

Research on User Stickiness of Logistics Platform and its Influencing factors

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Abstract: Nowadays, our society has undergone a change in the viewpoint of production and manufacturing, and will pay more attention to the needs of the majority of users, and gradually began to make demand-oriented research topics for the development of the times. Logistics platform is also under such a trend, pay more attention to user needs and experience. As the business focus of logistics platforms, how to cultivate user stickiness and continuously cultivate new users and retain old users under the competitive market situation has become a major problem for enterprises. Around these issues, this paper conducts a systematic and in-depth study. Based on the S-O-R theory, this paper uses the stimulus-organism-response model to answer the question of how to continuously improve the participation and willingness of platform users by finding factors that affect the stickiness of logistics platform users. Systematic analysis and process research of logistics platform-related literature guided by the research question identifies four factors that influence logistics platform user stickiness, namely platform gu-enterprise interaction, platform atmosphere cues, user fit and consumer trust, and includes platform network effect as a moderating variable in the research framework. Through the empirical study, the following conclusions were drawn: platform gu-enterprise interaction has a significant effect on user fit, platform atmosphere cues have a significant effect on consumer trust, and user fit and consumer trust have a significant effect on user stickiness. User fit mediates the influence of information request, switching cost, and personnel communication on platform user stickiness, and consumer trust mediates the influence of platform reputation, personalized recommendation, and service remediation on platform user stickiness. Finally, certain management suggestions and research limitation outlooks are given to managers of logistics platforms.

Keywords: Logistics platform, S-O-R model, User stickiness, User fit, Consumer trust.

1. Introduction

At present, platform-based transformation has become an important direction for the transformation of Chinese logistics enterprises, and the network platform and its derived platform economy have gradually become an unstoppable trend of industrial Internet-based transformation and upgrading development. This development mode of platform transformation will provide more innovative opportunities for the logistics industry and promote the high-quality development of the logistics industry. The "platform economy" is an emerging economic model driven by the Internet and digital technology and relying on network information infrastructure. It emphasizes the ease of online transactions and services, and uses data as a key factor of production. Clearly, logistics platforms are gaining momentum to influence the whole segment of logistics services, and platform-based transformation has become an important initiative for Chinese logistics companies in the process of transformation and upgrading, and its application will provide support and guidance for enterprises to achieve digital and intelligent transformation. However, in recent years, the logistics industry has undergone tremendous changes, with the emergence of many diversified and vertical logistics platforms, which have strong competitiveness and advanced models. However, despite the rapid development of the logistics industry, the platform model, after all, belongs to the Internet economic model, there is a head effect, but users are not willing to remember more than one or two brands, thus, for a majority of logistics platforms, the end is either a dismal business or forgotten by users. Some pain points of traditional logistics are not completely solved in a short period of time, and many small and medium-sized enterprises have a low

degree of mechanization and automation in the logistics process, with more manual consumption, low efficiency and high loss, resulting in poor user satisfaction and experience. Therefore, the rapid development of logistics platforms in the low customer stickiness urgently needs to be studied and explored.

2. Literature Review

2.1. User Stickiness Overview

Stickiness has different applications in different disciplines, and the term stickiness is often associated with certain chemical biological substances, referring to their characteristics that do not change their nature with external influences, such as spider webs. The connotation about user stickiness first appeared in the Internet field, and then gradually and widely applied to other fields. In the field of Internet, the popularity of the term stickiness is derived from the development of network makes consumers in a connected world, people's consumption mode and consumption behavior are significantly different compared with the past, consumers can get massive information of goods and services through cell phone APP, website, social media, electronic communication devices, etc., and their online conversion cost and search cost are reduced for websites to attract and retain consumers. It poses a great challenge, therefore, user stickiness in the Internet domain reflects the strength of the relationship between users and specific web services, and measures the ability of web services to attract users, such as blog stickiness, game stickiness, etc.

