A Study on the Influencing Factors of Takeaway Customer Satisfaction Based on Grey Relational Model

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Abstract: The takeout and ordering market of our country sprouted earlier. With the rapid development of mobile Internet, the takeout market base of our country is huge, the takeout and ordering industry is developing rapidly, and the appearance of takeout platforms such as Meituan further promotes the development and transformation of the industry. As a typical service industry, customer satisfaction has always been the key factor affecting the development of takeout and ordering industry. Under the background of the development of mobile internet, this paper divides the influencing factors of customer satisfaction into four dimensions: food factor, price factor, service factor and convenience factor, and sets up corresponding secondary indicators. Furthermore, the grey correlation model is introduced to analyze the influencing factors. It is found that food factor (r_1=0.8102), price factor (r_2=0.7261), service factor (r_3=0.7654)、convenience factor (r_4 = 0.7201) are the influencing factors of customer satisfaction.And customer satisfaction have significant correlation, on this basis, the corresponding development proposals are put forward.

1. Introduction

China's take-away industry sprouted earlier. In the early stage of development, based on the huge market size and industry growth space, Ali, Baidu and other Internet companies and a large number of investment institutions have cut into the take-away industry, and capital inflows. The development of take-away O2O has brought certain benefits to catering merchants, and also provided consumers with great consumption convenience. [1]After the large-scale integration of China's take-out O2O industry in 2015, the industry development pattern has gradually stabilized. In 2017, the number of users selling orders in foreign countries exceeded 300 million, a year-on-year increase of 19%, and the size of the take-away ordering market has exceeded 200 billion. With the increasing convenience of take-out service, the service scene has been further expanded, and the ability to meet consumer demand has been further enhanced. The size of the take-away market still has a good growth rate, but the demographic dividend has declined and the growth rate has declined.

As can be seen from Figure 1, the market size of the take-away ordering market has reached 71.24% in 2104, and by 2017, this number has dropped to 23.48%, and the growth rate has gradually slowed down, so the mining of the stock market is particularly Important, and the effective mining of the stock market depends on the deepening of user needs and the improvement of user experience, increasing the user's stickiness and obtaining incremental users through the diversity of take-out order service and the quality of service. In this case, consumer satisfaction Degree improvement is an important developmental hand in the take-away ordering industry. At present, the take-out order is mainly based on the network APP platform and network approach. The top-ranking transaction is the US group take-out, hungry, Baidu take-out, this paper systematically analyzes the customer satisfaction of the order-selling order, in order to provide certain suggestions for the development of the industry.

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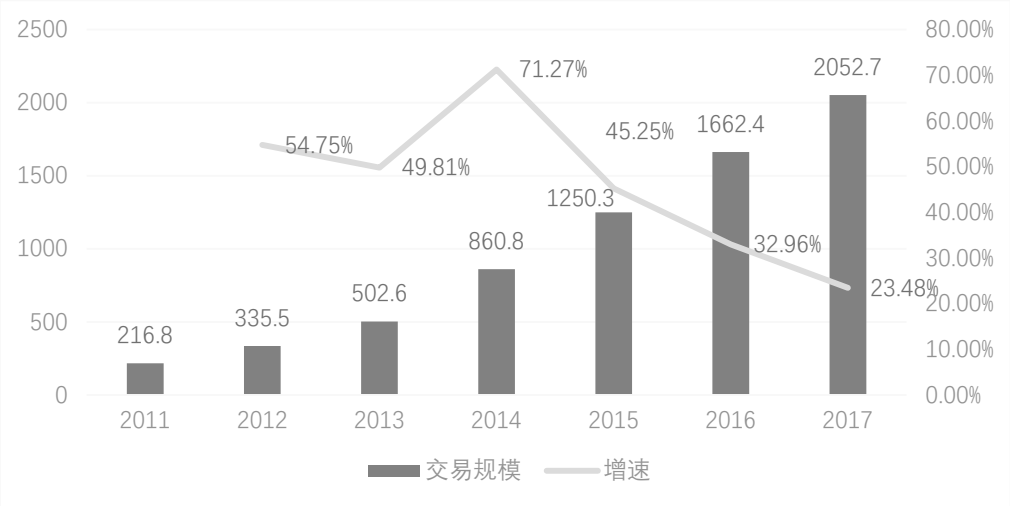

