Research on The Impact of Reviews on Consumer Perceived Value in Live Streaming

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ABSTRACT
E-commerce live streaming is a new form of online shopping, showing an explosive growth trend in recent years. And live reviews are one of the important influencing factors of consumer behavior. Taking live-streaming reviews as the research object, this paper constructs a model of the impact of live-streaming reviews on consumer perceived value including the mediating variable of social presence. We also put forward some hypotheses, and then tested the model and hypotheses through empirical methods. The results show that review quantity and review valence have a positive impact on consumers' perceived utilitarian value, perceived hedonic value, and perceived social value. Meanwhile, social presence plays a partial mediating role in the impact of live comments on consumers' perceived value.

Keywords: Live-streaming reviews, Social presence, Consumer perceived value.

1. INTRODUCTION
Since the rise of live e-commerce in China in 2016, it has shown explosive growth in just a few years. According to the 45th "Statistical Report on the Development Status of the Internet in China", as of March 2020, Chinese e-commerce live broadcast users have reached 265 million, accounting for 37.2% of online shopping users.

E-commerce live streaming is a way for the anchor to show consumers the actual product through real-time video so that viewers can understand the real product more intuitively. The commenting function of e-commerce live streaming allows users to express their opinions in the comment section in real-time. It is not only a new form of instant feedback data based on real consumption situations [1], but also a type of online review.

Consumer perceived value, as an important factor influencing consumers' purchase decisions, has been shown to positively affect consumers' willingness to engage, purchase intention, and impulse buying behavior[2-5]. However, there are no specific studies on the impact of different dimensions of live commenting on consumers' perceived value. The comment function, as one of the important modules of e-commerce live streaming, has a non-negligible impact on consumer behavior. Based on this, this article takes e-commerce live streaming as the research object to empirically study the impact of comments on consumers' perceived value in the live broadcast context. This paper seeks to address the following questions.

(1) What characteristics of live commentary play a role in influencing consumers' perceived value?

(2) What values do the different characteristics of live commentary cause consumers to perceive?

(3) Does social presence play a role in the impact of live commentary on consumers' perceived value?

And the theoretical values and innovations of this study are as follows.

First, regarding the study of the impact of live commentary on consumers, most existing studies focus on the impact of interactivity between live streaming on consumers' perceived value, purchase intention, etc. Existing studies do not subdivide live commentary. This study divides the characteristics of live commentary into review quantity and review valence, which makes the study of the impact of live commentary on consumers a step deeper.

Second, this study introduces social presence as a mediating variable into the theoretical model. It has been shown that online reviews positively affect the social
presence and social presence positively affects consumers’ perceived value. However, no studies have linked the two in the same scenario and studied them together. This study not only expands the theoretical system of social presence theory, but also expands the scope of online reviews.

2. HYPOTHESES BASIS

Live review is a real-time text comment located in the bottom left corner of the live stream. This study combines the characteristics of live e-commerce streaming and existing research on pop-ups and online comments and divides live comments into two dimensions: review quantity, and review valence. In this study, review quantity refers to the sum of the number of comments in the comment section of the live streaming. Review valence refers to the quality or positiveness of consumers’ evaluations of products or services. When most of the online comments are positive, the overall comment valence is positive, otherwise it is negative. Meanwhile, this paper classifies the consumer perceived value that lives commentary may affect into three types: utilitarian value, hedonic value, and social value. Utilitarian value refers to consumers’ cognitive evaluation of the role of live commenting in helping consumers solve problems and achieve goals. Hedonic value refers to the positive emotions or feelings (such as pleasure and relaxation) that live commenting brings to consumers. Social value refers to consumers’ evaluation of the value produced by the realization of communication and purpose and social interaction/quasi-social interaction. This study proposes the following hypotheses.