In e-commerce, creating and maintaining a competitive, long-term sustainable e-commerce channel requires a focus on the "stickiness" of business processes. Traditionally,

stickiness is generated on eCommerce sites through brand equity, customer loyalty and other useful site features. However, for an independent e-commerce platform, stickiness built solely on the merchant's brand equity, customer relationships, customer loyalty, etc. is easily replicated and is not sufficient to retain users indefinitely, and users may shift behavior when competitors are able to provide better quality of service. Therefore, websites also need to build intricate connections with users and create barriers to conversion through process integration, data, etc. to form a competitive advantage for the website.

From the above definition of user stickiness, it is easy to see that the definition of different stickiness based on the subject can be divided into two types : one is website (platform) stickiness and the other is user (consumer) stickiness. The former mainly emphasizes a kind of attraction and ability to retain users of the website or platform, while the latter mainly emphasizes a kind of psychological or behavioral preference of users or consumers to the website. Considering that this paper studies the problem of logistics platform users, so drawing on Wang Haiping's definition, combined with the research objectives of this paper, user stickiness is defined as a user's cognition and emotion of continuous use of the logistics platform, which is specifically expressed as a behavior that does not change its continuous use of the platform when faced with switching pressure or other external social environmental influences.

2.2. Customer Business Interaction Overview.

Customer-enterprise interaction is the interconnection that occurs between customers and companies through platforms in order to get a better experience. With the development of society and further upgrading of consumption and the continuous pursuit of personalized experiences by customers, it is becoming increasingly important for customers to easily interact with other customers or companies through social networks, media, and platforms. Currently, domestic and foreign scholars have studied the antecedents and consequences of customer-enterprise interaction and value creation from the perspective of customers. Lemke et al. (2011) argue that in a customer-enterprise interaction, users gain a sense of belonging through communication with the company, which increases their loyalty to the brand. Wei (2013) studied the antecedents of co-creation value, such as customer value co-creation behavior, customer engagement, relationship benefits, customer experience quality, need for uniqueness, emotional experience, and relationship experience.

In this paper, based on users' behaviors and attitudes toward logistics platform information, the forms of customer-enterprise interaction are classified as information request, conversion cost, and personnel exchange. Information request refers to customers' access to product and brand information through the relevant channels of the platform; switching cost refers to "the psychological, material and economic costs that customers have to face when changing suppliers", in this paper, it refers to the price paid by users to change logistics platforms; personnel communication refers to the communication between users and platform customer service staff, bilateral users will The communication between users and platform customer service staff, bilateral users will feedback their opinions and suggestions to the platform, and the platform will respond to them in time, so as to promote the improvement and development of the logistics platform.

2.3. Atmospheric Clues Overview.

Ambient cues are defined as a platform environment that drives an emotional or affective response from consumers or users and increases their willingness to repeat use. In an intense marketing environment, the impact of ambient cues on user behavior deserves in-depth study. In previous studies, most scholars have classified ambient cues into high and low task cues, but this division is too general and abstract. According to domestic scholar Chubing Zhang (2017), this paper divides logistics platform ambience cues into platform reputation, personalized recommendation, and service remediation. Chubing Zhang's (2017) division of ambience cues is more comprehensive and specific, especially for the construction of platforms, and the three dimensions of platform reputation, personalized recommendation and service remediation can well explain and represent the main content of platform ambience cues. Among them, platform reputation refers to the cognition or emotion held by platform users when they evaluate the logistics platform as an independent individual, which forms the "platform reputation", specifically including platform users' opinions on the rationality of the platform structure, the fairness of the platform rules, the fairness of the platform intermediary, the quality of the platform goods, the perfection of the platform services, the integrity of the platform information, etc. The personalized recommendation refers to whether the recommendation function of the logistics platform is tailored to the user's situation, whether the platform is easy to use and whether they can learn more about the products or services they are interested in on the platform. Service redress refers to, on the one hand, the reasonable explanation of the reasons for service failures and the necessary care and respect received by the user after a service failure on the platform. On the other hand, it refers to the responsiveness and ease with which staff deal with user complaints and the fairness with which users evaluate the company's fulfilment of its service commitments.

