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Full Research Paper

A Research on the Impact of Reverse Logistics Service Quality on Consumer Loyalty in O2O Fresh Food E-commerce Enterprises

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Abstract: The popularity of mobile internet and big data has led to the rapid development of e-commerce. As one of the most suitable models for fresh food e-commerce platforms, the competition in the O2O fresh food e-commerce market is becoming increasingly fierce. This paper provides suggestions for O2O fresh food e-commerce companies to improve the quality of reverse logistics services through a study of the role of reverse logistics service quality on consumer trust and consumer loyalty. The study shows that the four dimensions of timeliness, communication quality, reliability and empathy of O2O fresh food e-commerce reverse logistics service quality can directly and positively influence consumer loyalty to different degrees, and trust also has a significant influence on consumer loyalty, and consumer trust has a mediating effect in the relationship between timeliness, communication quality, reliability, empathy and loyalty.

Keyword: O2O fresh food e-commerce, Reverse logistics service quality, Customer trust, Customer loyalty

1. INTRODUCTION

In recent years, with the continuous development of the economy and the Internet, online shopping has been integrated into modern urban life, but the loss of consumer trust caused by the asymmetry of information on the Internet has also become increasingly serious. Consumer trust in e-commerce products has become an issue that must be addressed for the sustainable and healthy development of e-commerce. As a result, consumer trust and consumer loyalty have become key concerns for companies and academics. Consumer trust is influenced by factors such as customer service responsiveness, ability to answer questions and perceived service quality ^[1], and these influences can have an effect on consumer repurchase, word of mouth, repurchase intentions, and continued consumer expectations, so how to maintain consumer trust and build consumer loyalty in an intense e-commerce environment is of great significance to e-commerce companies.

O2O refers to that customers can purchase and pay for goods and services online, and pick up goods or experience services in offline physical stores. It is a combination of payment model and offline store traffic. By integrating online and offline information, capital and business flows, it can not only bring opportunities for offline service transformation, but also further facilitate consumers ^[2]. With the continuous improvement of the O2O business model, fresh produce e-commerce has been developing rapidly. As fresh produce is different from traditional e-commerce products, there are high storage requirements and delivery timelines, and there are returns and exchanges for unsatisfactory goods in daily transactions, which has led to the concept of reverse logistics being widely focused on by O2O fresh food e-commerce. The concept of reverse logistics has also received continued attention in the B2C e-commerce model. Some studies have demonstrated that improving the quality of reverse logistics services by formulating reasonable service policies and strengthening the training of customer service personnel's attitude and skills can achieve the purpose of promoting repeat purchases by consumers. However, both in domestic and foreign studies, research on the quality of e-commerce reverse logistics services

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mostly takes the B2C model as the background to establish an evaluation system as well as to put forward relevant opinions to improve its quality and other aspects. There is a lack of systematic research on the combination of reverse logistics service quality with consumer trust and consumer loyalty under the O2O model, and the failure to build a relevant evaluation index system to propose corresponding countermeasures and suggestions.

To address the shortcomings of existing research, this paper attempts to construct a research model to systematically analyze the mechanism of the four dimensions of O2O fresh food e-commerce reverse logistics service quality on consumer loyalty, so as to provide relevant suggestions for the sustainable and healthy development of O2O e-commerce.

2. THEORETICAL BASIS AND RESEARCH HYPOTHESIS

2.1 O2O fresh food e-commerce reverse logistics service quality and consumer loyalty

Service quality represents consumers' subjective evaluation of services, which is based on a comparison between consumers' expectations and actual feelings^[3], and can be used to measure whether the level of service meets consumers' expectations^[4]. According to Bitner's concept of service quality as presented in his research, service quality determines consumers' willingness to make repeat purchases after the initial purchase^[5]. The social transaction theory holds the following view regarding the factors that determine consumers' repeat purchase intention: comparing relationship output and personal expectations determines an individual's satisfaction with the relationship, and this satisfaction is a subjective judgement. If an individual perceives that the output of the relationship is off expectations, the individual is dissatisfied with the relationship, whereas conversely the individual is satisfied and willing to remain in the relationship. The concept of the comparative level of alternatives is similar to that of opportunity cost, in that individuals will choose to maintain their current relationship when the most attractive alternative relationship is still less attractive than the one they are currently in. Applying these theories to business transactions, service quality, as an important factor in a firm's connection with consumers, can greatly influence consumers' intention to repeat a purchase.

