Application of Intelligent Dispatching in Urban Common Distribution with the Case of “Cargo Carpooling”

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Abstract: Urban distribution, as the main link of logistics, is not only one of the main bottlenecks in the logistics industry to reduce costs and increase efficiency, but also one of its main drivers. With the in-depth application of information technology in the industry, urban co-distribution has gradually become the main means of integrating resources and an important innovation point. Through the joint research and practice of "freight carpooling " platform company, this paper further clarifies the key role of "intelligent scheduling" technology in reducing cost and increasing efficiency in urban co-distribution.

1. Introduction

In 2018, the total cost of social logistics was 13.3 trillion yuan [1], with a year-on-year growth of 9.8% and a growth rate of 0.7 percentage points higher than that of the same period last year. As a major indicator to measure the operational efficiency of social logistics, the ratio of total social logistics costs to GDP in 2018 was 14.8 percent, 0.2 percentage points higher than the same period last year. Transportation costs (6.9 trillion yuan) accounted for 7.7 percent of GDP, down 0.3 percentage points from a year earlier. According to data released by China's warehousing association, more than 1 trillion yuan of total logistics costs are incurred by urban distribution.

Under the initiative of national ministries and commissions, the transport and planning research institute has provided good guidance and policy support for further realizing the cost reduction and efficiency increase of the logistics industry and promoting the standardization, informatization, scale, intensification and greening of the logistics industry. Urban co-distribution is based on the integration of goods delivery order or enterprises in the owner's demand [2]. At the same time, it can use of existing resources of transport capacity of urban distribution in vehicles to complete the fulfillment of as many city distribution goods as possible. So that, urban co-distribution could reduce logistics costs, improve logistics operation and management efficiency, and optimize the economic benefits of urban distribution in logistics industry.

“Cargo Carpooling” is a successful case of city joint distribution. With the “Cargo Carpooling” model, the number of urban distribution vehicles can be reduced with certain delivery needs. At the same time, based on the mastery of information and data on distribution vehicles, we can further optimize and explore the value of urban freight vehicles, and guide the logistics industry to use clean energy and new energy to complete logistics activities. Through the analysis of the successful case of “cargo carpooling”, this paper aims to understand the market positioning, application effect and application prospect of “cargo carpooling” and contribute to the benign and rapid development of the logistics industry

2. "Cargo Carpooling" Market Positioning

City common distribution is usually divided into two types. One is based on the use of a common urban distribution center node to achieve a common use of capacity resources by multiple cargo owners. This type of distribution is usually a point-to-multipoint distribution activity. The other type does not need to obtain the goods owner's order and cargo demand directly through the city

distribution center node, and realize the mode of joint use of capacity resources. This kind of distribution mode is usually a multi-point to multi-point distribution activity. This paper mainly studies and analyzes the second model called Cargo Carpooling, which is more complicated than the first one, but in terms of market demand, is also a common distribution mode that must exist for a long time. Since the freight carpooling has a clear service group in the market, the research mainly starts from five aspects: customer positioning, order positioning, service requirements, service mode, and capacity procurement mode.

2.1 Customer Positioning

"Cargo Carpooling" is mainly for small and micro logistics enterprises, small and micro-commerce enterprises and professional market enterprises with distribution needs [3]. Such customers are usually more sensitive to cost, have a certain degree of tolerance for timeliness, and require planned capacity arrangements and a stable supply of delivery services.

2.2 Order Positioning

The orders and goods of "Cargo Carpool" come from the logistics market, logistics park, wholesale market and industrial parks gathered by small and micro enterprises or warehouse logistics parks [4]. From the existing data, it can be summarized that its orders are characterized by small batches and multiple batches. The average order volume is less than 1m3 (actual data is 0.76m3), and the weight of the goods is more than 30kg, mainly serving some weights exceeding the weight requirements of express delivery goods.

2.3 Service Requirements

The "cargo carpooling" service needs to meet the requirements for the next day's arrival. For example, in Beijing, after the customer's order is placed, the goods must arrive on the second day (usually before 20:00, and the area must cover all administrative areas of Beijing, including Yanqing, Huairou, Shijingshan, Mentougou, Fangshan and other rural areas. In addition to distribution, the "Cargo Carpooling" service also includes value-added services such as loading and unloading (including upstairs), reverse logistics (including packaging), collection of goods (including freight) and POD (receiving receipts).

