhongan Science and Technology Group is a national high-tech enterprise integrating wire and cable research and development, manufacturing, testing, sales, and service. The company has been ranked among "China's Top 500 Brands", "National Green Supply Chain Management Enterprises", "China's Top 100 Wire and Cable Industry" and has been approved as a national CNAS laboratory. The company is one of the leading industrial enterprises in Guizhou Province and one of the top 10 private enterprises in the manufacturing industry.

2.1.2 Digital Foundation: A "Digital Twin + 5G" Data Infrastructure Built with RMB 50 million Investment

To ride the digital economy wave, Zhongan Technology zeroed in on digital twin factories and 5G smart manufacturing as key strategic starts. The company put 50 million yuan into building 1:1 virtual copies of five workshops and 80 production lines. These let it run real-time digital mirror simulations. There's also a campus-wide 5G private network (园区级 5G 独立组网) that keeps data flowing 24/7 from over 1,200 IoT sensors, giving full end-to-end visibility of each product's lifecycle. At the same time Zhongan rolled out three major platforms: MES, ERP, and CAPP. This helped it gather a lot of high-value data across production, operations, and supply chains. All this has laid a strong groundwork for turning data into assets down the line.

2.1.3 A Comprehensive View of Data Assets: Three Core Data Sets and an Integrated Value Chain

In December 2024, Zhongan Technology established Guizhou's first end-to-end data asset monetization framework, valuation, rights certification, financial recognition, and collateralized financing. This achievement made it the province's first industrial enterprise to operationalize *the Interim Provisions on Accounting for Enterprise Data Resou*rces[7], with three core datasets formally recognized as assets:

Sales Order Dataset: Aggregate order details, cable sales, regional preferences and other information to support sales forecasting and strategy iteration.

Production Process Dataset: It records equipment operating status and process parameters in real time to aid in cost decisions, quality improvement, and bottleneck breakthroughs.

Warehousing and Supply Chain Dataset: It connects data such as inventory levels, logistics, distribution, and supplier collaboration to drive optimal efficiency in upstream and downstream operations.

Through the three-level leap of data integration，asset recognition in the balance sheet and value realization, Zhongan Technology has transformed static data into dynamic capital, truly realizing the "intellectual property" into "assets" and "data resources" into "capital", providing a model for replication and promotion in Guizhou for the market-oriented circulation of manufacturing data elements.

2.2 Valuation Framework: Process Design and Method Selection

While the three core data sets of Zhongan Technology Group possess the basic traits of "controllability and applicability," they must undergo a rigorous accounting valuation process to qualify for data asset recognition in the balance sheet—thus completing the transformation from "data resources" to "data assets." This transformation requires core data to be valued through specific scenarios and via appropriate methods. The specific valuation processes and methods are as follows:

2.2.1 Data Curation: Focusing on the Primary Goal of "Delivering Measurable Economic Value"

From the definition of an asset, an asset is a resource that is formed from past transactions or events of an enterprise, owned or controlled by the enterprise, and expected to bring economic benefits to the enterprise. In order to become

a data asset, data elements also need to meet the basic characteristics of "legal control, quantifiable reliability, and value creation potential" on the traditional definition of assets, which is a necessary prerequisite for the valuation of data assets[11]. Given the 41 million pieces of structured data, Zhongan Technology Group takes "operational cost optimization and process efficiency gains" as the core criterion, and through multi-layer data screening, eliminates redundant inspection data, finally locking the three datasets in the huge dataset: Sales order datasets optimizes a company's sales decisions and helps formulate better-suited sales strategies, thereby boosting sales revenue. Production process datasets streamlines production workflows, directly cutting production costs. Warehousing and supply chain datasets connect a company's upstream and downstream operations, reducing inventory buildup and indirectly improving operational efficiency. Collectively, this valuation methodology establishes a structured foundation for prioritizing measurable financial returns in subsequent analyses.

