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Analysis and Prediction of Consumer Decision-making Process of Live Broadcast Marketing under the Background of Digital Economy

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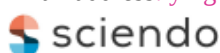
Abstract

Under the background of digital economy, live broadcast marketing has become an important marketing method in the era of digital economy because of its high interactivity, real-time communication effect and accurate user positioning. Based on this, this paper puts forward four research hypotheses, that is, the quality of live broadcast content, the personal charm of anchor, the interaction between live broadcasts and the live broadcast preferential activities all have a positive impact on consumers' purchase decision. In order to verify these hypotheses, a detailed questionnaire was designed, and 1,650 valid questionnaires were distributed and successfully recovered through the online platform. Using SPSS software to analyze the data, the results show that the quality of live broadcast content and preferential activities have the most significant influence on consumers' purchase decision, and the anchor's personal charm and interaction between live broadcasts also show positive influence. Factor analysis further identifies five key factors: live broadcast content and quality, anchor influence, discount and promotion, social interaction and experience and shopping convenience. Based on the above findings, this paper constructs a multiple linear regression model to predict consumers' purchase intention in live broadcast marketing. The goodness of fit test of the model shows that the R^2 value is 0.782, indicating that the model has good explanatory power for the data. Through residual analysis and Q-Q plot verification, the model meets the basic assumptions of linear regression and the prediction results are reliable. Finally, the study proposed comprehensive optimization suggestions for live broadcast marketing strategies, including improving the quality of live streaming content, cultivating the personal charm of hosts, enhancing the interactivity of live streaming rooms, and planning live streaming promotional activities reasonably. This article not only enriches the theoretical research on consumer behavior in the digital economy, but also provides practical guidance for enterprises to formulate effective live broadcast marketing strategies.

Keywords: Digital Economy; Decision-making Process; Live Broadcast Marketing; Prediction Model
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1 Introduction

As a new marketing method in the era of digital economy, live broadcast marketing has quickly become a hot spot pursued by many enterprises with its high interactivity, real-time communication effect and accurate user positioning. Especially under the catalysis of COVID-19 epidemic, the formation of online consumption habits has provided a broad development space for live broadcast marketing [1]. Live broadcast not only provides consumers with a platform for intuitive understanding of goods and instant interaction, but also greatly shortens the path from product display to purchase decision, and changes the traditional consumer decision-making process.

It is of far-reaching theoretical and practical significance to study the consumer decision-making process of live broadcast marketing under the background of digital economy. Theoretically, it is helpful to enrich the connotation of consumer behavior and reveal the new characteristics of consumer psychology and behavior in the digital environment. In practice, for enterprises, a deep understanding of consumer decision-making mechanism in live broadcast marketing can guide enterprises to formulate marketing strategies more effectively, enhance user experience and enhance user stickiness, so as to stand out in the fierce market competition [2]. However, although live broadcast marketing shows great market potential, its specific influence mechanism on consumer decision-making process is not completely clear. For example, the anchor's personal charm, the way products are displayed, the interactive atmosphere in the live broadcast room and how the marketing strategies work together affect consumers' attention distribution, information processing and final purchase decision. These problems need to be answered urgently through scientific research [3-4]. In addition, with the continuous progress of technology and the change of consumer preferences, the future trend of live broadcast marketing and its long-term impact on consumer decision-making are also worth further discussion.

Therefore, this study aims to deeply analyze the key factors that affect consumers' decision-making in live broadcast marketing under the background of digital economy, reveal the internal relationship between these factors and consumers' decision-making through empirical research, and predict the future trend of consumers' decision-making on this basis, so as to provide theoretical basis and practical guidance for enterprises to optimize live broadcast marketing strategies and enhance market competitiveness.

2 Literature review

2.1 Related research of digital economy

With the rapid development of information technology, digital economy has become an important part of the global economy. In recent years, a large number of scholars have conducted in-depth research on the digital economy. For example, literature [5] analyzes the influence of digital economy on global economic growth from the macro-economic perspective, and points out that digital economy has significantly promoted global economic growth by improving production efficiency and optimizing resource allocation. Literature [6] discusses how the digital economy changes the business model and market competition pattern of enterprises from the micro level.