2.4 Service Mode

The service mode of "cargo carpooling" is mainly based on the O2O mode of the Internet, in which the customer (shipper enterprise) orders and check online, capacity (logistics main body) delivery offline [5].

2.5 Capacity Procurement Model

Usually logistics services (delivery capacity) have four procurement modes: self-operated, purchased, outsourced, crowdsourced [6,7], which is shown in Fig. 1.

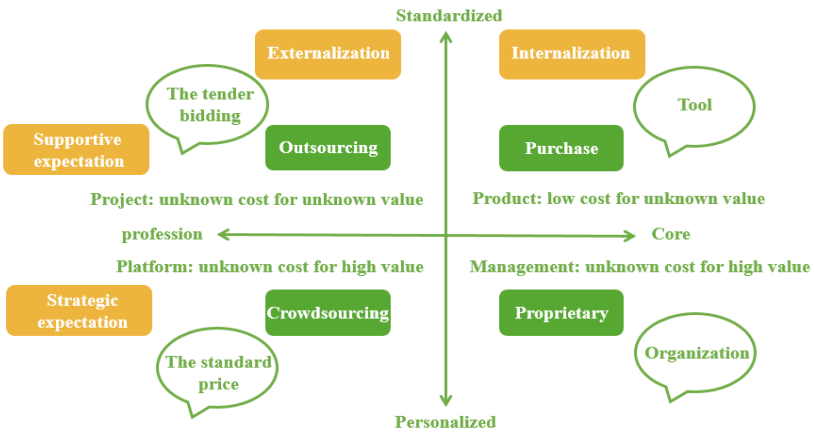

Fig. 1 Logistics service procurement model

The main capacity procurement mode adopted by “Cargo Carpooling” is crowdsourcing mode, which can reduce management investment and customer costs. This model realizes that the capacity unit is no longer a single enterprise service, and the cargo owner enterprise can have more choices. This is a comprehensive utilization mode of transportation resources.

“Cargo Carpool” mainly relies on mobile internet for placing orders. Through the Internet "cargo carpooling" can achieve efficient information transmission, information feedback, realize the management of long-distance distribution services, and complete the visual monitoring of the entire process [8]. At the same time, the application of cloud computing can provide multi-point and multi-channel login support for cargo owners, unified system iterative upgrade, maximize system efficiency, and reduce customer's own information investment.

3. "Cargo Carpooling" Intelligent Scheduling Application Effect

Nowadays, the mode of intelligent transportation of “cargo carpooling” has been carried out in Beijing and has achieved good application results. This paper mainly describes four aspects: reducing errors and errors, improving scheduling efficiency, improving transportation resource management efficiency and reducing customer cost.

3.1 Reduce Errors and Mistakes

Usually, an order for a city delivery must be handled by at least a customer, logistics company, dispatcher, driver, consignee, etc. In the process of document circulation, the person in charge of each link must fill in, record and count the information of the order. When the order quantity is large, there will be information transmission errors or mistakes, resulting in data deviation, which is undoubtedly a barrier for the application of intelligent scheduling. The “Cargo Carpooling” model gradually realizes paperless, transparent and automated through the system in order circulation, which can completely avoid this obstacle and reduce the mistakes. Users can share information in the whole process by entering and uploading at one time. Through statistics, the average customer entry order is within 15 seconds. If the order upload method can achieve the second-order completion of the thousand orders, through the system docking of some customers, the processing efficiency of the second-level 100,000-single can be realized, and the accuracy of 100% can be achieved.

3.2 Improve Scheduling Efficiency

Through comprehensive comparison of manual scheduling and system intelligent scheduling, intelligent scheduling has been exceeded manual scheduling in time and accuracy in multi-point to multi-point carpool distribution business scheduling process. The efficiency of intelligent scheduling in "cargo carpooling" mode and manual scheduling is shown in Table 1.