Due to the rapid development of third party logistics in recent years, the gap between positive service levels is small and in a state of competitive saturation. According to social transaction theory, the perceived attractiveness of consumers' positive logistics services in terms of substitutable relationships is basically the same as the attractiveness of current relationships, and the comparative difference between expectations and outputs is small and stable. Therefore the impact of positive logistics service quality on consumer loyalty is relatively stable. However, as reverse logistics does not yet have a standardised process, the awareness, policies and levels of return services provided by different merchants vary greatly. Therefore, in the process of reverse logistics services, there is often a gap between consumers' service perceptions and expectations, which leads to a substitutable relationship between the different services provided by different merchants, and the current service quality of reverse logistics has a greater impact on customers' repetitive purchase intention. Studies have shown that merchants' post-purchase guarantee policies (e.g. conditional exchanges or refunds) can increase consumer loyalty and the likelihood of future purchases, and that a satisfactory product reverse logistics service experience can be profitable for the company^[6].

One of the most popular frameworks for exploring the specific dimensions of service quality is the SERVQUAL model proposed by the PZB team. Specifically, the model considers the five components of service quality as tangibility, assurance, reliability, responsiveness and empathy.

Based on the SERVQUAL model, this study explores the impact of O2O fresh food e-commerce reverse logistics service quality on consumer loyalty through four dimensions, including timeliness, communication quality, reliability and empathy, respectively, by referring to Huang En-yu's (2019) and Li Yi's (2019) reverse logistics service quality evaluation system.

Accordingly, this study proposes the following hypothesis:

H1a: The timeliness of O2O fresh food e-commerce reverse logistics service has a significant positive impact on consumer loyalty;

H1b: The communication quality of O2O fresh food e-commerce reverse logistics service has a significant positive impact on consumer loyalty;

H1c: The reliability of O2O fresh food e-commerce reverse logistics service has a significant positive impact on consumer loyalty;

H1d: The empathy of O2O fresh e-commerce reverse logistics service has a significant positive impact on consumer loyalty.

2.2 O2O fresh food e-commerce reverse logistics service quality and consumer trust

Trust is a state of mind in which consumers believe that the other party will not do something detrimental to them based on a positive expectation of the firm's behaviour or intentions^[7]. Although O2O fresh food e-commerce provides online and offline purchasing modes for customers, online shopping is still the first choice for most young consumers. Due to the characteristics of online shopping environment, consumers may feel uneasy because they can't try products. At this time, loose and clear return policies will eliminate consumers' concerns and reduce perceived risks to a certain extent. Even if there are problems with returns, the quality of the reverse logistics service can reflect the strength of the company and help consumers determine whether the e-commerce company is worthy of trust again, helping to build and restore consumer trust^[8]. Under the O2O model, customers experiencing a satisfactory offline experience will reduce the perceived risk of shopping online, which in turn will lead to continued trust both online and offline^[9].

In summary, this study believes that O2O fresh food e-commerce reverse logistics service quality has a positive impact on consumer trust, and the following assumptions are proposed:

H2a: The timeliness of O2O fresh food e-commerce reverse logistics service has a significant positive impact on consumer trust;

H2b: The communication quality of O2O fresh food e-commerce reverse logistics service has a significant positive impact on consumer trust;

H2c: The reliability of O2O fresh food e-commerce reverse logistics service has a significant positive impact on consumer trust;

H2d: The empathy of O2O fresh e-commerce reverse logistics service has a significant positive impact on consumer trust.

2.3 Consumer trust and consumer loyalty

Toufaily et al. ^[10], in a review of the extant literature, found that the factors that have a direct impact on consumer loyalty can be grouped into five main categories: environment, company, goods or services, website and consumer characteristics. A consumer's trust in a merchant, as opposed to security and privacy, significantly influences emotional loyalty and repeat purchase behaviour^[11].

Lloyd & Mark^[12] developed a driving model from trust to satisfaction to consumer loyalty, suggesting that trust and satisfaction both have a mediating effect in the influence of service quality on consumer loyalty; perceived quality has an indirect effect on customer loyalty through customer trust^[13].

In summary, this study believes that trust also has a positive impact on consumer loyalty in O2O fresh food e-commerce transactions, and proposes the following hypothesis:

H3 : Consumer trust has a significant positive effect on consumer loyalty.

