Customer satisfaction in concrete distribution

Abstract：Concrete distribution is an indispensable part of urban construction. How to meet the needs of customers and improve customer satisfaction while scheduling vehicles has become a research hotspot. Aiming at the vehicle scheduling problem in concrete distribution, and considering the priority distribution of large customers can improve the satisfaction of large customers, and at the same time improve the long-term benefits of enterprises. This paper introduces the characteristics of concrete distribution, and analyzes the existing problems of concrete distribution, and puts forward countermeasures from the aspects of increasing policy support, improving the information level of commercial concrete distribution, and establishing the standard of commercial concrete distribution, so as to provide methods for solving the scheduling problem.
***Keyword*: Customer satisfaction ; concrete distribution ; satisfaction model**

Introduction

1. Research status of customer satisfaction theory

The customer satisfaction index CSI (Customer Satisfaction Index) is a kind of index developed by some developed countries and regions for the objective economy. It is mainly aimed at customers and used to test the quality index of services. At the same time, customer satisfaction refers to the degree of satisfaction of consumers with the products and services purchased and the gift services. The comprehensive evaluation value of products and services is used to reflect the basic status of products. There are more than 20 countries and regions known to use these indicators[1].At the same time, more countries have begun to pay attention to the improvement of customer satisfaction in economic statistics, because with the improvement and development of the economic level, the development of the national economic level is not only the improvement of the production speed of economic resources, so on this issue, the analysis of customer satisfaction is also the primary issue of economic development[2].Customer satisfaction is a measure of customer satisfaction with the process after the purchase behavior. It not only measures the customer 's evaluation of products and services, but also belongs to the customer 's internal psychological experience. It also reveals the problems of enterprises in creating customer value and delivering value[3].

1.1 Review of customer satisfaction theory

Customer satisfaction refers to the customer 's feeling of the extent to which their expressed, usually implied or must be fulfilled needs or expectations have been met. It is a psychological experience. The term " customer satisfaction " was first proposed by American scholar Cardozo (1965).He believed that customers are mainly affected by two aspects. On the one hand, it is the customer 's efforts to obtain the product. On the other hand, it is the expectation given to the product. And customer satisfaction is not only determined by the product itself, but also related to the experience of obtaining the product, and finally found that repeated purchase behavior will occur when customers are satisfied with the product[4].
Li Shaopeng selected PDD online shopping platform as the representative. Through reading literature, issuing questionnaires and data analysis, the structural equation model with perceived value composed of hedonic value and practical value as the intermediary variable and customer satisfaction as the result variable was carried out. Descriptive analysis, reliability and validity test, and finally hypothesis test.
Wang Xin establishes a vehicle scheduling model based on customer satisfaction, and uses genetic algorithm to solve the analysis, which will provide some effective solutions for enterprises.

1.2 The background of customer satisfaction theory

Customer satisfaction theory is the product of history. With the change of market, customer consumption concept, enterprise management strategy and other factors, it is the result of the comprehensive promotion of various factors. One of the backgrounds is the great change of commodity supply and demand relationship and marketing mode[5].In order to adapt to the rapid changes in the market economy, many enterprises have begun to seek changes, and the market-centered business model has gradually shifted to a customer-centered marketing model. The evaluation standard of products and services has also been transformed into the evaluation index of customer satisfaction. In order to win more customers, obtain long-term competitiveness and more performance, enterprises must provide more satisfactory services to customers in order to increase their core competitiveness.
The change of customers ' consumption concept also promotes the development of customer satisfaction theory. In the era of lack of goods, the purpose of customer consumption is mainly to meet the basic needs. Customers focus on the basic functions of products and services and their cheap price advantages. Enterprises must meet customer expectations from all aspects of business and improve customer satisfaction with the enterprise.
The third background is that the business strategy of the enterprise has undergone tremendous changes. The basic element of enterprise survival and development is to produce and sell products and services that meet the needs of society and customers. With the development of the market economy, the competition among

enterprises has changed into the competition for customers. By meeting the needs of customers, enterprises can win the market and achieve a win-win situation between enterprises and customers. Winning customers can win the market, which requires enterprises to work around the core resources of customers in all aspects of production, sales, marketing, corporate culture and so on. With the development of the economy and the great changes in the market environment, the supply and demand mode of the market, people 's consumption concept and the strategic direction of the enterprise have undergone fundamental changes. All these changes have finally gathered to the important resource of customers. Therefore, the research on customer satisfaction by enterprises and researchers is increasing, and the theory of customer satisfaction is generated.