Fig. 1 Scale and growth rate of O2O trade in China

Source: iiMedia Research

2. Takeaway order customer satisfaction analysis

2.1 Takeaway Order

The earliest form of take-away is the form of packaging. Although it is more traditional, it has been used by consumers and merchants. With the increasing application of the network and mobile Internet, this has also promoted the development speed of the take-away industry. In the development process of the take-away industry, the main experience has gone through the following stages: First, telephone ordering, mobile phones and landline telephones have gradually become the must-have items for daily contact and communication of the public, and the public is slowly using the telephone to order food. This is also the take-away industry. One of the factors that have a higher rate of development. Compared with the traditional way of packing after ordering at a restaurant, the telephone ordering is more convenient, and the door-to-door purchase can be avoided, which largely makes the take-out ordering meal accepted by the public and promotes its development. The second is online ordering. With the popularity of the network, the development speed of the take-away industry has further improved. The main body of online ordering is mainly office workers and students. Some platforms and enterprises that use online ordering as their main business are also emerging at this stage. Third, ordering apps and other software ordering, etc., as an indispensable smart phone in the public life, the penetration rate is gradually increasing. In the field of instant messaging tools, WeChat is a social software with high usage rate. Many operators have also carried out secondary development on the WeChat platform. Take-out ordering is an important application. There are other ways to use other software with higher traffic, such as Alipay, WeChat, etc. The ordering website and the vast number of merchants hope to use the APP ordering platform and the WeChat service platform to obtain a part of the active user groups on the platform, find more customers and expand the development space. [2]The user selects the APP ordering platform and the WeChat ordering meal, and can obtain the situation of some take-out merchants in the area of the area, including some preferential conditions and detailed meal information, etc. The online payment function also makes the APP ordering platform and WeChat ordering more convenient.

2.2 Customer Satisfaction.

When measuring customer satisfaction, we will choose a random survey method to obtain sample data, and measure customer satisfaction with specific satisfaction indicators. [3]First, from the perspective of revenue and cost, customer satisfaction refers to the difference between the final revenue and the cost of the customer in the process of satisfying their own services and product

requirements. Churchill Suprenant analyzed customer satisfaction by pointing out the benefits from services and products and the benefits, energy, and time spent on getting the services and products. Secondly, from the perspective of emotions, customer satisfaction refers to the emotional response of consumers when they evaluate their services or products. If the evaluation made by the consumer has a good result, it will be more satisfactory in terms of emotion. If the result of the evaluation is not satisfactory, the performance in the mood will be more unsatisfactory. In the related research of customer satisfaction, Hunt pointed out that customer satisfaction is a feeling of experience evaluation of service or product; Oliver believes that customer satisfaction is a kind of time-saving evaluation of consumers' ability to recognize consumer experience and recognition. And the reflection, the essence is the psychological state that there is a certain difference between the consumer experience and the actual feeling. Finally, from the cognitive dimension, the perception and expectation before and after the service and product are obtained, after a certain measurement, the disappointing or positive psychological state. [4]From this dimension, there are other scholars who have studied customer satisfaction. Westbrook pointed out that it is an evaluation and cognitive process that compares the expectations before purchase with the actual performance of the product; Armstrong points out that among the many influencing factors, price, brand Service, product quality, etc. are the differences between the customer's cognitive expectations and product performance.

2.3 Factors Affecting Customer Satisfaction of Takeaway Orders.

The customer satisfaction of China's take-out ordering is affected by many factors. Luoqin (2016) used the US group network as an example and verified the reliability of the platform information, service level, marketing and other factors to significantly affect customer satisfaction through multiple regression analysis. [5]Yuan Mengru (2016) analyzed the impact of food delivery, O2O food quality, packaging and distribution, price service, and payment methods on customer satisfaction. [6]Based on the systematic review of related research and the actual situation, this paper will focus on the influencing factors of the satisfaction of take-out ordering: food factors, price factors, service factors and convenience factors.

