

# Enhancing Enterprise Efficiency through Cross-Domain Supply Chain Linkage Management

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**Abstract:** In recent years, with the complexity and variability of international finance, debt, and geopolitical risks, the growth rate of domestic economic operations has slowed down. More enterprise groups are facing the transformation and upgrading from domestic leadership to internationalization, achieving revenue growth of nearly 10 billion yuan per year against the trend. The severe and complex internal and external environment has brought many challenges to the supply chain for enterprises. This article focuses on the goal of an “enterprise supply chain system focusing on value creation, strengthening system linkage, and improving overall chain efficiency,” aiming to find solutions to problems such as strong demand variability, frequent emergency needs, coexistence of project shortages and inventory surplus, long material turnover cycles, and high organizational complexity. By searching for key activities in the entire business chain of demand, design, production, service, and finance, implementing source planning, process control, system linkage, analysis and summary, and team collaboration, we have achieved more scientific demand forecasting, more accurate planning, more effective procurement cost reduction, more stable production performance supply, more convenient inventory sharing services, and more efficient integration of business and financial policies.

**Keywords:** Supply chain management; Full chain benefits; Value creation; Purchasing management

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## 1. Linking the “marketing domain” and enhancing demand forecasting with a “scientific” approach

By constructing a pre-investment information system, optimizing decision-making and inventory models, and establishing a demand control mechanism, the accuracy of project forecasting has been continuously improved, the level of supply safety stock has been lowered, and the overall economic benefits have been significantly improved.

Firstly, the enterprise integrates the dispersed demand information from multiple points in the marketing area into a closed-loop process of production, supply, and sales collaboration through a pre-investment information system, achieving the integration of project time demand end-to-supply end information flow, and rapid linkage between parameter configuration design end and procurement end <sup>[1]</sup>. It can achieve an average reduction of about 10 to 15 days in application, planning, and procurement time, and an increase of more than 20% to 30% in efficiency.

Secondly, use mathematical and statistical analysis tools, combined with historical demand and supply patterns, to optimize the pre-investment auxiliary decision-making model and safety stock calculation model, and improve the accuracy of project and material forecasting. When the uncertainty of demand decreases, the level of material safety inventory reserves can also decrease year-on-year, and project performance is not affected.

Thirdly, solidify the dynamic control mechanism of demand, establish reminders and warnings for predicting the bidding risk, procurement delivery risk, and production and manufacturing risk of the project, release adjustable pre-investment materials, shorten the time from pre-investment of materials to project initiation, and achieve time, cost, and economic benefits <sup>[2]</sup>.

Lastly, predict the demand for shield tunneling products in advance, concentrate on locking in the production capacity and prices of key bottleneck raw materials in the product in case of supply shortage, and reduce procurement costs.

## **2. Linking the “research and development (R&D) domain” and making material planning more “precise”**

To pursue material planning with precision and save procurement costs, a cross-departmental information feedback mechanism is established. Through the analysis of the surplus of project models, the design quota is optimized, the priority of material categories is clarified, and the cost of large-scale procurement is reduced while reducing management complexity <sup>[3]</sup>.

Firstly, select project models, organize design, procurement, and workshop teams from multiple job perspectives for comparative analysis, activate surplus materials, and balance the use of procurement resources. Simultaneously, identify the reasons for the surplus and provide data support for later supply chain performance management.

Secondly, based on the analysis of material surplus, an efficient information feedback mechanism should be established with the technical department to provide references for modifying quotas for the design department and eliminate design redundancy. Thirdly, to clarify the priority order of component standardization work. According to the long tail model, it is urgent to prioritize the reduction of part numbers for key core category materials related to the product. The simplification of part number quantity has reduced direct procurement costs and management complexity in various fields.

## **3. Chain the “procurement domain” and make material cost reduction more “strategic”**

By using category analysis as the entry point, and identifying cost reduction factors, the system promotes cost reduction work and formulates differentiated procurement strategies for the cost domain elements that procurement focuses on, namely research and development production costs, inventory costs, and transaction costs, achieving significant cost reduction effects as shown in **Figure 1**.

Firstly, in terms of reducing material research and development production costs, suppliers are required to streamline their sub-components, thereby reducing their product research and development and manufacturing costs. Based on this, centralized procurement negotiations are carried out, shifting the focus of negotiations from price to value, and simultaneously carrying out localization development strategies <sup>[4]</sup>.

Secondly, in terms of reducing supplier inventory costs, we have increased the frequency of demand forecasting and demand time transmission to upstream suppliers. By reducing supplier inventory costs, we have directly lowered their sales prices to us <sup>[5]</sup>. In the procurement plan stage, the technical center and the procurement management center collaborate to prepare the requirements for filling out the itemized quotation

table, fully considering the characteristics of materials and categories, and developing a relatively fixed itemized quotation table that includes materials, manufacturing, services, certification, transportation, etc. In the procurement negotiation stage, analyze the itemized quotations of each supplier, fully mobilize the participation of “experts,” form a cross-departmental team, participate in the formulation of negotiation strategies, and seek the best negotiation solution.