H4a: Consumer trust plays an intermediary role in the effect of timeliness on consumer loyalty;

H4b: Consumer trust plays an intermediary role in the effect of communication quality on consumer loyalty;

H4c: Consumer trust plays an intermediary role in the effect of reliability on consumer loyalty;

H4d: Consumer trust plays an intermediary role in the effect of empathy on consumer loyalty.

2.4 Model building

On the basis of the relevant concepts and theories mentioned above, this paper attempts to build a research model to systematically analyze the influence mechanism of four dimensions of O2O fresh food e-commerce reverse logistics service quality on consumer loyalty, and takes consumer trust as an intermediary variable. The specific model is shown in figure 1:

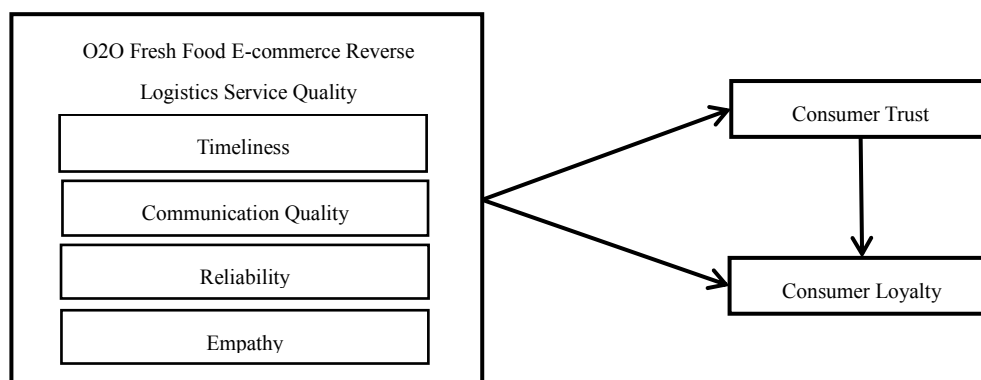


Figure 1. Research model

3. RESEARCH DESIGN

3.1 Variable measurement

Based on the mature scale^[14-15] and combined with the characteristics of O2O fresh food e-commerce, this study made some modifications to form a measurement scale in line with this study. All question items were on a 5-point Likert scale, from 1-5 indicating from completely disagree to completely agree, respectively.

3.2 Data collection

The questionnaire of this study was mainly distributed through online channels. The respondents of the survey were O2O fresh e-commerce users, and they had the experience of returning and replacing goods on relevant platforms. A total of 243 questionnaires were collected. After deleting 23 invalid questionnaires, the effective questionnaires were 220, and the recovery rate was about 90.5%. Among them, invalid questionnaire refers to the questionnaire that did not complete the answer, the total answer time was less than 120 seconds, or the score of each item was almost the same.

4. RESULTS AND ANALYSIS

As for the survey of respondents' familiarity with the existing O2O fresh e-commerce platforms, this paper selected four popular O2O fresh food e-commerce platforms so far in the questionnaire design, and also included the large chain supermarkets around the community that built their own O2O platforms into the survey scope. The two O2O fresh e-commerce enterprises that customers patronized most often are Hema and MISSFRESH, accounting for 60.9% and 52.3% respectively. Secondly, the large chain supermarkets around the community with self-built O2O platform are also favored.

4.1 Reliability Analysis and Validity Analysis

In order to obtain the degree of reliability of the current study, the reliability of the scale needs to be tested first. In this paper, Cronbach's Alpha coefficient (α coefficient) is used to analyze the reliability of the scale by conducting reliability tests on the question items. It can be seen from Table 4-1 that all the scales adopted in this study can ensure the reliability of the collected test data.

Table 4-1. The result of reliability analysis

Variables	Number of Items	Cronbach's α
Overall Reliability of the Questionnaire		0.909
O2O Fresh E-commerce Reverse Logistics Service Quality		0.935
Timeliness	3	0.769
Communication Quality	3	0.746
Reliability	3	0.731
Empathy	3	0.736
Customer Trust	4	0.788
Customer Loyalty	3	0.798

The validity analysis can be divided into two parts: content validity and structure validity. Based on the mature scale, the content validity of the prediction questionnaire in this paper is good, which need not be proved again. With regard to structure validity, the results of the analysis in Table 4-2 show that the scale passes the validity test. The scales of consumer trust and consumer loyalty variables also passed validity tests.