1.3 Customer satisfaction model construction

SOR is a theory proposed by cognitive psychology, which mainly describes the process in which external environmental stimuli (S) make the body respond (R) by mediating the body (O). The results of the influence of the body (O) are different. One of the important factors is that the psychological state of each intermediary body (O) when receiving external stimulation (S) is different ; eventually lead to different body reactions (R), SOR model diagram is shown in Fig.1. Mehrabian (1974) and other scholars believe that people do not live in a vacuum environment, we can easily receive the stimulation of the external environment, and have an impact on the internal psychological state of the body, and ultimately affect people 's behavior[6].The SOR theory was first used in the study of consumer behavior. It is believed that consumers ' purchase behavior is caused by external stimulation. External stimulation will affect consumers ' internal perception, generate purchase motivation or willingness, and then affect consumers ' behavior. The SOR theory can be used to link the external stimulation and internal perception of customers[7].

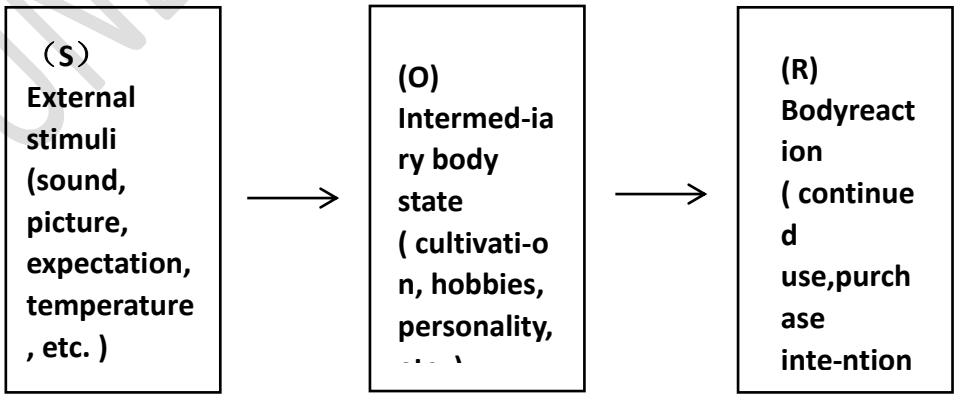
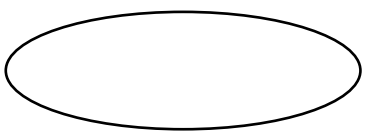


Fig.1 SOR theoretical model

In the article " Rural Tourists ' Emotional Experience : Occurrence Process in the Essence of Appeal " published by Yin Yingmei (2023), the SOR theory framework is used to analyze the occurrence process of rural tourists ' emotional experience,



and the effectiveness of SOR theory in analyzing emotional process is verified[8].

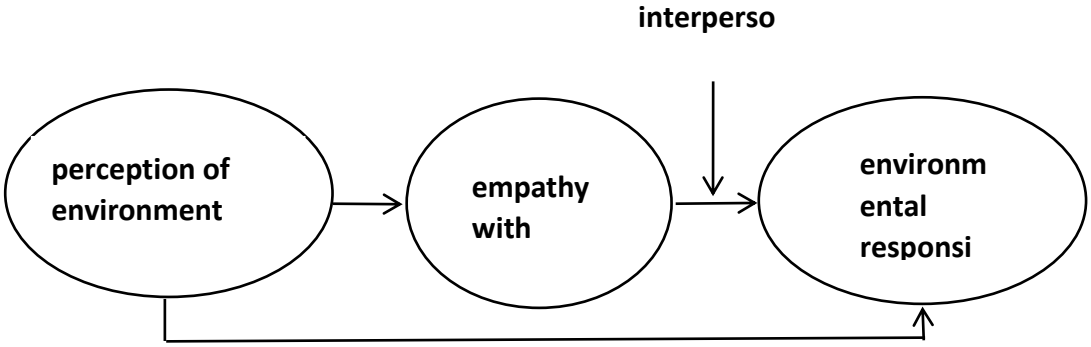


Fig 2 SOR theoretical model

1.4 The development background of customer satisfaction in China

The establishment of China 's Satisfaction Index (CCSI) evaluation system started late. In 1997, under the impetus of the China Quality Association and the National User Committee, the CCSI system research was started, and the top domestic academic institutions such as Peking University, National People 's Congress, Tsinghua University and the Academy of Social Sciences were jointly tackled, and the design of the national satisfaction index model suitable for China 's national conditions was carried out. In December 1999, the State Council issued the " Regulations on Several Issues Concerning Further Strengthening Product Quality Work, " which clearly stated that it was necessary to study and explore the evaluation method of customer satisfaction index.

