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Improvement of Logistics Operation Efficiency Based on Network Freight Transportation and Analysis of Its Economic Benefits

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Abstract: - In this paper, firstly, we construct the road cargo transportation monitoring system of network platform, in which we design the functional modules, construct the feature set of vehicle-cargo matching as well as feature screening, and complete the feature extraction of vehicle-cargo matching. And the logistics prediction model is constructed through Stacking integrated learning, and the meta-learner is used to train and test the training set and test set to obtain the prediction results of vehicle-cargo matching on network freight transportation platform. The results show that, in terms of operational efficiency, the time used for order taking in traditional logistics is 11.94 times that of network freight, the time used for picking up goods in traditional logistics is 2.38 times that of network freight, the time used for order taking to delivery of goods in network freight mode saves 21%, and the average score of customer satisfaction in network freight mode is 29.55% higher than that in traditional logistics mode. In terms of economic benefits, the average monthly net profit of traditional logistics is 1,057,800 yuan, and the average monthly net profit of network freight transportation is 3,101,800 yuan. It is verified that there are obvious advantages of network freight transportation both in terms of operational effectiveness and economic benefits.

Keywords: network freight transportation; logistics operation efficiency; economic benefit analysis; monitoring system; logistics forecasting model

1. Introduction

With the growing team of logistics industry practitioners, as well as the rapid development of the Internet industry, the combination of the two produces a new logistics business model, a network freight transport platform began to develop and grow [1]. The development of network freight can effectively realize the standardization and centralization of the entire logistics industry, can integrate the road transport resources, reduce the empty return rate, thus promoting the development of the traditional logistics industry to intelligent logistics. Network freight is developed on the basis of road freight NVOCC, network freight that is, network platform road freight transportation operations, refers to the network freight operators bear the responsibility and obligations of the carrier, is the first responsible for the entire transportation risk [2]. In terms of network freight transportation, the ability to carry out transportation, can carry out transactions is the key to the landing of the model, extremely test enterprise industry background and comprehensive strength [3-4]. Network freight this innovative model for the traditional road logistics transportation to bring intelligent, efficient development, to solve the traditional logistics industry, small, scattered, chaotic, poor situation, to achieve so that the owner has a car to choose, the driver has the goods can be transported, to solve the long-standing pain points in the industry,

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has a wide range of application value and market value [5].

In recent years many scholars have studied the network development of the logistics industry, literature [6] pointed out that the development of network logistics strategy can be summarized as a series of strategies, such as talent strategy, speed strategy, business expansion strategy and the establishment of a large logistics distribution center strategy. Literature [7] that network freight development now mode includes network freight division of labor and cooperation development mode, traditional logistics and network freight coexistence development mode, as well as traditional logistics development mode. Literature [8] believes that network freight should be modern logistics center to create a good logistics environment for the development of network freight. Literature [9] points out that network freight should be made to develop faster by reforming the logistics guidelines so that it has greater transportation resources and the advantages of network operation. Literature [10] introduced the basic principles of Petri nets in its research, established network freight detection model, and improved the basic algorithm of shortest path. Meanwhile, it is believed that the basic simulation algorithm should be used in the network with small road density, and the improved simulation algorithm should be used in the network with large road density, which can reduce the amount of computation and improve the work efficiency. Literature [11] for the shortest path calculation problem in operations research, combined with the status quo of network freight transportation proposed the definition of network freight critical points and the algorithm of subtree connectivity, and analyzed the economic benefits under the network freight transportation model in the experimental urban area.

In this paper, we first construct the network platform road cargo transportation monitoring system architecture, through the design of different modules in the framework of the transportation monitoring system, the vehicle terminal package can realize the data collection of temperature and humidity, light intensity and vehicle inclination in the process of logistics transportation. The positioning module is responsible for collecting the location information of the vehicle, the local storage unit stores the information, and the on-board power supply is the power supply. The data transmission unit, under the function of the wireless communication module, uploads data to the data processor through the communication interface, which uploads the collected data to the cloud platform database through the communication module, realizing the monitoring function of the network platform for road cargo transportation. At the same time, it constructs a feature set of vehicle and cargo matching of the network freight transportation platform, and screens the vehicle and cargo matching features to realize the feature extraction of vehicle and cargo matching of the network freight transportation platform. In order to accurately match the network freight platform cargos, the Stacking integrated learning prediction model is also constructed, through which the network freight platform cargos matching prediction results are obtained. The prediction function is the embodiment of the innovation of the traditional logistics business model under the background of big data, which lays a solid foundation for the development of the logistics industry in the future.