2.4. SOR Theory Overview.

SOR theory adds a description of intermediate psychological factors to the process of explaining the influence of external stimuli on individual behavior, emphasising the analysis of the process of psychological activity and explaining what psychological factors cause individual behavior to occur. In the field of economics and management, a number of scholars have explored and researched various aspects based on the S-O-R model. Among these aspects are stimuli, which can be both marketing stimuli and social-environmental stimuli. Marketing stimuli include product or service quality, price, advertising, promotion, etc., while social environment stimuli are mainly uncontrollable factors such as economic, political, technological and cultural factors, and also include the influence of customer interpersonal relationships, such as family, friends, acquaintances and other people; secondly, in terms of organism, the main emphasis is on the fact that after external stimuli are received by individuals, individuals will produce a series of psychological activities involving cognitive, value, emotional and affective. Finally, in terms of response, the research mainly covers both the psychological and behavioral aspects of the customer. The customer's responses include convergence and avoidance, with convergence responses focusing on satisfaction, loyalty and repeat purchase intentions, while avoidance responses have a negative impact

on consumer emotions or cognition, further deviating from the consumer's behavioral goals. It can be seen that the SOR theory model can effectively explain the mechanism of psychological influence between stimuli and individual behavioral intentions.

In a complex logistics market environment, if a company or platform wants to stimulate users' willingness to repeat use, identify and satisfy their needs, retain them and attract them to repeat visits, it needs to create a favorable environment for consumers to gain trust and recognition psychologically. Therefore, this study treats customer-enterprise interaction and ambient cues as stimulus variables (S); user fit and consumer trust as users' psychological processes (O); and user stickiness as response variables (R) to reveal the formation mechanism of user stickiness in logistics platforms based on the S-O-R model.