In the procurement review stage, the supplier manager should organize technical and economic experts to review the itemized quotations and total prices of materials. Technical experts should evaluate the rationality of the itemized quotations and total prices from a technical professional perspective, carry out value procurement, use the human-machine material cost analysis method as a basis to build a process, form an effective negotiation plan, and jointly carry out supply chain cost reduction and efficiency improvement work [6]. By predicting component demand and locking in demand at the sub-component level for the next year, demand management extends to the suppliers, bringing economies of scale through quantity price strategies and negotiation strategies. In the order execution stage, through reasonable production arrangements and production and delivery time arrangements, the ineffective input and inventory costs of suppliers are reduced. The key activities in the centralized procurement negotiation stage and order execution stage complement and promote each other, effectively controlling the overall procurement cost [7].

Thirdly, in terms of reducing transaction costs, we will make full use of system tools such as Enterprise Resource Planning (ERP), Supplier Relationship Management (SRM), and E-signature to accelerate information flow and achieve online signing of all procurement contracts throughout the year. This not only saves shipping costs but also creates more implicit benefits through the time opportunity value created by information technology driving the acceleration of information flow for the supply chain.

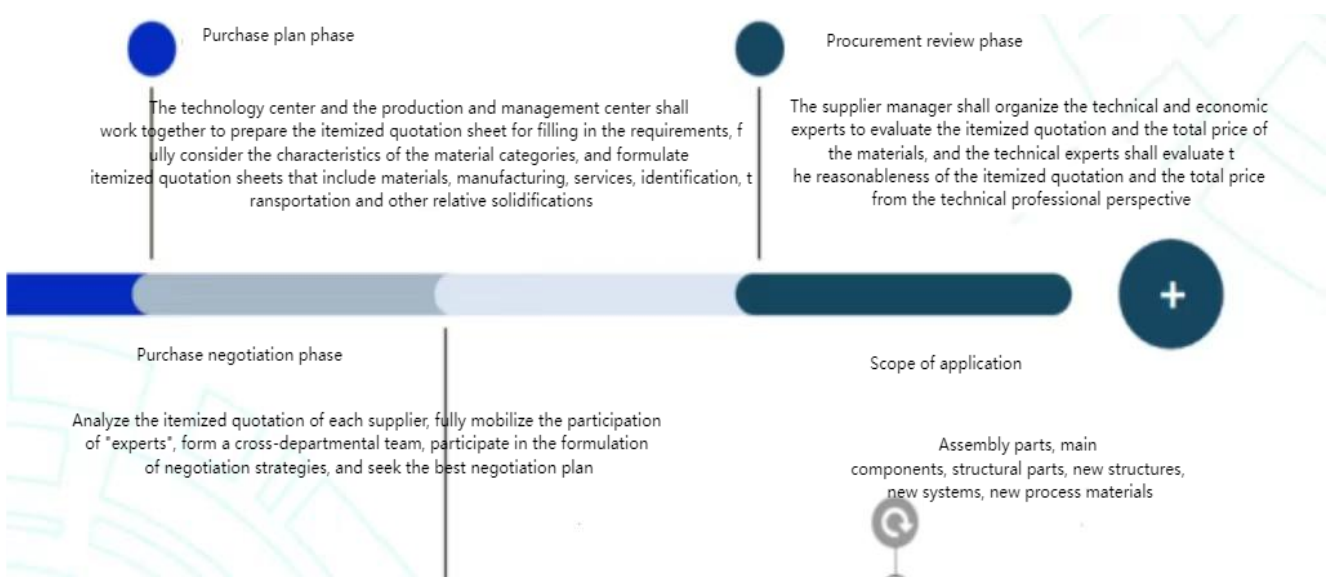


Figure 1. Procurement strategies to achieve significant cost reduction (Source: Wang *et al.* [8])

#### 4. Chain the “production domain” to ensure more stable supply and performance

Through specialized classification management of materials, analysis of material utilization efficiency, optimization of material control plans, and attention to process quality analysis, the timely rate of material supply and production has been improved, and the frequency of personnel allocation in the production workshop has been reduced.

Firstly, transform the material specialized management mode, find high-frequency transfer materials

and specialized materials to pilot the universal ERP operation, and then further expand the scope, especially for large customized mechanical products, which can even reach a total of nearly 100,000 pieces and nearly 100 million yuan of universal materials to form inter-project circulation <sup>[8]</sup>. This measure effectively reduces production delays caused by project shortages, reduces the frequency of worker transfers, improves labor efficiency, and reduces turnover days. It does not bring economic benefits to enterprises, and the inventory turnover rate of materials has also increased year by year. Specialized materials will also transform procurement into an inventory-based replenishment model, providing an important reference for the “three modernizations” construction of research and development <sup>[9]</sup>.

Secondly, strengthen the analysis of the matching degree of production project sending and receiving, and improve the accuracy of material control plans. Based on the monthly material receiving and issuing data of the Inspur ERP system, an analysis of the matching degree of production project receiving and sending was carried out. By selecting typical production projects and analyzing their inventory situation in depth, the difference between the monthly inbound and outbound amounts is calculated, and the matching situation between the material arrival time and the actual assembly demand time of the shield tunneling company is revealed in a data-driven and visual way. It can also be determined through data whether the procurement adjustment of the arrival time is in line with the production demand <sup>[10]</sup>. After a year of effort, the material control plan has been significantly improved, and the difference in the amount of inbound and outbound items for a single project has been significantly reduced from tens of millions to millions.