2. Network platform road cargo transportation monitoring system architecture

2.1 Architecture

The architecture of the network platform road cargo transportation monitoring system is shown in Figure 1, which consists of logistics vehicle-mounted terminal, data transmission module and logistics monitoring center

[12]. The logistics vehicle-mounted terminal includes a variety of sensors, which can complete the data collection of temperature and humidity, light intensity, and vehicle inclination in the logistics transportation process. The positioning module is responsible for collecting the location information of the vehicle, the local storage unit stores the information, and the vehicle power supply is used as the power supply of the monitoring terminal. The data transmission unit adopts NB-IoT as the wireless communication module, the sensor uploads data to the STM32MCU through the 12C communication interface, and the MCU uploads the collected data to the cloud platform database through the NB-IoT communication module [13]. The logistics monitoring center includes an access terminal and a cloud server. The cloud server completes data storage and processing, and the access terminal completes data interaction with the cloud platform as well as services such as monitoring, management, and abnormality alarms for vehicle environmental data.

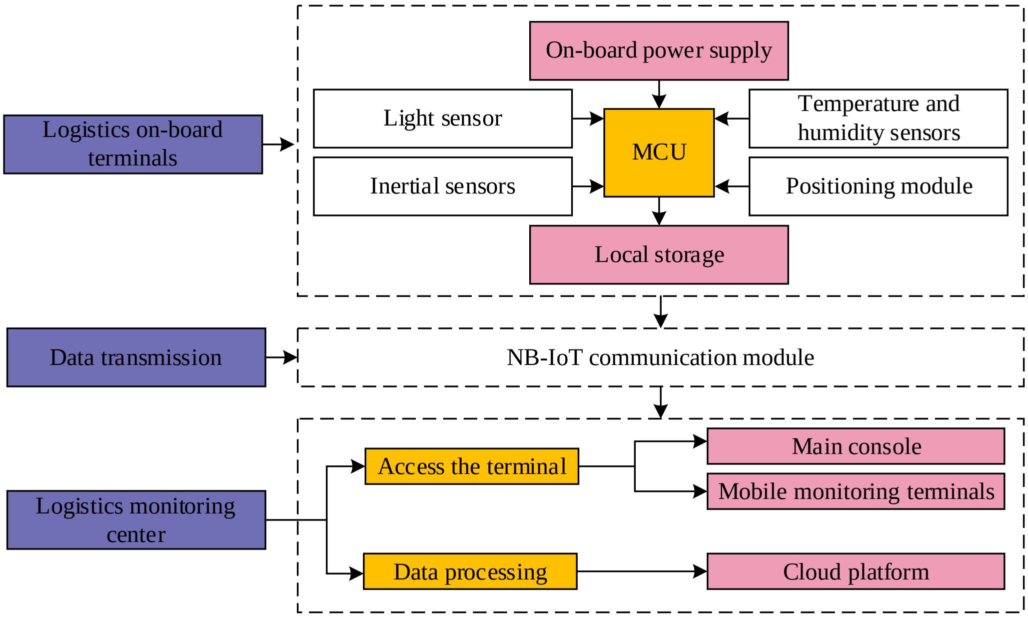

Figure 1 Network platform road freight transport monitoring system architecture

2.2 Hardware Design

The hardware structure of the logistics monitoring terminal is shown in Figure 2. The logistics vehicle monitoring terminal is mainly composed of STM32, local storage module, sensor module, GPS positioning module, NB-Io communication module and peripheral circuits.