2.3.1 Food factor

The most important concern for consumers to make online take-out orders is the food itself. First of all, the health and safety of food is a prerequisite for consumers to choose. At present, many out-of-sale orders are not safe. The take-away order platform is safe for sellers to sell food. And health control is the most basic factor for consumers to be satisfied with the platform; the food style of the food on the take-out platform is also increasingly concerned by consumers. At present, the main consumers of the take-out ordering platform are mainly white-collar workers. The quality has certain requirements; the third is the packaging material, the packaging material of the food also affects the quality and safety of the food. Many takeaway hot dishes, hot rice, hot soup, if the food packaging material is poor, it will directly affect the consumer body. health. In the research process, this paper sets the secondary indicators of the online take-out order food factor as: health and safety, dish style and packaging material.

2.3.2 Price factors

Consumers will consciously pursue cost-effectiveness when making consumption, and online take-out ordering brings certain convenience. However, the price is still one of the important reference factors for the take-out order. For example, the price of the online take-out order food itself is better than that of the offline store or the price is within an acceptable range. In addition, many online take-out platforms are gradually charging. Whether the food packaging cost, the order delivery cost, the packaging cost and the packaging material match, and whether the total cost is reasonable is also a key factor for consumers, which directly affects the satisfaction of the consumer online ordering. In the research process, this paper sets the secondary indicators of the online take-out order price factor as: whether the total price is higher than the offline store, packaging cost and delivery cost.

2.3.3 Service factors

In addition to food factors and cost-effective factors, the service factor of the network take-out platform is also an important factor affecting consumer satisfaction. When consumers use the online take-out platform to order food, they will inevitably encounter problems such as unsubscription or food quality complaints. The ordering of the take-out network ordering platform will deal with related disputes, order cancellation, service attitude and dispute handling. Efficiency is an important factor influencing consumer satisfaction. In the research process, this paper sets the secondary indicators of the network take-out order service factor as: after-sales dispute processing efficiency, unsubscribe processing, service attitude.

2.3.4 Facilitating factors

A powerful driving force for the development of online take-out ordering platform is convenience. This is also an important factor for online take-out ordering to attract consumers. Therefore, the convenience of online take-out ordering has further needs to be refined. This convenience includes the convenience of the APP ordering meal, the speed of the meal delivery and the degree of change in the taste of the food after the food is delivered. Since the take-away delivery takes a certain amount of time, the difference in the taste of the food will be accepted by the consumer. This is also a loss of the convenience of online take-out ordering. In the research process, this paper sets the secondary indicators of the convenience factor of online take-out ordering to: the convenience of APP ordering, the speed of distribution and the degree of change of food taste.

3. Empirical analysis

3.1 Questionnaire design.

Based on the analysis of the factors affecting customer satisfaction of take-out order, this paper selects the Likert five-point scale to obtain relevant data. The specific index system and option score correspondence table are shown in Table 1:

Table 1 Take-out order satisfaction index system and option score table

classification	coding	index
Satisfaction Y		Customer satisfaction
Food factorX_1)	S_1	Health and safety
	S_2	Dish style
	S_3	Packaging material
Price factor (X_2)	P_1	The total price is higher than the offline store
	P_2	Packaging costs
	P_3	Shipping fees
Service factor (X_3)	F_1	Dispute resolution efficiency
	F_2	Unsubscribe
	F_3	Service attitude
Convenience factor (X_4)	B_1	APP usability
	B_2	Fast delivery
	B_3	Meet specific needs

According to the rules of the use of the Likert five-point scale, this article has five options for measuring the customer satisfaction of the online take-out ordering of the sample, and the corresponding scores are distributed in 1-5 points. Between, according to the Likert scale option and score comparison table as shown in Table 2:

Table 2 Measurement item alternative and option score comparison table

Option score	1	2	3	4	5
Satisfaction	Very dissatisfied	Not satisfied	Generally satisfied	Quite satisfied	Very satisfied
Influencing factor	Very unimportant	unimportant	Generally important	More important	Very important