Table 4-2. The result of validity analysis

Items	Factor Load after Rotation			
	Timeliness	Communication Quality	Reliability	Empathy
A11	0.683			
A12	0.797			
A13	0.668			
A21		0.726		
A22		0.682		
A23		0.697		
A31			0.735	
A32			0.783	
A33			0.706	
A41				0.747
A42				0.612
A43				0.759
Eigenvalue	2.605	1.966	1.924	1.794
Cumulative Variance Interpretation Rate			69.079%	
KMO			0.935	
Bartlett			1146.285	
Sig.			0.000	

4.2 Correlation Analysis and Linear Regression Analysis

As can be seen from Tables 4-3, the four dimensions of O2O fresh food e-commerce reverse logistics service quality in this study are significantly and positively correlated with consumer trust and consumer loyalty, and consumer trust is also significantly and positively correlated with consumer loyalty.

Table 4-3. The result of correlation analysis

Variables		Timeliness	Communication Quality	Reliability	Empathy	Customer Trust
Customer	Person	0.711**	0.682**	0.698**	0.691**	/
Trust	p	0.000	0.000	0.000	0.000	
Customer	Person	0.716**	0.754**	0.684**	0.777**	0.723**
Loyalty	p	0.000	0.000	0.000	0.000	0.000

The regression analysis in this paper uses O2O fresh food e-commerce reverse logistics service quality and its sub-dimensions as the explanatory variables (X), consumer trust as the mediating variable (M) and consumer loyalty as the dependent variable (Y). There are three regression equations established. The first regression equation examines the linear regression relationship between the explanatory and dependent variables, the second regression equation examines the linear regression relationship between the explanatory and mediating variables, and the third regression equation examines the regression relationship between the mediating and dependent variables.

Model 1 was established, that is, consumer loyalty = $a_0 + a_1 * \text{timeliness} + a_2 * \text{communication quality} + a_3 * \text{reliability} + a_4 * \text{empathy}$, and the following results were obtained through multiple linear regression analysis:

According to Table 4-4, the F test results in model 1 show that the F value is 143.323, with a significance probability less than 0.05, indicating that the significance level has been reached. At least one item in the timeliness, communication quality, reliability and empathy will have an impact on consumer loyalty. It is significant to study model 1.

In addition, the adjusted R^2 of model 1 is 0.727, indicating that each factor in the service quality of O2O fresh food e-commerce reverse logistics can explain the 72.7% change of consumer loyalty. The value range of VIF in model 1 is [2.261, 2.652], which is no more than 10, that is, there is no multicollinearity problem in the regression model. DW value is 1.946, which is close to 2, indicating that there is no autocorrelation and the model is well constructed.

Table 4-4.

Model	R	R ²	Adjusted R ²	F	Sig.	DW
1	0.853	0.727	0.722	143.323	0.000	1.946
2	0.801	0.642	0.635	96.387	0.000	2.077
3	0.723	0.523	0.521	239.135	0.000	1.835

Table 4-5.

Model	Unnormalized Coefficient		t	Significance	Collinearity Statistics		
	B	Standard Error			Tolerance	VIF	
1	(Constant)	0.562	0.155	3.634	0.000		
	Timeliness	0.134	0.052	2.567	0.011	0.377	2.652
	Communication Quality	0.265	0.05	5.283	0.000	0.410	2.440
	Reliability	0.138	0.051	2.719	0.007	0.442	2.261
	Empathy	0.332	0.046	7.174	0.000	0.441	2.270
2	(Constant)	0.732	0.178	4.116	0.000		
	Timeliness	0.215	0.060	3.587	0.000	0.377	2.652
	Communication Quality	0.164	0.058	2.839	0.005	0.410	2.440
	Reliability	0.248	0.058	4.252	0.000	0.442	2.261
	Empathy	0.209	0.053	3.935	0.000	0.441	2.270
3	(Constant)	1.117	0.196	5.686	0.000		
	Customer Trust	0.721	0.047	15.464	0.000	1.000	1.000

In Table 4-5, the significance probability of the t-test of the constant term in the regression model is $0.000 < 0.05$, indicating that the constant should enter the regression equation. The four dimensions of O2O fresh

food e-commerce reverse logistics service quality all passed the t-value test, and the regression coefficient showed significance at the level of 0.05. The regression coefficient values were 0.134, 0.265, 0.138 and 0.332 respectively, indicating that timeliness, communication quality, reliability and empathy all had a significant positive impact on consumer loyalty.

