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Procurement Logistics Optimization of Supply Chain Management Based on Data Mining Technology

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Abstract: Data mining has become an important research topic in the field of information technology and has received extensive attention. With the maturity of data mining technology, data mining has gradually been applied to the field of enterprise management. Therefore, the application of data mining technology to enterprise supply chain management has far-reaching significance for improving the core competitiveness of enterprises. This paper aims to study the procurement logistics optimization of supply chain management based on data mining technology. Based on the analysis of the functions of data mining, the role of procurement management and the application of data mining in supply chain management, company A is taken as an example. Purchasing logistics optimization goals and purchasing organization structure are described and improved. Finally, this article compares the effects before and after the procurement logistics optimization shows that the company's procurement efficiency has been significantly improved, the procurement cycle has been greatly shortened, and the procurement cost has been significantly reduced.

1. Introduction

With the development of e-commerce, more and more companies have begun to use computer software to help companies standardize production and business processes, and improve the management efficiency and management level of corporate managers. This also produced a large amount of data information in production and business activities [1-2]. The rapid development of hardware technology enables people to build a huge database system to store these information resources, but the ensuing problem is how to extract the data that people are interested in from the massive data information, and analyze the extracted data, and transform them into knowledge and

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apply them to the production and business activities of enterprises to help enterprises reduce costs and increase profits [3-4].

In the business activities of an enterprise, procurement activities cover the entire process from demand to supply between the enterprise and the supplier, and are one of the key contents of enterprise supply chain management. As a connection interface between suppliers and enterprises, it builds a bridge for the cooperation and communication of various enterprises in the supply chain, ensures the realization of seamless connection of the supply chain system, and has a direct impact on the cost and profit of the enterprise[5-6]. Every penny of the reduction in purchasing expenditure can be directly converted into the direct profit of the enterprise. Because of the huge leverage effect on the profit of the enterprise, purchasing has become one of the most valuable parts of the enterprise's supply chain management. However, in the actual operation of the company, procurement has become one of the bottlenecks restricting the development of the company. In order to ensure the continuous production of the company, the company has to bear long-term high inventory and a large amount of capital occupation due to high inventory. With the intensified market competition, methods such as multi-stock inventory, multi-source supply, price priority and other methods in traditional procurement models have begun to restrict and hinder the development of enterprises. More and more enterprises have begun to pay attention to supply chain management. On the basis of chain management, the procurement process is optimized, the company's supply channels are constantly stabilized, the company's procurement cost is reduced, the company's procurement efficiency is improved, and the company's competitiveness and competitive advantage are maximized [7-8].

Based on the analysis of the functions of data mining, the role of procurement management and the application of data mining in supply chain management, this paper takes company A as an example to describe and improve its procurement logistics optimization goals and procurement organization structure. Finally, this paper through the comparison of the results before and after the optimization of procurement logistics, it can be seen that the company's procurement efficiency has been significantly improved, the procurement cycle has been greatly shortened, and the procurement cost has been significantly reduced.

2. Research on Procurement Logistics Optimization of Supply Chain Management Based on Data Mining Technology

2.1. The Function of Data Mining

(1) Business Intelligence

In the field of business intelligence, it is important to understand and fully interpret the business information of customers, markets, supplies and resources, as well as competitors. Business intelligence technology provides views of the past, current and long-term forecasts of business operations, including reports, online analysis and processing, business performance processing, competitive intelligence, benchmarking, and predictive analysis [9-10]. Without the use of data mining technology, the market situation of industrial and commercial enterprises cannot be effectively analyzed, and the quality and performance of similar products cannot be compared through customer feedback. It is also impossible to know the counterparty and invest in their best to stabilize high-value customers.

(2) WEB Search Engine

The WEB search engine is actually a large-scale data mining application. It uses various data mining techniques in a comprehensive form, such as tracking, indexing, and searching. Search

engine is a severe challenge for data mining [11].

Secondly, WEB search engines can process data on the Internet or create models based on huge data sets. At the beginning of building the model, it must create a query sequencer to assign a predefined category according to the required query subject. Regardless of the online construction of the model or the offline application construction in the network, the application speed of the model in the network requires real-time satisfaction of users' queries.

(3) Feature Description and Distinction

1) Feature description: It is a general description of the general features or characteristics of a given object. The attribute description results can be displayed in many ways, such as pie charts, bar charts, curves, multi-dimensional data cubes, multi-dimensional tables, etc.

2) Data differentiation: compare the general characteristics of a certain type of data with the general characteristics of another or more categories of data.

2.2. The Role of Procurement Management

(1) Purchasing creates conditions for companies to ensure supply, maintain smooth flow, and reduce the risk of out-of-stock. The supply of materials is a prerequisite for production. The raw materials, equipment and tools required for production are provided by the supplier. Without supply, there would be no production conditions and no materials, and thus no production.