3.2 Index data acquisition and reliability and validity analysis.

3.2.1 Index data acquisition

This paper selects the top-ranking US group take-out, hungry take-out and Baidu take-out as the research sample, and selects three consumers of the take-out platform to issue questionnaires through the online questionnaire. Each take-out platform 100 copies were distributed, 300 questionnaires were distributed, and 288 questionnaires were initially collected. The questionnaires with obvious or missing items in the questionnaire were eliminated, and 281 valid questionnaires were obtained. The overall effective rate of the questionnaire was 94%. The questionnaire issuance and recycling are shown in Table 3:

Table 3 Questionnaire Recycling Table

platform	Number of issues	Recycling quantity	Invalid questionnaire	valid questionaire	Efficient
US group takeaway	100	97	3	94	94%
Are you hungry?	100	95	2	93	93%
Baidu takeaway	100	96	2	94	94%
total	300	288	7	281	94%

3.2.2 Analysis of reliability and validity

After obtaining the questionnaire data, it is necessary to first check the quality of the collected data. The statistical method is usually to verify the reliability and validity. Reliability, the reliability of the data, indicates the consistency of the results obtained by repeated observations of the subject using a statistical method; validity is the validity of the data, and measures the validity of the acquired data for the problem to be studied. Data usefulness is obtained by validity measurement. Application of this article α as a reliability statistic, the corresponding clone Bach Alpha value is 0.652, which is in a credible range. Further validity check is shown in Table 4:

Table 4 KMO and Bartlett test

SME Sampling suitability		0.643
Bartlett sphericity test	Approximate chi square	482.322
	Degree of freedom	55
	Significant	0.000

According to the KMO and Bartlett test tables, the KMO value is 0.643, and the corresponding Bartlett sphericity test is 0.000 in the significance statistics. At the 99% confidence level, the sample data passes the validity test.

3.3 Take-to-order order customer satisfaction analysis.

3.3.1 Construction of gray-scale correlation model

The degree of relevance describes the change in the correlation between two or more factors over time or the change in the object. In the overall change process, if there is a certain consistency in the trend characteristics between the factors, then the factors are explained. The degree of

synchronization between the two is higher, which means that the degree of association between the factors is higher, and vice versa. The grey correlation method is based on the similarity between the development trend and the operational characteristics of the factors, and is used as a description of the degree of association between the factors. The gray-scale correlation method deals with the variable index by characterizing the similarity in the quantitative relationship between the two sets of variable indicators from the perspective of geometric methods.

Reference sequence$X_0 = \big(x_0(1), x_0(2), \cdots, x_0(n)\big), X_i X_0 X_0$ Related to and have a certain impact, then $X_i X_0$ For the sequence of behavior of the reference sequence,Follow the original sequence $\Delta_{ij}(k) = |x_i(k) - x_j(k)|$ Initializing,The initial values are respectively $y_0 = y_0(1), y_0(2), \cdots, y_0(n)) y_i = \big(y_i(1), y_i(2), \cdots, y_i(n)\big), (i = 1,2, \cdots \mathrm{m})$ And, after the non-dimensionalization of the original data, further processing is as follows:

$$\gamma_{0i}(k) = \frac{min_i min_k |y_0(k) - y_i(k)| + \rho max_i max_k |y_0(k) - y_i(k)|}{|y_0(k) - y_i(k)| + \rho max_i max_k |y_0(k) - y_i(k)|}$$

ρFor the resolution factor, the usual situation is takenρ=0.5。 Using the weighted average of the correlation coefficients of the reference sequence and the behavior sequence on each indicator, the correlation between the two groups is obtained:

$$r_i = \frac{1}{n} \sum_{k=1}^{n} r_i\,(k)$$

among themr_iFor the degree of association between the i-th reference sequence and its behavior sequence,r_iBetween 0 and 1, the value is positively correlated with the correlation, that isr_iThe larger the value, the greater the degree of association.