H1a: review quantity positively affects the consumer's perceived utilitarian value.
H1b: review quantity positively affects the consumer's perceived hedonic value.
H1c: review quantity positively affects the consumer's perceived social value.
H2a: review valence positively affects the consumer's perceived utilitarian value.
H2b: review valence positively affects the consumer's perceived hedonic value.
H2c: review valence positively affects the consumer's perceived social value.
H3a: social presence plays a mediating role in the effect of review quantity on the consumer's perceived social value.
H3d: social presence plays a mediating role in the effect of review valence on the consumer's perceived utilitarian value.
H3e: social presence plays a mediating role in the effect of review valence on the consumer's perceived hedonic value.
H3f: social presence plays a mediating role in the effect of review valence on the consumer's perceived social value.

Moreover, this paper establishes the following theoretical model:

![Figure 1 Model of the impact of live commenting on consumers' perceived value](image)

3. RESEARCH DESIGN AND DATA ANALYSIS

3.1. Questionnaire Design and Research Samples

This study adopted a questionnaire survey method to obtain data, and the scale design in the questionnaire referred to the mature scales in existing studies. The items in the questionnaire were all measured on a 5-point Likert scale, from 1 to 5, indicating "completely disagree" to "completely agree" respectively. To ensure the validity of the data, requirements were set at the beginning of the questionnaire to identify the people who had participated in live e-commerce.

We distributed the initial questionnaire to 98 respondents for pre-study, of which 80 were valid. The collected data were used to test the reliability and validity of each variable. Both the reliability and validity met the requirements, indicating that the questionnaire could be used in the formal study.

3.2. Data Collection and Sample Description

This study collected questionnaires through the online platform named “Wenjuanxing”, a platform...
providing functions equivalent to Amazon Mechanical Turk. A total of 500 questionnaires were distributed and 450 were returned, with a return rate of 90%. Among them, there were 348 valid questionnaires, with an effective rate of 77.33%. The sample characteristics of the questionnaires are shown in Table 1.

As shown in Table 1, the respondents were balanced between men and women, and their ages were mainly distributed between 21 and 35 years old. Most of them have college and bachelor's degrees. Their occupations are mainly office workers and students, and their monthly income is mostly below 10,000 yuan. Most of these users are young people who have certain purchasing abilities but are interested in discounts on goods in live e-commerce, which is in line with the actual situation of the main group of live e-commerce. And most of the respondents have been in contact with live e-commerce for more than 1 year, and have a practical understanding of live e-commerce. Thus, this sample can better reflect the impact of live streaming reviews on consumers' perceived value.

Table 1. Descriptive Statistics of Demographic Variables

| Item                              | Category                                      | Frequency | Percentage /% |
|-----------------------------------|-----------------------------------------------|-----------|---------------|
| Gender                            | Male                                          | 178       | 51.10         |
|                                   | Female                                        | 170       | 48.90         |
| Age                               | 20 years old and below                        | 9         | 2.60          |
|                                   | 21-25 years old                              | 156       | 44.80         |
|                                   | 26-35 years old                              | 130       | 37.40         |
|                                   | 36-40 years old                              | 41        | 11.80         |
|                                   | Over 41 years old                            | 12        | 3.40          |
| Academic qualifications           | High school (including junior college) and below | 22        | 6.30          |
|                                   | College                                       | 134       | 38.50         |
|                                   | Undergraduate                                 | 159       | 45.70         |
|                                   | Master and above                              | 33        | 9.50          |
| Career                            | Students                                      | 110       | 31.60         |
|                                   | Commuters                                     | 130       | 37.40         |
|                                   | Freelancer                                    | 67        | 19.30         |
|                                   | Other                                         | 41        | 11.80         |
| Monthly income                    | Less than 1000 RMB                            | 118       | 33.90         |
|                                   | 1000-5000 RMB                                 | 67        | 19.30         |
|                                   | 5000-10000 RMB                                | 97        | 27.90         |
|                                   | 10000 RMB or more                             | 66        | 19.00         |
| Average monthly live shopping spend | Under 100 RMB                                | 90        | 25.90         |
|                                   | 100-500 RMB                                   | 178       | 51.10         |
|                                   | 500-1000 RMB                                  | 49        | 14.10         |
|                                   | Over 1000 RMB                                 | 31        | 8.90          |
| Exposure to live e-commerce hours | Less than 6 months                           | 57        | 16.40         |
|                                   | 6 months - 1 year                             | 49        | 14.10         |
|                                   | 1 year - 2 years                              | 127       | 36.50         |
|                                   | More than 2 years                             | 115       | 33.00         |
| Total                             |                                               | 348       | 100.00        |
3.3. Reliability Analysis

