Research on the Optimization of the Purchasing Methods of Chinese State-Owned Enterprises from the Perspective of Supply Chain Procurement

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Abstract. As the backbone of China’s economic development, the procurement of state-owned enterprises has a far-reaching impact on the breadth and depth of the whole procurement field. With the rapid development of China’s economy and the accelerating pace of GPA accession, the role of procurement in the supply chain of Chinese state-owned enterprises has become more prominent. Based on the procurement dilemma of Chinese state-owned enterprises and the characteristics of procurement under the supply chain environment, this paper dialectically analyzes the relationship among supply chain management and procurement of Chinese state-owned enterprises, and compares the advantages and disadvantages of the general framework agreement procurement method and the bidding framework agreement procurement method from the perspective of supply chain procurement. On this basis, it explores that the consignment bidding framework agreement procurement is an effective way to optimize the procurement method of Chinese state-owned enterprises.

Keywords: supply chain procurement, state-owned enterprises, procurement optimization, consignment bidding framework agreement procurement.

1. Analysis of the bidding and procurement status of Chinese state-owned enterprises

1.1. Overview of Chinese state-owned enterprises’ procurement
In the development of China’s economy, the state-owned economy has always occupied a dominant position, and the state-owned enterprises have also played a significant role in the contribution of GDP for a long time. With its particularity, the state-owned enterprises have the dual attributes of corporate procurement and public procurement. Since the source of capital is state investment, the income is owned by the state, and the operation and management are supervised by the relevant state administrative departments, it can be said that the development of state-owned enterprises is related to the national economy, people’s livelihood and economic growth. According to the statistics of authoritative institutions in 2019, the total assets of the state-owned enterprises in the secondary industry accounted for about 32% of the total assets of all state-owned enterprises, while the number of state-owned enterprises in the tertiary industry accounted for about 64% of the total number of all state-owned enterprises. The central enterprise group and more than 2,600 subsidiaries owned by the whole people have all completed the reform of corporate ownership. Two-thirds of central enterprises
have introduced various types of social capital. The number of households of mixed ownership enterprises in various provinces, autonomous regions, and municipalities is as high as 49%. In 2019, the national government procurement scale reached nearly four trillion yuan, while the national state-owned enterprises and state-controlled enterprises’ procurement quotas were nearly fifteen trillion yuan. In comparison, the procurement quota of the state-owned enterprises is several times of that of government procurement, and it covers a wider range and has the greater impact on the whole procurement field. (refer with: Fig. 1).

Figure 1. The comparison of Procurement amount between government and state-owned enterprises.

In recent years, the procurement methods of large state-owned enterprises in China have changed from the decentralized procurement to the centralized procurement, aiming at realizing centralized procurement under the unified organization, giving full play to the advantages of centralized resource control, and strictly controlling corporate costs. Of course, in terms of the choice between open bidding procurement and non-bidding procurement, different state-owned enterprises also have diverse disposal methods, mainly based on the amount of procurement and the type of items purchased.

For a long time, the bidding and procurement of state-owned enterprises have been in a “gray zone”, in which the procurement is mainly in accordance with the law of the People’s Republic of China on Bidding and Tendering and the regulation of the Implementation of the Law of the People’s Republic of China on Bidding and Tendering. The bidding methods listed in the law of the People’s Republic of China on Government Procurement and the relevant provisions are not applicable to the state-owned enterprises. Admittedly, although the law of the People’s Republic of China on Bidding and Tendering (draft revision for public consultation) has been issued, there is no clear content on the management of state-owned enterprises’ bidding and procurement. Although many state-owned enterprises have established the management system for procurement and bidding, there are still some problems such as inadequate laws and standards and lack of rigid constraints, which make some state-owned enterprises appear “weak transparency and competitiveness”, “flexible deviation” and other phenomena in the procurement and bidding process. Taking province A as an example, more than 90% of the state-owned enterprises have established unified procurement management system. Among them, nearly 70% of the state-owned enterprises regard bidding as the main method of procurement. Purchasing that meets certain the limited standard mainly uses centralized procurement, while those below the limited standard use fractional procurement. In addition, nearly 57% of the state-owned enterprises have established the unified supplier database, and 67% have established a relatively complete procurement information management system. Due to the relatively single statutory bidding methods, which include open bidding and invitation bidding, and to the lack of legal basis for procurement methods such as applicable and competitive negotiation, inquiry, single-source procurement, and competitive negotiation, the state-owned enterprises have been constrained in the
bidding procurement process, both in terms of operation, and in handling questions and complaints, which has affected the procurement efficiency.

1.2. Analysis of the difficulties of Chinese state-owned enterprises’ procurement
State-owned enterprises are different from both ordinary private enterprises and government agencies. The bidding and procurement of state-owned enterprises not only have the economic requirement, but also have the requirements of standardization and fairness. Through investigation and data analysis, it can be found that today’s Chinese state-owned enterprises pay more attention to standardization and fairness, but lack of economic considerations. In addition, the construction of enterprise procurement strategy system is not scientific and long-term. The details are as follows.

