Research on the Feasibility and Distribution Mode of Urban Logistics Distribution by Rail Transit

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Abstract. In modern economic and social development, rail transit is the lifeblood of new urbanization and high-quality development in urbanized areas. As a core element of economic development, logistics plays an increasingly obvious role in promoting economic transformation and high-quality development. Under the normalization of epidemic prevention and control, expand the comprehensive logistics distribution system and focus on the deep integration of urban rail transit in densely populated cities. It is very necessary to promote the extension of the supply chain and improve the quality and efficiency of urban logistics distribution.

1. Introduction
The prevention and control of the Covid-19 has become normalized. The Covid-19 in 2020 has had a profound impact on all walks of life in the country, including the logistics industry, and has profoundly changed people's production and lifestyle\cite{1}. Under the epidemic situation, all walks of life have put forward higher requirements for the timeliness and accuracy of logistics and distribution. However, the current logistics industry is facing the development trend of "multi-small, scattered and weak". This epidemic provides for the intelligent, systematic and ecologicalization of the logistics industry. A rare opportunity. The most notable features of cities that build and operate rail transit are dense populations and better economic development. In these cities, with the changes in the epidemic, the demand for online and non-contact services has increased substantially, and the growth rate and volume have been accelerating. As a form of logistics service that directly faces end users, urban distribution has always been a topic of discussion by experts and scholars in the field of logistics and its timeliness and economy.

In the process of urbanization, the spatial distance between production and life continues to increase, and the scope of activities becomes wider and wider. "Central cities" and "city clusters" have become the main trends in urban development. In urban agglomerations, people and materials are concentrated in various cities and flow between cities. The central cities of "urban agglomerations" have a wide radiation area, a large population, complex urban traffic operations, and great pressure, and road restrictions are often adopted. The measures have caused some enterprises to increase the capacity of vehicles by increasing the number of personnel and outlets. On the contrary, they increase the burden of urban traffic, expand road traffic safety risks, and hinder the transformation, upgrading and long-term development of urban logistics distribution. Under the premise of considerable progress and major changes in current urban development planning, with the continuous progress of...
distribution technology, the application of urban rail transportation to the urban distribution service system is a new choice for urban distribution service transportation. Rail transit efficiently solves the problem of human mobility in large cities.

Relatively speaking, minivans can carry less cargo, which also makes them more flexible in urban areas. Smaller vehicles allow them to travel freely on narrow roads and are not easily affected by urban restrictions. To a certain extent, it affects the traffic jam problem. Electric motorcycles, which are popular in logistics express delivery, have become the main tool for logistics end distribution. They not only have the characteristics of flexible and energy-saving, but also reduce transportation costs and improve the efficiency of point-to-point logistics distribution. However, due to the limitation of volume, it is difficult for electric motorcycles to carry large quantities of goods, and there are certain limitations.

Rail transit can largely meet the needs of large-scale and high-speed population mobility in modern cities. People are the elements of economic activities, and things are also elements. Rail transit has a strong influence on the flow of elements. The catalysis and promotion of the significance of the introduction of rail transportation into the urban distribution system, combined with traditional road transportation, makes the urban distribution system more in line with the needs of today's urban economic development. With the continuous strengthening of the urban infrastructure structure, the combination of modern urban rail transportation and traditional road transportation is increasing, and the urban distribution system that introduces rail transportation means has the premise and foundation for its realization.

2. Benefits of integrating rail transit into urban distribution

Compared with traditional road transportation, rail transportation has the characteristics of large transportation volume, high transportation speed, low cost, ecological environment protection, and small transportation resource occupation, which will effectively reduce transportation costs [2]. Adapting to the economic and social development of large cities in the post-epidemic era, alleviating urban traffic pressure, promoting the shaping of a comprehensive logistics distribution system, accelerating the flow of economic factors, improving the economic and ecological benefits of social development, and making logistics services better serve urban development.

2.1. Relieve traffic pressure and improve distribution efficiency

For cities with rail transit, the population is dense and the number of vehicles far exceeds the capacity of urban traffic. Many cities have a year-round limited traffic policy. In addition, during the epidemic period, urban residents prefer private cars for life and work. The epidemic situation is normalized. In the short term, the pressure on urban road transportation will continue to be at a high point. On the other hand, rail transportation has large volume and high speed, which not only fills the road transportation gap, but also increases the overall distribution capacity and greatly reduces the delivery time in transit. It has obvious scale effects and facilitates the implementation of non-contact distribution, which is useful for alleviating road traffic. Congestion, improving the efficiency of distribution is of great benefit.