In this study, the reliability of the scale was tested by Cronbach’s α coefficient and SPSS 24.0 software was used for reliability analysis. The results of Cronbach’s α coefficient analysis are shown in Table 2. As shown in Table 2, the Cronbach’s α values for the scale as a whole as well as for each variable were greater than 0.7, indicating good internal consistency of the scale in this study.

Table 2. Reliability Analysis Results

| Variables          | Number of question items | Cronbach’s α |
|--------------------|--------------------------|--------------|
| Review Quantity    | 4                        | 0.915        |
| Review Valence     | 3                        | 0.916        |
| Social Presence    | 6                        | 0.918        |
| Utilitarian Value  | 4                        | 0.901        |
| Hedonic Value      | 6                        | 0.92         |
| Social Value       | 5                        | 0.933        |
| All Variables      | 28                       | 0.955        |

3.4. Validity Analysis

The questionnaire used in this study was based on well-established scales from existing studies, and the hypothesis model had good theoretical support. Therefore, it can be considered that this paper has good content validity. In this paper, we first conducted KMO and Bartlett sphericity examination for all variables, and the KMO values for each variable were 0.824 for review quantity, 0.709 for review valence, 0.913 for social presence, 0.821 for utilitarian value, 0.904 for hedonic value, and 0.883 for social value, with an overall KMO value of 0.936, all with a significance of 0.000, indicating that The data of the live review scale are suitable for factor analysis.

This study used AMOS 24.0 software to test the validity of the measurement model by conducting a validated factor analysis.

First, we examined the structural validity of the measurement model. The fit indices of this measurement model are shown in Table 3. From Table 3, the value of χ2/df is 1.723, which is less than 3, indicating an ideal fit. The value of RMSEA is 0.046, which is less than 0.05, indicating a good fit. The value of CFI is 0.970, the value of IFI is 0.970, and the value of TLI is 0.966, all of which are greater than 0.9. The values of GFI are 0.893 and AGFI are 0.870, both of which are less than 0.9, but both are close to 0.9, which are within the acceptable range, indicating that the adaptation is qualified. Overall, the model is well adapted.

Table 3. Table of overall fitting coefficients

| χ2/df | RMSEA | GFI | AGFI | CFI  | IFI  | TLI  |
|-------|-------|-----|------|------|------|------|
| 1.723 | 0.046 | 0.893 | 0.870 | 0.970 | 0.970 | 0.966 |

Next, we examined the internal consistency and convergent validity of the measurement model. Larger CR values indicate a high correlation between indicators. Generally, a CR value greater than 0.7 indicates a good internal consistency of the measurement model. The average variance extracted (AVE) is an indicator of convergent validity. Generally, AVE greater than 0.5 indicates that the measurement model has good convergent validity. As can be seen from Table 4, the factor loadings of each latent variable for the review quantity, review valence, social presence, utilitarian value, hedonic value, and social value for each topic are all greater than 0.6, indicating that each latent variable is highly representative of the topic to which it belongs. In addition, the AVE of each latent variable is greater than 0.5 and the combined reliability is greater than 0.7, indicating that the convergent validity is ideal and the measurement model has good intrinsic quality.