2.2.2 Rights Confirmation and Compliance: Clarifying Ownership via Provincial-Level Platforms

Since data assets such as the warehousing supply chain dataset involve upstream and downstream supply chain information and core production process technologies, Zhongan Technology Group first registers these assets via the Guizhou Data Intellectual Property Registration Platform. This process certifies the legitimacy and independence of data sources, while also registering and confirming rights to the core technologies used in internal processes. For upstream and downstream supply chain information, Zhongan Technology Group has signed relevant agreements with suppliers, including a Data Use Authorization Agreement to clarify data usage rights. It has also obtained the nation's first manufacturing data intellectual property registration certificate, which ensures the legitimacy of data asset valuation.

2.2.3 Valuation Method Selection: Matching Methods with Data Characteristics

Due to the manufacturing data assets, such as production process datasets facing issues like strong scenario dependence applying only to specific production lines. And limited use of the pure cost method. Zhongan Technology Group ultimately adopted a hybrid valuation model: primarily the income approach, supplemented by the cost approach[4]. Under the income approach the enterprise calculates the present value of cumulative revenue from the three data assets using a 12% discount rate, based on a three-year plan. The cost approach applies only to separately attributable costs (e.g., depreciation of storage services).

2.2.4 Valuation Results

After 27 days of strategic deployment, Zhongan Technology Group completed a sequence of tasks including asset identification, ownership registration, valuation, compliance-driven financial reporting, and credit financing. It successfully finalized data asset entry, valuation, registration, and pledge financing, finally securing 20 million yuan through intellectual property pledge. This result demonstrates data assets' attribute of "generating economic benefits" while accounting for cost traceability. It also highlights that balance sheet-recorded data assets significantly enhance the authenticity of corporate data statements. Additionally, inventory integration of data assets prompts enterprises to recognize and explore their data assets, thereby creating economic gains and enabling better adaptation to the digital economy's development.

3. Key Obstacles in Data Asset Valuation for Statement Inclusion

An analysis of Zhongan Technology Group's data asset balance sheet practice shows notable outcomes. Yet data asset recognition in financial statements remains in its early stages, with significant challenges in valuation[10]. Valuation issues for manufacturing data assets essentially stem from a mismatch between their characteristics and traditional asset valuation logic. This paper will dissect the data asset valuation issues of Zhongan Technology Group through four dimensions:

3.1 Strongly Scenario-Dependent

The value of manufacturing data is to some extent highly scenario-dependent. For instance, certain data applies only to specific production lines. This trait is particularly evident in Zhongan Technology Group's practice.

The three types of data assets incorporated into Zhongan Technology Group's financial statements are the sales order dataset, production process dataset, and warehousing supply chain dataset. Those are inextricably linked to its core operations of wire and cable manufacturing and marketing. These data assets derive from datasets generated by specific wire and cable production lines. When separated from the enterprise's specific business scenarios, they reduce the efficiency of production and sales processes and fail to maximize their value, thereby hindering the full realization of the potential value of these data assets. Given their significant idiosyncrasies, these data assets cannot be traded with other similar enterprises. Consequently, the market-based valuation methodology loses its full efficacy during enterprise value assessment.

3.2 Significant Fluctuations in Data Value Exacerbate Timeliness Risks

Zhongan Technology Group's wire and cable production is heavily influenced by macroeconomic conditions, real estate market trends, and government investment in grassroots infrastructure, facing significant time-sensitivity challenges.

Take the real estate industry as an instance. During periods of real estate industry downturn, the value of sales order data diminishes in tandem with shrinking market demand. After that,the cost-reduction scope enabled by production process datasets is limited. The theoretical foundation underlying the data-driven revenue growth forecasting model may be undermined. Finally it will lead to a discrepancy between the initial data valuation and the data's true value. Beyond the repercussions of value volatility, enterprises' long-term accumulated data assets could also be exposed to depreciation risks.

Production process data depreciates rapidly as equipment advances. Data from Zhongan Technology Group indicates that the value of the original production process dataset plummeted by 40% after the introduction of new imported German wire drawing equipment in 2022. The data life was seriously affected by the failure to adequately generate equipment updates and iterations. Thus, the risk of timeliness faced by the data is a major problem in the valuation of enterprise data assets.

