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# Influence of Service Quality of Agricultural Products E-Commerce Platform on Customer Loyalty - The Mediating Role of Customer Engagement

Ning Hu, Xi Chen[1*] and Ning Zhang[2]

[1*,2]*Business School, Shandong Jianzhu University, Jinan 250101, China*
[1*]*chenxi0801@naver.com*

***Abstract***

*With the popularity of computer networks and advances in information technology, online shopping has become a major way. The net purchase of agricultural products is becoming a new growth trend. China's agricultural development of the electronic business platform is very fast; from the customer's perspective, scholars have focused on improving the electronic business platform's experience and level of service to achieve engagement and loyalty. Existing research results show that electronic service quality directly affects customer loyalty. Based on existing theory, this paper focuses on the influence of electronic service quality and customer loyalty. At the same time, customer engagement is also considered, and together, a new model is established. The empirical test uses the data processing software SPSS 26.0 and AMOS 24.0 to analyze the 433 questionnaires gained from random interviews and online fill out. AMOS (version 24.0) was used to estimate the measurement and structural models. The test shows that the electronic service quality (process quality, outcome quality, recovery quality) has a prominent positive effect on customer engagement, as does the engagement with loyalty. Service recovery quality can not only directly affect customer loyalty but also indirectly affect customer loyalty through customer engagement, while service process quality and service result quality affect customer loyalty through customer engagement. On the one hand, these theories enrich the traditional customer relation model by introducing customer engagement as an intervening variable that corresponds more to the current online shopping environment. On the other hand, this paper is conducted with the premier electronic agriculture product business background; the result can supply some practical management advice for developing customer loyalty in this field.*

***Keywords:*** *E-Business platform of agriculture, E-Service quality, Customer engagement, Customer loyalty*

## 1. Introduction

With the continuous progress and popularization of computer network technology and the rapid development of online shopping, online shopping has become the main way of people's shopping. At the same time, there are more and more choices for online shopping. Among them, people's online shopping of agricultural products has gradually become a new growth trend, and agricultural products have become a new product for consumers to buy online.

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*Corresponding author

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With the concept of "Internet plus agriculture" put forward, the prospects of agricultural products will also be broader. It will birth new formats of rural electricity business and become a new engine and power for China's economic transformation.

Reviewing the existing research on the e-commerce platform of agricultural products, most of the current research is based on the qualitative analysis of the development model of the e-commerce platform of agricultural products [1]. In contrast, the quantitative empirical analysis is less. Among the few empirical studies based on consumer behavior, Fei took agricultural products as an example to analyze the impact of service quality of agricultural products e-commerce platform on consumers' willingness to buy agricultural products online and divided service quality into three dimensions: service environment quality, service process quality, and service result quality. Wang used the method of network survey to discuss consumption [2]. Li et al. found in the research on the development of fresh organic e-commerce platforms in China that user loyalty is difficult to maintain [3]. Therefore, in the e-commerce environment, in the face of repeated purchases of agricultural products, it is still very important to study customer loyalty to agricultural products' e-commerce platforms.

A significant literature study states that service quality positively affects consumers' repeat purchases and loyalty. Besides customer satisfaction, we look for other mediating variables that can lead to customer loyalty, such as trust [4], perceived value [5], etc. In recent years, due to the popularity and development of e-commerce, scholars have focused on the role of participation and interaction [6] in the long-term relationship between customers and enterprises. In this context, customer engagement is proposed. Now, Customer engagement is introduced. How can customers achieve fit when they accept the agricultural products e-commerce platform service to trigger customer loyalty, repeat purchases, word-of-mouth recommendation, and other behaviors?

Based on the existing literature review, this paper starts from the perspective of service quality of the E-Business platform of agriculture. Through empirical research, it explores whether the service quality of the E-Business platform of agriculture will affect consumers' customer loyalty. Based on the Internet background, this paper introduces the variable of Customer engagement into the existing research, breaks the original research path, and reveals the influence path of service quality and customer engagement of the E-Business platform of agriculture on customer loyalty. Nowadays, under the background of fierce competition in the e-commerce of agricultural products, the e-commerce platform of agricultural products can provide theoretical references for cultivating customer engagement, enhancing real customer loyalty, and increasing benefits.

The second part of this paper is a literature review and the development of hypotheses. This part summarizes the concept and dimension definition of service quality, customer engagement, and customer employability. Based on the literature review, this paper puts forward the hypothesis of this study and constructs the research model. This paper will examine the impact of service quality of e-commerce platforms for agricultural products on customer loyalty. Service quality has a positive impact on customer engagement. Customer engagement has a positive impact on customer loyalty. After presenting the methodology and data analysis, we discuss the findings and implications in the last section.