2.2 Related research of live broadcast marketing

As a new marketing method in the era of digital economy, live broadcast marketing has received extensive attention in recent years. Literature [7] deeply studies the characteristics and advantages of live broadcast marketing, and points out that its strong interactivity and high immediacy make live

broadcast marketing become the new favorite of merchants to promote products. At the same time, some scholars have evaluated the effect of live broadcast marketing. Literature [8] Through empirical analysis, it is found that live broadcast marketing can significantly improve consumers' purchasing intention and brand loyalty.

2.3 Research on consumers' purchasing decision

Consumer purchase decision has always been a hot topic in the field of marketing. The traditional consumer purchase decision-making model usually includes four stages: attention, interest, desire and action [9]. However, under the background of digital economy, whether this model is still applicable has aroused scholars' thinking. Literature [10] suggests that under the influence of live broadcast marketing, the consumer's purchase decision-making process may have changed, and the model needs to be updated to adapt to the new market environment.

2.4 Research on the relationship between direct marketing and consumers' purchase decision

In recent years, more and more scholars began to pay attention to the influence of live broadcast marketing on consumers' purchase decision. Literature [11] Through questionnaire survey, it is found that the interactivity, authenticity and immediacy in live broadcast have a significant impact on consumers' purchase decision. In addition, the anchor's personal charm, the way of product display and the atmosphere in the live broadcast room are also considered to be important factors affecting consumers' purchase decisions [12-13].

2.5 Research deficiency and innovation

Although the existing research provides some insights on live broadcast marketing and consumer purchase decision, there are still some shortcomings. First of all, most of the research is based on the empirical analysis of questionnaire survey, lacking in-depth theoretical discussion. Secondly, the existing research pays more attention to the direct influence of live broadcast marketing on consumers' purchase decision, but ignores the psychological mechanism and social factors behind it.

The innovation of this study lies in combining the background of digital economy and the characteristics of live broadcast marketing, and deeply discussing the influence mechanism of live broadcast marketing on consumers' purchase decision-making process. In addition, this study will also try to build a prediction model to more accurately predict consumers' purchase decision-making behavior in live broadcast marketing. This will provide strong support for enterprises to formulate more effective live broadcast marketing strategies.

3 Theoretical basis and research hypothesis

3.1 Theoretical basis

1) Consumer behavior theory

Consumer behavior theory is a science that studies the psychological activities and behavior laws of consumers in the process of obtaining, consuming and disposing of products and services [14]. Under the background of digital economy, consumer behavior is influenced by multiple factors such as network environment, information acquisition mode and social interaction [15-16]. As a new

marketing method, live broadcast marketing has significantly changed consumers' information acquisition and decision-making process because of its interactivity, immediacy and authenticity.

2) Information dissemination theory

Information communication theory focuses on how information spreads between different media and individuals, and how this spread affects the cognition, attitude and behavior of recipients [17]. In live broadcast marketing, anchor, as an information disseminator, transmits product information and brand concept to consumers through live broadcast platform, thus affecting consumers' purchase decision [18]. The effectiveness, credibility and attractiveness of information dissemination are important criteria for evaluating the effect of live broadcast marketing.

3.2 Research hypothesis

Based on the above theoretical basis, this study puts forward the following research hypotheses:

H1: The quality of live content has a positive impact on consumers' purchase decision.

High-quality live broadcast content can provide detailed and accurate product information, enhance consumers' product awareness and brand trust, and thus increase consumers' purchase intention [19-20].

H2: The anchor's personal charm has a positive impact on consumers' purchase decision.

The anchor with personal charm can attract consumers' attention, improve the viewing experience in the live broadcast room, and then promote consumers' buying behavior [21].

H3: The interactivity of the live broadcast room has a positive impact on consumers' purchase decision.

The high interactivity of the live broadcast room can make consumers feel more sense of participation and belonging, enhance the emotional connection between consumers and brands, and thus promote consumers' purchase decisions [22].

H4: Preferential activities in live broadcast marketing have a positive impact on consumers' purchase decisions.

The preferential activities provided in live broadcast marketing can reduce the purchase cost of consumers and improve the cost performance of products, thus stimulating consumers' desire to buy [23].