(1) The relevant laws and regulations are not sound, without strong operability. Bidding and procurement are mainly in accordance with the law of the People’s Republic of China on Bidding and Tendering and the regulation of the Implementation of the Law of the People’s Republic of China on Bidding and Tendering, leading to the lack of standardization in the process of implementing bidding and procurement by the state-owned enterprises. With regard to the handling of questions and complaints, due to the lack of direct legal basis, there are many contradictions between the supplier and the tenderer, making it difficult to effectively resolve the related issues. As for the voluntary procurement projects of the state-owned enterprises, there is no corresponding legal basis, which is difficult to guarantee the standardization of operations. Despite the introduction of some industry regulations by the industry self-regulatory organizations, the procurement support of state-owned enterprises in the areas of investment, construction, production and operation is inadequate.

(2) On the one hand, there is the dilemma in the choice of procurement methods for state-owned enterprises. On the other hand, the bidding method of state-owned enterprise procurement by law is relatively simple, thus it is difficult to fully guarantee the value for money of state-owned enterprise procurement. With regard to the selection of bidding procurement and non-bidding procurement, state-owned enterprises have different management methods. Some enterprises basically adopt the bidding procurement method, while others adopt the method of bidding procurement and non-bidding procurement through the establishment of management regulations according to the procurement quotas. According to the current laws and regulations, the state-owned enterprise procurement bidding methods are only open bidding and invitation bidding. The application of competitive negotiation, inquiry, single-source procurement, competitive negotiation and other procurement methods lacks legal basis. Among them, the applicable public bidding method can be divided into two ways, namely the statutory public bidding project and the voluntary public bidding project. The former is mainly for engineering construction projects. For example, the provisions on projects subject to bidding promulgated by the Development and Reform Commission of the State Council of the People’s Republic of China clearly stipulate that projects invested wholly or partly with state funds or financed by the state must be subject to public tender as long as the specified amount is reached. The latter is chosen by the state-owned enterprises themselves. However, in order to ensure the standardization of the procurement process, most of the state-owned enterprises blindly pursue the public bidding. There are advantages and disadvantages to this situation. The good side is that the inspection and audit requirements of the administrative authorities are guaranteed. The disadvantage is that this has a certain impact on the production and operation of enterprises, restricting the development of enterprises to some extent.

(3) The procurement management of state-owned enterprises is not optimized enough. On the premise of ensuring fairness, justice and legality, the choice of suppliers plays a decisive role in the realization of enterprise procurement effect. However, due to the narrow supplier development channels, as well as the relatively solid structure of the supplier database, some state-owned enterprises fail to effectively establish the selection evaluation mechanism, supplier integrity performance records, and supplier classification differentiated management. Therefore, the risk of bidding or malicious competition still exists, which seriously affects the quality of the development of state-owned enterprises.
(4) The e-procurement process of state-owned enterprises is slow. Through the combination of business characteristics, some large state-owned enterprises have established internal electronic bidding and procurement platforms, covering multiple procurement methods like bidding, as well as information release, bid evaluation, contract signing and other processes. Moreover, through the combination of supply chain procurement management requirements, they further enhance the functions of supplier pool, contract performance and supervision. Nevertheless, due to the failure to implement electronic bidding procurement or the separation of bidding commission, approval and bidding systems, some medium-sized state-owned enterprises cannot realize functions such as basic data establishment and information release system push, which is not conducive to the expansion of intelligent big data analysis in the future, as well as supporting and improving system functions such as delivery, acceptance, settlement, and inventory after the successful bid, seriously affecting the procurement efficiency and procurement costs.

(5) The level of strategic management of state-owned enterprises is not high. With the development of supply chain procurement globalization, procurement has become one of the important links for enterprises to reduce costs and improve profits. Therefore, the formulation of scientific and the effective procurement strategy are of great significance to improve the management level and increase the income of state-owned enterprises. At present, some state-owned enterprises have begun to pay attention to and take actions to formulate procurement strategies to comprehensively improve the overall procurement performance. However, the strategic perspective still remains in the scope of internal procurement, lacking certain international perspective and personalization. For example, although some state-owned enterprises have established centralized procurement platforms, there is serious homogenization.

With the gradual acceleration of China’s entry into the GPA, state-owned enterprise’s procurement is bound to face severe challenges. Therefore, it is necessary to ensure that the procurement methods and related standards are in line with the international standards, and comprehensively improve the level of procurement strategy.

2. Procurement characteristics of Chinese state-owned enterprises from the perspective of supply chain procurement

As for supply chain management, the cooperation between various companies in the supply chain needs to be coordinated to achieve information sharing and risk sharing, with customers as the operating direction and market demand as the driving force of the supply chain. Effective supply chain management can achieve four goals, namely the improvement of return on investment, the reduction of cash turnaround time, the reduction of corporate costs, and the provision of predictable income. For state-owned enterprises, the implementation of supply chain management can significantly reduce the cost of each link, which has many benefits. First of all, through more refined division of labor, state-owned enterprises can achieve professional operation, as well as the goal of further reducing production costs. Secondly, at the lowest cost, the enterprise with the highest efficiency to provide customers with the best products. Thirdly, the competitiveness of enterprises and even the entire supply chain has been improved.