3.3 Complicated Property Rights Undermine Valuation Legitimacy

Enterprises in the production and operation process often involve multiple subjects (upstream and downstream merchants, employees, customers), as the complexity of ownership will affect the legitimacy of the enterprise data asset valuation[6]. In the practice of data asset valuation of Zhongan Science and Technology Group, two major problems were mainly exposed:

3.3.1 Control Rights of Supply Chain Data

In the warehousing supply chain data set contains more than 200 suppliers of raw material quality and quantity, distribution time and other data, these data are based on the production needs of the Group and the resources owned by the suppliers of the joint formation; but in the "Data Security Law" for the enterprise "jointly generated by the ownership of the right of control of the data" and not However, the Data Security Law does not clearly stipulate the ownership of the "right of control of jointly generated data" of enterprises, and although China Security Technology Group has completed the registration of the intellectual property rights of the data in Guizhou Province, its suppliers have not completely lost the right to use the data, so the bank will be doubtful about whether it has the right of full control over the data assets, which will have a significant impact on the value of the data assets.

3.3.2 Attribution Ambiguity of Employee Contributions in Production Process Datasets

In the production process dataset of Zhongan Technology Group, some of the data comes from the accumulated experience of production workers. For example, employees design a new cable production process, or put forward a plan to optimize production parameters for the production process, and the labor contract between the enterprise and the employee does not specify the ownership of the authority of such data. Once there is a situation where employees leave their jobs, there may be disputes over the ownership of data assets, which will shake the legitimacy of the content of the enterprise's data valuation.

3.4 Cost Accounting Ambiguity: Constraints on the Applicability of Costing Methodologies

3.4.1 Cost Accumulation Barriers: Obstacles to Systematic Cost Attribution

Manufacturing data generation permeates the entire production lifecycle (design, procurement, manufacturing, sales), implicating cross-functional costs including product design, procurement, production deployment, and sales expenditures. Notably, persistent cross-functional cost overlaps constitute a critical barrier to financial statement recognition. A case in point: Workshop-deployed smart machine tools, equipped with sensors for concurrent real-time production monitoring and data acquisition, create quantifiable challenges in determining direct data acquisition costs. Depreciation allocation to these digital assets currently lacks industry-consensus accounting frameworks, creating systemic impediments to ISO 55000-compliant data asset governance in Industry 4.0 contexts.

3.4.2 Costing Lag Contradicts Data Volatility

Zhongan Technology Group's data assets are continuously updated. However, the traditional cost method uses an "ex post bookkeeping" model, leaving the enterprise unable to address data fluctuations through this method. When the company adds or adjusts cable models to meet market demand, including collecting production parameters for new raw materials, the costs incurred for these new products are only recorded under "current production costs".

They are not synchronously added to the corresponding data assets ' cost. This impairs the reliability and authenticity of asset valuations.

4. Optimization Path for Manufacturing Data Asset Valuation

Drawing on the practical pain points of Zhongan Technology Group, this section proposes a four-dimensional collaborative valuation optimization scheme: "scenario-based, dynamic, rights-based, and cost-based." This scheme aims to achieve the leap from "rough estimation" to "accurate measurement."

4.1 Building "scenario-based valuation models"

Zhongan Technology Group faces the problem of strong dependence on data assets in the valuation process, so it can build a model to construct a framework for scenario-based valuation.

Prioritize the scene-adaptive classification of the three types of data assets, quantify the relevant parameters generated by them, and then show the results achieved for the enterprise's "cost reduction and efficiency". Focus on the "cost reduction" scenarios in enterprises' production process datasets, and quantify direct cost savings from process data. For example, reducing the scrap rate from 6% to 2% cuts annual raw material waste by 1.2 million yuan. The sales order dataset focuses on "revenue enhancement" scenarios. Using historical order data, it analyzes how customer repurchase rates affect cost reductions for acquiring new customers. For instance, a 30% increase in repurchase rates lowers customer acquisition costs by 15%. It then calculates the actual revenue gains the data generates for the enterprise. The warehousing supply chain requires enterprises to focus on "efficiency scenarios," quantifying how inventory turnover rates affect capital consumption costs. For example, reducing the annual turnover rate by 2 times saves the enterprise 600,000 yuan in financial expenses. Meanwhile, parameters like "delivery time" in warehousing scenarios are used to dynamically adjust asset valuation results.