(2) Quality assurance is an important part of procurement. The quality of the material determines the quality of the product. Whether a specialized product can be produced depends on the quality of the raw materials and equipment provided by the supplier.

(3) The main means of cost control. Supply cost is the main part of production cost, including supply cost, purchase cost, warehousing cost, warehousing cost, working capital cost and management cost, etc., strengthen the organization and management of procurement and procurement, save money, Reducing storage costs and accelerating working capital turnover play an important role.

2.3. Application of Data Mining in Supply Chain Management

(1) Product quality. Product quality is the index that best reflects the strength and technical level of an enterprise, and is the most direct manifestation of the value of an enterprise. It can be accepted by people and is the first level of evaluation indicators. Only through in-depth product evaluation can we provide the most direct reference basis for the establishment of a cooperative relationship. Product quality evaluation mainly includes product qualification rate, quality system certification, anti-repair return rate and so on.

(2) Price, mainly including product price, discounted quantity, transportation cost, etc.

(3) Product development and production. This aspect mainly includes the relevant technical capabilities and operational management capabilities that the company has mastered in the process of operation and management. The evaluation indicators include the following aspects: technology research and development capabilities and speed, adaptability to new technologies, current equipment and manufacturing capabilities, and so on.

(4) Service. Including service standards, communication and feedback capabilities, and service improvement capabilities. The supply chain focuses on the close team partnership between enterprises. A good partnership can help improve logistics efficiency and enable the supply chain to play its maximum role. The establishment of a good cooperative relationship requires systematic support, and the active participation and support of partners in organizational structure, human

resources, cooperation and exchanges, etc. This kind of support is the guarantee and basis for maintaining the supply chain strategic partnership and the win-win cooperation between the two parties.

3. Experiment

This article takes A company as an example to study its procurement logistics optimization management.

3.1. Purchasing Logistics Optimization Goals

(1) Reduce the Material Procurement Cost of A Company

For a company, if it wants to improve its operating efficiency and maintain its long-term competitiveness in the market, the usual approach is to reduce its operating costs as much as possible without affecting the customer's demand for product quality. Cost reduction can be achieved in the various processes of business operations. From a supply perspective, every dollar saved in commission costs will directly translate into corporate profits. Therefore, the saving of procurement costs is considered to be a very important point in the reduction of business operating costs.

(2) Shorten the Material Procurement Cycle of A Company

The length of the material procurement cycle is also a very important factor for maintaining the company's long-term market competitiveness. As a company, in order to better cater to the market and meet customer demand for products, so that more customer orders can be obtained, how to shorten the delivery cycle is very important. The optimization of the company's procurement process, the enhancement of communication between departments, the appropriate arrangement of personnel positions, and the improvement of supplier management capabilities can effectively shorten the material procurement cycle.

(3) Strengthen Cooperation with Suppliers and Improve Company A’s Supplier Performance Management System

In the supply chain environment, in order to maintain a competitive advantage, in addition to optimizing internal resource allocation, smooth cooperation with suppliers is also one of the key factors. For Company A, it can become a long-term strategic partner with its suppliers, and both parties can reach a strategic procurement and supply plan, avoiding additional cost losses caused by information asymmetry to the greatest extent.

3.2. Improvement of the Procurement Organization Structure

Supplier development and management services are generally regarded as the initial stage of procurement. The main task at this stage is to find suitable suppliers, and review the basic information and supply qualifications of the suppliers, inquire and compare prices in time after obtaining material demand information, and maintain the corresponding information in the SAP system. In addition, it is also necessary to regularly evaluate the performance of suppliers in accordance with company requirements, and make corresponding countermeasures based on the results of the evaluation.

Daily material purchase and order tracking business. The main task is to generate material purchase orders and send them to the suppliers based on the basic information of the materials maintained in the company’s SAP system and the corresponding suppliers according to the

production plan or the needs of the user department. According to the demand date of the materials, do a good job of tracking the order until the materials are delivered and put into storage. At the same time, the purchaser also needs to make corresponding adjustments to the order delivery in time to meet the needs of the production plan, and prepare a certain amount of safety stock. In order to manage the procurement work more reasonably and improve the procurement capability and operational efficiency of procurement, these two businesses must be managed separately.

3.3. ARIMA Model

The full name of the ARIMA model is called the autoregressive moving average model, or ARIMA for short, also denoted as ARIMA (p, d, q). It is the most common statistical model used for time series forecasting. It is mainly composed of three parts: AR model (autoregressive model) and MA model (moving average model), and the order of difference I.