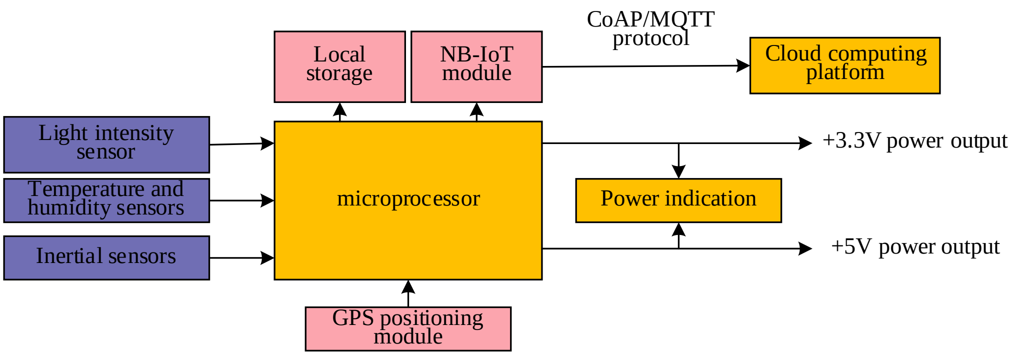

Figure 2 Logistics monitoring terminal hardware structure

2.2.1 Microcontrollers

The microprocessor used in this application is STM32, which, as the main control of the system, is not only responsible for processing the information, but also for communicating the different modules. It needs to remain powerful at high voltage and high consumption, connecting to the modules through various ports and communicating the resulting data after synthesizing them. Its advantage lies in the smaller development cost and extremely cost-effective [14-15].

2.2.2 Local storage

Real-time data collection and uploading is the focus of attention, and in the event of network fluctuations, after the data is uploaded to the cloud platform, all data should be backed up to prevent incorrect uploading and data loss. The system uses a MicroSD card with a capacity of 4MB, also known as TF card, and the data stored in the TF card is exported to the PC through the USB port.

2.2.3 Sensor modules

In order to ensure the real-time monitoring of various types of information of logistics in the mobile terminal, temperature and humidity sensors are added in the design process to monitor the temperature and humidity of logistics, the acceleration of the vehicle is measured by inertial sensors, and the intensity and time of the logistics subjected to light is detected by light intensity sensors; in addition, the shock vibration and inclination angle can also be reflected in the mobile terminal [16-17]. Among them, the temperature and humidity sensor adopts DHT22, and the single bus DATA pin is connected to the external pull-up resistor and the I/O port of the main control chip to collect the temperature and humidity information in the logistics transportation process. Illuminance sensor selected BH1750, built-in A/D converter, and the main control chip using 12C bus protocol communication, the collection of light intensity data in the logistics and transportation process. The inertial sensor uses MPU-6050 six-axis acceleration sensor to collect the tilt angle and acceleration information in the logistics transportation process [18].

2.2.4 Positioning module

This system provides a variety of choices for the positioning module, in order to minimize the impact of intermediate obstacles on positioning, the selection of Zhongke Micro STGM332DGPS positioning module to monitor the vehicle's current real-time position (latitude and longitude), driving speed, altitude, etc., which communicates with the main control chip through the serial port [19]. When meeting obstacles on the way of transportation, GPS signal is weak, affecting the real-time monitoring of the position of the logistics vehicle, at this time to take the navigation position projection method to calculate the position information of the logistics vehicle.

2.2.5 Communications module

NB-IoT module is selected for communication module for remote wireless transmission of data.BC95 module is selected for NB-IoT module.The module supports UDP and CoAP protocols and communicates with the main controller through serial port.The data collected by the wireless sensing network is first sent to the NB-IoT network, and then sent to the cloud server to realize the forwarding of data [20].

3. Prediction of vehicle-cargo matching based on machine learning algorithms

3.1 Feature extraction for vehicle-cargo matching on network freight transportation platforms

Feature extraction on network freight platform cargos matching is the process of converting the raw data of network freight platform cargos matching into features using relevant methods. To extract features from the original data of network freight platform cargo matching, the first step is to understand the relevant indicators affecting cargo matching, and then, according to the actual business situation, convert the collected original data into features that meet the actual business characteristics [21].