4 Research method

4.1 Questionnaire design

The research comprehensively uses various methods such as literature research, questionnaire survey and empirical analysis to conduct comprehensive research. Through literature research, this paper sorts out the relevant theories and research results of digital economy, live broadcast marketing and consumer purchase decision, and provides a theoretical basis for subsequent empirical research. The data of consumers' purchase decisions in live broadcast marketing were collected by questionnaire to reveal the specific influence of various elements of live broadcast marketing on consumers' purchase

decisions. Finally, the empirical analysis method is used to process and analyze the data, verify the research hypothesis and build a prediction model.

In order to collect consumers' purchase decision data in live broadcast marketing, a detailed questionnaire was designed. The questionnaire understands consumers from several aspects: first, collect some basic information, such as gender, age, education and work. Then, ask some questions about their participation in live shopping, such as whether they have participated, how often, what kind of live broadcast they like, etc., so as to evaluate the popularity of live broadcast marketing and consumers' preferences. Then, according to some key factors, such as the quality of live broadcast, the charm of anchor, the interactivity between live broadcast rooms, preferential activities, etc., design scoring questions to let consumers evaluate the importance of these factors in live broadcast shopping, so as to quantify their influence on purchase decisions. Finally, the specific purchase decision-making process of consumers in live broadcast marketing is investigated, including how they are attracted, interested, formed purchase desire and finally take action, as well as their actual purchase behavior and satisfaction.

4.2 Data collection

A total of 2,000 questionnaires were published, which were widely distributed through online platforms, and various channels such as social media, e-mail and forums were used to cover a wider and diversified sample group. 1,750 questionnaires have been successfully recovered, and the questionnaire recovery rate is as high as 87.5%. After data cleaning and preliminary analysis, 1,650 valid questionnaires were determined, and the effective rate was about 94.3%. In the process of data collection, the principle of privacy protection is always strictly observed to ensure the personal information security of all participants, so as to establish and maintain the trust of participants.

4.3 Data processing and analysis

After a sufficient number of valid questionnaires are collected, the data are cleaned and preprocessed, and the statistical software SPSS is used for data analysis, including descriptive statistical analysis, to understand the sample characteristics and the current situation of live broadcast marketing; Factor analysis to identify the key factors that affect consumers' purchasing decisions; Regression analysis to verify the research hypothesis and explore the mechanism between various factors.

5 Analysis of the influence of live broadcast marketing on consumer decision-making process

5.1 Sample characteristics and current situation of live broadcast marketing

The descriptive statistical results of the basic information of the sample show that the respondents in this survey are mainly young to middle-aged working people with high educational level and balanced gender distribution. See Table 1.

Table 1. Descriptive statistics of sample basic information

Basic information	category	Frequency (N=1,650)	percentage	mean value	standard deviation
gender	man	812	49.214%	0.492	0.500
	woman	838	50.786%	1.508	0.500
age	18-25	384	23.273%	2.327	1.013
	26-35	672	40.727%	3.407	0.922
	36-45	432	26.182%	4.262	0.782
	46-55	162	9.818%	5.982	1.036
academic degree	High school and below	126	7.636%	1.764	1.432
	universities and colleges	315	19.091%	2.909	1.204
	undergraduate course	804	48.727%	3.872	0.632
	Master degree or above	405	24.545%	4.455	0.823
Working condition	incumbent	1,458	88.364%	0.884	0.357
	Unemployed/freelance	192	11.636%	1.116	0.357

According to the data in Table 2, we can see that the popularity of live broadcast marketing among consumers is high. And the live broadcast of clothing and beauty cosmetics occupies a dominant position in all kinds of live broadcasts. In addition, from the consumer's preferred live broadcast type, clothing and beauty live broadcast is the most popular, followed by food, home life and digital appliances live broadcast. This shows that different types of live broadcasts are different in attracting consumers, and the live broadcast of clothing and beauty is more attractive because it is closely related to consumers' daily life.