## 2. Literature review and hypothesis development

### 2.1. Service quality

The academic research on service quality began in the 1970s and 1980s. The earliest definition of service quality is that it is the same as the result of previous standards and services [7]. Sasser et al. thought that we should consider the result of service and the process of service delivery [8]. Then, Gronroos believes that service quality is a perception of service, that the service quality perceived by customers is the key to the success of enterprises, and that the service quality is subjectively evaluated by customers themselves [9]. At this time, perceived service quality appeared for the first time in academic circles. Gronroos, combined with the theory of cognitive psychology, defined the concept of customer-perceived service quality as a result of the comparison between the initial level of customer expectation for service quality and the level of customer-perceived service quality; in reality, it emphasizes the gap between the service and expectation that customers feel in the process of enjoying the service. In the first mock exam, he also proposed a model of perceived service quality, which has been recognized by academic circles and has become the basis for future scholars. With the deepening of the research, Parasurama et al. developed and improved the service quality model, thinking that service quality is the gap between the service level perceived by customers and the service quality expected before [10]. In other words, the quality of service is equal to the original expected service minus the real cognitive service. Customer perceived service quality is the subjective evaluation of service, and it is the result of the comparison between customer's subjective expectations and actual perceived service level, which shows the quality of service. On this basis, domestic scholars give a similar definition. The definition should be given from the perspective of the service recipient and service provider. In the aspect of the service recipient, it means that the actual service received by customers has reached or exceeded the original expectation; in the aspect of the service provider, it means that the service level has reached the previous expectation [11].

The quality of service in this paper refers to the online quality of service, also known as electronic quality of service, which is developed and evolved from the traditional quality of service. With the popularization of Internet information technology, the development trend of electronic network service is further accelerated. Therefore, under the background of the network, more and more scholars have begun to pay attention to the research of online service quality. Zeithaml et al. defined e-service quality (e-SQ) for the first time. E-SQ is the degree of service online enterprises provides to ensure customers can more quickly and efficiently select, purchase, and deliver products from the website [12]. Therefore, e-service quality is a comprehensive measurement of online shopping services. The definition is based on the whole online shopping process, with the consumer's online shopping website as the interactive object, including the website service quality perceived by the consumer when using the website for shopping and the service result quality of the later webpage. Some scholars now define e-service quality from other aspects.

Gummerus et al. think consumers can use Internet information technology to interact with various online products and service providers [13]. This interaction includes the evaluation of the process and result. Chen proposed that electronic service quality is the subjective comparison and cognition between the psychological expectation and the information you need when you use a website to find and search the information you need [14]. Li et al. believe that in the Internet e-commerce environment, customer-perceived service quality is e-service quality [15]. Bauer et al. put forward a similar point of view; they believe that e-

 

service quality is only in online purchases with internet information technology as the interactive object [16]. Customers are the key players in perceiving services with various attributes related to their knowledge, experience, and desires. These expectations direct their purchase intention, emotional response, buying decisions, and repurchase behavior. Service quality and customer satisfaction are viewed together in business for their success [17].

### 2.2. Customer engagement

Customer engagement is a state of mind of being emotionally invested in the focal object (brand or medium), which leads to customers' frequent interactions with the focal object [18]. Since Kaln put forward the concept of engagement in 1900, the academic community began to pay more attention to it. Many scholars have carried out mutual research in different fields. In recent years, some marketing scholars have shown interest in engagement and have put forward the customer engagement concept [35]. iIIc summarized the previous research on engagement and discussed employee engagement in organizational behavior. Scholars in educational psychology discuss student engagement, and social psychology studies social engagement. In recent years, engagement has been introduced into the field of marketing. The traditional view is that customers are exogenous to the enterprise [19] and passive recipients and value destroyers. However, with the rapid development of the social economy, market competition has intensified, and the emergence of networks and other new social media leads to a change in customers' perspectives. They think that customers can create value for enterprises [20]. Some even think enterprises only play the role of partners, and customers are the real value creators [21]. With the rapid development of new media and the transformation of marketing ideas (the strengthening of service-oriented logic and the prevalence of relationship marketing paradigm), the concept of customer engagement (CE) is proposed. In this context, enterprises should further improve the management of customer relationships, achieve customer engagement, improve enterprise efficiency, and obtain competitive advantage [22].