In summary, the final model 1 can be obtained: consumer loyalty =0.562+0.134* timeliness +0.265* communication quality +0.138* reliability +0.332* empathy.

Similarly, the final model 2: consumer trust =0.732+0.215* timeliness +0.164* communication quality +0.248* reliability +0.209* empathy. And the final model 3 is obtained: consumer loyalty =1.117+0.721* consumer trust.

4.3 Mediating Effect Analysis

In this study, the model proposed by Wen was used to analyze the mediation utility. he model consists of three regression equations, in which X represents the independent variable, Y the dependent variable, M the intermediate variable, a, b, c, c' the regression coefficient, and e_1, e_2, e_3 represent the residual. The specific equation is as follows:

$$Y = cX + e_1 \quad (1)$$

$$M = aX + e_2 \quad (2)$$

$$Y = c' + bM + e_3 \quad (3)$$

It can be seen from Table 4-6 that in the first step of verifying the mediating effect, timeliness, communication quality, reliability, and empathy all have extremely significant positive effects on consumer loyalty, and the regression coefficients are 0.134, 0.265, 0.138, and 0.332, respectively, with the Sig. values all less than 0.05. Similarly, timeliness, communication quality, reliability and empathy all have extremely significant positive effects on consumer trust, and the regression coefficients are 0.215, 0.164, 0.248 and 0.209, respectively, with the Sig. values all less than 0.05. Putting the mediating variable "consumer trust" into the regression equation, the regression coefficient of consumer trust to consumer loyalty is 0.138, with the value of Sig <0.05. In summary, all the regression coefficients of a and b in the regression equation of this study are significant, indicating that the mediating effect of "consumer trust" exists, which can be verified in the third step without Sobel test.

Table 4-6. The result of mediating effect analysis

Dependent Variable	Independent Variables	Beta	t	Sig.	Adjusted R ²	F	Sig.
Customer Loyalty	(Constant)	0.562	3.634	0.000	0.722	143.323	0.000
	Timeliness	0.134	2.567	0.011			
	Communication Quality	0.265	5.283	0.000			
	Reliability	0.138	2.719	0.007			
	Empathy	0.332	7.174	0.000			
Customer Trust	(Constant)	0.732	4.116	0.000	0.635	96.387	0.000
	Timeliness	0.215	3.587	0.000			
	Communication Quality	0.164	2.839	0.005			
	Reliability	0.248	4.252	0.000			
	Empathy	0.209	3.935	0.000			
Customer Loyalty	(Constant)	0.461	2.902	0.000	0.728	118.152	0.000
	Customer Trust	0.138	2.344	0.020			
	Timeliness	0.104	1.963	0.051			
	Communication Quality	0.243	4.795	0.000			
	Reliability	0.104	1.986	0.048			
	Empathy	0.303	6.394	0.000			

In addition, after the introduction of mediating variables, communication quality, reliability and empathy still have significant positive effects on consumer loyalty. Sig. values are all less than 0.05, and the regression coefficient is less than the data in the first step, indicating that consumer trust plays a part in mediating the influence of communication quality, reliability and empathy on consumer loyalty. The regression coefficient of timeliness was no longer significant, and the Sig. value was greater than 0.05, indicating that trust played a completely mediating role in the influence of timeliness on loyalty.

5. CONCLUSIONS AND OUTLOOK

The results of this study show that the four dimensions of O2O fresh food e-commerce reverse logistics service quality - timeliness, communication quality, reliability and empathy can have a positive impact on consumer loyalty to varying degrees. And consumer trust has a mediating effect in the relationship. Through the analysis of the above results, this study concludes that O2O fresh food e-commerce enterprises should start from the four dimensions of reverse logistics service quality, make targeted improvement and perfection of the reverse logistics system to enhance consumer trust; do a good job of summarising experience in the process of providing reverse logistics services to enhance consumer experience from the source and avoid secondary returns from consumers.