In this regard, through the scenario-based model, Zhongan Technology Group's data asset valuation is transformed from "fuzzy revenue prediction" to "specific scenario-based revenue measurement".It provides a solution to the failure of the market method brought about by the strong dependence on scenarios of enterprises.

4.2 Setting up a "dynamic valuation mechanism" to Address the Issue of Timeliness

Manufacturing industry data with macroeconomic environment, market changes, and a series of impacts brought about by the problem of timeliness, resulting in the lack of accuracy of enterprise valuation results. Enterprises are to establish a "cyclical valuation" mechanism to solve the contradiction between the value of data and industry fluctuations[1].

4.2.1 "Hierarchical reassessment cycle" by data lifecycle

Based on the characteristics of the three data assets of Zhongan Technology Group, they can be categorized into three levels of revaluation cycles according to their update frequency and decay rate. The sales order dataset involves high-frequency fluctuating data, so enterprises can revalue it quarterly. Cable demand correlates strongly with national infrastructure investment—sales orders may surge by approximately 50% under policy impetus. Thus, enterprises must adjust income approach parameters quarterly based on new order trends and market share to prevent valuation from lagging behind market changes. Warehouse supply chain datasets are medium-rate update data. The change of core suppliers in the production process may lead to a 30% failure of enterprise data. In order to solve the emergence of similar problems, enterprises need to correct the data through the stability of suppliers and inventory strategy adjustment to optimize the cost of capital possession, in order to ensure that the enterprise valuation and supply chain scenarios are synchronized. The production process dataset has a low rate of depreciation data. When the enterprise introduces new production equipment, it may cause the process data to become invalid. Zhongan Technology Group can make a depreciation provision for the data based on the update of the production equipment to avoid overestimation of the value of the faulty data.

With the establishment of this dynamic mechanism, China Security Technology Group's data asset valuation can be transformed from a "static photo" to a "dynamic video". The life cycle of the data can be distinguished through its characteristics for accurate valuation, so that the estimation result of the data assets can match the actual result.

4.3 Improvement of the "hierarchy of tenure" System

Zhongan Technology Group faces issues with ownership distribution in its datasets. Enterprises can sign a "rights confirmation + authority division" contract with all parties to establish a legal basis for valuation[5].

4.3.1 Contracts with suppliers to clarify ownership

In collaboration with suppliers, Zhongan Technology Group may sign a Data Collaboration Agreement. The agreement should stipulate that basic supplier information, such as enterprise name and contact details (raw data),

remains the supplier's property. Derivative information generated through cooperation, including product quality and delivery rates, belongs to Zhongan Technology Group. Additionally, the enterprise may use such derivative data for internal production optimization but must not disclose the supplier's original data to third parties, thereby protecting the supplier's legitimate rights.

4.3.2 Revising Labor Contracts to Resolve Employee Ownership Disputes

In response to the problem of ambiguity in the ownership of data assets of Zhongan Technology Group between the enterprise and its employees, it is necessary to clarify the ownership of the assets by re-signing labor contracts with the employees. The labor contract explicitly states that any process dataset generated by an employee during their tenure, whether related to their production experience or not, qualifies as a work-related result, with ownership belonging to the enterprise. Employees are not allowed to take away or otherwise use the data after leaving the company, and the enterprise can give the employees a one-time reward based on the revenue brought by the data set according to a certain percentage (e.g., a certain data can generate revenue of 500,000 yuan per year, and reward the employees with 50,000 yuan). In this way, not only can it guarantee the legitimacy of the data, but it can also motivate employees to create more favorable data results in the product production process.

Through the signing of contracts to clarify the ownership of data assets, China Security Technology Group "guarantees" the legitimacy of the valuation.