3.1.1 Matching feature set construction

Network freight platform car and cargo matching, mainly refers to the role of the network freight platform, the owner and the owner of the car together, to complete the matching of goods and vehicles. Therefore, the key to the success of vehicle and cargo matching is the vehicle and cargo parties. In this paper, the feature set is constructed based on the indicators and their related contents that affect the vehicle-cargo matching of network freight transportation platform. Several main factors of car-cargo matching are as follows:

(1) Load, i.e., the number of transportation vehicles required to deliver this cargo [22]. According to this indicator, it can be judged whether there is overloading or multiple transportation of multiple vehicles for many times. The formula about the load volume can be described as equation (1):

$$c = \frac{a}{D} \tag{1}$$

In the formula, a indicates the number of goods, and D indicates the unit vehicle load.

(2) If the separate analysis of the cargo owner's requirements for the length of the vehicle or the length of the vehicle owned by the owner of the vehicle does not have practical significance, so the two should be linked together to analyze, through the length of the similarity index can be achieved by the linkage between the two, described as equation (2):

$$B = \frac{f}{M} \tag{2}$$

In the formula, B indicates the car length similarity, f indicates the car length requirement, and M indicates the car length.

(3) Model similarity is mainly manifested in the requirements of cargo owners for models, and Table 1 shows the types of model similarity, which are divided into four categories.

Table 1 Types of vehicle model similarity

Serial number	Type
1	The cargo owner has no restrictions on the vehicle model

2	The cargo owner's vehicle model requirement is consistent with the vehicle model the owner has
3	The cargo owner's vehicle model requirement is basically consistent with the vehicle model the owner has
4	The cargo owner's vehicle model requirement is inconsistent with the vehicle model the owner has

(4) Usually, the owner of the vehicle has a certain preference for applications for transportation issued by a familiar owner, and this indicator can be measured by the volume of units traded between the two in the previous year.

(5) This indicator makes it possible to determine the type of vehicle suitable for the transportation of the current cargo and the owner's preference for the type of cargo to be transported. Usually this preference is determined by the level of revenue, which can be used to transport the price of goods per kilometer unit as in equation (3):

$$H = d / b / g \tag{3}$$

In the formula, H indicates the price of transportation of goods per kilometer unit, d indicates the total price of the order, b indicates the distance of transportation, g indicates the weight of goods.

(6) The cargo delivery address is related to the route of cargo transportation, and has an important connection with the owner's preferences. When matching the transportation routes, it is not necessary to do accurate matching, and you can use commonly used network maps, such as Baidu map for coarse matching [23].

According to the above indicators and combined with the actual situation of the specific business can be constructed network freight platform car cargo matching initial feature set.

3.1.2 Matching feature screening

Feature screening can be realized by packing screening, that is, all the features of the network freight platform car and cargo matching, packed in a specific algorithm for screening.Lasso regression model can compress the regression coefficients corresponding to the features of low value to zero, so that the model has sparsity, according to this characteristic can be selected to match features of the car and cargo of better quality, and its model is described as:

$$S(\omega) = \|y - X\omega\|^2 / n + \gamma \|\omega\|_1 \tag{4}$$

In Eq. (4), the feature vector is described by X, the response variable is described by y, the number of samples is described by n, the regulation parameters are described by γ, the regression coefficients are described by ω, and the L_1-paradigm number is described by $\|\omega\|_1$, which is used as a penalty constraint. Different regression coefficients can be obtained by changing different values of γ. When γ is large enough, the regression coefficients converge to zero, and the features corresponding to these converging regression coefficients can be rounded off to achieve the purpose of vehicle and cargo matching feature screening for network freight platforms [24].

3.2 Stacking's prediction model for vehicle-cargo matching on network freight transportation platforms

3.2.1 Stacking Integrated Learning Predictive Model Construction

For a single model, the phenomenon of diminishing marginal utility usually occurs in terms of prediction accuracy, in order to avoid this phenomenon, this paper adopts the Stacking integrated learning model for predicting the online freight platform car-cargo matching, which integrates multiple prediction methods together, and then forms a new prediction model, which will get a better performance than the separate model. The Stacking integrated learning model is shown in Fig. 3, which firstly divides the acquired feature set of online freight platform car-cargo matching and trains and tests the base learners of the first layer model to get the prediction results of all base learners, and generates a new dataset through these results, which is inputted into the meta-learner located in the second layer model to be trained and tested again. Model outputs the prediction results about vehicle and cargo matching on the web freight platform [25].