5.1 Attaching importance to service quality of reverse logistics and promoting consumer trust

Based on above empirical results, this study thought O2O fresh food electricity provides the high quality of the reverse logistics service enables consumers to enjoy the good consumer experience, is beneficial to maintain the good relationship between customers, thereby increasing consumer confidence in the electricity, loyalty. Therefore, O2O fresh food e-commerce must pay attention to the management of reverse logistics service quality.

Fresh products themselves have the characteristics of perishable, spoiled fresh products will bring consumer complaints. Therefore, when consumers are faced with the situation that the quality of fresh products does not meet the purchase expectation, they should get timely response from the e-commerce platform after applying for return and replacement, which is conducive to reducing consumers' complaint. In addition, some e-commerce trading platforms set up cumbersome return process, so that consumers in the face of fresh products that do not meet the requirements will also choose not to return due to the trouble of return, by their own losses. This is likely to cause a backlog of consumer dissatisfaction, and even lead to the idea that the e-commerce is not worthy of trust again, resulting in a loss of consumers.

O2O fresh e-commerce enterprises should also pay attention to communication quality. Firstly, in addition to providing online artificial/intelligent customer service and telephone communication, e-commerce enterprises can also add more communication channels for consumers to give feedback by opening official Weibo accounts, WeChat public accounts or registering official accounts on short video platforms such as Tik Tok/Kuaishou. Secondly, enterprises can further enhance the service awareness of customer service personnel and improve their service skills through regular training. Finally, an assessment and evaluation mechanism can be established. The implementation of this mechanism first requires O2O fresh food e-commerce to conduct reasonable supervision on the communication process between consumers and customer service without any privacy, such as telephone recording after informing consumers in advance. Based on this, the customer service staff's business ability is evaluated from the aspects of communication attitude and result combined with consumers' feedback, urging the customer service staff to truly be friendly and polite and communicate actively.

In addition, as consumer demand is increasingly diversified and personalized, according to the empathy dimension, O2O fresh food e-commerce should try to give sufficient rights to staff within the scope of ability and cultivate a team of employees with temperance. To make it have enough space to solve different return disputes, such as according to the different needs of consumers, in combination with the actual situation, to provide return

service such as refund, refund only or refund negotiation. O2O fresh e-commerce should also strengthen the construction of organizational culture and create an enterprise atmosphere that truly cares for consumers. At the same time, follow-up visits should be made, and a special team should be set up to make return visits to consumers who have returned or replaced goods, so that consumers can feel the sincerity of e-commerce and the positive attitude of solving problems.

5.2 Summarize the experience of handling returns and improve the consumption experience of customers from the source

Although high-quality reverse logistics service is conducive to consumers' trust in O2O fresh food e-commerce, and can promote consumers' positive attitude towards subsequent purchase and word-of-mouth communication, if consumers still apply for return and replacement after shopping again, the remedial effect of reverse logistics service may not be as good as before. Consumers are worried that the fresh products they buy are still not satisfactory, so they gradually lose trust in the e-commerce and turn to other O2O fresh food e-commerce enterprises. For the e-commerce company, it will be more difficult to restore the trust of consumers, and it may need to spend a lot of financial and material resources, resulting in a significant increase in operating costs.

Therefore, this study believes that O2O fresh food e-commerce should summarize experience in the process of providing reverse logistics services. They can summarize the reasons for the return described by consumers, the time and place of applying for return and replacement, as well as the records of the purchase and shelf of this batch of products, analyze and classify the various problems, and then make corresponding adjustment plans. Specifically, the purchasing department may be required to pay more attention to the quality control of fresh products and strictly select suppliers, or the R&D department may be required to improve the packaging of fresh products, or it may be required to strengthen the protection measures of forward logistics distribution and put forward higher requirements on logistics distribution personnel. In a word, it is necessary to improve consumers' consumption experience at the source and avoid consumers' second return, so as not to waste the customer value created in the previous return logistics service.

6. RESEARCH LIMITATIONS AND PERSPECTIVES

The hypothesis of the relationship between service quality, consumer trust and consumer loyalty of O2O fresh food e-commerce reverse logistics put forward by this research model has been confirmed, but it only preliminarily reveals the mechanism that O2O fresh food e-commerce reverse logistics service quality affects consumer loyalty through consumer trust. In addition, the influence mechanism of other possible mediating variables and moderating variables, such as consumer satisfaction, needs to be further studied and improved.

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