2.2. Adapt to the smart and ecological direction of urban development

Rail transit makes extensive use of advanced transportation, information, security and other technologies, which is a clear sign of the construction of smart cities. The construction of smart cities promotes the automation and intelligentization of rail transit, and the development of rail transit promotes the comprehensive construction of smart cities. Very large and large cities face the problem of population and resource imbalance. In terms of realizing sustainable urban development and enhancing urban vitality, rail transit has unique advantages. The internal recycling of rail transit systems is energy-efficient and low-carbon compared to road transportation. Consider both epidemic prevention and control and production development.
2.3. Promote the upgrade of the city's integrated logistics distribution system

Economic development places high requirements on the high-speed, precise and flexible rationing of elements. Whether it is an organization or a group of individuals, logistics and distribution are required to be more agile and timely. The continuous expansion of the rail transit network is closely linked to the business, residents, and important nodes of the city. Becoming an important part of improving the city’s three-dimensional and comprehensive logistics distribution system. Proprietary lines and supporting facilities will transform the urban distribution logistics system, accelerate the integration of urban logistics enterprises, and closely connect with road transportation to form a more complete, scientific and efficient The urban logistics distribution mechanism promotes the systematic upgrading of the urban logistics distribution system and mechanism.

3. Feasibility analysis of rail transit used in urban logistics distribution

This article uses the mind map method to carry out the feasibility analysis of rail transportation in urban logistics distribution, focusing on the three parties involved in the rail company, distribution company and customer needs, to conduct detailed research, and more comprehensive and targeted analysis of rail transportation in urban logistics The feasibility of distribution is analyzed as shown in Figure 1.

![Feasibility analysis chart of urban logistics distribution for rail transit.](image)

Figure 1. Feasibility analysis chart of urban logistics distribution for rail transit.

3.1. Rail company aspect

Policy support: As an important component of infrastructure investment, my country's urban rail transit occupies a prominent position in the national five-year plan, reflecting the planned and periodicity of rail transit development. my country is the country with the most rail transit cities and the longest mileage in the world. Under the normalization of the epidemic situation, the "new infrastructure" represented by urban rail has become more and more prominent in the promotion of the economy. From the perspective of urban planning and development or population migration, urban rail transit is used in urban logistics and distribution to promote an integrated logistics system The construction of all has great development potential.

Independence of road rights: Urban rail transit has independent operating routes, and it undertakes advanced information, security, control and other technologies. The special operating environment allows rail transit to avoid the complex conditions of road traffic and realize material transfer at a higher speed. Furthermore, the close connection between rail distribution and highway distribution is realized in the system, and automated and intelligent high-standard urban logistics distribution services are provided.

Mutual benefit and win-win: Urban rail has a natural connection with urban logistics distribution and distribution companies in terms of operating time, means of delivery, transportation routes and transportation organization. The combination of grid-based rail transit and network-based distribution companies has promoted the full use of rail transit service urban development and helped distribution companies create new point-line connections, which have become a key part of three-dimensional distribution.
3.2. Delivery company aspect
Reduce costs: There are short-term peaks and long averages during the operation period of rail transit, especially in the post-epidemic era, when the passenger volume during normal periods is small and the fluctuation range is small[3]. The effective use of surplus capacity through logistics and distribution will not only help rail companies to dispatch vehicles and facilitate the travel of the masses, but also for distribution companies’ current methods of increasing road vehicles and spreading outlets to cope with the substantial increase in logistics demand. Transportation's standardization cooperation will greatly reduce the cost of personnel, materials, and operations of the distribution company.

Improve quality and efficiency: Rail transit is not only the main mode of transportation for commuting, travel, and movement of people in the urban area, it is also an important channel for regional development between the urban area and the sub-centers and intercity. Therefore, the organization, coordination, planning and design of rail transit cover the central area and development area of the city. The rail transit stations are widely distributed, which builds an efficient operation platform for the distribution center and terminal distribution of the distribution company, and promotes the intensification of logistics distribution resources.

Capacity empowerment: In view of the huge test of the explosive growth of online demand for the delivery company's capacity, it has the characteristics of diversified rail transit models, tailored to specific urban development and transportation needs, combined with the main rail transit models of my country as A, B, There are four types of C and D. The specific parameters are shown in the following table 1. Commonly used pallets and turnover boxes in distribution can be effectively used, which is helpful for automatic connection with road transportation. The most prominent of the highly integrated urban rail transit system is the system's specifications and standards, which not only enhances the capacity on the means of transportation, but also improves the overall efficiency in the middle section of the transportation which accounts for a relatively high proportion of the distribution, so as to realize the empowerment of the capacity. Inject new energy into traditional road distribution.

Table 1. Parameter table of main models of rail transit.

| Vehicle model | Effective length (m) | Width (m) | Capacity for single carriage (person) | Running speed (km/h) |
|---------------|----------------------|-----------|---------------------------------------|----------------------|
| Model A       | 22.8                 | 3         | 310                                   | 80-120               |
| Model B       | 19                   | 2.8       | 240                                   | 80-120               |
| Model C       | 19                   | 2.6       | 220                                   | 70-80                |
| Model D       | 22.8                 | 3.3       | 250                                   | 140-160              |

3.3. Customer requests aspect
Seamless connection: The joint operation of rail transit and distribution companies solves the demand for non-contact logistics and creates a smooth and tightly connected distribution channel. The collaboration of smart rail system and smart logistics and distribution promotes seamless connection and optimization of processes such as distribution, packaging, transportation, loading and unloading, and distribution. Provide customers with high-quality logistics service experience and build a solid platform.