As word-of-mouth manifests customer engagement, we can define social media-driven customer engagement as the "manifestations from customers toward a firm or a brand beyond purchase" [23], motivated by social media affordances. Social media foster online customer manifestations toward firms/brands through social affordances, fulfilling users' needs [24]. Some studies have shown that customer engagement can improve users' continuous use [25], strengthen emotional commitment [26], promote customers' trust in enterprises and customer satisfaction [27], improve enterprise reputation, form customer loyalty [28], and then improve enterprise performance [29]. Han and Yuan (2013) also investigated the customer engagement mechanism influencing customer behavior intention from the brand equity perspective. Scholars still focus on the definition and dimension of customer engagement or use qualitative research methods to explore the mechanism of customer engagement. Although there is no unified concept of customer engagement, scholars all agree that customer engagement is a psychological state between customers and enterprises in the process of repeated and co-creating value. Therefore, on the one hand, applying customer engagement to the experience of agricultural products e-commerce platforms will also have a certain impact on customer engagement; that is, customer-perceived product quality, service quality, and service quality will have an impact on customer engagement. On the other hand, the factors influencing customer engagement include perceived quality, customer satisfaction, customer involvement, etc.

### 2.3. Customer loyalty

At present, there is much research on the concept of customer loyalty. Customer loyalty includes having loyal customers, reducing service costs, making them willing to pay more for products or services, and free word-of-mouth marketing [30]. From the behavior perspective, Anderson and Sullivan believe customer loyalty is a kind of customer repurchase behavior [31]. Gremler and Brown take the service industry as the research object and define it as the frequency of customers' repeated purchases from a specific enterprise with a positive attitude. When there is a demand for repurchase, they will continue to choose the original enterprise [32]. Han and Wei defined customer loyalty as the long-term behavior of customers selecting a brand or service due to the influence of product price, quality, and service [33]. From the perspective of single behavior, scholars have questioned the definition of customer loyalty. They put forward that customers' repeat purchase behavior may be because consumers have too few choices and insufficient substitutes, or it is a regular habit behavior, which is not true loyalty. Then, from the attitude perspective, Zeithaml pointed out that customer loyalty is a willingness to maintain a long-term relationship between customers and enterprises [12]. Lu and Song pointed out customer loyalty is the degree of customer attachment to enterprise products and services [34]. Subsequently, Shankar et al. found that loyal consumers are willing to consume, others do not easily convince them, and they are more willing to recommend products and services to others [35]. At present, it is easy for academic circles to consider the combination of attitude and behavior to explain customer loyalty. Among them, the main representative viewpoints are: Dick and Basu pointed out that customer loyalty is determined by consumers' positive purchase attitude and continuous purchase behavior [36]. Oliver made a pioneering contribution to the definition of customer loyalty on this basis [37]. He believed that customer loyalty is the strong will and commitment of consumers in the process of long-term purchase and selection of their favorite products and services, as well as the actual repeated purchase behavior. No matter the situation's impact, it will not produce the behavior of conversion. Ma and Zhang pointed out that customer loyalty refers to customers' dependence when they purchase an enterprise's products and services [38]. They have a preference attitude, will make repeated purchases, and will actively promote and recommend for the enterprise. In other words, customer loyalty is a combination of attitude and behavior. Loyalty is reflected in the behavior loyalty of repeated purchases and includes the positive attitude loyalty to a certain product and brand [39].

Based on the research situation of an e-commerce platform for agricultural products, this paper takes customer loyalty as a whole. It is considered from two aspects: attitude and behavior loyalty. Customer loyalty is a preference and dependence on agricultural products when consumers purchase agricultural products on the e-commerce platform for agricultural products.

### 2.4. E-commerce platform service quality and customer engagement

With the change in marketing concepts, scholars have begun to think that customer engagement can create profits for enterprises and provide value activities for customers [40]. According to the theory of customer value, customer value refers to the value increase perceived by customers when they experience the products or services provided by enterprises, and then emotional attachment will be formed between customers and value providers [41]. At present, there is no accepted definition of customer engagement. Previous studies have generally believed customer engagement is a psychological state formed by repeating and creating value for enterprises [42]. When customers shop on the e-commerce

 

platform for agricultural products, they feel the quality of the service process and service result. If the e-commerce platform of agricultural products makes mistakes in service, they will experience quality-of-service recovery. Customers will establish an emotional bond with the e-commerce platform in these three stages when they feel more service. Therefore, if customers feel that shopping on the website platform is a good experience, it will lead to customer engagement. In other words, the level of service quality perceived by consumers at various stages of e-commerce platform shopping may lead to customer engagement. Reitz proposed an online customer engagement model based on his research and analyzed the experience of Facebook users. The results also showed that customer-perceived information service quality positively correlates with customer engagement [43]. Claussen et al. found that the quality of their software is customer engagement through the empirical study of Facebook users [44]. The meaning of customer engagement is close to the concepts of customer involvement and customer participation [45], and the research on the relationship between service quality and customer involvement and customer participation also supports the above reasoning. Therefore, this paper puts forward the following hypotheses.