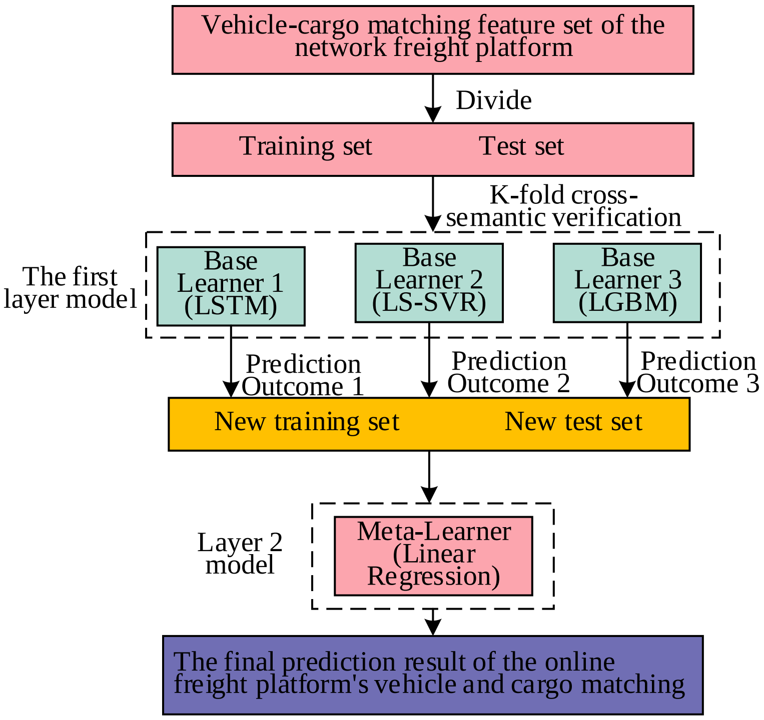

Figure 3 Stacking ensemble learning model

In the Stacking integrated learning model about vehicle and cargo matching prediction for online freight platform, the base learner selected for the first layer model is Stacking as least squares support vector regression machine Stacking algorithm respectively, and the second layer meta-learner uses Stacking linear regression algorithm.

Least squares support vector regression machine, referred to as LS-SVR. LS-SVR is an extension of the support vector machine, which can convert the quadratic optimization problem into a system of linear equations to solve the problem, and has the advantages of simple computation and fast convergence, and has a better performance in all kinds of prediction problems. Set the sample set of vehicle and cargo matching features of network freight platform as:

$$z = \{(x_1, y_1), ..., (x_m, y_m)\} \tag{5}$$

$$(x_m, y_m) \in Z, i = 1, 2, ..., m \tag{6}$$

The least squares vector machine regression for this sample is described as:

$$\begin{cases} \min A = \upsilon\upsilon^T / 2 + C\sum_{i=1}^{m} e_i^2 \\ s.t. y_i = \upsilon\Phi(x_i) + l + e_i \end{cases} \tag{7}$$

In Eq. The hyperplane normal vector is described by υ, the penalty coefficients by C, the paranoia vector by l, and the relaxation coefficients by e. The transpose is described by T, and the mapping shadow is described by Φ.

To obtain the minimum value of the objective function, the Lagrangian function description formula is established as:

$$L = A - \sum_{i=1}^{m} \alpha_i [\upsilon\Phi(x_i) + l + e_i - y_i] \tag{8}$$

The regression coefficient in Eq:

$$\alpha = (\alpha_1, ..., \alpha_i, ..., \alpha_m) \tag{9}$$

In order to find the optimal solution, the above optimization problem is converted into a problem of solving a system of linear equations and the formula can be expressed as:

$$\begin{bmatrix} 0 & Q^T \\ Q & H + C^{-1}I \end{bmatrix} \begin{bmatrix} l \\ \alpha^T \end{bmatrix} = \begin{bmatrix} 0 \\ y \end{bmatrix} \tag{10}$$

In the above formula, $y = (y_1, y_2, ..., y_m)^T$, $Q = (1, ..., 1)^T$ and $H = \Phi^T(x)\Phi(x')$ are satisfied and the unit matrix is described by I. The values of α and l are obtained in the above calculation process, on the basis of which the prediction model about LS-SVR is constructed for predicting the car-cargo matching of network freight platform, described by Eq:

$$y(x) = \sum_{i=1}^{m} \alpha_i k(x, x_i) + 1 \tag{11}$$

The kernel function is described by $k(x_i, x_j)$ in Eq.