In the economic activities of modern enterprises, the procurement management under the supply chain management environment, as a key link in the enterprise supply chain management, has a crucial impact on whether the production and operation of the enterprise can be carried out smoothly. On the basis of purchasing products and services, it forms and gradually optimizes the stable and harmonious supply relationship between enterprises and suppliers through standardized management and control processes, and finally forms an excellent supplier group. Through the standard and standardized management process, the goals of standardizing the procurement process, optimizing the supplier group, sharing procurement information, reducing procurement costs, and the win-win results with suppliers are finally achieved. Therefore, the state-owned procurement management in the supply chain management mode must focus on “supplier”, “time”, “quality”, “quantity” and “location”. Compared with the simplicity and intentionality of the traditional procurement model, the procurement
management of Chinese state-owned enterprises in the supply chain environment has the following characteristics.

2.1. Mode shift from focusing on standardization to considering both efficiency and standardization

The procurement of state-owned enterprises has undergone a transformation from a planned economy to a market economy. During the planned economy period, there was no legal basis for the procurement method, which was basically decided by the enterprises themselves. In the market economy period, due to the government’s emphasis on bidding and procurement, a series of laws, regulations and rules have been issued, and the procurement procedures of state-owned enterprises have been standardized. However, the existing laws, namely the law of the People’s Republic of China on Bidding and Tendering and the regulation of the Implementation of the Law of the People’s Republic of China on Bidding and Tendering, cannot effectively regulate the procurement of state-owned enterprises. In addition, there are only two ways of bidding procurement, namely open bidding and invitation bidding. Although there are two industry self-regulation regulations, namely Specifications of Non-bidding Procurement Agency Service and Specifications of Procurement Operation of State-owned Enterprises, they are only selective specifications without sufficient mandatory.

For non-statutory bidding projects, in order to pass the inspection and audit regulations by the government administrative department, the state-owned enterprises follow government procurement, which focuses on the procedural and normative procurement, and puts economy and efficiency in the second place. With the rapid development of China’s economy, especially the urgent demand for the entry into the GPA, the procurement of state-owned enterprises is bound to be affected. In order to effectively integrate with the international standards and enhance the overall competitiveness of enterprises, state-owned enterprises procurement must reflect efficiency on the basis of taking into account the norms, and further improving the corporate governance mechanism.

2.2. Procurement shift from optimizing inventory to optimizing order

Compared with the traditional procurement model, the procurement supply chain is based on demand, emphasizing the formation of procurement activities and taking the production order as the driving mode. It refers to the purpose-oriented and coordinated supply chain channel coordination when state-owned enterprises make strategic or tactical adjustments in accordance with market changes, which is no longer equivalent to the traditional procurement planning arrangement. Only in this way, the inventory and related expenses of the purchaser can effectively reduce, and the costs can be saved.

2.3. Shift from the general sales relationship to the strategic partnership

Under the traditional procurement mode, the relationship between state-owned enterprises and suppliers is a general buying and selling relationship. However, in the supply chain management, state-owned enterprise procurement seeks a long-term and stable partnership, rather than the short-term transactions. With the continuous improvement of supply chain coordination, state-owned enterprises and suppliers coordinate the development of products, the formulation of synchronous plans, and the prediction of future demand, thereby truly realizing the sharing of demand and inventory information. At the same time, through the establishment of the efficient evaluation mechanism, state-owned enterprises evaluate the services of suppliers and select suppliers with common development intention. Then, the two sides establish a win-win strategic partnership to achieve their respective corporate strategic objectives and improve their ability to control risks. In the supply chain procurement model, the coordinated development between the supply and demand sides can not only improve the competitiveness of the enterprise itself, but also bring vitality to the whole supply chain.
2.4. Procurement mode shifts from traditional decentralized procurement to centralized procurement

With the rapid development of China’s market economy, the operation of state-owned enterprises has become more and more standardized, and higher requirements have been put forward on the enterprise management. Especially when the scale of enterprises keeps expanding and the operation mode of the enterprise groups emerges, the original, the decentralized and independent procurement management mode can no longer meet the needs of the development of state-owned enterprises. State-owned enterprises have strengthened their advantages in market prices and services by establishing a centralized procurement, centralized management, and unified bidding platform procurement management system to achieve a unified external environment. This centralized procurement mode not only reduces the procurement costs and expenses, and takes advantage of capital to relieve the enterprise’s capital pressure, but also facilitates the establishment of long-term strategic cooperative relationship with suppliers, thus forming a stable supply chain. Under the coordination of the supply chain, manufacturing, procurement and supply links can be carried out simultaneously, which shortens the demand response time and improves the timeliness of material supply.

3. Analysis of the relationship between supply chain management and state-owned enterprise procurement

3.1. Definition of procurement under supply chain management

Although there are major differences between supply chain procurement and traditional procurement, certain internal relationships still exist. Procurement under supply chain management generally refers to a series of activities of identifying, purchasing, acquiring and managing all resources required or potentially required by the enterprise in order to pursue and achieve its strategic goals (Zhang Yuyan, Ren Lin. Global Governance: A Theoretical Analysis Framework [J]. Proceedings of the International Academy of Social Sciences, Chinese Academy of Social Sciences, 2015 (3): 17-18.).