Table 4. Factor loadings

| Paths          | Standard load | AVE | CR  |
|----------------|---------------|-----|-----|
| A1 ← Review Quantity | 0.819         |     |     |
| A2 ← Review Quantity | 0.739         |     |     |
| A3 ← Review Quantity | 0.931         |     |     |
| A4 ← Review Quantity | 0.925         |     |     |
| B1 ← Review Valence  | 0.917         | 0.801 | 0.923 |
Finally, there is a test of discriminative validity. This study uses the square root of average variance extraction (AVE) to compare with the correlation coefficient between the latent variables to judge. When the square root of AVE is greater than the correlation coefficient between the latent variables, it indicates that the model has good discriminative validity. It can be seen from Table 5 that review quantity, review valence, social presence, utilitarian value, hedonic value, and social value are all significantly correlated (p<0.001), and they are all less than the square root of the corresponding AVE, indicating that each potential variable has a certain correlation and a certain degree of discrimination between each other, which means that the discriminative validity of the scale data is ideal.

Table 5. Distinct validity

|                         | Review Quantity | Review Valence | Social Presence | Utilitarian Value | Hedonic Value | Social Value |
|-------------------------|-----------------|----------------|----------------|-------------------|---------------|--------------|
| Review Quantity         | 0.7348          |                |                |                   |               |              |
| Review Valence          | 0.474***        | 0.801          |                |                   |               |              |
| Social Presence         | 0.553***        | 0.477***       | 0.6537         |                   |               |              |
| Utilitarian Value       | 0.534***        | 0.447***       | 0.514***       | 0.7102            |               |              |
| Hedonic Value           | 0.577***        | 0.567***       | 0.508***       | 0.501***          | 0.6606        |              |
| Social Value            | 0.552***        | 0.550***       | 0.587***       | 0.586***          | 0.546***      | 0.7371       |
| Square Root of AVE      | 0.857           | 0.895          | 0.809          | 0.843             | 0.813         | 0.859        |

*** represents p-values less than 0.001, and the diagonal line is the AVE mean-variance extracted.
3.5. Structural Equation Modeling

3.5.1. Overall Model Fit Test

In this study, the AMOS 24.0 software was used to test the fit indicators of the structural equation model fitness. The results are shown in Table 6. The $\chi^2/df$ is 1.807, which is lower than 3. The RMSEA is 0.048, which is less than the standard 0.05. The GFI is 0.886 and the AGFI is 0.864, which are not very good, but both are close to 0.9. The CFI is 0.967, the IFI is 0.967, and the TLI is 0.963, which are all greater than 0.9. Overall, the structural model of this study fits well. The hypothesis testing can be carried out in the next step.

| Goodness-of-fit index | $\chi^2/df$ | RMSEA | GFI | AGFI | CFI | IFI | TLI |
|-----------------------|-------------|-------|-----|------|-----|-----|-----|
| Fitted value          | 1.807       | 0.048 | 0.886 | 0.864 | 0.967 | 0.967 | 0.963 |
| Judgment Criteria     | <3.000      | <0.050 | >0.900 | >0.900 | >0.900 | >0.900 | >0.900 |

3.5.2. Model Hypothesis Testing

This study hypothesized that review quantity and review valence positively influenced perceived utilitarian value, perceived hedonic value, and perceived social value. Social presence plays a mediating role in the influence of review quantity and review valence on perceived utilitarian value, perceived hedonic value, and perceived social value. The results of the model are shown in Figure 2.

From the results of the runs, the standard regression coefficients for all paths were significant. This indicates that the research hypotheses H1a, H1b, H1c, H2a, H2b, and H2c were supported, as shown in Table 7. The results show that the coefficient of the path between review quantity and utilitarian value is 0.31 and reaches the significance level of 0.01, so hypothesis H1a is valid. The path coefficient of review quantity and hedonic value is 0.33 and reaches the significance level of 0.01, so hypothesis H1b holds. The path coefficient of review quantity and social value is 0.25, which reaches the significance level of 0.01, so hypothesis H1c holds. The path coefficient of review valence and utilitarian value is 0.18 and reaches the significance level of 0.01, so hypothesis H2a holds. The coefficient of the path between review valence and hedonic value is 0.33 and reaches the significance level of 0.01, so hypothesis H2b holds. The coefficient of the path between review valence and social value is 0.28, which reaches the significance level of 0.01, so hypothesis H2c is valid. The effects of review quantity and review valence on perceived utilitarian value, perceived hedonic value, and perceived social value were significant.