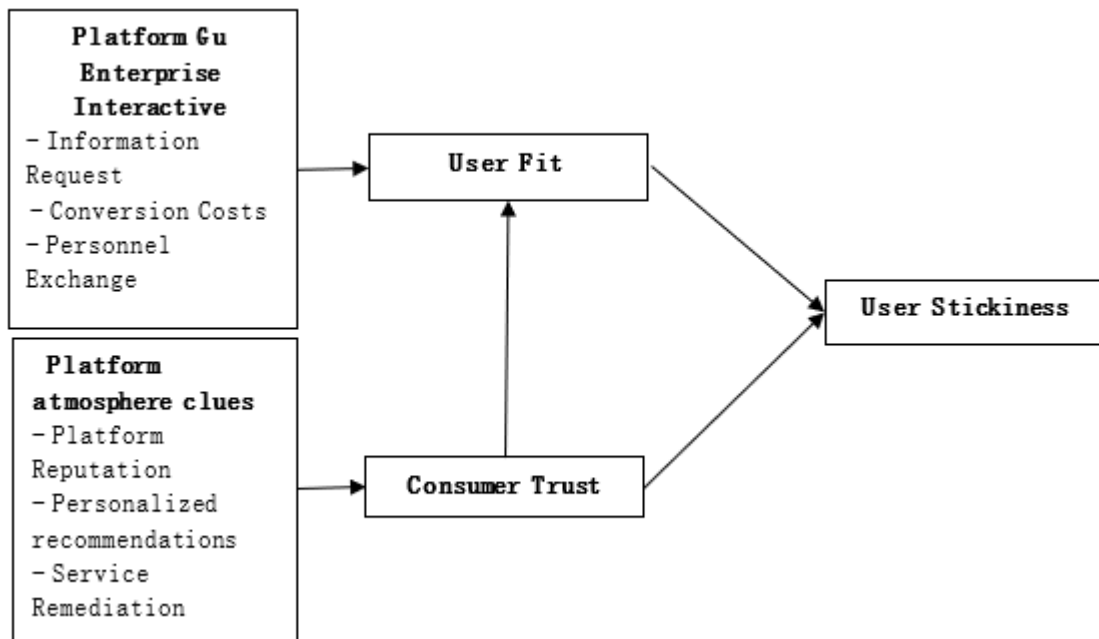


Figure 1. The conceptual model of this paper

3.2. Research on the impact of platform Consumer-enterprise interaction on user fit.

In the process of consumers using the platform services, they will interact with the logistics platform or other customers in various exchanges in order to obtain various values or information useful to help them shop. In the logistics service platform, Consumer-enterprise interaction has become an important way for users to obtain information. Based on the characteristics of the logistics platform, the Consumer-enterprise interaction in this paper can be divided into information request, conversion cost and personnel exchange. This paper argues that platform consumer-enterprise interaction has a positive impact on user fit. Accordingly, the hypothesis is proposed:

H1: In the process of users using the logistics platform, platform consumer-enterprise interaction has a positive impact on user fit.

H1a: In the process of users using the logistics platform, information request has a positive impact on user fit.

H1b: In the process of users using the logistics platform,

3. Research Model Construction and Hypothesis Formulation.

3.1. Research Model Construction.

The SOR model has been widely used in the study of individual user behavior, as can be seen from a review of related theories. It is believed that the stimulus of the environment has both emotional and cognitive components. Therefore, this paper takes the platform customer-enterprise interaction and platform atmosphere cues as the stimulus (S) in the context of logistics platform economy. Combining use and satisfaction theory, consumer trust and user fit as user emotional and cognitive responses (O), and user stickiness as individual responses (R), the SOR model is used to integrate the three aspects into one research framework as follows.

the switching cost has a positive impact on user fit.

H1c: In the process of users using the logistics platform, personnel communication has a positive impact on user fit.

3.3. Hypothesis on the impact of platform atmosphere cues on consumer trust.

Existing research has demonstrated that platform climate cues in the sink market environment have an impact on both consumer perceptions and emotions. Based on the characteristics of mobile social e-commerce, the study finds that platform quality, product quality, and service quality have an impact on consumers' purchase intention through two mediating variables: trust and perceived risk. Therefore, the study uses the perceived state of trust as a mediating variable. Based on this, the study concludes that consumer trust mediates the relationship between platform ambience cues and consumer stickiness, and proposes the following hypothesis.

H2: Platform ambience cues have a positive effect on consumer trust.

H2a: Platform reputation has a positive effect on consumer trust.

H2b: Personalized recommendation has a positive effect on

consumer trust.

H2c: Service remediation has a positive impact on consumer trust.

3.4. The impact of consumer trust on user fit.

Trust refers to the comprehensive trust evaluation of organizational members for the overall environment within the organization and is considered one of the most important environmental factors. Consumers will have more trust in the logistics platform because of the reliability of the platform and the high quality information provided by the platform, and trust will increase consumers' favorable perception of the logistics platform and reduce their perceived risk. An individual's perception of a trusting environment has a significant impact on their psychology and behavior. For example, studies have confirmed that trust in sharing economy platforms affects users' purchase decisions. Because trust enhances users' long-term reciprocal expectation networks, a good trust climate promotes social and emotional connections between users and platforms that go beyond ordinary economic exchanges. Once such connections are formed, users invest a great deal of extra effort in their interactions and feel a strong sense of autonomy as they play a decisive role in the value co-creation process. Consumer trust not only enhances users' sense of competence by improving their ability to integrate resources, but also promotes the formation of their sense of belonging. On the other hand, consumer trust also helps to enhance users' sense of belonging and is more likely to make users feel that the tasks they want to accomplish are needed from the heart rather than controlled or coerced by the merchant. Accordingly, the study proposes the hypothesis that

H3: Consumer trust has a positive effect on user fit.