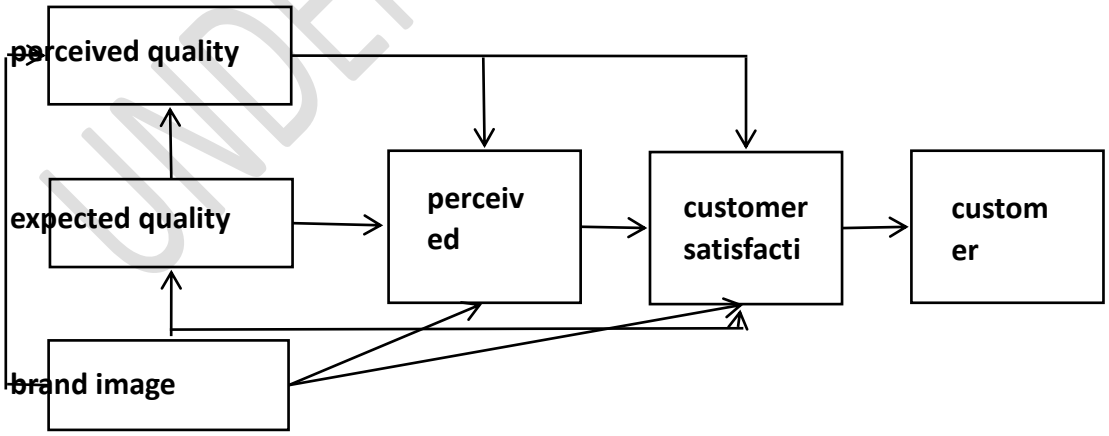


Fig. 3 China Customer Satisfaction Index (CCSI) model

CCSI is a quality evaluation method with Chinese characteristics, which is based on the American Customer Satisfaction Index (ACSI) and China 's national conditions and characteristics.

Through access to information and other ways to understand the status of customer satisfaction in vehicle scheduling, to understand the customer 's

requirements for priority scheduling, combined with the current problems and deficiencies in vehicle scheduling and other aspects, to make the best solution for concrete distribution. Through the investigation and research in this area, we can clearly understand more needs of customers, learn from the theoretical knowledge of customer satisfaction, and point out the direction of reasonable professional improvement for customer satisfaction, so as to promote the better development and improvement of enterprises.

2. Customer satisfaction in vehicle scheduling

Vehicle scheduling operation is a part of logistics distribution. Vehicle scheduling operation refers to the operation of reasonably dispatching vehicles to send goods from the distribution center to customers. Vehicle scheduling consists of distribution centers, goods, demanders, transport vehicles, distribution routes, various constraints and set goals. The distribution center is a cargo distribution center, which plays a role in transit, temporary storage and allocation. In reality, the distribution center generally exists in the form of stations, docks and urban transit stations. The goods are initiated by the supplier and reach the demand side through multiple distribution centers. Transport vehicles generally have the constraints of load and mileage, and are divided into ordinary cargo vehicles and professional special goods transport vehicles. In the general vehicle scheduling problem, the transport vehicle must return to the starting point in a distribution task. Distribution path, also known as transportation network, is an important reference element of vehicle scheduling. Proper selection of distribution path can save a lot of distribution resources and increase the scope of distribution[9].

2.1 Definition of logistics customer satisfaction

Logistics distribution can be divided into distribution center distribution, warehouse distribution and store distribution according to the distribution subject. Distribution basically needs to be based on the way of freight transportation. Enterprises need to fully allocate their own transportation capacity to meet customer needs to the greatest extent, and deliver goods to customers in the fastest and most economical way.

With the rapid growth of logistics volume and the increasingly fierce competition in the logistics industry, express delivery companies are not only concerned about the vehicle scheduling in the distribution process, but more importantly, the customer 's satisfaction with the distribution service, and the service provided by the express delivery company for the customer needs to match the customer 's own expectations. If according to the same standard for all customers of the enterprise to provide the same service, this will lead to some customers may not be satisfied, and some customers can accept the enterprise 's higher than its expected service, the former may be lost, and the latter may not be able to get higher than its

expected service, which caused the unreasonable allocation of resources. How to get the maximum customer satisfaction with the lowest cost has become the focus of attention of academia and enterprises in recent years[10].