3.2. Comparative analysis between traditional purchasing model and supply chain management purchasing model

In the traditional procurement mode, after receiving the order placed by the purchaser, the supplier formulates a production plan and carries out processing and manufacturing according to the order. Due to the antagonistic relationship between the supply and demand sides, in order to ensure that the supplier can deliver the goods on time, the purchaser should track the progress of the order, or send personnel to be stationed at the production base to supervise the processing and production. The supplier will take the following actions to ensure the quality of the products. First of all, the supplier will conduct self-inspection of the products processed or find a third party for inspection. Then, after passing the quality inspection, the materials are first stored in their own inventory. Finally, the supplier provides the goods according to the supply order submitted by the purchaser. After receiving the goods, the purchasing party will conduct the quality inspection, and then go through the relevant formalities for storage after the inspection is qualified.

Based on the procurement model of supply chain management, the supplier is comprehensively certified by the purchaser through qualification review and supply capacity inspection. The internal procurement platform of the enterprise realizes the transformation from the purchase order of the enterprise to the supply order of the supplier. The supplier is solely responsible for the quality of the product, eliminating the need for the purchaser to repeat the quality inspection. By sharing inventory information, the purchaser and the supplier can combine the purchaser’s inventory with the supplier’s inventory. Based on the supply chain procurement model in the current era of “Internet +”, fundamental changes have taken place between the supply and demand sides. Information sharing reduces physical inventory and procurement costs, and improves the efficiency of the whole supply chain. It is conceivable that there are many similarities and differences between supply chain procurement and traditional procurement, mainly reflected in information, inventory, acceptance,
supplier quantity, supplier evaluation, procurement volume and requirements for on-time delivery, etc. (refer with: Table 1).

3.3. Challenges facing state-owned enterprise procurement from the perspective of supply chain
At present, state-owned enterprises are deeply entrenched in the operation philosophy of price control to save costs and often ignore other hidden costs. Therefore, supply chain procurement fails to promote the overall supply chain operation. There are mainly the following aspects of the embodiment.

3.3.1. Insufficient cooperation between supply and demand sides. Although most of the state-owned enterprises have established the supply chain system at present, the goal of both parties in the actual supply process is always to maximize their respective profits. Therefore, there is a short cooperation time between the supply and demand sides, insufficient cooperation depth, and a certain degree of agreement. In short, driven by their own interests, supply and demand parties often compete more than cooperate. Since the two sides have not formed a long-term strategic partnership in the real sense, there are uncertainties in the procurement process and procurement risks.

Table 1. Comparative analysis table.

<table>
<thead>
<tr>
<th>Content</th>
<th>Traditional procurement</th>
<th>Supply chain procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply and demand relationship</td>
<td>Confrontation-based</td>
<td>Mutual benefit and win-win situation</td>
</tr>
<tr>
<td>Information</td>
<td>Undisclosed, asymmetry and not shared</td>
<td>Fully shared, accurate and timely</td>
</tr>
<tr>
<td>Inventory</td>
<td>The purchaser establishes its own inventory.</td>
<td>The purchaser has zero inventory. The supplier has inventory control, the flexibility to adjust production to avoid waste and reduce risk.</td>
</tr>
<tr>
<td>Acceptance</td>
<td>Acceptance tasks are heavy, stressful, and costly.</td>
<td>The operation of acceptance is eliminated, reducing acceptance costs and saving delivery time.</td>
</tr>
<tr>
<td>Number of suppliers</td>
<td>Relatively more</td>
<td>Relatively small. Long-term and stable partnerships guarantee the quality of products and services.</td>
</tr>
<tr>
<td>Supplier evaluation</td>
<td>In the event of delayed delivery, non-compliance with the agreement or other factors, the purchaser will choose a new supplier.</td>
<td>Comprehensive evaluation of suppliers, evaluation indicators include price and quality, where quality mainly includes products, technology, delivery, services and other content.</td>
</tr>
<tr>
<td>Procurement quantity</td>
<td>Insufficient volume control over procurement</td>
<td>Small procurement; Contribute to the need to produce on time.</td>
</tr>
<tr>
<td>On-time delivery</td>
<td>Insufficient control over time</td>
<td>On-time delivery by suppliers is the basis of refined production. The improvement of the entire supply chain meets the timeliness of user needs, based on stable production and transportation control.</td>
</tr>
</tbody>
</table>

3.3.2. Low degree of information sharing between supply and demand sides. In the context of the supply chain procurement model, the purchaser and the supplier need to share the information with each other. However, in the real environment, the degree of information sharing between the two sides is not high, which further increases the risk of uncertainty in the state-owned enterprise procurement. For the sake of their own interests, each party will retain or block relevant self-interest supply and demand information. Therefore, the procurement process presents a typical game state of asymmetric
information. The mutual suspicion between the supply and demand leads to price fraud, quality fraud and other situations, making it difficult for supply chain checks and balances to work.

3.3.3. The selection of suppliers is dominated by price index. The price factor is dominant in the supply chain. However, there is a lack of evaluation management for suppliers. In the traditional procurement mode, the adversarial price negotiation and bidding-based procurement mode still dominate, so it is difficult to select qualified suppliers. Due to the lack of sufficient trust between the supply and demand sides, it is difficult for the purchaser to supervise the production process and quality of the supplier, resulting in the situation that the quality of the supplied product is sub-optimal and excessive. In this context, the normal operation of state-owned enterprises has been severely affected, greatly increasing the risk and inventory costs of state-owned enterprise inventory.