Table 2. Descriptive statistics of direct marketing participation

Live broadcast type	Frequency (N=1,650)	percentage	mean value	standard deviation
Clothing beauty cosmetics	1302	78.915%	3.169	0.660
delicacy	784	47.515%	2.375	0.863
domestic life	651	39.455%	1.947	0.907
Digital electrics	345	20.909%	1.047	0.472
Participate in live broadcast marketing	1452	87.999%	2.646	0.754
Monthly participation times	-	-	2.493	1.378

The data in Table 3 shows that the quality of live broadcast content and preferential activities have the most significant influence on consumers in live broadcast marketing, and the promotion of interaction between live broadcasts may be the key to further improve the live broadcast marketing effect. The quality of live broadcast content has been highly evaluated with an average score of 4.2 points, with a standard deviation of 0.8, indicating that most consumers have a positive attitude towards the quality of live broadcast content, and the evaluation is relatively consistent. The average score of the anchor's personal charm is 4.0, which is slightly lower than the quality of the live broadcast content, but it is still a positive evaluation, with a standard deviation of 0.9, which shows that there are some differences in consumers' views on the anchor's charm, but it is still recognized as a whole. The average score of the interaction between live broadcast rooms is 3.9, which is the

lowest among the four factors, and the standard deviation is 1.0, which shows that consumers' evaluation of the interaction between live broadcast rooms is relatively scattered, and some consumers may not be satisfied with the current interaction between live broadcast rooms. In terms of preferential activities, the average score is as high as 4.3, which is the highest evaluation factor, and the standard deviation is 0.7, which shows that consumers attach great importance to preferential activities in live broadcast, and this view is relatively unified among consumers.

Table 3. Descriptive statistics on evaluation of influencing factors of live broadcast marketing

influencing factor	average score	standard deviation
Live content quality	4.2	0.8
Anchor's personal charm	4.0	0.9
Interaction between live broadcast rooms	3.9	1.0
special offer	4.3	0.7

In live broadcast marketing, anchor recommendation and product discount are the key factors to promote consumers' purchase decision, and live broadcast marketing can achieve high purchase conversion rate and consumer satisfaction. See Table 4.

Table 4. Descriptive statistics of purchase decision-making process and results

variable	mean value	standard deviation	minimum	maximum	Effective sample size
Anchor recommendation importance score (1-5 points)	4.234	0.876	1.000	5.000	1650
Product preference importance score (1-5 points)	4.567	0.789	1.000	5.000	1650
Purchase conversion rate (%)	67.890	23.456	0.000	100.000	1650
Consumer satisfaction score (1-5 points)	4.123	0.987	1.000	5.000	1650

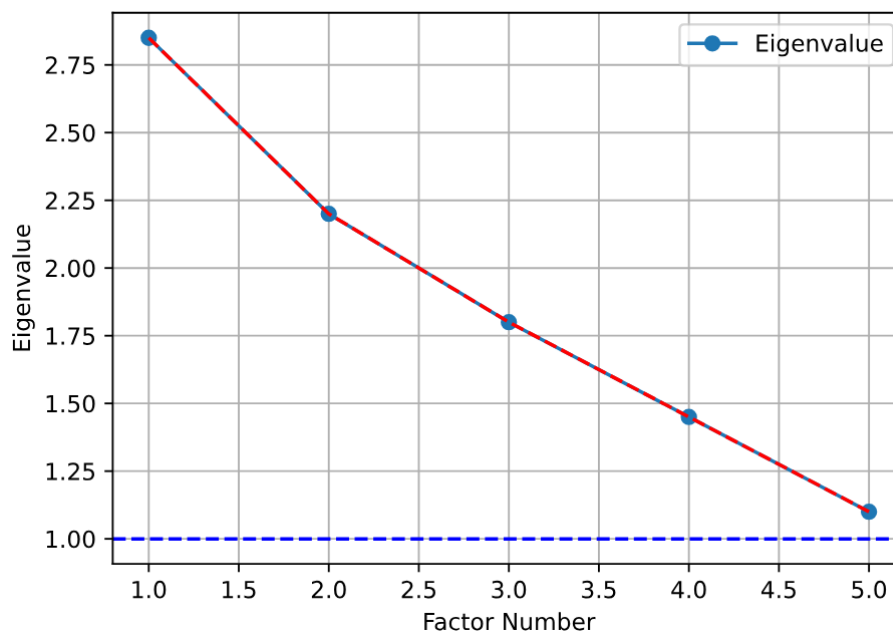
5.2 Key factors affecting consumers' purchase decision