H1: The service quality of agricultural products e-commerce platforms positively impacts customer engagement.

H1a: The quality of service processes has a positive impact on customer engagement.

H1b: The quality of service outcome has a positive impact on customer engagement.

H1c: The service recovery quality has a positive impact on customer engagement.

### 2.5. E-commerce platform customer engagement and customer loyalty

Research shows that customer engagement can improve users' continuous use [46], and users' continuous use is the embodiment of customer loyalty to some extent. According to the theory of Brodie et al., customer engagement may be the antecedent variable of customer loyalty. When the corresponding customers believe that the enterprise is reliable and honest, there will be trust between the two sides. The higher the degree of fit, the higher the customer's attachment to the enterprise, the higher the emotional commitment between them, and the more can lead to customer loyalty. At the same time, the research of Han et al. shows that customer engagement can form customer loyalty and has a significant positive impact on customer loyalty. Samala et al. empirically confirmed that customer engagement enhances tourist satisfaction, trust, and loyalty to certain tourism brands [47].

Therefore, this paper puts forward the following hypotheses.

H2: Customer engagement has a positive impact on customer loyalty.

### 2.6. E-commerce platform service quality and customer loyalty

In 1986, Davis combined Ajzen's TPB and Hshbein's TRA to put forward Tam and formed Tam. This model mainly explains perceived usefulness and ease of use to predict and analyze users' behavior. Then, in the aspect of the model expansion, Celik et al. added perceived information quality, system quality, and service quality to the classic TAM model when they studied online shopping, explaining the problem of user continuous use [48]. Suppose the relationship between consumers and the e-commerce platform of agricultural products is divided according to the time order of shopping. In that case, it can be roughly divided into pre-purchase, mid-purchase, and post-purchase. Tam's theory explains consumers' perceived service quality before, mid-purchase, and post-purchase of agricultural products on the e-commerce platform.

According to the existing customer relationship theory, providing high-quality service can improve and maintain customer loyalty. Important literature verified the direct relationship between service quality and customer loyalty in the network environment [49][50]. Meanwhile, Wolfinbarger and Illy found that customer loyalty is the outcome variable of e-sq. Subsequently, some scholars have also researched the impact of different e-service quality dimensions on customer loyalty. Through empirical research, Marimon et al. tested the positive impact of e-service quality responsiveness on customer loyalty. Qi et al. did not use the concept of e-service quality but also tested that website convenience has a significant positive impact on customer loyalty, which has the same factor components as e-service quality. Also, scholars (2009) verified that website service quality (service process quality, service result quality, and service recovery quality) has a positive impact on customer loyalty in the context of online shopping. Among them, the quality-of-service results also directly affect customer loyalty through the intermediary variable of customer trust. Then, Zhang et al. demonstrated that service process quality and service recovery quality have a significant direct impact on customer loyalty from three aspects of service process quality, service recovery quality, and service result quality, taking online shopping in China as the research background.

To sum up, the theoretical basis and existing literature show that there is a direct effect between service quality and customer loyalty. Therefore, this paper puts forward the following hypotheses.

H3: The service quality of agricultural products e-commerce platforms has a positive impact on customer loyalty.

H3a: The positive effect of service process quality on customer loyalty.

H3b: The positive effect of service outcome quality on customer loyalty.

H3c: The positive effect of service recovery quality on customer loyalty.

## 3. Materials and methods

### 3.1. Theoretical model

This paper will examine the impact of service quality of e-commerce platforms for agricultural products on customer loyalty. Service quality (process quality, outcome quality, recovery quality) has a positive impact on customer engagement. Customer engagement has a positive impact on customer loyalty. This part summarizes the hypotheses mentioned above and draws the research model shown in Figure 1.