3.3.4. Uncoordinated operation process. As long as the operation procedures between the nodes in the supply chain procurement are not coordinated, it is difficult for the overall interests of each party in the supply chain to achieve optimality. The traditional procurement process is to formulate procurement plans, compare suppliers, sign contracts, deliver materials to the enterprises according to the procurement contracts, handle the storage of materials, and evaluate the procurement work. The whole process involves various departments such as procurement, accounting, auditing, warehousing, among which the uncoordinated communication between any two departments will affect the next process. Due to various degrees of incoordination in the process, the whole supply chain will have various problems such as long procurement cycles, product backlogs, increased costs, and low staff efficiency.

3.3.5. Slow ability to respond to user needs. Under the traditional procurement mode, inventory is a crucial factor to drive enterprise procurement. State-owned enterprises will adjust their production plans mainly based on the corresponding inventory, with user demand occupying a secondary position. Therefore, many state-owned enterprises mainly focus on procurement, logistics, production and other processes at the upstream of the supply chain and ignore the customer satisfaction, demand pattern change and other processes at the downstream of the supply chain. In addition, the untimely and unsmooth information communication between the two parties also result in the two parties’ asynchronous response to user needs and the failure to follow up in a timely manner. In other words, supply chain procurement lacks the ability to respond to changes in demand.

3.3.6. Inadequate supervision and control mechanisms. In the traditional procurement mode, as the procurement responsibilities are not clearly divided, the procurement process of state-owned enterprises lacks effective supervision mechanisms, as well as incentives and constraints on related business personnel such as suppliers and procurement personnel. Theoretically, supply chain procurement needs to meet the needs of customers, that is, to deliver materials to customers at an appropriate time, place, quantity and quality, thereby enhancing the competitiveness of enterprises. However, in the design of the supply chain system, state-owned enterprises often focus on back-end processes such as manufacturing and distribution, and ignore other hidden costs, due to procurement with the goal of reducing costs. Therefore, there are still many deficiencies in supply chain procurement.

Through analysis and comparison, this paper attempts to find a procurement mode in the supply chain that can solve the problems existing in the procurement development, so as to reduce the overall cost of the supply chain and maximize the benefits of all state-owned enterprises in the supply chain.
4. Thoughts on the optimization of Chinese state-owned enterprises’ procurement methods from the perspective of supply chain procurement

4.1. Comparative thoughts on the advantages and disadvantages of the current common procurement methods

As the shortage of traditional procurement methods hinders the application of supply chain procurement theory in procurement practice, the “overlay” combination method is used to optimize traditional procurement methods, and forms some new procurement methods, such as framework agreement procurement, bidding framework agreement procurement, which are widely used in the supply chain procurement of state-owned enterprises. However, in practice, there are also many deficiencies in this superimposed supply chain procurement method.

4.1.1. General framework agreement procurement. In general framework agreement procurement, enterprises first focus on customer demand, and then invite limited suppliers to participate in the competition based on the demand. After negotiation, the suppliers sign a material purchase agreement within a certain period of time, and then execute the purchase order in accordance with the agreement. Framework agreement procurement is mainly applicable to materials that can form procurement batches, with high standardization, high-frequency demand, and stable supply and demand relationships.

General framework agreement procurement method indicates a series of distinctive and unique procurement methods making full use of the advantages of centralized procurement method, forward contract ordering method, random procurement method, negotiation procurement method and enquiry procurement method. In general framework agreement procurement method, companies invite some suppliers to participate in competition according to user demands, agree with the suppliers to sign material procurement agreement in a certain period of time and execute procurement order in accordance with the agreement.

General framework agreement procurement method is mainly applicable to purchasing batch materials with high standardization, high-frequency demand, and stable supply and demand relationship. Procurement price or pricing formula is generally clarified, and the quantity of materials is an estimated value within the framework agreement period. Framework agreement procurement can help enterprises control resources and improve business negotiation capability. As a special contract mechanism, it integrates many trivial and repeated transactions to establish a long-term contract.

It has certain advantages to promote supply chain procurement through the general framework agreement procurement, as shown below. First, the supply and demand sides have established a long-term strategic cooperative partnership, which provides conditions for the implementation of supply chain procurement. Second, it is conducive to the coordinated development of enterprises and joint resistance to market volatility risks in supply chain procurement. Third, the procurement process is simplified, so that suppliers only have to sign the purchase agreement and execute the order within a certain period of time. Fourth, the framework agreement procurement improves the continuous delivery in large quantities and less frequently, and achieves continuous delivery in multiple small quantities, that is, the true on-demand procurement. Fifth, it improves the standardization level of demand materials and increases the competitiveness of enterprises in the supply chain.