Table 1. Comparison of scheduling efficiency

Number	Project	manual scheduling	intelligent scheduling
1	The time of one hundred orders	20 min	less than 1 sec
2	The missing rate of one thousand orders	5‰	0
3	The retransmission rate of one thousand orders	9%	0

3.3 Improve the Efficiency of Transport Resource Management

Compared with manual scheduling, the “cargo carpooling” model has greatly improved the efficiency of transportation resource management, which is shown in Table 2.

Table 2. Comparison of efficiency of transport resource management

Number	Project	manual scheduling	intelligent scheduling
1	Distance of single vehicle	74 km	95 km
2	Capacity of one hundred orders	21.1 vehicle	18.6 vehicle
3	Value of single vehicle	557	633

3.4 Reduce Customer Costs

Compared with manual scheduling, first of all, the “cargo carpooling” mode reduces the distance, increases the vehicle's full load rate and the driver's bicycle income, and leaves an empty space for further cost reduction. Secondly, Intelligent dispatching can realize comprehensive use of more orders and more capacity, reduce the manpower required for the “cargo carpooling” platform, and reduce management losses by reducing the error rate. Thirdly, intelligent scheduling based on industry standards can reduce time and manpower investment by referring to standard algorithms when “cargo carpooling” opens up new areas. Therefore, the adoption of intelligent scheduling can reduce the cost of platforms, customers and industry.

4. The Application Prospects of "Cargo Carpooling" Intelligent Scheduling

4.1 Establish a “Floating” City Common Distribution Network

A “floating” distribution network within the city will be established gradually. “Multi-tower scheduling” in the city will be realized through the “smart dispatch tower” for collecting goods in different regions, which can reduce the "empty rate" several times and customer costs based on increasing driver income.

4.2 Promote the Development of Freight Public Services

Co-delivery has always had the attributes of “public service”. By establishing an “urban floating” distribution network and “multi-tower scheduling”, we can provide customers with lower-cost “temporary delivery” services. By sharing technical support for “green distribution”, the city’s truck traffic is further reduced.

4.3 Optimize Industry Management Data Services

Opening distribution data to industry management departments can provide decision-making reference for urban traffic optimization and cargo transportation management of industry management departments. Commercial guidance can gradually solve the problems of driver traffic, docking and loading and unloading, purify the industry market, reduce waste and pollution, and improve safety and efficiency.

4.4 Promote the Use of Clean Energy

That accumulate driver's service data and credit and provide drivers with financial leasing services, can promote the use of clean energy and new energy vehicles, which contribute to establish a clean energy capacity pool, and prioritize the use of clean energy capacity to guide drivers to replace traditional oil vehicles as soon as possible. At the same time, data accumulation provides a reference for decision-making in clean energy infrastructure construction, improving the efficiency of infrastructure use and further reducing the distribution cost of the entire city.

4.5 Deepen the Integration of Urban and Rural Areas

More than 25% of orders on the “Cargo Carpooling” platform is sent to the countryside. Reduce unit cost through carpooling service, reduce infrastructure construction investment through direct delivery, reduce delivery through day delivery, improve distribution efficiency through “smart scheduling”, improve cargo safety through driver guidance, and achieve energy saving and environmental protection through clean energy adoption so that Urban and rural integration will be

strongly supported. In addition, “cargo carpooling” can realize low-cost and far-distance distribution services, and provide more effective practical support for “Beijing-Tianjin-Hebei integration”.

4.6 Play a Standardized Role

The success of “cargo carpooling” depends on the construction and implementation of standardization, and the leading role of the system. By fully absorbing the standard requirements of smart logistics, logistics integrity, car-free transportation, rural logistics, etc., we will develop new modes and new formats of the logistics industry, promote the logistics industry to “reduce costs and increase efficiency”, create a good business environment, and lead the logistics development of transportation industry. The standard system of operation, marketing and technology can provide practical basis and experimental environment for urban public distribution standardization construction.

5. Conclusion

In the urban distribution, actively adopting the mode of common distribution, using advanced and efficient technical means is an effective means to achieve the national call and landing hand. The joint efforts of research institutions and enterprises can achieve better economic and social benefits. This paper clarifies the feasibility and importance of the application of “smart dispatch” in the common distribution mode of urban enterprises through the research and practice of a “cargo carpooling” platform in Beijing. It can provide practical basis and development experience for intelligent technology applications in the logistics industry.

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