 

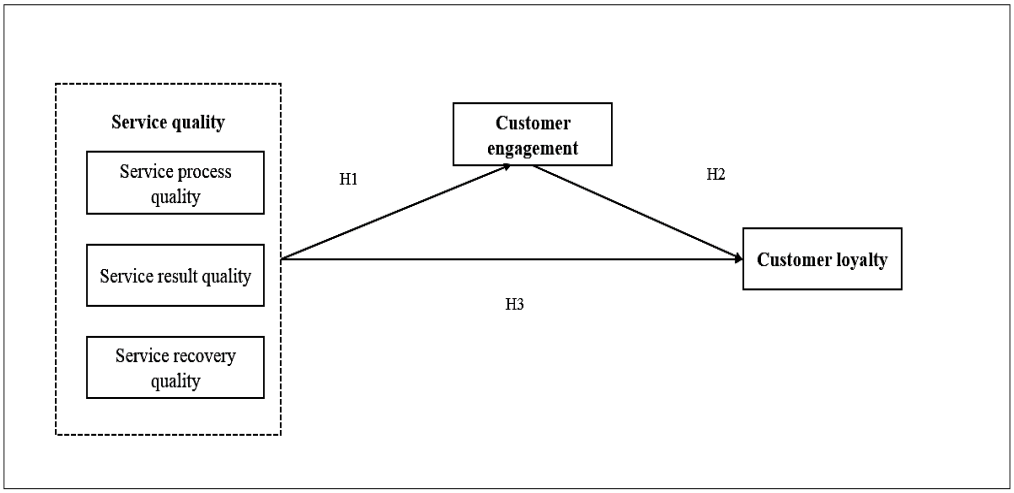


Figure 1. The research framework

### 3.2. Measurement scaling for constructs and items

Sociodemographic measures include marital gender, age, average monthly income, and occupation. Sex was measured dichotomously. The age range was measured using an ordinal scale. The occupation was also measured using an ordinal scale, and agricultural products usually purchased were measured in the local currency and converted into U.S. dollars.

The questionnaire in this paper uses the 7-point Likert scale. For each measurement item, 1-7 points represent from "totally disagree" to "completely agree ."The measurement items of each variable are based on the items verified to be trustworthy and appropriate in the previous study. They are modified in combination with the situation of this study. The content of measurement items is shown in Table 1.

Table 1. Variable scale

| Part | Question item | Researcher |
|---|---|---|
| Service process quality (6 items) | The website's web design is very convenient for finding the agricultural products and information you need to buy. | Zeithaml et al (2002), Parasuraman et al (2005), Collier & Bienstock (2006) |
| | The website's web design can give people a clean and professional feeling. | |
| | The website search engine function is strong, making it easy to find those who want to buy agricultural products. | |
| | The website will not abuse your personal information. | |
| | The website can provide sufficient and timely updated information on agricultural products. | |
| | The website processes transactions quickly. | |
| Service result quality (6 items) | The website can deliver the purchased agricultural products when you require them. | |
| | The agricultural products delivered by this website are consistent with your expectations. | |
| | The agricultural products delivered by the website are consistent with their advertising. | |
| | The agricultural products delivered by the website are in good condition. | |
| | The website business can fulfill the promise. | |
| | The merchants of the website can accurately deliver the purchased agricultural products. | |

| | | |
|---|---|---|
| Service recovery quality (4 items) | When there is a problem with the transaction, the website service staff can tell you how to do it. | |
| | The website's service staff can solve your problems in a friendly and quick manner. | |
| | When the transaction problems, the site will take the initiative to apologize to you. | |
| | The website will compensate you for the loss due to the quality problems of its agricultural products. | |
| Customer engagement (3 items) | Spent a lot of time on the agricultural products e-commerce platform. | Vivek (2009) |
| | Anything related to this business station will attract your attention. | |
| | You like to share your experience using the agricultural products e-commerce platform with your friends. | |
| Customer loyalty (6 items) | When buying agricultural products online, this platform is your first choice. | Kassim & Abdullah (2010) |
| | Even if other e-commerce platforms for agricultural products have lower prices, Nong agricultural products will not quickly turn to other e-commerce platforms for agricultural products. | |
| | You will continue to buy agricultural products on the agricultural products e-commerce platform. | |
| | Compared with the e-commerce of agricultural products, you consume more on this platform. | |
| | You prefer this platform to e-commerce for agricultural products. | |
| | You will recommend this e-commerce platform for agricultural products to others. | |

**Note: Arrangement by researchers.*

## 4. Data analysis and results

### 4.1. Analysis of sample characteristics

This survey was conducted through an online crowdsourcing platform in China, which provides functions equivalent to Amazon Mechanical Turk. The online survey platform used in this paper is the most representative in China. Therefore, the representativeness of the sample for the survey method. Before the formal questionnaire was issued, 20 people (10 men and 10 women) were pretested in a small range. According to the pretest results, some sentences were properly adjusted to form a formal questionnaire.