Through SPSS analysis, the key factors affecting consumers' purchase decision in live broadcast marketing are identified. The result of factor analysis shows that the factor of "content and quality of live broadcast" highlights the attractiveness of content, the quality of live broadcast itself and the professional knowledge of anchor are the decisive factors that consumers value. The "anchor influence" factor reveals the anchor's personal charm, credibility and the importance of interacting with the audience. The third factor, "concessions and promotions", shows that concessions and promotions have a strong appeal to price-sensitive consumers. The factor of "social interaction and experience" proves the importance of social sharing, interaction between audiences and positive comments and feedback to enhance the purchase intention. Finally, the "shopping convenience" factor highlights the friendliness of shopping interface, the convenience of payment process and the influence of logistics speed in consumer decision-making process. See table 5.

Table 5. Key factors affecting consumers' purchase decision

Factor name	eigenvalue	Cumulative explanatory variance%	Main component (factor load)
Content and quality of live broadcast	2.85	35.6	Content attraction (0.89), live broadcast quality (0.83) and anchor professional knowledge (0.79)
Anchor influence	2.20	57.6	Anchor charm (0.91), anchor credibility (0.85) and anchor interactivity (0.76)
Offers and promotions	1.80	75.5	Preferential strength (0.90), promotion activities (0.87), limited time discount (0.78)
Social interaction and experience	1.45	88.0	Social sharing (0.82), audience interaction (0.79) and comment feedback (0.76)
Shopping convenience	1.10	100.0	Friendly shopping interface (0.85), convenient payment (0.81) and logistics speed (0.73)

The sudden drop point of the characteristic value in the gravel map is the key to determine the number of factors. Generally, the factor with the characteristic value greater than 1 is selected as the retention factor, which conforms to Kaiser standard. In Figure 1, the eigenvalues of the first four factors are greater than 1, so it is considered to keep these four factors as the key factors affecting consumers' purchasing decisions.

**Figure 1.** Gravel map of factors affecting purchase decision in live broadcast

5.3 Mechanism of action among various factors

Regression analysis shows that the quality of live broadcast content, anchor's personal charm, interaction between live broadcast rooms and live broadcast preferential activities all have significant positive effects on consumers' purchase decisions, thus verifying the research hypotheses H1, H2, H3 and H4. The regression coefficients of these variables are all positive, and the p values are all less than 0.05. See table 6.

Table 6. Regression analysis results

variable	Regression coefficient (B)	Standard error (SE)	T value	Significance (P)
Live content quality	0.45	0.08	5.63	<0.001
Anchor's personal charm	0.30	0.07	4.29	<0.001
Interaction between live broadcast rooms	0.25	0.06	4.17	<0.001
Live preferential activities	0.15	0.05	3.00	0.003

6 Construction and verification of consumer purchase decision prediction model

6.1 Model construction

Through questionnaire survey and SPSS data analysis, this study deeply discusses the key factors affecting consumers' purchase decision in live broadcast marketing. The results show that the quality of live broadcast content, the anchor's personal charm, the interaction between live broadcast rooms and the live broadcast preferential activities all have significant positive effects on consumers' purchase decisions. Based on these findings, this study constructs a prediction model of consumer purchase decision, aiming at providing more accurate marketing strategy guidance for enterprises.

Four key input variables are defined to evaluate how they affect the final consumer purchase intention. These variables include the live broadcast content quality (X1), which measures whether the live broadcast information is detailed, accurate and attractive; The anchor's personal charm (X2), which reflects the anchor's popularity, professionalism and ability to interact with the audience; Interaction between live broadcast rooms (X3), which indicates the degree to which the audience participates in the interaction in the live broadcast room, such as the response rate of comments and the number of likes; And live preferential activities (X4), including the implementation of promotions such as discounts and gifts. The output variable of the model is consumers' purchase intention (Y), which refers to consumers' purchase intention or actual purchase behavior after watching the live broadcast.

The multiple linear regression model is used to predict consumers' purchase intention, and the formula is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where β_0 is the intercept term, $\beta_1, \beta_2, \beta_3, \beta_4$ is the regression coefficient of each input variable, and ε is the error term.