3.3.2 Empirical analysis based on grey relational theory

The questionnaire design of this paper covers the first-level indicators and correspondingly sets the corresponding secondary indicators. The first-level indicators and the second-level indicators are linearly transformed according to the mean value, as follows:

$$X_p = \frac{1}{n} \sum_{k=1}^{m} w_{k,p} (p = 1,2,3;\ \ m = 1,2,3;)$$

In the mean linear transformation,X_pAs a primary indicator,$w_{k,p}$forX_pCorresponding secondary indicators. In the customer satisfaction analysis of take-out ordering, this paper first takes customer satisfaction as a reference series, and takes the food factor, price factor, service factor and convenience factor as the reference sequence. According to the number of samples, the matrix can be obtained as follows:

$$\begin{bmatrix} y_i \\ x_{1i} \\ x_{2i} \\ x_{3i} \\ x_{4i} \end{bmatrix} = \begin{bmatrix} y_1 & y_2 & \cdots & \cdots & y_{280} & y_{281} \\ x_{1,1} & x_{1,2} & \cdots & \cdots & x_{1,280} & x_{1,281} \\ x_{2,1} & x_{2,2} & \cdots & \cdots & x_{2,280} & x_{2,281} \\ x_{3,1} & x_{3,2} & \cdots & \cdots & x_{3,280} & x_{3,281} \\ x_{4,1} & x_{4,2} & \cdots & \cdots & x_{4,280} & x_{4,281} \end{bmatrix}$$

Determine the reference data columny_i:

$$y_i = [y_1 \quad y_2 \quad \cdots \quad \cdots \quad y_{280} \quad y_{281}]$$

Dataless non-dimensional processing:

$$x'_{ji} = \frac{x_{ji}}{y_i} (j = 1,2,3,4; i = 1, \cdots, 281)$$

$$\begin{bmatrix} x'_{1i} \\ x'_{2i} \\ x'_{3i} \\ x'_{4i} \end{bmatrix} = \begin{bmatrix} \frac{x_{1,1}}{y_1} & \frac{x_{1,2}}{y_2} & \cdots & \cdots & \frac{x_{1,280}}{y_{280}} & \frac{x_{1,281}}{y_{281}} \\ \frac{x_{2,1}}{y_1} & \frac{x_{2,2}}{y_2} & \cdots & \cdots & \frac{x_{2,280}}{y_{280}} & \frac{x_{2,281}}{y_{281}} \\ \frac{x_{3,1}}{y_1} & \frac{x_{3,2}}{y_2} & \cdots & \cdots & \frac{x_{3,280}}{y_{280}} & \frac{x_{3,281}}{y_{281}} \\ \frac{x_{4,1}}{y_1} & \frac{x_{4,2}}{y_2} & \cdots & \cdots & \frac{x_{4,280}}{y_{280}} & \frac{x_{4,281}}{y_{281}} \end{bmatrix}$$

make$\Delta_{0=}\left|x'_{j1} - x'_{ji}\right|$ $(j = 1,2,3,4; i = 1, \cdots, 281)$, there is the following matrix:

$$\begin{bmatrix} 0 & \frac{x_{1,2}}{y_2} - \frac{x_{1,1}}{y_1} & \cdots & \cdots & \frac{x_{1,280}}{y_{280}} - \frac{x_{1,1}}{y_1} & \frac{x_{1,281}}{y_{281}} - \frac{x_{1,1}}{y_1} \\ 0 & \frac{x_{2,2}}{y_2} - \frac{x_{2,1}}{y_1} & \cdots & \cdots & \frac{x_{2,280}}{y_{280}} - \frac{x_{2,1}}{y_1} & \frac{x_{2,281}}{y_{281}} - \frac{x_{2,1}}{y_1} \\ 0 & \frac{x_{3,2}}{y_2} - \frac{x_{3,1}}{y_1} & \cdots & \cdots & \frac{x_{3,280}}{y_{280}} - \frac{x_{3,1}}{y_1} & \frac{x_{3,281}}{y_{281}} - \frac{x_{3,1}}{y_1} \\ 0 & \frac{x_{4,2}}{y_2} - \frac{x_{4,1}}{y_1} & \cdots & \cdots & \frac{x_{4,280}}{y_{280}} - \frac{x_{4,1}}{y_1} & \frac{x_{4,281}}{y_{281}} - \frac{x_{4,1}}{y_1} \end{bmatrix}$$