However, general framework agreement procurement method is prone to imbalance during the supply chain procurement operation and forms three game relationships:

First, the game of scale and quality. The relationship between quantity and quality in procurement also follows the law of mutual change, and a game relationship exists. The transformation from the pursuit of scale and proportion of general framework agreement procurement to the pursuit of quality and effect is an inevitable process from quantitative change to qualitative change. Scale and procurement rate are two intuitive measures that can reflect the implementation scope and implementation degree of framework agreement procurement model in enterprises.
Effect is dependent on scale. At the initial implementation stage of framework agreement procurement, scale is the main contradiction, especially for enterprises with a framework agreement procurement rate of less than 50%, and the main goal is to increase the scale. However, after years of exploration, improving the quality of framework agreement procurement has gradually become the main contradiction. Especially, companies with a framework agreement procurement rate of 70% or more should focus on increasing the quantity of demand material, promoting the standardization of demand, cultivating the main supplier group, improving purchasing efficiency and reducing labor intensity, instead of increasing the quantity of framework agreement procurement;

Second, the game of the number of suppliers. Reducing the number of suppliers is one of the purposes of framework agreement procurement, which can optimize the structure of suppliers, increase the average share of supply of suppliers, and enhance the initiative of negotiation and market bargaining power of purchasers. If there are few suppliers in the general framework agreement at the initial stage, it is likely to eliminate competition, block the channel of introducing new suppliers, make suppliers inert, and even form alliances. Consequently, purchasers will lose their initiative in the market. Particularly, the current market integrity system is not standardized and the transaction competition environment is not orderly. A certain number of suppliers should be maintained to increase the competitive atmosphere, so that the purchasers can firmly grasp the initiative. However, with the rapid advancement of general framework agreement procurement, purchasers can further grasp the law of demand, accurately analyze the cost structure of materials, and improve the detailed evaluation mechanism for the strength and performance of suppliers, thus decreasing the number of suppliers. Especially for bulk and general materials, small number of framework agreement suppliers is recommendatory, and the top-ranked suppliers should be preferred. Above 80% materials are provided by the top 20% suppliers, thus stimulating the potential of suppliers;

Third, the game of cooperation agreement cycles. The period of general framework agreement procurement directly determines the attractiveness to suppliers and the size of demand batches. A longer cooperation agreement period indicates larger demand batches and greater importance for suppliers, and the purchasers have stronger negotiation power. However, if the period is too long, the competition among suppliers will substantially decease, and the adaptability of procurement and supply to demand and market changes may also decline. Short-period framework protocols can not only be operated more flexibly, but also quickly adjusted and optimized. However, if the period is too short, the collection batch is small, which can neither attract suppliers nor help to reduce the number of contracts or to liberate the labor force of the procurement staffs. Therefore, the purchaser should comprehensively consider the actual conditions such as the demand characteristics of different material categories, supplier capabilities, and market trends, and reasonably determine the period of framework agreement.

Under the influence of market economy, the general framework agreement procurement method is usually more adaptable to the changes of the environment than the traditional procurement method. However, there are still many deficiencies when it is used by state-owned enterprises, such as non-compliant way of selecting suppliers, inadequate competition when choosing suppliers, limited bilateral cooperation resulting from inadequate technical exchanges between supply and demand, the failure to establish long-term cooperative relations between supply and demand sides caused by unscientific material subcontracting programs, delays in delivery, the lack of information sharing, insufficient knowledge of material inventory, as well as the lack of coordination in supply chain procurement process. It is precisely because of these shortcomings that the general framework agreement procurement method is constantly optimized. On this basis, the bidding framework agreement procurement method comes into being.

4.1.2. **Bidding framework agreement procurement.** Bidding framework agreement procurement refers to the centralized bidding within a certain period of time, using bidding to sign an agreement with a small number of suppliers for goods or services within a certain period of time. Bidding frame agreement procurement method can not only help the purchaser reduce the procurement risk, but also
optimize the supplier structure, so as to build a healthy ecological supply system to truly achieve a win-win situation for the supply and demand sides. Furthermore, the effective formation of the fair competition atmosphere attracts potential and high-quality supply resources, breaks the monopoly of suppliers, promotes the improvement of the cost performance of original suppliers’ products, saves procurement funds, guarantees the quality of procurement materials, and improves the competitive strength of enterprises.

The tendering framework agreement procurement method also has the following characteristics:

First, the bidding announcement of public bidding framework agreement is published on public publications, and bidders have the right to participate in competition. The tender determines bid evaluation methods in advance according to legal procedures, and selects the successful bidder based on the principles of openness, fairness, and justice. Information transparency is conducive to fair competition, and ensures effective supervision of the procurement process. Moreover, it can help companies to find powerful suppliers which are more in line with corporate development, and form strategic partnership. Meanwhile, companies can find more suitable supply chain networks, enhance competitiveness based on the comprehensive strength of supply chain, and promote the legal and orderly operation of supply chain procurement.

Secondly, the bidding framework agreement involves not only the bidder's quotation, but also the bidder’s qualifications, R&D capabilities, technological advancement, manufacturing capabilities, product quality guarantee system, after-sales service capabilities, and commercial credibility. The bidders are comprehensively evaluated to determine the final winning supplier. In addition, the tender can flexibly reduce the weight of price factors in the final bidding results according to different types of materials and economic environment, and use the procurement method more scientifically to select high-quality suppliers and improve the overall efficiency of the supply chain.

Third, for suppliers which have failed to make timely supplies or have poor after-sales service capability in previous supply process, in the new round of evaluation and scoring of bidding framework agreements, expert judges can objectively reduce the probability of winning bid and make the winning supplier realize that the purchaser can still carry out effective process control on the purchase order, so as to prevent the supplier from perpetrating a fraud or delaying delivery. On the premise of meeting the bidding conditions and ensuring the supply of materials, for the materials required for daily inspection and maintenance, the regional factors can be appropriately considered in the evaluation of bids to determine the primary and alternative suppliers. This can make up for the lack of correct procurement evaluation and reduce procurement risks.