3.2.2 Realization of vehicle-cargo matching prediction on network freight transportation platforms

The prediction process of vehicle-cargo matching for network freight platform based on Stacking integrated learning model is as follows:

(1) Determine the structure of the Stacking integrated learning model, select LS-SVR as the base learner of the first layer model in the Stacking integrated learning model, and select the linear regression algorithm as the meta-learner of the second layer model.

(2) The predicted feature set of online freight platform vehicle-cargo matching input to the Stacking integrated learning model is divided into two parts: the original training set and the test set T.

(3) The base learners in the Stacking integrated learning prediction model are trained by the K-fold cross-validation method, i.e., P is divided into K equal parts, denoted as $(D_1, D_2, ..., D_K)$, and each base learner treats one of the parts as the K-fold test set and the remaining $K-1$ parts as the K-fold training set. Using the K-fold training set, each base learner is trained, the prediction results are obtained using the K-fold test set, and the prediction results derived from each base learner are integrated to form a new dataset, which serves as the training set for the meta-learner.

(4) Predictions are made using all base-learner pairs and the average of the prediction results is obtained to the set $(T_1, T_2, ..., T_K)$, which is treated as the test set $T^{'}$ of the meta-learner.

(5) The meta-learner in the second layer model trains and tests the training set $D^{'}$ and the test set $T^{'}$, respectively, and then obtains the final prediction results of vehicle-cargo matching on the network freight platform.

4. Analysis of operational efficiency and economic benefits

4.1 Analysis of Operational Effectiveness

In order to verify the overall effectiveness of the network freight logistics operation mode, from the logistics monitoring system constructed in this paper, the 12 trucks of Y logistics company are extracted from the platform of the order taking time, pickup time, transportation distance of 2000 kilometers directly to the delivery of the order to the delivery time, delivery time, and through telephone communication to obtain the customer's satisfaction data for the freight distribution situation. As comparative data, it is necessary to obtain the order taking time, pickup time, freight time, delivery time, and customer satisfaction data on freight delivery from the records of Y logistics company in the original logistics distribution process.T denotes the traditional platform, and N denotes the network freight transportation.

Comparison of operational efficiency is shown in Table 2, 12 trucks of Y logistics company under traditional logistics management, the fastest time to take orders is 1.5h, and the longest time to take orders is 2.2h. And under the operation and management of network freight transportation, the shortest time to take orders for 12 trucks is 0.10h, and the longest time to take orders is 0.21h, and the time taken to take orders in traditional logistics is 11.94 times longer than that of network freight transportation. The main reason for the longer order taking time under traditional logistics management is that, under the network freight management mode, the driver checks the freight order through the platform to understand the volume and weight of the goods as well as the actual delivery address, and if it is determined that the goods can be delivered, the deposit will be delivered in the platform at the first time to grab the order, which saves a lot of time wasted because of ditching amount of time in the meantime. If the driver is unable to deliver the goods for other reasons, the deposit paid in the platform will be deducted. Traditional logistics managers still use the old method of telephone or WeChat communication to make verbal contracts with drivers after receiving freight orders. The communication process wastes part of the time, the driver receives the order to verify the volume and weight of the goods, as well as the actual delivery address, this process wastes a lot of time, thus resulting in the traditional logistics management under the acceptance of the order time than the network freight acceptance of the order time to take a longer period of time.