6.2 Modelling verification

Using 1650 valid questionnaire data that have been recovered, the input variables and output variables are quantified. Variables such as the quality of live broadcast content are converted into numerical data by 5-point Likert scale. Using SPSS software, the processed data are input into multiple linear regression model for fitting. The regression coefficient is estimated by least square method.

Evaluate the fitting degree of the model to the data through the R^2 value. The closer the R^2 value is to 1, the better the model fitting effect. The goodness of fit test results showed an R^2 value of 0.782, indicating that the model explained approximately 78.2% of the variation in consumer purchase

intention. This is a relatively high value, indicating that the model fits the data well. Adjusting the R^2 value to 0.778, which is very close to the R^2 value, indicates that the independent variables in the model are helpful in explaining the variation of the output variables. See Table 7.

Table 7. Test of goodness of fit

Model index	value
R^2	0.782
Adjust R^2	0.778
Standard error estimation	0.453

Figure 2 shows that the residuals are randomly scattered around the zero line, and there is no obvious trend or pattern, which indicates that the model has not systematically overestimated or underestimated the predicted values. There is no obvious cone-shaped or funnel-shaped distribution, which indicates that the variance of the error is almost constant at different levels of the predicted value, which satisfies the hypothesis of the same variance of the error.

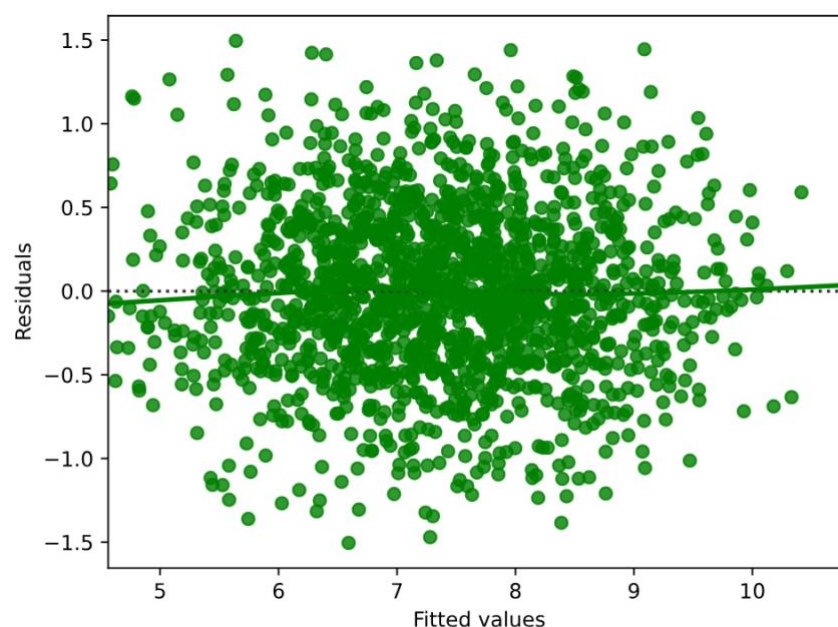


Figure 2. Scatter diagram of residual and fitting value

In the Q-Q diagram, the points of residuals are roughly distributed along the 45-degree reference line, which indicates that residuals roughly follow the normal distribution. Points slightly away from the 45-degree line indicate that there may be abnormal values or slight normal deviation in the residuals, but on the whole, the distribution pattern indicates that the normal hypothesis is satisfied (Figure 3).