3.5. The impact of consumer trust on user stickiness and the role of mediation.

When examined from the perspective of S-O-R theory, consumer trust is an important bridge between platform ambience cues and user stickiness. In the study of CSR, it was found that consumers who are satisfied with a company's product or service also develop emotional trust in that company. Trust plays a mediating role in perceived ease of use, perceived usefulness, and perceived interestingness on consumers' purchase intentions, and previous studies have confirmed the mediating role of trust. Therefore, the study takes the cognitive state of consumer trust as a mediating variable and considers trust to play a mediating role between ambient cues and user stickiness, and proposes the following hypothesis based on the logistics platform as the research object.

H4: Consumer trust has a positive effect on user stickiness.

H5a: Consumer trust plays a mediating role in the influence of platform reputation on user stickiness.

H5b: Consumer trust plays a mediating role in the effect of personalized recommendation on user stickiness.

H5c: Consumer trust plays a mediating role in the effect of service remediation on user stickiness.

3.6. The impact of user fit on user stickiness and the role of mediation.

Platforms are incarnations of organizations or companies, and the relationship between consumers and platforms is very similar to the relationship between individuals and organizations; therefore, this paper infers that user fit can also

promote users' organizational commitment to platforms, which in turn enhances their user stickiness.

Second, user fit can increase consumer satisfaction. According to self-determination theory, the sense of autonomy is highly correlated with individual interests and demands, and it is the degree to which an individual perceives "this is what I do" in the process of behavior, which is also the natural expression of individual values. Therefore, once consumers gain a sense of autonomy in the value co-creation process, they are more likely to perceive hedonic value and ignore utilitarian costs, which means they are more likely to be satisfied in the value co-creation process. Expectation confirmation theory suggests that satisfaction is an important factor driving sustained user behavior. Therefore, it is inferred that user fit can promote consumers' satisfaction, which in turn positively affects their user stickiness.

Therefore, the hypothesis is proposed:

H6: User fit has a positive effect on user stickiness

H7a: User fit plays a mediating role in the effect of information request on user stickiness

H7b: User fit plays a mediating role in the effect of switching costs on user stickiness

H7c: User fit mediates the effect of human communication on user stickiness

4. Questionnaire Design and Collection

This questionnaire is divided into four parts, the first part is about the questionnaire description, which explains to the respondents the purpose of conducting the questionnaire and the concept of logistics platform. The second part is about the basic information of the respondents, including gender, age, monthly income level, education level, occupation and monthly income level. The third part is the measurement of information request, switching cost, personnel communication, user fit, platform reputation, personalized recommendation, service remediation, trust atmosphere and user stickiness in the logistics platform. The last part is the acknowledgement, which expresses appreciation to the respondents for their serious participation in this questionnaire.

Due to the impact of the epidemic, this paper's questionnaire was distributed in the form of electronic questionnaires, and this paper used a web-based questionnaire platform, Questionnaire Star, to create and distribute the questionnaires for data collection. To ensure the representativeness of the returned questionnaires, this paper was distributed to groups of different ages, different income levels and frequent users of various types of logistics platforms.

The questionnaires were collected from December 2022 to January 2023, and 321 questionnaires were distributed, and the invalid questionnaires were eliminated according to the following criteria: C1) answer time less than or equal to 90 seconds; C2) questionnaire options were filled in indiscriminately; C3) the same options appeared continuously throughout the questionnaire. After screening, there were 252 valid questionnaires left, with a recovery rate of 76.6%.

5. Data Analysis and Results

5.1. Reliability and validity tests

The reliability and validity of the scales were tested using SPSS 26.0 software.

Table 1. Cronbach's alpha coefficients for each question item

Variables	Number of items	Cronbach's α
Information Request	5	0.840
Conversion Costs	3	0.708
Personnel Exchange	5	0.918
Platform Reputation	4	0.938
Personalized recommendations	4	0.897
Service Remediation	5	0.927
User Fit	4	0.894
Consumer Trust	5	0.931
User Stickiness	4	0.905

As shown in the above table, the Cronbach's α coefficients of all variables were greater than 0.7, which met the requirements of reliability, indicating that the scale has good reliability. Meanwhile, according to the analysis results of

SPSS26.0 software, the Cronbach's α coefficient of the overall scale was 0.978, indicating that the overall scale has a high internal consistency and is suitable for subsequent analysis.