The formal questionnaire was issued from November to December 2020. In this study, a non-random sampling survey was adopted. Through a questionnaire survey of 470 customers who purchase agricultural products through the e-commerce platform, 37 invalid questionnaires, which are the questionnaires with inaccurate answers, inconsistent answers, and careless content filling, were eliminated, and 433 valid questionnaires were collected. The sampling efficiency was 92.1%.

Among the effective data samples collected, 44.8% were men, and 55.2% were women. According to the age distribution, 3.2% were under 20, 50.8% were 20-39, 43.2% were 40-59, and 2.8% were over 60. According to the occupational distribution, 9.9% were civil servants and institutions, 17.1% were enterprise employees, 3.5% were self-employed, 2.1% were students, 26.6% were retired, 40.9% were unemployed or others. According to the distribution of educational background, 20.1% have a high school education background, 23.3% have a junior college education background, 36.0% have an undergraduate education background, and 20.6% have a graduate education background or above. Regarding economic level, 53.3% are below the middle level, 41.8% are above the middle level, and 4.8% are

 

above the middle level. Regarding the agricultural products usually purchased, fruit for 25.9%, vegetables for 28.9%, meat and egg for 21.5%, aquatic products for 15.9%, and others for 7.8%. The statistics are shown in Table 2.

Table 2. Demographics of the survey respondents (N = 433)

| Item | Characteristic | Number of Samples | Percentage |
|---|---|---|---|
| Gender | Male | 194 | 44.8% |
| | Female | 239 | 55.2% |
| Age | 20 or younger | 14 | 3.2% |
| | 21–40 | 220 | 50.8% |
| | 41–60 | 187 | 43.2% |
| | 60 or older | 12 | 2.8% |
| Occupation | Institution and civil servant | 43 | 9.9% |
| | Enterprise staff | 74 | 17.1% |
| | Individual management | 15 | 3.5% |
| | Student | 9 | 2.1% |
| | Retire | 115 | 26.6% |
| | Unemployed or others | 177 | 40.9% |
| Education | High school and below | 87 | 20.1% |
| | College degree | 101 | 23.3% |
| | Bachelor degree | 156 | 36.0% |
| | Graduate or above | 89 | 20.6% |
| Economic level | Below average | 231 | 53.3% |
| | Middle level | 181 | 41.8% |
| | Above average | 21 | 4.8% |
| Agricultural products are usually purchased | Fruit | 112 | 25.9% |
| | Vegetable | 125 | 28.9% |
| | Meat and egg | 93 | 21.5% |
| | Aquatic product | 69 | 15.9% |
| | Other | 34 | 7.8% |

### 4.2. Reliability and validity

Following the two-step approach recommended by Anderson and Gerbing, we first examined the measurement model to verify the reliability and validity of the instrument and then assessed the structural model.

AMOS (version 24.0) was used to estimate the measurement and structural models. As the normality of samples is an important assumption for covariance-based AMOS estimation, we first examined the skewness and kurtosis of the data to assess the normality of samples. The skewness values for the sample ranged from -0.916 to -0.214, which were within the threshold of 3.0 for acceptable skewness. The kurtosis values of items for the two samples were between -0.863 and 1.33, which were also below Kline's standard of 8. These two samples were, therefore, accepted as fulfilling the assumption of normality.

We performed both principal components factor analysis and confirmatory factor analysis (CFA) to assess the reliability and validity of the scales. The sample's Kaiser–Meyer–Olkin (KMO) statistics was 0.745, indicating that the data was amenable for factor analysis. All indicators loaded on the expected factors and were higher than 0.6, while loadings on other factors for all indicators were lower than 0.4, suggesting good convergent and discriminant validity.

A 5-factor measurement model was set up to further assess construct reliability and validity according to the CFA approach. As shown in [3], the Cronbach's a and Composite Reliability (CR) value of each construct ranged from 0.857 to 0.984, above the suggested threshold of 0.7. For construct validity, both convergent validity and discriminant validity were examined. Convergent validity was confirmed by reviewing the Average Variance Extracted (AVE) and indicator loadings. As shown in Table 4, all AVE values were higher than the recommended level of 0.5. The standard loadings of all items were above the desired threshold of 0.7 and significant at 0.001. This showed good convergent validity.

The discriminant validity is supported when the square root of the AVE for each construct is greater than the correlations between that construct and other constructs. As shown in Table 4, the square roots of the AVEs for both datasets were all greater than the inter-construct correlations depicted in the off-diagonal entries, thus demonstrating discriminant validity.