At this time $\Delta_{min} = \min_{j=1}^{4} min_{i=1}^{281} \left|x'_{j1} - x'_{ji}\right|, \Delta_{max} = \max_{j=1}^{4} max_{i=1}^{281} \left|x'_{j1} - x'_{ji}\right|$ Gray number resolution coefficientρ=0.5, then by the formulaξ_iThen get the matrixR_γ。

$$\xi_i = \frac{\Delta_{min} + \rho\Delta_{max}}{\Delta_0 + \rho\Delta_{max}}$$

Based on the acquired survey samples, the gray-scale correlation analysis is performed. The values corresponding to the points on the curve of the reference sequence and the behavior sequence are the correlation coefficients, and the average values of the correlation coefficients of the corresponding elements of the reference index and the reference sequence are used to describe each data sequence. The relationship with the reference sequence, thereby obtaining the relationship between the take-out order and take-away food factors, price level, service quality, and convenience factors and customer satisfaction.

$$r_j = \frac{1}{281}\sum_{i=1}^{281} \xi_{ij} \ (j = 1,2,3,4)$$

byr_jFurther obtain the correlation coefficient values and the associated order of the reference series and the ratio series, as shown in the table:

Table 5 Correlation coefficient table between customer satisfaction and influencing factors of take-out order

Comparative factor	Correlation	Correlation value	Relevance ranking
Food factor	r_1	0.8102	1
Price factor	r_2	0.7261	3
Service factor	r_3	0.7654	2
Convenience factor	r_4	0.7201	4

Look at the associated values in the gray correlation analysis table: $r_1 > r_3 > r_2 > r_4$。According to the sample survey, it is clear that the most relevant to the customer satisfaction of online take-out ordering is the food factor. As the economy continues to develop, the consumption power of residents increases, and the quality requirements for food are also getting higher and higher. In terms of contrast factors, food quality, safety and hygiene have the highest correlation with customer satisfaction; in terms of price, the overall correlation with customer satisfaction is

relatively weak, which is basically the same as the convenience of online take-out ordering, and the current overall price level of online take-out ordering It is not high, and the ordering consumer group is concentrated in the urban white-collar workers, so the price sensitivity of the online take-out order is weak. In terms of service factors, among the various influencing factors, the service factors of online take-out ordering are ranked second. Before the price factor and convenience factor, consumers are more concerned about the cancellation of order, the efficiency of dispute handling, and the quality of service. Under the research framework of this paper, the convenience factor of online take-out ordering is less related to customer satisfaction, and the convenience includes APP ease of use and delivery speed. These factors are one of the important supporting factors for the development of online take-out order, so each network is for sale. Ordering is more important for the construction of convenience factors, and the overall convenience level is relatively high. In the comparison of various factors, customers' perception of convenience factors is relatively weak.

4. Summary

The development of mobile Internet superimposed a huge population base has rapidly increased the development momentum of the take-away ordering industry. In the past few years, the take-away ordering industry has experienced explosive growth, but as the demographic dividend gradually declines and market competition intensifies, stock users The excavation is becoming increasingly important. This paper takes the mainstream form of the current take-out order as the entry point, systematically analyzes the customer satisfaction and its influencing factors of the network take-out order, and finds that the food factor, price factor, service factor and convenience factor all affect the customer satisfaction through the gray correlation model analysis. An important factor in the degree, and the food factor has the greatest effect. In the development of the online take-out ordering industry, it is recommended to do the following: First, to ensure food safety and hygiene, food safety and health is the lifeline of the development of take-out ordering and the lifeline of the development of the catering industry, and also the most concerned factor for customers; The service quality of the take-out ordering service has been improved, and the in-depth optimization has been made in terms of ordering, unsubscribing, dispute handling, and handling efficiency of complaints, especially to optimize service quality by customer big data and improve service quality. Third, we must pay attention to pricing strategy. It is found that the price of take-away order is not the most concerned factor for customers, but it still has certain relevance. Therefore, it is necessary to make full use of the pricing strategy, such as introducing other services through traffic advantage or other business traffic or traffic support to obtain certain Revenue, providing space for the catering order platform to carry out preferential activities; Fourth, the network take-out ordering platform should continue to improve convenience, optimize distribution efficiency, use modern technology and computer technology to achieve maximum efficiency and continuous optimization of processes. When active and innovative business models to enhance the customer experience.

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