The commonly used formula for difference operation is as follows:

$$y_t - y_{t-1} = (\alpha - 1) y_{t-1} + \varepsilon_t \tag{1}$$

$$\Delta y_t = y_t - y_{t-1} = (\alpha - 1) y_{t-1} + \varepsilon_t \tag{2}$$

$$\Delta(\Delta y_t) = \Delta^2 y_t = (y_t - y_{t-1}) - (y_{t-1} - y_{t-2}) \tag{3}$$

4. Discussion

Company A's work in optimizing the company's procurement process, from the initial preparation of the project to the implementation of the optimization plan confirmation function, and achieved remarkable results, took about a year in total. In the procurement process optimization project, the company's management and leaders at all levels provided strong support, and the relevant departments of the company also worked together to continuously promote the in-depth development of the project. By comparing the company's various indicators before and after the implementation of the procurement process optimization project, it can be seen that the procurement process optimization plan of company A has significantly helped the company's operations. See the following aspects for details:

(1) Reduction of Procurement Costs

The purchasing department and financial department of A company will make detailed statistics at the beginning of each month of the company’s various material purchases and the cost savings of various purchases, so that the purchasing department can find the cost savings of various purchases in time. The defects and weaknesses in the process, so that we can better communicate and negotiate with various suppliers. According to the latest information report released recently, after the implementation of the procurement process optimization program project, the procurement logistics cost of A company has been reduced by more than 10% compared with the beginning of the project, which has brought huge benefits to A company.

Table 1 and Figure 1 are the cost comparison before and after the optimization of the material procurement process for a product with a large demand from company A as an example:

Table 1. Comparison table before and after the optimization of the procurement cost of A company

Project	Before process optimization	After process optimization
Material scrap rate	4.3%	0.8%
Cost waste	16.2%	3.2%
Emergency procurement success rate	44%	90%

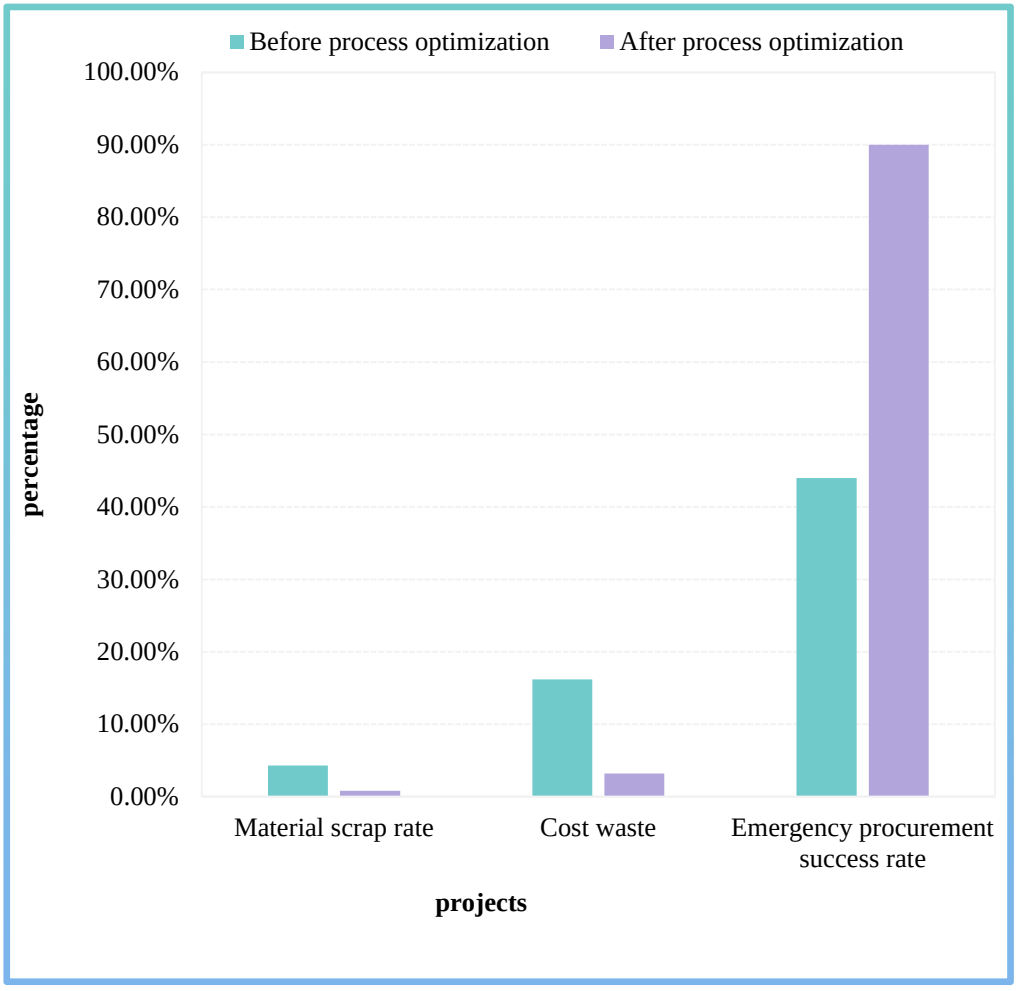

Figure 1. Comparison Figutre before and after the optimization of the procurement cost of A company