Under the traditional logistics mode, the driver's pickup time is 4.3h at the shortest and 5.7h at the longest, while the pickup time under the network freight transportation mode is 1.7h at the shortest and 2.5h at the longest, and the pickup time under the traditional logistics is 2.38 times as long as that of the network freight transportation. The main reason is that the network freight mode is the pickup time requirements, if beyond the platform of the pickup time, it is considered to give up the single behavior, not only can not deliver the single goods, the deposit delivered in the platform will also be deducted. The traditional mode, there is no pickup time requirements, so the pickup time all depends on the driver's subjective ideas, there is no guarantee of the efficiency of the pickup, so the traditional mode of pickup time than the network freight mode pickup time is much more. In essence, the traditional logistics mode of goods delivery time and network freight mode of goods delivery time is not much difference, but due to the pre-ordering time and pick-up time time gap is large, resulting in the traditional logistics mode of goods order to distribution time than the network freight mode of goods order to distribution time is 21% more than the mode of goods to distribution time. Through telephone communication with customers satisfaction issues can be seen, the traditional logistics mode of customer satisfaction with the highest score of 72 points, while the network freight mode of customer satisfaction with the highest score of 98 points, the average customer satisfaction score than the traditional logistics mode of customer satisfaction with the average score of 29.55% higher.

Table 2 Operational efficiency comparison

	Order receiving time/h		Delivery time/h		Time from order to delivery/h		Customer satisfaction/points	
	T	N	T	N	T	N	T	N
1	2	0.12	4.3	2.1	89	72	72	95
2	1.8	0.21	5.6	2.3	89	73	70	97
3	1.5	0.14	4.7	1.9	87	72	68	97
4	1.7	0.15	4.9	1.9	89	76	67	97
5	1.7	0.12	5.2	1.9	90	72	70	98
6	2.2	0.10	5.7	1.7	87	73	71	95

7	2.1	0.14	5.4	2.3	86	75	71	97
8	1.9	0.15	4.9	2.5	90	74	60	95
9	1.9	0.11	5.3	2.1	89	74	63	97
10	2.0	0.13	5.1	2.1	89	74	68	94
11	2.0	1.13	4.8	2.2	90	73	68	96
12	1.8	0.15	5.1	2.0	87	70	65	96

Through the above analysis, it can be seen that the network freight logistics management model studied in this paper has obvious operational efficiency no matter from the time of accepting the order, the time of picking up the goods or the time of accepting the order to the distribution, and the customer satisfaction is much higher than the traditional logistics management model, which has the ideal operational efficiency.

4.2 Analysis of economic benefits

In order to open up the market, Y logistics company will publish freight information in the network freight platform, drivers can grab orders in the platform, and Y logistics company also receives traditional logistics distribution, at the end of the year in order to assist the company's decision-makers to make strategic decisions, the profit situation in the traditional logistics mode and the profit situation in the network freight platform mode will be separated. In order to study the economic benefits of logistics based on network freight, Company Y was taken as the research object to obtain the monthly income statement of Company Y under the traditional logistics mode in 2022, as well as the income statement under the network freight platform model, including gross profit and net profit. Table 3 shows the monthly profit in 2022, the operating income of the traditional logistics mode and the network freight mode are showing a month-by-month upward trend, but the operating income of the network freight mode has been lower than the operating income of traditional logistics, and the average monthly operating income is 11.6414 million lower than the operating income of traditional logistics. The fundamental reason is that as an emerging technology product, the network freight platform has only begun to develop in recent years, and many enterprises and drivers do not understand this kind of big data platform, and are not willing to try unfamiliar platform operations. As a result, the operating income in the network freight mode is lower than that in the traditional logistics model.

Table 3 Monthly profits in 2022

	Operating income/10,000 yuan		Operating cost/10,000 yuan		Gross profit/10,000 yuan		Net profit/10,000 yuan	
	T	N	T	N	T	N	T	N
1	13608.03	12447.96	13279.03	11837.31	329.00	610.65	58.48	107.89
2	12102.20	12049.71	11917.44	11072.54	184.00	977.17	-56.00	178.42
3	13932.00	13368.77	13519.17	12367.88	412.83	1000.89	81.32	233.13
4	15901.00	13907.46	15377.25	13054.23	523.75	853.23	152.00	241.35