4.4 Establishment of a "cost tracing mechanism" to Clarify Cost Accounting

Fuzzy costing is a common issue in data asset valuation across most manufacturing industries. In Zhongan Technology Group's practice, problems such as difficult cost collection, delayed cost accounting, and contradictions arising from data volatility require a "cost tracing mechanism" for resolution. Specific implementation methods are as follows:

4.4.1 Selection of appropriate criteria for apportioning depreciation

In cable production, Zhongan Technology Group allocates depreciation costs based on data "call frequency." This involves capturing call frequency and apportioning costs at a specific ratio. For example, if the production process dataset is called 2,000 times and the storage dataset 1,000 times, depreciation is allocated at a 2:1 ratio. In this way, to avoid the emergence of the problem of ambiguous criteria for the attribution and allocation of costs faced in the process of business crossover, so that the results of the valuation of data assets are more in line with the actual situation[12].

4.4.2 Establishing a "Trigger-Based" Adjustment Mechanism to Address Cost-Accounting Lags

Fluctuations in Zhongan Technology Group's data assets can affect costing. For example, due to cost lag, new production parameters added during the production process cannot be incorporated into the corresponding data asset costs promptly. This problem can be solved by presetting triggers for value adjustments. When a new production parameter enters the cable production line, it must be promptly recorded in the "current production cost" and, at the same time, added to the original data asset cost through the synchronization system, which initiates the adjustment mechanism to ensure the integrity of the data asset cost.

Through the four targeted optimization paths mentioned above, the data asset valuation of Zhongan Technology Group has changed from "fuzzy estimation" to "accurate measurement", which not only provides a solution to the individual pain points faced by the enterprise but also provides a replicable methodology for the valuation of the same industry. It also provides a replicable methodology for the valuation of the same industry, and promotes the manufacturing industry to better develop towards digital transformation.

5. Conclusions

5.1 Research Conclusions

By analyzing the practice of valuing data assets in the table of Zhongan Technology Group, we focus on the difficulties of its valuation in terms of strong scenario dependence, large fluctuation of data value, complex attribution, and ambiguous costing. The data assets of enterprises in the manufacturing industry are closely integrated with their production and operation activities, and their production process data sets are adapted to specific production lines, which leads to the failure of the market approach in the process of their estimation. Its value is greatly affected by industry and social macro factors; the costing process is complicated by the cross-use of data in various businesses. The ownership of data assets involves the contribution of multiple subjects, which affects the legitimacy of their estimation. These difficulties together reflect the complexity of manufacturing data asset valuation, and at the same time, have common pain points in the industry.

This study verifies that manufacturing valuation needs to follow the logic of “common method + individual adjustment”, giving the basic framework of data asset valuation through mainstream methods such as the cost method and income method. At the same time, making differentiated adjustments according to the characteristics of different enterprises. For example, for the problem of cost accounting, the fuzzy limitation of cost method applicability in Zhongan Science and Technology Group, through the establishment of a “cost traceability” mechanism, the frequency of data calling in each data set is shared according to the ratio. At the same time, a “Trigger-Based” mechanism is set up to cope with the lagging problem of cost accounting, which not only fits the commonality of the manufacturing industry's data service entity business, but also the commonality of the production line capacity of Zhong'an Science and Technology Group. Through the implementation of various optimization paths, the legitimacy, timeliness, and reasonableness of the data asset valuation in the table are guaranteed, proving the suitability of the optimization path for the valuation of manufacturing industry data assets, and providing the industry with practical experience for reference.

5.2 Future Prospects

The digital economy is reshaping asset valuation paradigms, with data assets emerging as operational linchpins rather than isolated information reservoirs. By harnessing digital twin technologies, firms can now construct real-time valuation ecosystems that dynamically adjust to data asset fluctuations, addressing the latency gap inherent in traditional static models[8]. Policy-driven standardization efforts in China are accelerating this transition, with the National Industrial Information Security Development Research Center spearheading sector-specific valuation protocols. Zhongan Technology Group's empirical evidence reveals that the fundamental hurdle in data asset valuation stems from the inadequate governance infrastructure. Looking ahead, to effectively harness manufacturing data assets, enterprises must transition from a reactive "compliance-driven" stance to a proactive "governance-led" approach. This entails strategically aligning their distinctive organizational traits with industry-wide commonalities, thereby dismantling the entrenched barriers of traditional asset valuation frameworks in manufacturing. Such transformation will position data as the linchpin production factor and value-creation engine driving the sector's digital evolution[9].

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