Table 2. Convergent validity test table

Variables	Measurement indicators	Standardized factor loadings	Combinatorial reliability (CR)	Average Variance Extraction (AVE)
Information Request	RI2	0.722	0.799	0.574
	RI3	0.698		
	RI4	0.857		
	RI5	0.824		
Conversion Costs	COS2	0.500	0.769	0.633
	COS3	0.476		
	COS3	0.699		
	PE1	0.795		
Personnel Exchange	PE2	0.848	0.915	0.682
	PE3	0.863		
	PE4	0.767		
	PE5	0.846		
User Fit	UF1	0.86	0.894	0.679
	UF2	0.836		
	UF3	0.809		
	UF4	0.789		
Platform Reputation	PR1	0.893	0.940	0.797
	PR2	0.908		
	PR3	0.934		
	PR4	0.837		
Personalized recommendations	PS1	0.833	0.896	0.634
	PS2	0.712		
	PS3	0.857		
	PS4	0.821		
	PS5	0.778		
Service Remediation	RV1	0.839	0.925	0.712
	RV2	0.818		
	RV3	0.82		
	RV4	0.855		
	RV5	0.889		
Consumer Trust	AT1	0.883	0.933	0.736
	AT2	0.877		
	AT3	0.825		
	AT4	0.893		
	AT5	0.815		
User Stickiness	UST1	0.774	0.901	0.694
	UST2	0.861		
	UST3	0.9		
	UST4	0.818		

As shown in the table above, the standardized factor loadings for each measure were greater than 0.5; CR was

greater than 0.7; and (3) AVE was greater than 0.5, indicating good convergent validity.

Table 3. Square root of AVE and correlation coefficient between potential variables

	1	2	3	4	5	6	7	8	9
Information Request	0.71								
Conversion Costs	0.258	0.664							
Personnel Exchange	0.443	0.451	0.813						
User Fit	0.413	0.457	0.715	0.811					
Platform Reputation	0.372	0.365	0.688	0.717	0.873				
Personalized recommendations	0.441	0.398	0.739	0.7	0.777	0.777			
Service Remediation	0.439	0.326	0.746	0.647	0.727	0.809	0.83		
Consumer Trust	0.45	0.334	0.691	0.671	0.754	0.768	0.835	0.841	
User Stickiness	0.373	0.307	0.615	0.655	0.579	0.662	0.72	0.785	0.759

As shown in the table above, the square root of AVE is greater than the correlation coefficient between this variable and other variables, as the measurement model has good discriminant validity.

stickiness influence factor research model were collected through questionnaires, and the path coefficients of the model and its significance test results were obtained through the output statement of AMOS 26.0 as shown in Table 4.

5.2. Hypothesis testing

In this thesis, the data of the logistics platform user

Table 4. Path test results

Paths	Standardization factor	Standard Error	Critical Ratio	P	Results
Information Request→ User Fit	-0.011	0.049	-0.208	0.835	No Support
Conversion Costs→ User Fit	0.79	0.125	6.96	***	Support
Personnel Exchange→ User Fit	0.449	0.051	7.412	***	Support
Platform Reputation→ Consumer Trust	0.206	0.027	6.916	***	Support
Personalized recommendations→ Consumer Trust	-0.096	0.026	-3.422	***	No Support
Service Remediation→ Consumer Trust	0.974	0.06	15.192	***	Support
Consumer Trust→ User Fit	0.417	0.055	6.985	***	Support
User Fit→ User Stickiness	0.273	0.049	5.341	***	Support
Consumer Trust→ User Stickiness	0.855	0.077	9.946	***	Support

Note: *** indicates $p < 0.01$

From the results of the above path coefficient tests, it can be seen that:

After the test, research hypotheses H1b, H1c are valid and H1a is not valid, research hypotheses H2a, H2c are valid and H2b is not valid, and research hypotheses H3, H4, and H6 are

valid.