2.2 Influencing factors of customer satisfaction of concrete distribution

In 2021, the national production of ready-mixed concrete will reach 3.3 billion cubic meters, an increase of 6.9 % year-on-year, and the market size will reach trillions. In the face of such a large market size and demand, most of the ready-mixed concrete enterprises in China have begun to expose drawbacks. Because of the lack of scientific concrete distribution scheduling system, they can not meet the growing demand of the market, and the profits of enterprises have fallen sharply. Therefore, a scientific distribution scheduling scheme is urgently needed to replace the traditional manual scheduling, so as to realize the transformation and upgrading of ready-mixed concrete enterprises.
With the rapid development of China 's economy and society, the demand for concrete in infrastructure industries such as construction and bridges is increasing. China has become the country with the largest production and use of concrete[11].Considering the problems of site, resources and efficiency, most of the construction parties use commercial concrete ; commodity concrete is also called ready-mixed concrete, which has the characteristics of centralized mixing, convenient construction and commercial supply[12].Since commercial concrete cannot be stored in finished products, and it is easy to condense for a long time, the requirements for timeliness are high. Therefore, it is extremely important to study the vehicle scheduling in the distribution process[13].In response to this problem, experts and scholars at home and abroad have done a lot of research :Tommelein et al[14].first identified the distribution problem of commercial concrete as a JIT (just-in-time) production process problem.

2.2.1 Concrete distribution

As a kind of logistics distribution method, concrete distribution not only has the commonness of logistics distribution, but also has its own characteristics[15]:
1.High degree of distribution specialization
The entire distribution process has a special concrete vehicle to distribute, and it needs to be continuously stirred throughout the transportation process to ensure its quality to meet the needs of the construction site. In addition, before loading and after unloading, the requirements for the tank are also strict, so as to avoid the residual concrete solidification in the tank affecting the quality of the concrete transported next time.
2. Concrete is not in stock

Unlike other commodities, concrete is only a few hours from its production to the completion of pouring. If the distribution cannot be completed within the specified time, the concrete will lose its original value.

3.Uncertainty of demand

The order of concrete is determined by the production progress of the construction site, and the progress of the construction site is affected by multiple factors such as weather and construction equipment, which makes it difficult to determine the demand for concrete[16].

4.Concrete distribution has strict time window limit.

Commercial concrete is a temporary transition product, and the distribution of concrete must be completed within the time window.

5.Restrictions on the scope of distribution

Due to the strict time window limit of commercial concrete, it takes a certain amount of time to complete loading, transportation and unloading, so the entire distribution range is limited.

6.Single model distribution

According to the different strength grades of concrete, there are many different types of concrete. In the process of concrete distribution, it is necessary to ensure that only one type of Tables1. Table 1: Concrete is installed in one vehicle.

classification	index
Before business occurs (A1)	Note on Customer Service from Concrete Plant (A11)
	Emergency Services Plan (A12)
	Customer Service Organization (A13)
Business in progress (A2)	Ordering Convenience (A21)
	Timeliness of delivery (A22)
	Delivery accuracy (A23)
	Safety of goods (A24)
	Inventory Availability Ratio (A25)
After the business occurs(A3)	Convenience of concrete supply (A31)
	Real-time tracking of concrete vehicles (A32)
	Effectiveness of Customer Claims and Complaints (A33)

Using the five-level scoring method, relevant data can be obtained by consulting industry experts in the form of questionnaires.
The weight coefficient of criterion layer A = (a1, a2, a3) = (0.22, 0.52, 0.26) can be obtained by AHP method.
The index weight coefficient before the occurrence of business is R1 = (r11, r12, r13) = (0.44,0.16,0.40).
The index weight coefficient in business occurrence is R2 = (r21, f22, f23, f24, r25) = (0.10,0.23,0.36,0.35,0.06).
The index weight coefficient after the occurrence of the business is R3 = (r31, r32, r33) = (0.31,0.26,0.43).
The index weight coefficient matrix is :

$$B = \begin{bmatrix} R_1 \\ R_2 \\ R_3 \end{bmatrix}$$

The weight coefficient of each index is
X = (X11, X12,... X33) = AB =
(0.05,0.09,0.08,0.04,0.12,0.18,0.15,0.03,0.10,0.08,0.08) Based on the analysis results, it can be seen that the factors in business occurrence are the most important. Among the specific indicators, the timeliness, accuracy and integrity of delivery are the indicators that customers are most concerned about.
Through the above analysis, the factors in the business is the most concerned about the customer.