As the data collected was self-reported from a single source, we tested the data for common method bias using Harman's single factor test. Five factors were extracted from the data. The factors extracted from the sample explained an 85.9% variance in the collected data. However, the most significant factors for these samples accounted for 39% (less than 40%). The results showed that no single factor dominated the total variance, indicating a lack of common method bias.

Table 3. Results of confirmatory factor analysis

| Construct | Indicator | Standard loading [1] | AVE | CR | Cronbach's α |
|---|---|---|---|---|---|
| Service process quality | SPQ1<br>SPQ 2<br>SPQ 3<br>SPQ 4<br>SPQ 5<br>SPQ 6 | 0.936<br>0.953<br>0.955<br>0.948<br>0.957<br>0.954 | 0.904 | 0.983 | 0.982 |
| Service result quality | SRQ 1<br>SRQ 2<br>SRQ 3<br>SRQ 4<br>SRQ 5<br>SRQ 6 | 0.950<br>0.959<br>0.958<br>0.954<br>0.955<br>0.956 | 0.913 | 0.984 | 0.984 |
| Service recovery quality | SRC 1<br>SRC 2<br>SRC 3<br>SRC 4 | 0.965<br>0.968<br>0.965<br>0.965 | 0.933 | 0.982 | 0.982 |
| Customer engagement | CE1<br>CE2<br>CE3 | 0.816<br>0.824<br>0.809 | 0.666 | 0.857 | 0.857 |
| Customer loyalty | CL1<br>CL2<br>CL3<br>CL4<br>CL5<br>CL6 | 0.796<br>0.796<br>0.801<br>0.794<br>0.818<br>0.803 | 0.642 | 0.915 | 0.915 |

**Note: [1] All standard loadings were significant at p<0.001.*

Table 4. Correlations and the square root of AVE (diagonal)

| | SPQ | SRQ | SRC | CE | CL |
|---|---|---|---|---|---|
| SPQ | **0.951** | | | | |
| SRQ | 0.513 | **0.956** | | | |
| SRC | 0.410 | 0.459 | **0.966** | | |
| CE | 0.561 | 0.564 | 0.677 | **0.816** | |
| CL | 0.566 | 0.579 | 0.677 | 0.630 | **0.801** |

**Note: SPQ: Service process quality; SRQ: Service result quality; SRC: Service recovery quality; CE: Customer engagement; CL: Customer loyalty.*

After examining the measurement validity and reliability, we tested the proposed hypotheses using AMOS 24.0. After modifying the original model, the actual and recommended values of the model fit indices are listed in Table 5. The fit indices of the model were better than the recommended thresholds, demonstrating a good fit between the model and the data.

Table 5. Measures of the model fit

| Fit index | $X^2$/df | RMSEA | GFI | CFI | NFI | TLI |
|---|---|---|---|---|---|---|
| Recommended range | <3.84[a] | <0.08[b] | >0.90[a] | >0.90[a] | >0.90[a] | >0.90[a] |
| Model Value | 1.440 | 0.039 | 0.932 | 0.992 | 0.975 | 0.991 |

**Note: 1. RMSEA, root mean square error of approximation; GFI, goodness of fit index; CFI, comparative fit index; NFI, normed fit index; TLI, non-normed fit index. 2. [a]. According to Bentler and Bonett and Lee et al., [b]. According to Browne and Cudeck, and Lee et al.*

### 4.3. Hypotheses testing

Path modeling was performed to test H1 to H3. Our results show that electronic service quality (process quality, outcome quality, recovery quality) has a prominent positive effect on customer engagement, and so does the engagement to loyalty. Service recovery quality can not only directly affect customer loyalty but also indirectly affect customer loyalty through customer engagement, while service process quality and service result quality affect customer loyalty through customer engagement. The results are reported in Table 6.

Table 6. Structural model results

| Hypotheses | Structural Path | Estimate | S.E. | T value | p | Results |
|---|---|---|---|---|---|---|
| H1a | SPQ → CE | 0.095 | 0.022 | 4.227 | *** | accepted |
| H1b | SRQ → CE | 0.084 | 0.022 | 3.866 | *** | accepted |
| H1c | SRC → CE | 0.158 | 0.021 | 7.466 | *** | accepted |
| H2 | CE → CL | 0.828 | 0.056 | 14.752 | *** | accepted |
| H3a | SPQ → CL | 0.013 | 0.015 | 0.903 | 0.367 | rejected |
| H3b | SRQ → CL | 0.019 | 0.014 | 1.304 | 0.192 | rejected |
| H3c | SRC → CL | 0.031 | 0.015 | 2.104 | 0.035* | accepted |