On the basis of the above results, this paper conducts mediating effect analysis by Bootstrap test, and Bootstrap sampling method is set to bias-corrected nonparametric percentile method.

Table 5. Bootstrap confidence intervals for the total, indirect, and direct effects

	Total effect	Indirect effects	Direct effect	Results
Information Request→ User Stickiness	(0.283,0.496)	(0.159,0.351)	(0.051,0.245)	Partial Agency
Conversion Costs→ User Stickiness	(0.260,0.502)	(0.189,0.400)	(-0.035,0.187)	Full Agency
Personnel Exchange→ User Stickiness	(0.527,0.727)	(0.177,0.462)	(0.173,0.437)	Partial Agency
Platform Reputation→ User Stickiness	(0.513,0.730)	(0.447,0.737)	(-0.145,0.110)	Full Agency
Personalized recommendations→ User Stickiness	(0.618,0.820)	(0.368,0.642)	(0.040,0.302)	Partial Agency
Service Remediation→ User Stickiness	(0.683,0.868)	(0.288,0.681)	(0.102,0.402)	Partial Agency

As can be seen from the above table, the confidence intervals of the total and indirect effects of all latent variables do not contain zero, indicating that user fit plays a mediating role in the effects of information request, switching cost, and personnel communication on logistics platform user stickiness, and hypotheses H7a, H7b, and H7c hold. Consumer trust plays a mediating role in the effects of platform reputation, personalized recommendation, and service remediation on logistics platform user stickiness, and hypotheses H5a, H5b, and H5c hold.

And in the confidence interval of the direct effect, the Bootstrap confidence interval of conversion cost and platform reputation contains 0, which indicates that the mediating effect of user fit in the effect of conversion cost on logistics platform user stickiness is fully mediated, and the mediating effect of consumer trust in the effect of platform reputation on logistics platform user stickiness is also fully mediated. The confidence intervals of information request, personnel communication, personalized recommendation, and service remediation do not contain 0, which indicates that the mediating effect of user fit in the influence of information request and personnel communication on the stickiness of logistics platform users is partially mediated, and the mediating effect of consumer trust in the influence of personalized recommendation and service remediation on the stickiness of logistics platform users is partially mediated.

6. Summary

First, customer-enterprise interaction has an impact on the perceived value of users, with switching costs and personnel communication having a greater impact on user engagement. Although the information request is helpful to stimulate the customer's willingness to use the platform and thus generate adherence to the platform, but the relationship between information request and user fit is not significant, the logistics platform should adopt different strategies for each form of customer-enterprise interaction, the deeper the customer's participation in the interaction, the stronger their experience, the more they can stimulate their satisfaction with the product or service, and thus generate "dependence" on the platform. dependence" on the platform.

Second, the platform atmosphere cues will have an impact on the user's trust perception, the platform reputation and service remedies have a greater impact on consumer trust. Although personalized recommendation will save consumers' time and energy, but it also means the data and labeling of the user's grasp. In this way, logistics platform users will inevitably be labeled and categorized by "others" and lose their human subjectivity (in the eyes of others). At the same

time, this also means an invisible violation of users' privacy. Therefore, personalized recommendation will reduce the trust of consumers.

Third, information request, conversion cost and personnel exchange enhance user stickiness through the realization of user fit. Platform reputation, personalized recommendation and service remedy enhance user stickiness through the realization of consumer trust. Consumer trust and user fit play an important role in the occurrence of users' repeated use behavior. Trust will reduce consumers' psychological burden, and fit will enhance users' emotional approval and psychological expectation consistency, both of which are manifestations of users' approval and thus become customers of merchants or willing to make recommendations to others. Logistics platform can improve the level and quality of logistics services, optimize web design, provide transparent and personalized services, improve the platform and its own reputation to enhance user fit and win the trust of consumers.

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