In the supply chain-based procurement model, tendering framework agreement procurement has some weaknesses:

First, the technical exchange between the supply and demand sides is inadequate, and the cooperation between the two parties is limited. According to the procurement process stipulated in the bidding framework agreement, technical exchange should be performed before the tender application. After the in-depth communication between the supply and demand sides, the supplier should assist the purchaser to compile detailed bidding framework agreement material technical standard, which can be changed according to different types of materials. The standard includes accurate technical parameters related to material quality, such as specifications, quality standards, material brands, production and processing processes. Pictures can be used as necessary. Also, the purchaser can ask the suppliers to provide samples to express the material form of the tendering framework agreement. If Technical Standards cannot accurately describe the characteristics of the material of the tendering framework agreement, the bidders will have divergent views on the materials. When the questions are not answered in a timely and effective manner, the bidders will randomly participate in the bidding and freely quote based on subjective consciousness. Sometimes the scheduled bid opening time of the bidding framework agreement will be delayed, thus hindering the orderly progress of procurement and delaying, delaying material demand time, and hindering the normal development of supply chain procurement.
Second, the subcontracting plan of materials is not scientific, and the supply and demand sides cannot establish a long-term cooperative relationship. For a wide variety of materials, the subject matter is often subcontracted when formulating the bidding plan. Subcontracting is not simply permutation and combination of materials, but to reasonably subcontract materials based on different types, circulation degree in the market, and the qualifications and capabilities of suppliers in the industry. Reasonable subcontracting of materials helps the tender to select and cooperate with qualified suppliers; on the contrary, the long-term cooperative relationship between the supply and demand sides will become fragile, which is not conducive to establishing the long-term supply-demand relationship in the supply chain procurement model.

Third, it is difficult to judge a malicious low price. Although buyers can save procurement costs in the fierce competition of suppliers, ultra-low quotations will be made by suppliers. Suppliers will gain profits at the cost of product quality, technical support and after-sales service, leading to poor product quality and performance, which will increase quality risk in production and construction. Therefore, judging the rationality of quotation is the focus of tendering framework agreement procurement. However, the enterprise is not a fixed item, but an organization which is constantly and dynamically operated and developed. The supply chain network of an enterprise is also developing dynamically. Therefore, all costs constantly change in the entire economic market, and it is difficult for bid evaluation experts to judge the rationality of quotation in the short bidding time.

Fourth, the delay in delivery is contrary to prompt delivery in the supply chain procurement model. The number of successful suppliers is limited. If suppliers are required to supply in batches in a short period of time, they will face heavier supply pressure and delay delivery. Meanwhile, suppliers strengthened the right to speak in the execution of the order based on the identity of winning suppliers, and play little attention to the prompt supply of the bidding materials. This violates the demand for immediate delivery in the supply chain procurement model and hinders economic development.

Fifth, the judges are highly subjective in evaluation. Some judges cannot objectively and impartially score suppliers. Instead, they judge suppliers subjectively based on their preferences or according to users’ intention, which violates fairness.

Sixth, information sharing is deficient; knowledge of material inventory is insufficient; operational processes is uncoordinated.

Compared with the general framework agreement procurement method, the bidding framework agreement procurement method is further optimized. But in the long-term practice process, its unique advantages and disadvantages also gradually emerge. On the one hand, it is conducive to the fair competition of enterprises, ensuring the effective supervision and operation of the procurement process. Enterprises can find stronger that more consistent with the development of the enterprise, and form strategic partnership with them. In addition, according to the different types of materials and the similarities and differences in the economic environment, the tenderer can flexibly reduce the weight of price factors in the final bidding results, and in use the procurement methods to select high-quality suppliers, improve the overall benefit of the supply chain. On the other hand, due to the insufficient technical exchanges between the supply and demand sides, cooperation between the two sides is also at a limited level. Due to the unscientific sub-contracting plan, the supply and demand sides cannot establish a long-term cooperative relationship. In addition, there are disadvantages such as delayed delivery, lack of information sharing, and insufficient grasp of material inventory, which hinder the further improvement of supply chain procurement efficiency. (see Table 2).
Table 2. A Comparison of the benefits of two framework agreement procurement methods in 2019.

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Indicator content</th>
<th>Bid framework agreement procurement benefit value</th>
<th>General framework agreement procurement benefit value</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Procurement on-time completion rate</td>
<td>95%</td>
<td>90%</td>
<td>30%</td>
</tr>
<tr>
<td>2</td>
<td>Acceptance rate of materials</td>
<td>88%</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>3</td>
<td>Completion degree of transaction price to target price</td>
<td>114%</td>
<td>87%</td>
<td>20%</td>
</tr>
<tr>
<td>4</td>
<td>Purchasing cost savings rate</td>
<td>3%</td>
<td>1%</td>
<td>15%</td>
</tr>
<tr>
<td>5</td>
<td>Future sustainable price cuts possibility</td>
<td>2%</td>
<td>1%</td>
<td>10%</td>
</tr>
<tr>
<td>6</td>
<td>Supplier response speed</td>
<td>100%</td>
<td>80%</td>
<td>5%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>74.55%</td>
<td>64.65%</td>
<td>100%</td>
</tr>
</tbody>
</table>

4.2. Consignment bidding framework agreement procurement method

Through objective comparison of the advantages and disadvantages of the general framework agreement procurement method and the bidding framework agreement procurement method, this article summarizes the practice experience of many state-owned enterprises’ material procurement based on the purpose of raising the level of supply chain management, and finally puts forward a proposal that the bidding framework agreement procurement method is optimized to form the consignment bidding framework agreement procurement method.