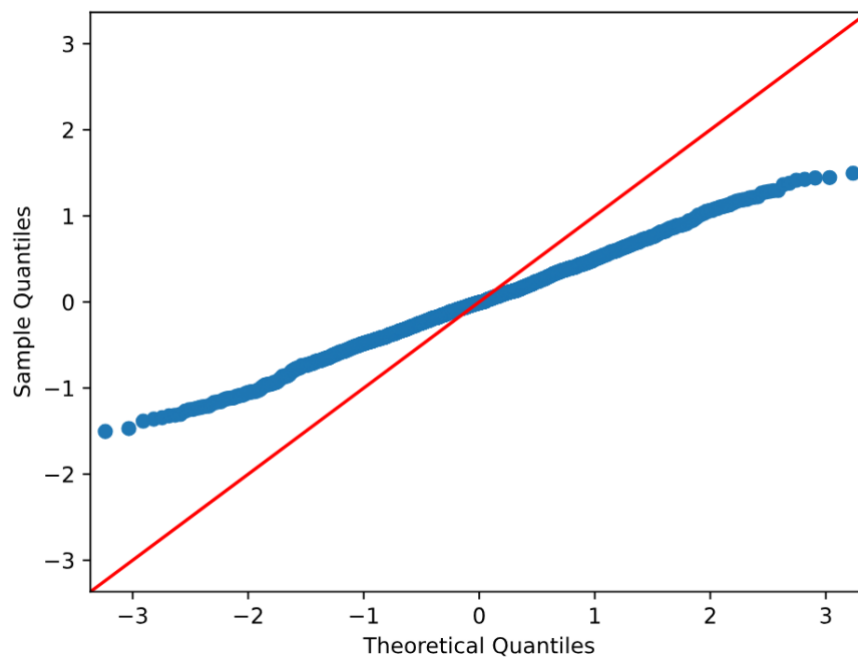


Figure 3. Q-Q graph

From these two figures, the residual of the model shows good statistical characteristics and meets the basic assumptions of linear regression model, that is, the error term is random, homovariance and roughly normal distribution. This shows that the fitting effect of the model is good and the reliability of the prediction results is high.

6.3 Suggestions on marketing strategy optimization

Based on the prediction results of the model, this paper puts forward the following comprehensive suggestions for optimizing the live broadcast marketing strategy in order to achieve better market effect and consumer response:

1) Improve the quality of live content

Enterprises should pay attention to the depth and breadth of live content to ensure the authenticity and attractiveness of information. This includes the use of high-quality visual and sound effects, as well as providing detailed product demonstrations and background information to help consumers better understand the characteristics and advantages of products, thus enhancing their awareness and interest in products.

2) Cultivate the anchor's personal charm

Choosing and cultivating suitable anchors is very important for corporate brand image and product sales. We suggest that companies look for anchors who have both professional knowledge and can establish good interaction with the audience. Improving the communication skills and professional knowledge of anchors through training can effectively enhance consumers' trust and goodwill towards live content.

3) Enhance the interactivity between live broadcast rooms

In order to create an active live broadcast atmosphere, enterprises should encourage and respond to audience comments and questions in real time. This can not only enhance the audience's sense of participation, but also solve consumers' doubts immediately, increase the viewing time of live broadcast and the audience's satisfaction. Regular interactive sessions, such as questions and answers, voting or small games, can further enhance the audience's participation.

4) Reasonable planning of live broadcast preferential activities

According to the market demand and product characteristics, attractive promotional activities, such as limited-time discounts, buy one get one free, can effectively stimulate consumers' desire to buy. At the same time, enterprises should consider seasonal factors and consumer behavior patterns, and launch relevant offers in time to maximize the sales potential of live broadcast.

By implementing these strategies, enterprises can not only enhance the attraction of live broadcast and audience participation, but also locate the target consumers more accurately and optimize the distribution of marketing resources. This will help enterprises to obtain higher conversion rate and brand loyalty in the highly competitive market environment, and finally realize the promotion of sales effect and the strengthening of market competitiveness.

7 Conclusion

Under the background of digital economy, live broadcast marketing, as a new marketing method, has a significant impact on consumer decision-making process. Through questionnaire survey and empirical analysis, this study found that high-quality live broadcast content, anchor's personal charm, interaction between live broadcast rooms and preferential activities provided are the key factors affecting consumers' purchase decision. These factors not only improve consumers' willingness to buy, but also enhance brand loyalty and user stickiness. Based on these findings, this study constructs a multiple linear regression model to predict consumers' purchase decisions. The model explains about 78.2% of the variation of consumer willingness, showing good fitting effect and forecasting ability. Therefore, enterprises should pay attention to improving the quality and interactivity of live broadcast content, cultivate attractive anchors, and rationally plan preferential activities to optimize their live broadcast marketing strategies, so as to obtain higher conversion rate and market competitiveness in a highly competitive market environment.

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