| Paths                                           | Standardization factor | S.E. | C.R.  | P    | Significance  |
|-------------------------------------------------|------------------------|------|-------|------|---------------|
| H1a: Review Quantity → Utilitarian Value         | 0.309                  | 0.052| 5.133 | ***  | Significant   |
| H1b: Review Quantity → Hedonic Value             | 0.328                  | 0.049| 5.758 | ***  | Significant   |
| H1c: Review Quantity → Social Value              | 0.248                  | 0.057| 4.469 | ***  | Significant   |
| H2a: Review Valence → Social Value               | 0.179                  | 0.058| 3.21  | **   | Significant   |
| H2b: Review Valence → Hedonic Value              | 0.332                  | 0.055| 6.11  | ***  | Significant   |
| H2c: Review Valence → Social Value               | 0.285                  | 0.065| 5.415 | ***  | Significant   |

Note: *** represents $p<0.001$; ** represents $p<0.01$; same below.
3.5.3. A Test of the Mediating Effect of Social Presence

The Bootstrap method was used in this study to investigate the mediating role of social presence in the effects of review quantity and review valence on perceived utilitarian value, perceived hedonic value, and perceived social value. Whether the confidence interval contains 0 at 95% accuracy was used as the criterion for judging the mediating effect. The results are shown in Table 8.

Table 8. Results of mediated effects of social presence

| Paths                          | Effect Value | SE  | Bias-corrected 95% CI   | Percentile 95% CI   |
|-------------------------------|--------------|-----|------------------------|---------------------|
|                               |              |     | Lower  | Upper  | P     | Lower  | Upper  | P     |
| Review Quantity - Social Presence - Utilitarian Value | 0.073 | 0.034 | 0.015 | 0.151 | 0.015 | 0.012 | 0.147 | 0.02  |
| Review Quantity - Social Presence - Hedonic Value | 0.112 | 0.04  | 0.043 | 0.201 | 0.002 | 0.038 | 0.194 | 0.002 |
| Review Quantity - Social Presence - Social Value | 0.135 | 0.036 | 0.075 | 0.221 | 0     | 0.071 | 0.212 | 0     |
| Review Valence - Social Presence - Utilitarian Value | 0.048 | 0.024 | 0.01  | 0.106 | 0.014 | 0.008 | 0.101 | 0.02  |
| Review Valence - Social Presence - Hedonic Value | 0.074 | 0.03  | 0.027 | 0.148 | 0.001 | 0.023 | 0.137 | 0.002 |
| Review Valence - Social Presence - Social Value | 0.089 | 0.029 | 0.041 | 0.157 | 0     | 0.039 | 0.154 | 0     |

As can be seen from Table 8, the Bootstrap test intervals for review quantity and review valence to ultimately affect utilitarian value, hedonic value, and social value through social presence do not contain 0, indicating the existence of a mediating effect. Since review quantity and review valence have direct effects on utilitarian value, hedonic value and social value, the mediating effect of social presence is a partial mediating effect. Hypotheses H3a, H3b, H3c, H3d, H3e, and H3f all hold.

4. CONCLUSION

This paper introduces the theory of social presence and empirically analyzes the impact of live commentary on consumers’ perceived value. The research conclusions are as follows.

First, review quantity can positively affect consumers’ perceived utilitarian value, perceived hedonic value, and perceived social value.

Second, review valence can positively affect consumers’ perceived utilitarian value, perceived hedonic value, and perceived social value.

Third, social presence plays a mediating role in the effect of review quantity and review valence on consumers’ perceived value (including perceived utilitarian value, perceived hedonic value, and perceived social value).

AUTHORS’ CONTRIBUTIONS

Chunxiao Liu contributed to the conception of the study, performed the experiment, contributed and contributed to analysis and manuscript preparation.

Hao Zhang helped perform the analysis with constructive discussion.

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