*Note: 1. Note: SPQ: Service process quality; SRQ: Service result quality; SRC: Service recovery quality; CE: Customer engagement; CL: Customer loyalty. 2. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$*

# 5. Discussion and conclusions

## 5.1. General Discussion

From the perspective of consumers of an e-commerce platform for agricultural products, this paper brings customer engagement into the research framework of the online purchase of agricultural products. It discusses the impact of service quality of e-commerce platforms for agricultural products on customer loyalty and the mediating role of customer engagement in this process. The results show that the service quality of different dimensions has an impact on customer engagement; the service recovery quality of the agricultural e-business platform can not only directly promote customer loyalty but also indirectly affect customer loyalty through customer engagement. Service process quality and service result in quality only affects customer loyalty through customer engagement.

## 5.2. Management implications

This paper takes the e-commerce platform of agricultural products as the research object, verifies the strengthening effect of service quality on customer loyalty, and predicts customer loyalty through the fit between service quality and customer. The research results provide ideas and theoretical guidance for developing customer loyalty on the e-commerce platform of agricultural products and also lay a foundation for the further maintenance of loyal customers, which has a certain guiding significance.

First, the competition for agricultural products on more and more e-commerce platforms is increasingly fierce. When consumers purchase agricultural products on the e-commerce platform, the service process quality of the platform is the first perceived service quality of consumers, and it is also the pre-factor of customer engagement and loyalty. E-commerce platforms should adjust their strategies according to their characteristics and market changes. Strengthen the function of the e-commerce platform for agricultural products, provide real and effective information on agricultural products for consumers, reduce the online purchase process of agricultural products, and ensure the safety of online payment so that consumers have a good experience in online shopping.

Secondly, this study also confirms the importance of the quality-of-service results. Agricultural products e-commerce platforms should improve the service quality of online shopping and pay attention to the timely and high-quality delivery of agricultural products to consumers. High-quality service quality is the main source of customer engagement and customer loyalty. Therefore, the e-commerce platform should control packaging, delivery time, and logistics standards more strictly according to the characteristics of agricultural products.

Thirdly, it is precisely because of the particularity of agricultural products themselves that there is a great difference between buying ordinary goods (clothes, books, etc.) online. Therefore, when the service of an e-commerce platform appears, the service remedy measures of ordinary commodities in the e-commerce environment cannot be applied to the e-commerce platform environment of agricultural products. The e-commerce platform should be aware that when there is a lack of service, it should pay attention to active two-way communication with customers, quickly solve complaints, pay compensation as promised, timely understand customers' satisfaction with the remedial quality, and promote customers' trust again. In the process of interactive experience exchange, the agricultural products e-commerce platform should cultivate and retain continuous interaction with consumers to form a fit and achieve customer loyalty.

 

Finally, enterprises and customers should create value together. We should implement customer engagement management for customers, and customer engagement can solve this problem well. In creating value with enterprises, congenial customers invest in cognition, emotion, and behavior, which create value for enterprises and themselves. Creating value together is the process of continuous contact between enterprises and corresponding customers, and customer loyalty will be formed when experiencing service. Therefore, the goal of the e-commerce platform for agricultural products should transition from cultivating customer satisfaction to creating suitable customers and co-creating value activities. The formation of fit customers can maintain and promote corporate profits, maintain their loyalty to the platform, and become loyal customers.

### 5.3. Limitations and future research

This paper analyzes the different dimensions of service quality of agricultural products e-commerce platforms and the path of customer loyalty influenced by customer engagement. Although the research of this paper extends the research of customer loyalty of agricultural products e-commerce platforms to a certain extent, there are still the following deficiencies, and as the direction of further study.

First, the e-commerce platform of agricultural products mentioned by the interviewees in this paper covers many e-commerce platforms such as Taobao, Jingdong, Shunfeng, etc. Still, it is mainly an e-commerce platform that is highly popular. Promoting this conclusion is necessary to be further verified in other e-commerce platforms of agricultural products.

Secondly, this study collects data for the platforms that consumers often buy. Although the research model and hypothesis have been well verified, the research does not classify the types of agricultural products e-commerce platforms. Whether the research conclusions of this paper apply to other kinds of agricultural products e-commerce platforms also needs further verification.

Finally, in future research, we can consider some potentially relevant regulatory variables, such as the personal characteristics of consumers, the type of agricultural products purchased, etc. (in this paper, the respondents mainly buy fresh products) into the scope of the study, and improve the model, to get more accurate and systematic conclusions.

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