5	16982.28	14792.56	16455.28	13931.22	527.00	861.34	161.48	279.54
6	16491.50	15220.34	15913.53	14225.79	577.97	994.55	142.80	303.19
7	18092.00	15978.00	17640.00	15045.78	452.00	932.22	116.00	311.57
8	18701.80	17742.18	18248.80	16547.67	453.00	1194.51	122.20	346.81
9	21348.73	19337.51	20887.00	18206.50	461.73	1131.01	138.23	454.38
10	22971.35	21423.67	22543.04	20423.35	428.31	1000.32	101.23	403.77
11	23983.41	22964.33	23511.29	21998.18	472.12	966.15	148.43	461.59
12	22862.00	23774.18	22412.07	21774.32	449.93	1999.86	103.23	400.56

Through the analysis of the 2022 monthly income statement of Company Y's traditional logistics model and the online freight platform model, it reflects the trend between operating income and operating cost of Company Y's traditional logistics and online freight platform in the 2022 accounting period. Figure 4 shows the monthly revenue and cost trend, the operating cost of the traditional logistics mode and the network freight mode is also an upward trend month by month, and the operating cost of network freight is significantly smaller than the operating cost of traditional logistics, and the average monthly cost is 17.6826 million yuan smaller than that of traditional logistics. The average monthly net profit of traditional logistics was 1.0578 million yuan, and the average monthly net profit of network freight was 3.1018 million yuan. It can be seen that the operating income of traditional logistics is high but its cost is also high, while the operating income of network freight is slightly less, but the operating cost is also small, especially in August and December, the operating income is 11.9451 million yuan and 19.9986 million yuan higher than the operating cost respectively. Therefore, in the long run, the economic benefits of network freight are significantly better than those of traditional logistics.

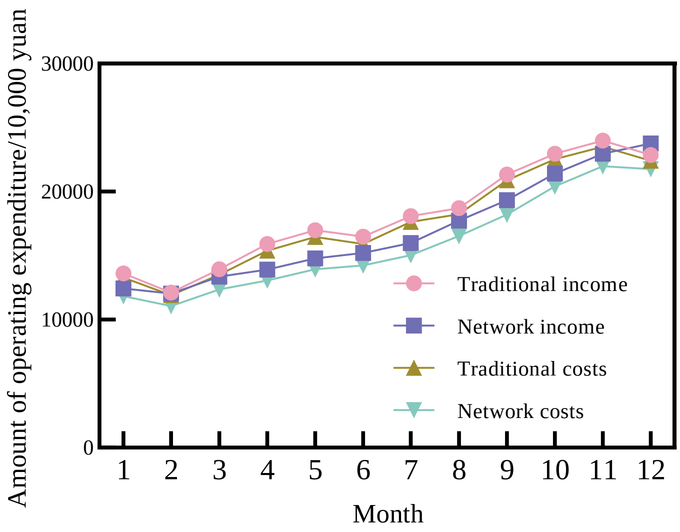

Figure 4 Monthly revenue and cost trends

5. Conclusion

In order to verify that network freight transportation can effectively improve operational efficiency and economic benefits, this paper firstly constructs the road cargo transportation monitoring system on network platform and designs the hardware within the system, which includes microcontroller, local storage, sensor module, positioning module and communication module. The preservation and processing of road cargo transportation data are realized through these modules. And the logistics monitoring center includes access terminal and cloud server, the cloud server completes the data storage and processing, the access terminal and cloud platform complete the data interaction as well as the monitoring of vehicle environment data, management, abnormal alarm and other services. And through the experiment, it is found that under the traditional logistics management of Y logistics company, the fastest order taking time is 1.5h and the longest is 2.2h, while under the network freight management, the shortest order taking time is 0.10h and the longest is 0.21h, the shortest traditional logistics pickup time is 4.3h and the longest is 5.7h, while the shortest network freight pickup time is 1.7h and the longest is 2.5h, the time used by the traditional logistics picking up order to distribution is more than the time used by the network freight. The time taken by traditional logistics from order taking to delivery is 21% more than the time taken by network freight transportation. The average monthly net profit of traditional logistics is 1.0578 million yuan, and the average monthly net profit of network freight transportation is 3.1018 million yuan. Therefore, in the future development of the logistics industry, the network freight transportation business model is more in line with the needs of economic development, and employment has obvious advantages of operational efficiency and economic benefits.

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