(1) Consignment bidding framework agreement procurement is a procurement model based on vendor managed inventory (VMI). Its main characteristics are as follows. Information sharing is realized among enterprises within the supply chain. The purchaser’s zero inventory reduces the procurement costs. The supplier has autonomy in inventory and adjusts production and delivery schedules as needed to avoid wasted inventory and reduce supply chain risks. The mutually beneficial and win-win relationship ensures the quality of materials, eliminates the need for inspection and improves the timeliness of supply.

(2) The use of the procurement method of consignment bidding framework agreement has the following significance for promoting the development of supply chain procurement. Firstly, cooperation between enterprises in the supply chain is deepened. Secondly, the degree of information sharing is improved. Thirdly, supply chain procurement risk is reduced. Fourthly, it promotes the coordinated development of the supply chain procurement mode, and simultaneously responds to user needs, thereby maximizing the overall benefits of the supply chain. Fifthly, it practices the concept of supply chain procurement.

(3) Four changes can be realized through the application of the consignment bidding framework agreement. Firstly, inventory procurement on the demand side is transferred to order procurement on the supply side. Secondly, adversarial relations are transformed into strategic partnerships. Thirdly, the two parties switch from non-public information to information sharing. Fourthly, The large-volume, low-frequency continuous delivery of inventory held by the demand side is transformed into a small-volume, multi-frequency continuous delivery of inventory held by the supplier.

Case: Consignment Sales Tendering Framework Agreement Procurement of Blast Furnace Tapping Machine Pipe Drilling Function in Steel Plant

The tapping machine drill pipes of blast furnaces of steel plants A and B were previously purchased by agreement. The annual cost of a single furnace was up to 4 million yuan. In 2019, the best cost-effective procurement was implemented, and new pricing method was planned. Combined with the blast furnace production process and the historical consumption data of drill pipes, the drill pipes of the two blast furnaces were purchased through the consignment tendering framework agreement on the basis of the entire furnace function. The bidding document clearly clarifies that the bidding scope is the total cost and on-site technical service for the drill pipes of the two blast furnaces in 2019.
The total cost is based on the annual unit, including material costs, manufacturing costs, heat treatment, parts inspection, labor costs, transportation costs, and on-site technical service costs of the drill pipes. The total price is fixed regardless of the actual consumption of drill pipes. After the bidding, the general contracting price of the tapping machine pipe drilling function of the two blast furnaces was 3.58 million yuan, 1.79 million yuan for a single furnace. Compared with the general agreement supply, the cost was reduced by 55%, and marked effect was achieved. Meanwhile, due to the improvement in supply quality of drill pipes, the delay in tapping of the blast furnaces was reduced, the damage to the iron channel was reduced, and the blast furnaces could maintain long-term stable operation cycle.

In this example, the change in supply mode and pricing method has reduced the annual purchase cost of the drill pipes by nearly half. In the previous one-piece valuation method, the supplier hopes to consume more materials, and human factors are likely to increase the actual settlement costs. After the consignment tendering framework agreement procurement model is adopted, the annual fee is fixed, and suppliers will consciously improve product quality and reduce product consumption to pursue profits, thereby ensuring the quality.

By investigating a production-oriented state-owned enterprise in Anhui Province, as of the end of December 2019, the annual cumulative procurement (winning) amount reached 76.380 billion yuan. After the implementation of the consignment tendering framework agreement procurement model, the amount was decreased by 5.948 billion yuan compared with the control price of 82.028 billion yuan, with an average decrease of 7.25%, thereby achieving the goal of “regulating procurement behavior and reducing procurement costs”.

The optimized procurement mode provides the way and channel for the implementation of the overall supply chain strategy, which is obviously more suitable for the dynamic and collaborative development of the supply chain procurement, and realizes the efficient and orderly operation of the supply chain procurement mode.

4.3. Conclusion and deficiencies
On the whole, the consignment bidding framework agreement procurement can improve the efficiency of procurement, the economic efficiency of the company, and the actual benefits of all parties in the entire supply chain, enabling enterprises to increase their competitive strength and more adapts to the rapidly changing and diverse demand environment of the market economy. On the other hand, due to the limitations of knowledge and time, the research in this paper has many deficiencies, mainly reflecting in the following points.

(1) The research object has limitations. The preset research object of this paper is the material procurement of representative state-owned enterprises.

(2) The research method has limitations. This paper only mentions the role of procurement methods in the supply chain, without the impact of cloud procurement platform application, procurement strategy, procurement supervision, procurement risk and other factors on the supply chain procurement.

(3) The research subject has limitations. This paper only considers the purchaser as a supply chain node. How to promote suppliers to participate in the new product design at which stage is also worth exploring.

References