Whole process tracking: Rail transit and distribution companies have advanced logistics technologies such as interconnection, Internet of Things, data processing, transmission, etc., which can realize real-time feedback of information transmitted between nodes, and have a substantial client user population, so that customers can fully understand their needs Logistics information and various notification methods ensure the safety of items and protect customer privacy, provide more customized services and construct a real-time interaction mechanism between customers and logistics companies.

Timeliness and precision: The modern economy has given birth to production models such as zero inventory, flexible manufacturing, and agile manufacturing, which reverse the reform of the logistics industry and have high requirements for logistics timeliness and precision. The networked layout of
rail transit, the reliability of transportation, and the distribution company's extensive sites and flexibility of transportation ensure the timeliness and accuracy of logistics, and lay a solid foundation for the various logistics needs of customers.

4. The operation mode of rail transit used in urban logistics distribution

4.1. Restructure logistics resources
Adjust and innovate the organization and coordination mode of urban logistics distribution, set up distribution nodes according to the functional areas of urban planning, realize the clustering of distribution objects, and improve the pertinence of distribution services. Reconstruct logistics resources in the region, design transfer centers and transfer service stations based on the integration with rail transit networks, subdivide business processes to promote the generation of distribution specialization, strengthen coordination and unity between processes, and improve the operating efficiency of the overall distribution mechanism. Regarding that the transfer center and service station are the key link between the distribution center and the customer, strengthen the construction and management of the transfer point, introduce automation and intelligent logistics technology, realize the combined transfer and combined transportation of rail transit and road traffic to a higher degree, and create favorable conditions. Efforts will be made to build a transfer center to transform and accelerate functions, and deepen the all-round integration of rail transit in the city's integrated logistics distribution system.

4.2. Combined passenger and cargo delivery
By analyzing the operation of rail transit in different cities, sum up the time distribution characteristics of rail transit passenger transportation, and then design special cargo boxes according to passenger transportation demand and passenger embarkation and landing, and set up designated areas and safe areas for passenger and freight intermodal transportation in the same direction, Classify and transfer in the transfer center, set up freight cars during the peak period of the passenger flow, arrange freight trains during the inspection period and the passenger trough period, or add freight ferry cars according to the platform conditions. Optimize the platform design of the transfer center, set up a large-scale cargo transfer platform, strengthen the connection of passenger transportation, use new operation scheduling technology and equipment, establish a loading and unloading auxiliary system including identification, transportation, and circulation, divide the transfer area, and meet the premise of meeting the efficiency of passenger transportation, To strengthen the passenger-cargo combination from all levels[4].

4.3. Small items delivered with customers
According to passenger flow, rail network and item flow information, a mode for passenger-to-station small goods to be distributed with passengers can be set. Based on instant messaging software and rail transit clients with a good user base, it provides real-time item distribution node information and delivery progress. Choose pick-up and delivery services according to the itinerary and the transfer point. Based on big data, cloud computing, Internet of Things, blockchain and other technologies, and formulate incentives and incentive measures to encourage passengers on the way to bring small items to the express site to realize the safe and complete connection of the last mile of item delivery.

5. Conclusion
The logistics distribution and delivery services carried out by urban rail transit have great potential value to urban economic development. It can not only share the pressure of road logistics and transportation, but also deepen the potential use value of public service facilities. The construction of the rail transit distribution system makes the distribution of goods shift from above ground to underground, which greatly relieves the traffic pressure in the city and becomes a shared economic development model. Therefore, it is necessary to use rail transit to accelerate the operation efficiency
of logistics distribution and systematically build a rail transit distribution operation mechanism by rationally designing container containers, optimizing platform facilities, constructing a distribution network, and increasing the training of logistics practical talents. Realize convenient urban logistics distribution, make full use of the remaining resources of rail transportation to construct a distribution system, and provide powerful measures for the development of urban logistics distribution in the new era.

Incorporating rail transportation into the current urban distribution system can improve the overall operational efficiency of the urban distribution system and better meet the needs of modern urban development. In the long run, the quality of the urban distribution system is important to the degree of modernization of a city. The indicators are of far-reaching significance for the improvement of the city’s distribution system to enhance a city’s economic strength and improve its overall competitiveness.

Economic development and social progress are centered on this person. Rail transit is integrated into the urban logistics distribution system, which is a requirement for the evolution of a modern city. It is also a manifestation of optimizing the economic structure, converging industrial efficiency, and inter-industry collaborative innovation to enhance the comprehensive competitiveness of the city. Create a more convenient and happy life for citizens.

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