Thirdly, focus on process quality analysis, reduce the cost of repairing quality issues, deeply study and understand the concept of big business and full cost, and no longer only focus on the total price, but also on the sub-item quotation of process quality <sup>[11]</sup>. Through analyzing the quotations of suppliers in the quality assurance and maintenance stages, we found that when these costs are high, the ownership costs between us and customers will decrease. Based on this cognitive change, a group of suppliers with poor quality were eliminated, and the frequency of replacing defective products during the production and assembly process was reduced. The explicit cost of repairing quality issues decreased year by year.

## **5. Linking the “service domain” and making after-sales response more “agile”**

Based on the spatial characteristics of inventory, a “central warehouse” was planned to manage the balance between total inventory in and out, and a “front warehouse” was constructed to enable the front to obtain inventory information in the shortest time possible, and to organize and quickly allocate to suitable areas, to find solutions for improving service quality and efficiency.

Firstly, build and operate a “virtual accessory large inventory system,” which uses “virtual” information data as a carrier to share “actual” inventory materials with various demand units of the group company, achieving the purpose of the fast query, fast supply, and saving procurement funds, truly contributing to “doing well in construction and promoting operation.” <sup>[12]</sup> Functions cover the warehouses between various subsidiaries of the enterprise, achieving dynamic querying and real-time information sharing of inventory accessories at the group level, promoting the effective utilization of inventory resources, and accelerating the consumption process of project-free materials. The bottleneck problem of accessory supply that once plagued the enterprise has been effectively alleviated, and the circulation time of the accessory procurement process has been shortened by nearly a week. Both domestic and international markets have seen significant improvements in the timely delivery and material requisition of after-sales accessories.

Secondly, through the construction of the “balanced inventory” function in the central warehouse and front-end warehouse, the inventory of slow-moving items has been successfully consumed, avoiding unnecessary re-

procurement costs, and the surplus materials have also significantly decreased from the beginning to the end of the period.

Thirdly, in the design phase, it is required that the technical system perform “source management” on after-sales parts. When applying for production level 2 material codes, their level 3 and level 4 material codes should be synchronously issued and entered. It is recommended to prioritize this work in international projects to reduce the time required for code application and review during later services <sup>[13]</sup>. In the procurement phase, for emergency after-sales parts procurement plans of service types, the approval process should be shortened to ensure the timely delivery of special funds. In the logistics transportation phase, the arrival information should be tracked during the process, and a dedicated person should ensure the shipment of international and service after-sales parts. Physical isolation should be carried out, and the logistics department should stamp the “special materials” seal on after-sales parts when processing storage to avoid them being called by production projects.

## **6. Linking the “financial domain” and diversifying fund payments**

The focus is on finding various financial and tax integration policies and proportional payment strategies to minimize expenses while maintaining stable supplier relationships, scientifically managing commercial credit, and effectively controlling compliance risks <sup>[14]</sup>.

Firstly, through close collaboration with the financial system and coordination with local customs, international departments, national and local taxes, import and export agencies, and suppliers, all parties have ensured smooth information flow, optimizing the entire business chain, including global procurement, and processing and trade manual import, and export verification. By processing the material processing manual, enterprises can be exempted from tariffs and deferred payment of large value-added tax.

Secondly, in terms of supply chain finance payments, the finance team negotiated with the upstream of the supply chain to achieve a net cost reduction in contract fund management <sup>[15]</sup>. Simultaneously, we have successfully transformed the payment methods of some suppliers from short-term bank acceptance to long-term diversified financial instrument payments, such as 12 months of cloud credit, E-credit, etc., achieving efficient utilization of funds.

Thirdly, we will adhere to the implementation of a “portrait based” classification system for suppliers, and effectively integrate it with the funding ratio plan. According to statistics, the coefficient of variation of payments between different months of the year has decreased compared to the previous year, and the payment rhythm has become more stable compared to the previous year.

## **7. Conclusion**

In summary, we should recognize that for enterprises to achieve a leap in value creation, they need to vigorously collaborate with upstream resources to unleash value creation in technological innovation, optimize overseas supply and service mechanisms as soon as possible to ensure compliance, and continue to improve and optimize institutional processes and organizational actions to reduce various costs. All the past actions can be considered as a preface. Looking ahead to the future, the business should focus on serving customers and creating value with unchanged goals. It should cultivate strategic thinking, innovative thinking, systematic thinking, mathematical thinking, and logical thinking, and facilitate supply chain and cross-departmental collaboration in the two main value streams of integrated product research and development and enterprise marketing lead payment collection. Implementing the concept of full cost management, realizing various changes in the supply chain, leveraging information technology support, and integrating and sharing end-to-end information both inside and outside the

enterprise, helps the enterprise further improve efficiency and move towards higher quality development.

## Disclosure statement

The author declares no conflict of interest.

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