2.2.2 Problems in concrete distribution

With the continuous development of urbanization in China, concrete has developed rapidly in various large, medium and small cities across the country, but there are still many problems in concrete distribution, which restrict the rapid development of concrete industry to varying degrees. Therefore, understanding these problems is an important step to realize the scientific, efficient and low cost of concrete distribution. On the basis of full investigation, we found the following problems in the field of logistics distribution[17].
1.Low degree of informatization of concrete distribution
At present, compared with the distribution of cold chain, medicine and other industries, the informationization of concrete distribution is still at a lower level, and the whole distribution activities can not be flexibly mastered, mainly in the following two aspects.
1) A small amount of information equipment
In the investigation of concrete distribution enterprises, it is found that except for a few qualified concrete distribution enterprises equipped with modern information equipment, most concrete vehicles are not equipped with GPS positioning system, vehicle monitoring system, fuel consumption detection system and other information equipment that can improve the quality of concrete distribution service. The application of these technical equipment will directly affect the

efficiency of concrete distribution.

2) Lack of information processing of distribution data

In the investigation of the existing concrete distribution enterprises, only a small number of enterprises have established the concrete management information system and the concrete distribution vehicle monitoring system. The former is used to manage the order information, vehicle distribution status, vehicle maintenance and payment and other information, while the latter is used to monitor the operation status of the distribution vehicle.

2.Low management level leads to high distribution cost.

At present, at the bottom of the specialization of concrete distribution management, the current concrete distribution management still belongs to experience management, and the theory of modern logistics is not applied to the whole process of concrete distribution, resulting in higher distribution costs, while concrete distribution belongs to heavy asset operation. Experience management is bound to greatly weaken the price competitiveness of concrete distribution and affect the survival and development of enterprises[18].First of all, in terms of time control, there is no scientific and rigorous plan, and it can not be timely delivered according to the needs of the construction site. There are many phenomena such as waiting for blanking on the construction site and waiting for blanking on the concrete mixer truck, and the quality of service is not guaranteed. Secondly, in terms of vehicle scheduling, many concrete manufacturers ' distribution scheduling of concrete mixer trucks is mostly subjectively arranged by dispatchers based on past experience. With the continuous change of concrete demand, how to effectively use the existing number of concrete mixers, maximize the transportation efficiency of mixers, and meet customer needs in a timely and effective manner has become the main problem of concrete distribution scheduling at this stage. Thirdly, on the route of distribution, the driving route of concrete mixer truck lacks scientific planning. Drivers often fail to understand the road conditions in time and empirically choose their own driving route. With the increasing pressure of urban traffic, the choice of unreasonable distribution route will inevitably affect the quality of concrete distribution service.

3.Lack of talent, lack of theoretical support

There is a general lack of talents in the logistics industry, and there is an extreme shortage of concrete distribution talents. Many staff engaged in concrete distribution are not professionals. Their professional level and quality are not high, and their service awareness is lacking. Some even do not master the basic knowledge of concrete distribution services, and their professional knowledge is even more impossible. There is a lack of professional guidance in the distribution scheduling and route optimization of commercial concrete, and the empirical scheduling affects the quality and efficiency of distribution service. In addition, when the distribution process encounters emergencies, such as vehicle failure during the distribution process, leakage of concrete during the distribution process, and other emergencies, it is not possible to comprehensively consider the solutions from a professional perspective, and there is a lack of professional treatment

methods[19].In the theoretical research, the theoretical research of concrete distribution is not deep enough, and a series of theoretical and technical problems need to be studied, such as the selection of concrete distribution mode, the location of mixing station, the optimization of vehicle scheduling and distribution path, and the construction of concrete distribution information platform. There are few studies, and there is a lack of effective guiding theory and technical support for concrete distribution.

4.The low degree of standardization of concrete transportation

Promoting logistics standardization is an inevitable choice to develop modern logistics industry. In the service of domestic logistics distribution, there are unified standards for the distribution of agricultural products, pharmaceutical distribution and passenger vehicle transportation. However, due to the respective operation modes of concrete distribution, the standards of concrete distribution are also different. The whole concrete distribution industry lacks both a reasonable and effective standard system and a unified standard criterion in terms of standardization[20].

1) Lack of uniform standards in the access system of concrete transport enterprises

The low entry threshold of the concrete distribution industry has led to a large number of enterprises that do not have concrete distribution standards to join the concrete distribution team, affecting the efficiency of the entire distribution industry.

2) Concrete transport lack of uniform standards

The main tool for concrete transportation is the concrete mixer truck, which lacks unified standards in terms of tank capacity, vehicle identification, and equipment informatization.

3) There is no uniform standard for loading and unloading of vehicles.

There is a lack of norms in the operation of loading and unloading of tankers, and there is a lack of uniform requirements for the tools and methods of loading and unloading.

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