(2) Shorten the Procurement Cycle

After the implementation of the procurement process optimization project, company A's production raw material procurement cycle was shortened from ten weeks before optimization to three weeks, and non-productive raw materials were shortened from eight weeks before optimization to four weeks on average. Take a product as an example. The comparison of the time spent in each link is shown in Figure 2:

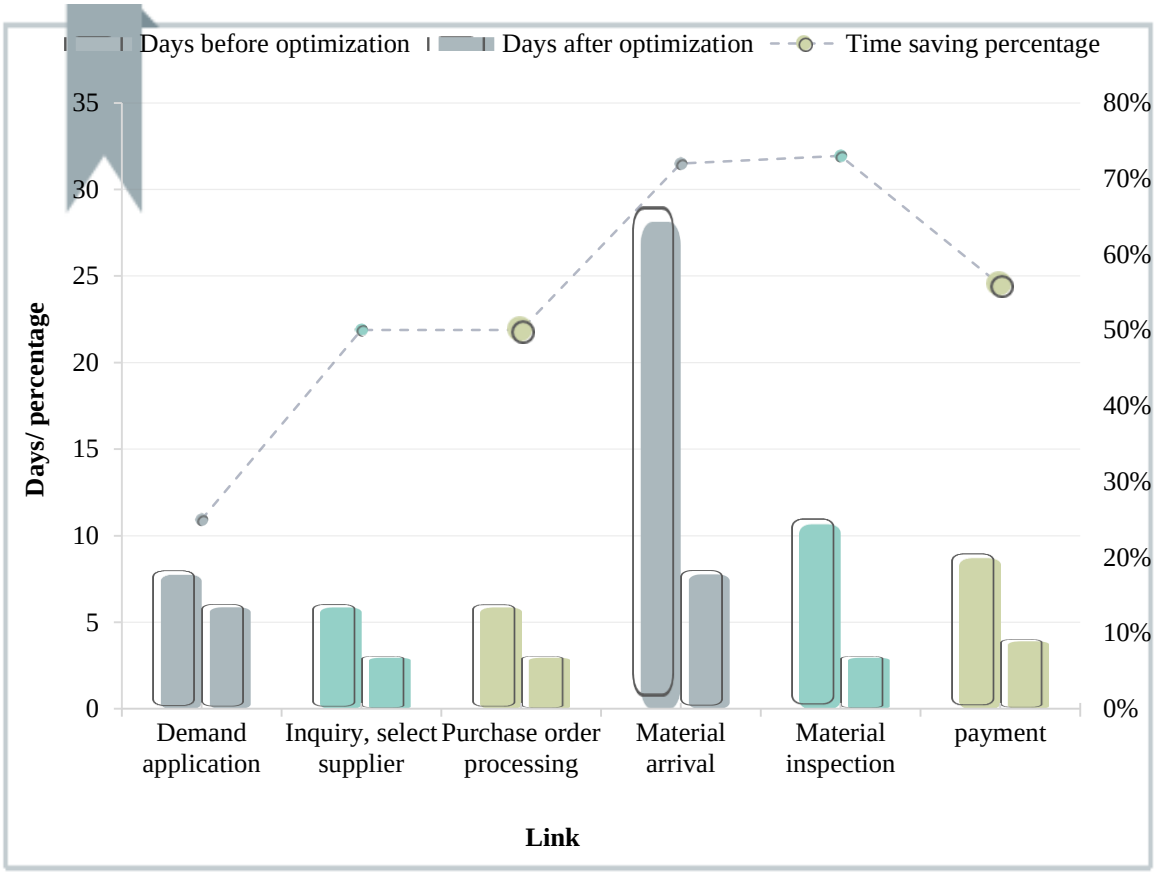

Figure 2. A comparison chart before and after the optimization of the procurement cycle of A company

5. Conclusions

With the acceleration of the economic integration development process of all countries in the world and the in-depth formation of a global competitive market, the challenges that enterprises need to bear and the pressure of market competition have become more and more serious. The traditional competition among enterprises is gradually being replaced by the competition among the entire supply chain, and it has gradually developed into a normal state. In the era of enterprise supply chain management, in addition to optimizing internal resource allocation, companies must also cooperate with external customers and suppliers to eliminate unnecessary links that do not add value to the supply chain, and work together to improve the flexibility of the supply chain and establish long-term strategic partnerships with suppliers and customers.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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